CITY of DULUTH
Spirit Mountain Recreation Authority
Contract Documents

Contract B – Water Supply Pump Stations

Duluth, Minnesota

Bid No.: SM 4502B

Opening Date: November 20, 2014

Time: 2:00 pm

Place: RM 100, Duluth City Hall
411 West 1st St.
Duluth, MN 55802

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SPECIFICATIONS SIGNATURE PAGE

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.

Signature	Jeffrey R. Ledin Typed or Printed Name
Oct / 17 / 2014 Date	25222 License No.

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PROJECT DIRECTORY

Project Name: Contract B - Water Supply Pump Stations **Location:** Duluth, Minnesota

Owner
Name: Spirit Mountain Recreation Area
Address: 9500 Spirit Mountain Place
Duluth, MN 55810
Contact: Brandy Ream, Executive Dir.
Phone: 218-624-8501
E-mail: bream@spiritmt.com

Owner
Name: Spirit Mountain Recreation Area
Address: 9500 Spirit Mountain Place
Duluth, MN 55810
Contact: Jody Ream, General Manager
Phone:
E-mail: jream@spiritmt.com

Owner
Name: Spirit Mountain Recreation Area
Address: 9500 Spirit Mountain Place
Duluth, MN 55810
Contact: Ryan Abel, Trail Maintenance Mgr.
Phone:
E-mail: ryanabel@spiritmt.com

Project Manager
Name: Foster Jacobs Johnson
Address: 345 Canal Park Drive Suite 200
Duluth, MN 55802
Contact: Randy Anderson
Phone: 218.213.1825
E-mail: randya@fjj.com

Engineer
Name: SEH
Address: 416 South 6th Street, Suite 200
Brainerd, MN 56401-3540
Contact: Jeff Ledin
Phone: 218.855.1711
Fax: 888.908.8166
E-mail: jledin@sehinc.com

Other
Name:
Address:
Contact:
Phone:
Fax:
E-mail:

Snow Making Consultant
Name: Torrent Engineering & Equipment
Address: P.O. Box 270
10693 N. Orn Rd.
Milford, IN 46542
Contact: Mark Meadows
Phone: 574.658.3200
E-mail: mark@torrentee.com

Other
Name:
Address:
Contact:
Phone:
E-mail:

END OF DOCUMENT

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TABLE OF CONTENTS

Number	Document
	Introductory Information
	Title Page
	Specifications Signature Page
	Project Directory
	Table of Contents
	Bidding Requirements
	Invitation to Bid
	Additional Forms
	Bid Form
	Non-Collusion Affidavit
	Contract Forms
	Performance Bond
	Payment Bond
	Conditions of the Contract
	Insurance and Indemnity Requirements
DIVISION 1 - GENERAL REQUIREMENTS	
	Summary
01 11 00	Summary of Work
	Price and Payment Procedures
01 25 13	Product Substitution Procedures
01 29 10	Applications for Payment
	Administrative Requirements
01 31 13	Coordination
01 31 19	Project Meetings
01 32 16	Progress Schedules
01 33 00	Submittal Procedures
	Temporary Facilities and Controls
01 52 19	Temporary Sanitary Facilities
01 57 12	Stormwater Management and Erosion Control
01 57 19	Air, Land, and Water Pollution
	Execution and Closeout Requirements
01 71 13	Mobilization
01 75 00	Starting and Adjusting
01 77 00	Closeout Procedures
DIVISION 3 - CONCRETE	
	Maintenance of Concrete
03 11 00	Concrete Forming
03 20 00	Concrete Reinforcing
	Cast-in-Place Concrete
03 30 00	Cast-in-Place Concrete

	Precast Concrete
03 41 00	Plant-Precast Structural Concrete

DIVISION 4 - MASONRY

04 20 00	Unit Masonry Assemblies

DIVISION 5 - METALS

05 12 00	Structural Steel Framing
05 50 00	Metal Fabrications

DIVISION 6 - WOOD, PLASTICS, AND COMPOSITES

06 10 00	Rough Carpentry
06 10 53	Miscellaneous Rough Carpentry
06 17 53	Shop-Fabricated Wood Trusses

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

	Thermal Protection
07 21 00	Thermal Insulation
07 21 19	Foamed-In-Place Masonry Insulation
	Roofing and Siding Panels
07 41 13	Metal Roofing and Wall Panels
	Joint Protection
07 92 00	Joint Sealants

DIVISION 8 - OPENINGS

	Doors and Frames
08 11 13	Hollow Metal Doors and Frames (Commercial)
	Specialty Doors and Frames
08 33 00	Coiling Doors and Grilles
	Entrances, Storefronts, and Curtain Walls
08 45 00	Translucent Wall and Roof Assemblies
	Hardware
08 71 00	Door Hardware
	Louvers and Vents
08 90 00	Louvers and Vents

DIVISION 9 - FINISHES

	Painting and Coating
09 91 00	Painting

DIVISION 10 - SPECIALTIES

	Interior Specialties
10 44 00	Safety Specialties

DIVISION 26 – ELECTRICAL

26 00 01	Certification
26 00 11	Basic Material and Methods
26 05 19	Low-Voltage Electrical Power Conductors and Cables
26 05 26	Grounding and Bonding for Electrical Systems
26 05 29	Hangers and Supports for Electrical Systems
26 05 34	Conduit
26 05 37	Boxes
26 21 00	Low-Voltage Electrical Service Entrance
26 24 16	Panelboards
26 27 17	Equipment Wiring
26 27 26	Wiring Devices
26 28 18	Enclosed Switches
26 29 13	Enclosed Controllers
26 51 00	Interior Lighting
26 56 00	Exterior Lighting

DIVISION 31 - EARTHWORK

	Earth Moving
31 23 16	Structure Excavations and Backfills

DIVISION 32 - EXTERIOR IMPROVEMENTS

	Bases, Ballasts, and Paving
	Aggregate Surfacing
32 15 00	Aggregate Surfacing

DIVISION 41 - MATERIAL PROCESSING AND HANDLING EQUIPMENT

41 22 00	Hoists & Trolleys
41 22 13	Bridge Cranes

DIVISION 46 - WATER AND WASTEWATER EQUIPMENT

46 31 33	Installation of Pump Stations

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CITY OF DULUTH
INVITATION TO BID (ENG)

PROJECT NAME/DESCRIPTION: City of Duluth, Spirit Mountain Recreation Area, Water System Improvements Contract B - Water Supply Pump Stations
SEH PROJECT NUMBER: FOSJJ 129137
BID NUMBER: SM 4502B

Sealed bids will be received by the City Purchasing Agent in and for the Corporation of the City of Duluth, Minnesota, at his office, Room 100 - City Hall, Duluth, Minnesota, 55802, (218) 730-5340 until 2:00pm local time on Thursday November 20, 2014 for the above named project. Immediately thereafter, bids will be taken to Room 106A - City Hall, where they will be publicly opened and read aloud.

NOTICE TO BIDDERS:

1. **A Project Labor Agreement (PLA) will be required for any bid that is over or could virtually go over $150,000.**
2. **Unless a Certificate of Exemption is provided, any out-of-state bidder receiving a bid award will have 8% retained from invoice payments on any contracts over $50,000**. **Submit a signed copy from the State of Minnesota when submitting Payment and Performance Bonds. This form may be found at the following web address: http://taxes.state.mn.us/Forms_and_Instructions/sde.pdf.**

Scope of project: Construction of two (2) Water Supply Pump Stations: Main pump station and River pump station; including site work, foundations, floors and complete building enclosures, plus mechanical and electrical equipment for these water pump stations. Also includes the installation of pump skids provided under separate contract.

Questions pertaining to this project should be directed to the issuing office: SEH, 418 W. Superior St., Ste. 200, Duluth, MN 55802, 218.279.3000.

A pre-Bid conference will be held at 10:00 a.m. on Thursday November 6, 2014 at Spirit Mountain Recreation Area, 9500 Spirit Mountain Place, Duluth, MN 55810. Representatives of Owner and Engineer will be present to discuss the Project. Bidders are encouraged to attend and participate in the conference.

Plans and specifications are on file for inspection at the City Engineering office, Duluth Builders Exchange, F.W. Dodge Plan Room, Minneapolis Builders Exchange and St. Paul Builders Exchange.

Digital image copies of the Bidding Documents are available at http://www.sehinc.com for a fee of $30. These documents may be downloaded by selecting this project from the BIDDING DOCUMENTS link and by entering eBidDocTM Number 3568732 on the SEARCH PROJECTS page. For assistance and free membership registration, contact QuestCDN at 952.233.1632 or info@questcdn.com.

Paper copies of the Bidding Documents may be obtained from Docunet Corp. located at 2435 Xenium Lane North, Plymouth, MN 55441 (763.475.9600) for a fee of $70.

A certified check or bank draft, payable to the order of the City of Duluth, negotiable U.S. Government Bonds (at par value), or a satisfactory bid bond executed by the bidder and acceptable surety, in an amount equal to five per cent (5%) of the total bid, shall be submitted with each bid.

Attention is called to the fact that not less than the minimum salaries and prevailing wages as set forth in the contract documents must be paid on this project. The contractor must take affirmative action to ensure that the employees and applicants for employment are not discriminated against because of their race, color, creed, sex or national origin, and must meet the affirmative action goals. Contractors are encouraged to subcontract with Disadvantaged Business Enterprises when possible.

Contractor will comply with all applicable Equal Employment Opportunity laws and regulations.

The City of Duluth is an Equal Opportunity employer.

CITY OF DULUTH
Dennis Sears
Purchasing Agent

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Additional Forms

The following forms and regulations/rules/statutes and interpretations, which are incorporated by reference in this contract, are available on the World Wide Web at the sites listed below. The City of Duluth will use its best efforts to ensure that the most recent, applicable forms and regulations/rules/statutes and interpretations are included on the web sites provided; however, if you are the successful bidder, prior to signing the contract, you are responsible for comparing the versions of the forms and regulations/rules/statutes and interpretations attached to the contract which you are signing with the versions on the web to ensure conformity.

THE VERSIONS OF THE FORMS AND REGULATIONS/RULES/STATUTES and INTERPRETATION ATTACHED TO THE CONTRACT WILL BE CONTROLLING. HARD COPIES OF ALL FORMS ARE AVAILABLE AT THE ENGINEERING DIVISION, EXCEPT THE NON-COLLUSION AND AFFIRMATIVE ACTION POLICY STATEMENT, WHICH ARE AVAILABLE AT THE CITY OF DULUTH PURCHASING DEPARTMENT.

Item listing from web:

FORM	WEB SITE
Affidavit of Non-Collusion (required by awarded contractor only)	www.duluthmn.gov/engineering/construction_documents.cfm
Affirmative Action Policy Statement/Certificate - EEO	www.duluthmn.gov/engineering/construction_documents.cfm
(required by awarded contractor only)	
Bidder's Label for submitting project bids	www.duluthmn.gov/engineering/construction_documents.cfm
Certified Payroll Report form WH347 (front side only)	www.dol.gov/whd/forms/WH347.pdf
Contractor's Haul Route	www.duluthmn.gov/engineering/construction_documents.cfm
Debarment/Suspension Notice (most current version)	www.dot.state.mn.us/pre-letting/prov/order/suspension.pdf
HUD 4010	www.hud.gov/offices/adm/hudclips/forms/files/4010.pdf
IC-134 form	www.taxes.state.mn.us/Forms_and_Instructions/ic134.pdf
IC-134 on-line submittal (click: Submit Contractor Affidavit; r-side of screen)	www.mndor.state.mn.us/
MN Rules 5200.1105 & .1106	www.duluthmn.gov/engineering/construction_documents.cfm
MN Statutes 177.41 to 177.44	www.revisor.mn.gov/statutes/?id=177
Notice to Bidders Prompt Payment to Subs	www.duluthmn.gov/engineering/construction_documents.cfm
One-Call Instructions	www.duluthmn.gov/engineering/construction_documents.cfm
Purchasing Division General Specifications	www.duluthmn.gov/engineering/construction_documents.cfm
Request to Sublet TP-21834 (5-12-09)	www.duluthmn.gov/engineering/construction_documents.cfm
Statement of Compliance Form (12-10)	www.dot.state.mn.us/const/labor/forms.html
Statement of Compliance Form - 2nd page WH347	www.dol.gov/whd/wh347.pdf
Supplemental General Conditions Part II 4/15/11	www.duluthmn.gov/engineering/construction_documents.cfm

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OFFICIAL SEALED BID

REQUEST FOR BID
Issue Date:10/21/2014
Bid # SM4502B

RETURN BY OPENING TIME TO:
Purchasing Division
RM 100 City Hall
411 West 1st Street
Duluth, MN 55802

Buyer: Dennis Sears
Phone: 218-730-5003
Fax: 218-730-5922

Contract B – Water Supply Pump Stations

BID OPENING, AT 2:00 PM ON Thursday, November 20, 2014

Note: All bids must be written, signed, and transmitted in a sealed envelope, plainly marked with the bid number, subject matter, and opening date. The City of Duluth reserves the right to split award where there is substantial savings to the city, waive informalities and to reject any and all bids. Bidder should state in proposal if bid is based on acceptance of total order. Sales tax is not to be included in the unit price. Bidder to state freight charges if, proposal is F.O.B. shipping point, freight not allowed. Low bid will not be the only consideration for award of bid. All pages must be signed or initialed by authorized bidder's representative as indicated at the bottom of the page(s) of the request for bid.

BID DEPOSIT REQUIREMENTS: 5% OF BID AMOUNT
Deposit shall mean cash, cashier's check or corporate surety bond payable to or in favor of the City of Duluth.

A PERFORMANCE BOND AND A PAYMENT BOND shall be required of the successful bidder, BOTH in the full amount of the bid.

INSUREANCE CERTIFICATE required per attached requirements.

ADDENDUM RECEIPT ACKNOWLEDGEMENTS:

ADDENDUM NO. , DATED _____

ADDENDUM NO. , DATED _____

ADDENDUM NO. , DATED _____

Total Bid: $_____

TOTAL BID IN WORDS:

_____

CONTRACTOR NAME:

_____

OFFICIAL SEALED BID

THE CONTRACTOR AGREES TO ALL OF THE PROVISIONS CONTAINED IN THE CONTRACT DOCUMENTS. ENCLOSED HEREWITH FIND A CERTIFIED CHECK OR BID BOND IN THE AMOUNT OF AT LEAST 5% OF THE AMOUNT OF PROPOSAL MADE PAYABLE TO THE CITY OF DULUTH AS A PROPOSAL GUARANTEE WHICH IT IS AGREED BY THE UNDERSIGNED WILL BE FORFEITED IN THE EVENT THE FORM OF CONTRACT AND BOND IS NOT EXECUTED, IF AWARDED TO THE UNDERSIGNED.

SIGNED: _____ FOR

_____

A PARTNERSHIP (OR)

_____

A CORPORATION INCORPORATED UNDER THE LAWS OF THE STATE OF:

_____

PRESIDENT _____

VICE-PRES. _____

SECRETARY _____

TREASURER _____

ADDRESS(ES) _____

_____

BEING DULY SWORN, DEPOSES AND SAYS THAT THERE ARE NO OTHER PERSONS COMPRISING ABOVE COMPANY OR FIRM THAN THE ABOVE NAMES, AND THAT THERE ARE NO PERSONS OR CORPORATIONS INTERESTED IN THE FORGOING PROPOSALS, EITHER AS PRINCIPAL OR SUBCONTRACTOR, OTHER THAN THE ABOVE NAMES; ALSO THAT THE PROPOSALS ARE MADE WITHOUT ANY CONNECTION WITH ANY PERSON OR PERSONS MAKING ANY PROPOSAL FOR THE ABOVE WORK; THAT THEY ARE IN ALL RESPECTS FAIR AND WITHOUT COLLUSION OR FRAUD; AND THAT NO PERSON ACTING IN ANY OFFICIAL CAPACITY FOR THE CITY OF DULUTH IS DIRECTLY OR INDIRECTLY INTERESTED THEREIN, OR IN ANY PORTION OF THE PROFIT THEREOF.

_____

OFFICIAL SEALED BID

SUBSCRIBED AND SWORN TO BEFORE ME THIS

DAY OF A.D.,

NOTARY
PUBLIC

IMPORTANT NOTE BIDDERS:
PLEASE DISREGARD THE NOTE ON PAGE 1
REGARDING SALES TAX FOR THIS BID. ALL
APPLICABLE SALES AND/OR USE TAXES ARE
TO BE INCLUDED IN BID PRICING. ALSO,
ALL BIDS ARE TO BE F.O.B. JOBSITE.
THE BLANK ON PAGE ONE FOR FREIGHT IS TO
TO BE LEFT BLANK.

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AFFIDAVIT AND INFORMATION REQUIRED OF BIDDERS

Affidavit of Non-Collusion:

I hereby swear (or affirm) under penalty of perjury:

1) That I am the bidder (if the bidder is an individual), a partner in the bidder (if the bidder is a partnership), or an officer or employee of the bidding corporation having authority to sign on its behalf (if the bidder is a corporation);

2) That the attached bid or bids have been arrived at by the bidder independently and have been submitted without collusion with and without agreement, understanding, or planned common course of action with any other vendor or materials, supplied, equipment or services described in the invitation to bid, designed to limit independent bidding or competition;

3) That the contents of the bid or bids have not been communicated by the bidder or its employees or agents to any person not an employee or agent of the bidder or its surety on any bond furnished with the bid or bids and will not be communicated to any such person prior to the official opening of the bid or bids; and

4) That I have fully informed myself regarding the accuracy of the statements made in this affidavit.

Signed:_____

Firm Name:_____

Subscribed and sworn to me before this____ day of _____, _____

NOTARY PUBLIC_____

My commission expires: _____

Bidder=s E.I. Number_____

(Number used on employer=s quarterly Federal Tax return)

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CITY OF DULUTH

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: That we:

_____
(contractor's name)

(hereinafter called the "Contractor") located at:_____

_____
(contractor's address)

and _____
(surety's name)

(a corporation holding a certificate of the Insurance Commissioner of the State of Minnesota showing that it is authorized to contract as a surety, hereinafter called the "Surety") located at:

_____
(surety's address)

are held and firmly bound unto the City of Duluth (hereinafter called the "Owner"), in the penal sum of _____ Dollars ($_____) for the payment of which we bind ourselves, our heirs, executors and administrators, successors and assigns, for the faithful performance of a written contract for the purpose of:

_____

_____

_____

according to plans, profiles, and specifications thereto annexed. A copy of that contract is incorporated herein by reference and is made a part hereof as if fully copied herein.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH That,

A) If the Contractor shall in all respects comply with the terms and conditions of the Contract (which includes the contract documents) and such alterations as may be made in said contract as documents therein provide for, and shall complete the contract in accordance with its terms,

B) If the Contractor shall indemnify, defend and save harmless the owner from all costs, expenses, damages, injury or conduct, want or care or skill, negligence or default, including patent infringement on the part of the Contractor, agents or employees, in the execution or performance of the contract,

C) If the Contractor shall indemnify the owner for all costs that may accrue on account of the enforcing of the terms of the bond, if action is brought on the bond, including reasonable attorney's fees, in any case where such action is successfully maintained,

D) If the Contractor shall comply with all laws pertaining to doing the work under the contract,

Then, this obligation shall be void; the Contractor and Surety jointly and severally agree to pay to the Owner any difference between the sum to which the Contractor will be entitled on the completion of the contract and that which the Owner may be obliged to pay for the completion of the work by contract or otherwise, and any damages, direct or indirect, or consequential, which the Owner may sustain on account of the work, or on account of the failure of the Contractor to properly and in all things, keep and execute all of the provisions of the Contract, provided however that Surety's liability to pay damages is limited to the amount of the Performance Bond as set forth above.

And, the said Contractor and Surety hereby further bind themselves, their successors, executors, administrators and assigns, jointly and severally, that they will employ and fully protect the said Owner against and will pay any and all amounts, damages, costs and judgements which may be recovered against or which the Owner may be called upon to pay to any person or corporation by reason of any damage arising from the performance of said work, repair or maintenance thereof, or the manner of doing the same, or the neglect of the said Contractor or his agents or servants, or the improper performance of the said work by the Contractor or his agents or servants, or the infringements of any patent rights by reason of the use of any material furnished or work done, as aforesaid, or otherwise. For the purpose of this paragraph, a subcontractor shall be deemed to be the agent or employee of the Contractor to the extent of his subcontract.

The Contractor and the Sureties do hereby expressly waive any objection that might be interposed as to the right of the Owner to require a bond containing the foregoing provisions, and they do hereby further expressly waive any defense which they or either and any of them might interpose to an action brought hereon by any person, firm, or corporation, including subcontractors, materialmen and third persons, for work, labor, services, supplies or material performed, rendered or furnished as aforesaid, upon the ground that there is no law authorizing the Owner to require the foregoing provisions to be placed in this bond.

And the Surety, for value received, hereby stipulates and agrees that the obligations of the Surety and this bond shall in no way be impaired or affected by any extension of time, modification, omission, addition or change in or to the contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provision thereof, or by any assignment, subletting or other transfer thereof, or of any part

thereof, or of any work to be performed, or of any moneys due or to become due thereunder; and the said Surety does hereby waive notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby stipulates and agrees that any and all things done and omitted to be done by and in relation to executors, administrators, successors, assignees, subcontractors and other transferees, shall have the same effect as to said Surety as though done or omitted to be done by and in relation to the Contractor.

Signed this _____ day of _____, 20___.

_____
Name of Principal

_____
By

_____
Name of Surety

By _____
Attorney-in-Fact

ACKNOWLEDGEMENTS

State of Minnesota)
) ss. Principal – Individual
County of St. Louis)

This instrument was acknowledged before me on _____
by _____.

Notary Seal _____
Notary Public

State of Minnesota)
) ss. Principal – Corporate or Partnership
County of St. Louis)

This instrument was acknowledged before me on _____
by _____ as _____
of _____.

Notary Seal _____
Notary Public

State of Minnesota)
) ss. Surety
County of St. Louis)

Be It Known, That on this _____ day of _____ A. D., 20___, came before me personally _____, to me personally known, who being by me duly sworn, did say that he/she is the _____(title) of _____ the above named corporation which executed the foregoing bond as surety; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; that said instrument was executed in behalf of said corporation, by authority of its Board of Directors; that said corporation hold a certificate of the Insurance Commissioner of the State of Minnesota showing that it is authorized to contract as a surety; and said _____ acknowledged said instrument to be the free act and deed of said corporation.

Notary Seal _____
Notary Public

APPROVED AS TO FORM, CORRECTNESS AND VALIDTY HEREOF

Dated this _____ day of _____, 20 ___

_____
Assistant City Attorney Duluth MN

Dated this _____ day of _____, 20 ___

_____
Finance Director Duluth MN

CITY OF DULUTH

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: That we:

_____
(contractor's name)

(hereinafter called the "Contractor") located at: _____

_____
(contractor's address)

and _____
(surety's name)

(a corporation holding a certificate of the Insurance Commissioner of the State of Minnesota showing that it is authorized to contract as a surety, hereinafter called the "Surety") located at:

_____
(surety's address)

are held and firmly bound unto the City of Duluth (hereinafter called the "Owner"), for the benefit of persons furnishing labor and materials for the contract set forth below, in the penal sum of

_____

Dollars ($_____) for the payment of which we bind ourselves, our heirs, executors and administrators, successors and assigns, for the payment of all labor and materials supplied by any person in the performance of a written contract for the purpose of:

_____

_____

according to plans, profiles, and specifications thereto annexed. A copy of that contract is incorporated herein by reference and is made a part hereof as if fully copied herein.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION ARE SUCH That,

A) If the Contractor shall make payments, as they may become due, to all persons supplying "labor and materials," as defined in Minnesota Statutes Section 574.26, used directly or indirectly by the Contractor, or his Subcontractor, in the prosecution of the work provided for in the contract,

B) If the Contractor shall indemnify the owner or other claimant for all costs that may accrue on account of the enforcing of the terms of the bond, if action is brought on the bond, including reasonable attorney's fees, in any case where such action is successfully maintained,

Then, this obligation shall be void; otherwise it shall remain in full force and effect.

And, the said Contractor and Surety agree that in accordance with Minnesota Statutes Section 574.26 not only said City, but any person furnishing “labor and materials,” as defined in Minnesota Statutes 574.26, may sue on this bond for their use on account of any sums due them for anything so furnished.

The Contractor and the Sureties do hereby expressly waive any objection that might be interposed as to the right of the Owner to require a bond containing the foregoing provisions, and they do hereby further expressly waive any defense which they or either and any of them might interpose to an action brought hereon by any person, firm, or corporation, including subcontractors, materialmen and third persons, for work, labor, services, supplies or material performed, rendered or furnished as aforesaid, upon the ground that there is no law authorizing the Owner to require the foregoing provisions to be placed in this bond.

And the Surety, for value received, hereby stipulates and agrees that the obligations of the Surety and this bond shall in no way be impaired or affected by any extension of time, modification, omission, addition or change in or to the contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provision thereof, or by any assignment, subletting or other transfer thereof, or of any part thereof, or of any work to be performed, or of any moneys due or to become due thereunder; and the said Surety does hereby waive notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby stipulates and agrees that any and all things done and omitted to be done by and in relation to executors, administrators, successors, assignees, subcontractors and other transferees, shall have the same effect as to said Surety as though done or omitted to be done by and in relation to the Contractor.

Signed this _____ day of _____, 20___.

_____
Name of Principal

_____
By

_____
Name of Surety

By _____
Attorney-in-Fact

ACKNOWLEDGEMENTS

State of Minnesota)
) ss. Principal – Individual
County of St. Louis)

This instrument was acknowledged before me on _____
by _____.

Notary Seal _____
Notary Public

State of Minnesota)
) ss. Principal – Corporate or Partnership
County of St. Louis)

This instrument was acknowledged before me on _____
by _____ as _____
of _____.

Notary Seal _____
Notary Public

State of Minnesota)
) ss. Surety
County of St. Louis)

Be It Known, That on this _____ day of _____ A. D., 20___, came before me personally _____, to me personally known, who being by me duly sworn, did say that he/she is the _____ (title) of

_____

the above named corporation which executed the foregoing bond as surety; that the seal affixed to the foregoing instrument is the corporate seal of said corporation; that said instrument was executed in behalf of said corporation, by authority of its Board of Directors; that said corporation hold a certificate of the Insurance Commissioner of the State of Minnesota showing that it is authorized to contract as a surety; and said _____ acknowledged said instrument to be the free act and deed of said corporation.

Notary Seal _____
Notary Public

APPROVED AS TO FORM, CORRECTNESS AND VALIDTY HEREOF

Dated this _____ day of _____, 20 ___

_____

Assistant City Attorney Duluth MN

Dated this _____ day of _____, 20 ___

_____

Finance Director Duluth MN

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City of Duluth
Indemnification & Insurance Requirements

(Updated February 16, 2011)

(Please Be Sure These Requirements Can Be Met Before Submitting Your Response)

INDEMNIFICATION CLAUSE

The Contractor will defend, indemnify and save the City harmless from all costs, charges, damages, and loss of any kind that may grow out of the matter covered by this contract. Said obligation does not include indemnification of the City for claims of liability arising out of the sole negligent or intentional acts or omissions of City but shall include but not be limited to the obligation to defend, indemnify and same harmless the City in all cases where claims of liability against the City arise out of acts or omissions of City which are derivative of the negligence or intentional acts or omissions of Contractor such as, and including but not limited to, the failure to supervise, the failure to warn, the failure to prevent such act or omission by Contractor and any other such source of liability. In addition, Contractor will comply with all local, state and federal laws, rules and regulations applicable to this contract and to the work to be done and things to be supplied hereunder.

INSURANCE

a. Contractor shall provide the following minimum amounts of insurance from insurance companies authorized to do business in the state of Minnesota, which insurance shall indemnify Contractor and City from all liability described in the paragraph above, subject to provisions of subparagraph below.

(1) Worker's compensation in accordance with the laws of the state of Minnesota.

(2) Public Liability and Automobile Liability Insurance with limits not less than **$1,500,000** Single Limit, and twice the limits provided when a claim arises out of the release or threatened release of a hazardous substance; shall be in a company approved by the city of Duluth; and shall provide for the following: Liability for Premises, Operations, Completed Operations, Independent Contractors, and Contractual Liability.

(3) City of Duluth shall be named as **Additional Insured** under the Public Liability, Excess/Umbrella Liability* and Automobile Liability, or as an alternate, Contractor may provide Owners-Contractors Protective policy, naming itself and the City of Duluth. Contractor shall also provide evidence of Statutory Minnesota Worker's Compensation Insurance. Contractor to provide Certificate of Insurance evidencing such coverage with 30-days notice of cancellation, non-renewal or material change provisions included. The City of Duluth does not represent or guarantee that these types or limits of coverage are adequate to protect the Contractor's interests and liabilities.

**An umbrella policy with a "following form" provision is acceptable if written verification is provided that the underlying policy names the City of Duluth as an additional insured.*

(4) If a certificate of insurance is provided, the form of the certificate shall contain an unconditional requirement that the insurer notify the City without fail not less than 30 days prior to any cancellation, non-renewal or modification of the policy or coverages evidenced by said certificate and shall further provide that failure to give such notice to City will render any such change or changes in said policy or coverages ineffective as against the City.

(5) **The use of an "Acord" form as a certificate of insurance shall be accompanied by two forms – 1) ISO Additional Insured Endorsement (CG-2010 pre-2004) and 2) Notice of Cancellation Endorsement (IL 7002) or equivalent, as approved by the Duluth City Attorney's Office**.

b. The insurance required herein shall be maintained in full force and effect during the life of this Agreement and shall protect Contractor, its employees, agents and representatives from claims and damages including but not limited to personal injury and death and any act or failure to act by Contractor, its employees, agents and representatives in the negligent performance of work covered by this Agreement.

c. Certificates showing that Contractor is carrying the above described insurance in the specified amounts shall be furnished to the City prior to the execution of this Contract and a certificate showing continued maintenance of such insurance shall be on file with the City during the term of this Contract.

d. The City shall be named as an additional insured on each liability policy other than the workers' compensation policies of the Contractor.

e. The certificates shall provide that the policies shall not be changed or canceled during the life of this Contract without at least 30 days advanced notice being given to the City.

f. Contractor shall be required to provide insurance meeting the requirements of this Paragraph unless Contractor successfully demonstrates to the satisfaction of the City Attorney, in the exercise of his or her discretion, that such insurance is not reasonably available in the market. If Contractor demonstrates to the satisfaction of the City Attorney that such insurance is not reasonably available, the City attorney may approve an alternative form of insurance which is reasonably available in the market which he or she deems to provide the highest level of insurance protection to the City which is reasonably available.

Procedure verified by:

_____ Date _____

Don Douglas, Claims Adjuster
Duluth City Attorney's Office

PRE-2004 CG 2010

A. **Section II - Who Is an Insured** is amended to include as an insured the person or organization shown in the Schedule, but only with respect to liability arising out of your ongoing operations performed for that insured.

****

NOTICE OF CANCELLATIONS ENDORSEMENT IL-7002 (10-90)

All Coverage Parts included in this policy are subject to the following condition: If we cancel this policy for any reason other than non-payment of premium, we will mail advance notice to the person(s) or organization(s) as shown in the Schedule.

Schedule

Person or Organization (Name and Address)	Advance Notice (Days)
City of Duluth Purchasing Division Room 100 City Hall 411 West First Street Duluth, MN 55802	30

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SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Work Included in Contract Documents
   2. Contract Information
   3. Contract Information
   4. Contract Information
   5. Work Under Other Contracts
   6. Future Work
   7. Work Sequence
   8. Contractor Use of Premises
   9. Occupancy Requirements
   10. Products Ordered in Advance
   11. Owner Furnished Products
   12. Work Restrictions

1.02 WORK INCLUDED IN CONTRACT DOCUMENTS

A. Description of the Project:
   1. Construction of water system improvements for the Spirit Mountain Recreational Area. This contract manual for Contract B is part of a larger project for which three additional separate contracts will be awarded. A general description of the four project contracts is included below.
      a. Contract A
      Reversible Water Supply and Runoff Collection Pipeline: Includes a runoff collection system, a grit chamber, transfer pipeline, yard piping at the Main pump station, low pressure supply pipe, a wet well and yard piping for the River pump station, an intake pipe (in St Louis River) and an intake structure.
      b. Contract B
      Water Supply Pump Stations. Main pump station and River pump station; including foundations, floors and complete building enclosures, plus mechanical and electrical equipment for these water pump stations. <u>Installation of pump skids purchased under contract D is part of this Contract B.</u>
      c. Contract C
      Hillside Water Improvements. Includes high pressure steel lines for increased distribution of water, upgrades to valve stations and electrical improvements
      d. Contract D
      Water Pumping Improvements: Off-site manufactured complete packages for water pumping equipment skids (with electrical equipment and controls) for Main and River pump stations.

1.03 CONTRACT INFORMATION

A. Type of Contract: Owner will award Multiple Prime Contracts.

B. Scope of Contract:
   1. Each contract is complete unto itself, including all labor and material required to complete each contract to the point of receiving the next section of Work to be installed.
   2. All Contracts will include:
      a. Contract Forms:
         1) Agreement
         2) Performance Bond
         3) Payment Bond
         4) Certificates

b. Conditions of the Contract:
   1) General Conditions
   2) Supplementary Conditions
c. Specifications:
   1) Division 1 - General Requirements
   2) Applicable Technical Sections
d. Addenda
e. Contract Modifications

3. Separate contracts will be issued for:
   a. The other 3 Contract packages as listed above

1.04 WORK UNDER OTHER CONTRACTS

A. Other Work at Site:
   1. Owner reserves the right to let other separate contracts for Work of the Project, or to pursue other Work at the Site with its own personnel.
   2. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.
   3. Coordinate the Work of this Contract with work performed under separate contracts.

B. Work Not Included:
   1. Work not included is either marked “NIC,” or “by others,” on Drawings or is noted in each section of Specifications.
   2. Provide all labor and materials required unless so specifically noted or marked.
   3. Install Work indicated to be furnished by others or Owner unless specifically stipulated to be furnished and installed by others or Owner.

1.05 CONTRACT TIMES

A. Time of the Essence:
   1. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

B. Contract Times:
   1. Construction operations are expected to start May 1, 2015 however, the Notice to Proceed letter will be the official authorization to commence construction operations.
   2. Work can commence upon Notice to Proceed at Main Pump Station.
   3. Exterior piping and concrete wet well at River pump station will be completed and backfilled by others no later than July 1, 2015. Work can commence on River Pump Station subsequently.
   4. Prefabricated pumping equipment skids (by Contract D) will be completed and available for scheduled delivery;
      a. Main Pump Station after July 1, 2015
      b. River Pump Station after August 1, 2015.
   5. Substantial and Final Completion:
      a. The Work will be substantially completed on or before October 1, 2015, and completed and ready for final on or before October 31, 2015.

C. Liquidated Damages
   1. Contractor and Owner recognize that time is of the essence and that Owner will suffer financial loss if the Work is not completed and milestones not achieved within the times specified, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):
   2. Substantial Completion: Contractor shall pay Owner $5,000 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified for Substantial Completion until the Work is substantially complete.
   3. Final Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay

Owner $1,000 for each day that expires after such time until the Work is completed and ready for final payment.

4. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

1.06 CONTRACTOR USE OF PREMISES

A. Confine operations at Site to areas permitted under contract or as directed by Engineer

B. Conform to site rules and regulations affecting Work while engaged in Project construction.

C. Existing Structures:
   1. Keep existing driveways, and adjacent streets clear and available to public in accordance with Owner's or local authority's requirements.
   2. Repair damages caused to existing public and private property and structures due to operations of Contractor to the satisfaction of, and at no additional cost to Owner.
   3. Take complete field measurements affecting all existing construction, wiring, piping, and equipment in this Contract, and assume responsibility for proper fit between Work and existing structures and other equipment.

D. Construction personnel may park only in areas designated by the Owner.

E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor air intakes.

F. Damaged Property:
   1. Patch and/or clean existing improvements and restore damage of property on, or adjacent to Site occasioned by this Work, including, but not limited to, lawns, walks, curbs, pavements, roadways, structures, and utilities which are cut or damaged by operations and are not designated for removal, relocation, or replacement in the course of construction.
   2. Public Property or Utilities: Comply with laws, ordinances, rules, regulations, standards, orders of utility owner or any public authority having jurisdiction.
   3. Provide written acceptance of restoration work by authority or Owner.

1.07 PRODUCTS ORDERED IN ADVANCE

A. Storage:
   1. Products will be allowed to be stored at the Site prior to commencement of construction activities.
   2. Contractor shall store such items as directed by Owner.

1.08 OWNER FURNISHED PRODUCTS

A. Items furnished by Owner will be identified in the Specification sections.

B. Owner's Responsibilities:
   1. Arrange for, and deliver Owner reviewed Shop Drawings, Product Data and samples to Contractor.
   2. Arrange and pay for product delivery to Site.
   3. At time of delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective or deficient items.
   5. Arrange for manufacturer's warranties, inspections and service.

C. Contractor's Responsibilities:
   1. Review Owner reviewed Shop Drawings, Product Data and samples.
   2. Receive and unload products at Site; inspect for completeness or damage, jointly with Owner.
   3. Provide support systems to receive Owner's equipment.
   4. Protect Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
   5. Install and otherwise incorporate Owner-furnished items into the Work.

6. Repair or replace items damaged after receipt, except that damage caused by Owner's employees or agents.

1.09 WORK RESTRICTIONS

A. On-Site Work Hours:
   1. Normal business working hours of 7:00 a.m. to 5:00 p.m. Monday through Friday.
   2. Weekend Hours: 7:00 a.m. to 5:00 p.m. with 48 hours' notice to Project Manager and Engineer.

B. Existing Utility Interruption:
   1. Do not interrupt utilities serving facilities occupied by Owner or others without written permission by Engineer
   2. Notify Engineer not less than 2 days in advance of proposed utility interruptions.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 SCHEDULE OF CONTRACTS

Not Used

END OF SECTION

SECTION 01 25 13

PRODUCT SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. Administrative and procedural requirements for handling requests for substitutions.

1.02 DEFINITIONS

A. Definitions used in this Article are not intended to change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Requests for changes in products, materials, equipment and methods of construction required by Contract Documents proposed by Contractor.

C. The following are not considered substitutions:
   1. Revisions to Contract Documents requested by Owner or Engineer.
   2. Specified options of products and construction methods included in Contract Documents.
   3. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.03 SUBMITTALS

A. Substitution Request Prior to Bid: For a Product Substitution to be considered, the following conditions must be met:
   1. All requests must be submitted in writing no later than 10 calendar days prior to the date for receipt of the bids.
   2. Faxed submittals will <u>not</u> be considered.
   3. Submit each request for substitution (one material or product per form) on the attached "Substitution Request Form" attached at the end of this section (either duplicated from the Project Manual or available from Engineer's office) together with a self-addressed, stamped envelope. Submittals not accompanied by this form properly filled in and endorsed will be discarded without review. NO EXCEPTIONS.
   4. Identify any impact of the substituted product on related items.
   5. Approved items will be listed in addenda. Requests for substitution will be returned in the self-addressed, stamped envelope provided by bidder at Engineer's earliest convenience.

B. All substitutions permitted on addenda must meet or exceed requirements of the specifications including, but not limited to:
   1. Warranty.

C. Substitution Request After Bid: Requests for substitution will be considered if received within 60 days after commencement of the work. Requests received more than 60 days after commencement of the work may be considered or rejected at the discretion of Engineer.
   1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for change order proposals.
   2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related specification section and Drawing numbers.
   3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
      a. Product data, including drawings and descriptions of products, fabrication and installation procedures.
      b. Samples, where applicable or requested.

c. A detailed comparison of significant qualities of the proposed substitution with those of the work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
d. Coordination information, including a list of changes or modifications needed to other parts of the work and to construction performed by Owner and separate contractors that will become necessary to accommodate the proposed substitution.
e. A statement indicating the substitution's effect on Contractor's construction schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall contract time.
f. Cost information, including a proposal of the net change, if any in the contract sum.
g. Certification by Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated.
h. Include Contractor's waiver of rights to additional payment or time, which may subsequently become necessary because of the failure of the substitution to perform adequately.

D. Substitution Conditions:
1. Contractor's substitution request will be received and considered by Engineer when one or more of the following conditions are satisfied, as determined by Engineer, otherwise requests will be returned without action except to record noncompliance with these requirements:
a. Extensive revisions to Contract Documents are not required.
b. Proposed changes are in keeping with the general intent of Contract Documents.
c. The request is timely, fully documented and properly submitted.
d. Contractors and suppliers will be expected to provide the specified product unless prior approval is received from Engineer's office in sufficient time so that all bidders can be notified through an addendum.
e. The specified product or method of construction cannot be provided within the contract time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the work promptly or coordinate activities properly.
f. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
g. A substantial advantage is offered to Owner, in terms of cost, time, energy conservation, or other considerations of merit, after deducting offsetting responsibilities Owner may be required to bear. Additional responsibilities for Owner may include additional compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, or separate contractors, and similar considerations.
h. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where Contractor certifies that the substitution will overcome the incompatibility.
i. The specified product or method of construction cannot be coordinated with other materials, and where Contractor certifies that the proposed substitution can be coordinated.
j. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where Contractor certifies that the proposed substitution provides the required warranty.
k. Where a proposed substitution involves more than one prime contractor, each contractor shall cooperate with the other contractors involved to coordinate the work, provide uniformity and consistency, and to assure compatibility of products.

E. Limitations: Contractor's submittal and Engineer's acceptance of Shop Drawings, Product Data, or Samples that relate to construction activities not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval.

F. Substitution Causing Redesign: Engineer time for redesign as a result of substitution, will be charged to Owner, then deducted by Construction Change Directive from Contract Amount.

G. Engineer's Action:
1. Request Prior to Bid: If approved, substitution will be included in an addendum.

2. Request After Bid:
   a. If necessary, within one week of receipt of the request for substitution, Engineer will request additional information or documentation necessary for evaluation of the request.
   b. Within two weeks of receipt of the request, or one week of receipt of the additional information or documentation, whichever is later, Engineer will notify Contractor of acceptance or rejection of the proposed substitution.
   c. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name.
   d. Acceptance will be in the form of a change order.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SUBSTITUTION REQUEST FORM

TO: Attn: Jeff Ledin
Short Elliott Hendrickson Inc.
416 South 6th Street, Suite 200
Brainerd, MN 56401-3540
218.855.1700

PROJECT: Construction of water system improvements for the Spirit Mountain Recreational Area

SECTION NO.	ARTICLE NO.	SPECIFIED PRODUCT	PROPOSED SUBSTITUTION

A. Does the substitution affect dimensions shown on Drawings? Yes ☐ No ☐

B. Does the substitution affect other trades? Yes ☐ No ☐

C. Does the manufacturer's guarantee differ from that specified? Yes ☐ No ☐

D. If you indicated "Yes" to Items A, B, or C above, attach a thorough explanation on your company letterhead.

E. If there are other differences between proposed substitution and specified product, attach a thorough explanation on your company letterhead. If differences are not noted and acknowledged in writing by Engineer, product must comply with specification requirements.

F. The proposed substitution was used within the last 24 months on the following project:

Project Name _____

Location _____

Engineer _____

Telephone No. _____

G. Has the proposed substitution been used on an SEH project within the last 12 months? Yes ☐ No ☐

If yes, which project? _____

All questions must be answered. Incomplete forms will not be reviewed.
Include a self-addressed, stamped envelope for reply.

Submitted By: _____

Signature

Firm

Address

Date

Phone

E-mail

For Use by Design Consultant

☐ Not Accepted, Not Enough Information
☐ Not Accepted, Does Not Appear to be Equal
☐ Accepted ☐ Accepted as Noted
☐ Received Too Late

By _____

Date _____

Remarks _____

SECTION 01 29 10

APPLICATIONS FOR PAYMENT

PART 1 GENERAL

1.01 SUMMARY

A. Procedures for Administration of Applications for Payment:
   1. Schedule of Values:
      a. Coordination.
      b. Format and Content.
      c. Breakdown Detail.
      d. Schedule Updating.
   2. Application for Payment:
      a. Coordination.
      b. Format.
      c. Typical Application.
   3. Additional Requirements:
      a. Initial Application.
      b. Substantial Completion.
      c. Final Payment.

B. Related Sections:
   1. Section 01 33 00 - Submittal Procedures
   2. Section 01 74 20 - Construction Waste Management
   3. Section 01 77 00 - Closeout Procedures

1.02 SCHEDULE OF VALUES

A. Coordinate preparation of Schedule of Values with preparation of Construction Schedule.

B. Format and Content:
   1. Include following Project identification on Schedule of Values:
      a. Project name and location.
      b. Name of Engineer.
      c. Engineer's Project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Use Project Bid Form

C. Breakdown Detail:
   1. Provide breakdown of Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports.
   2. Break principal subcontract amounts down into several line items.

D. Schedule Updating: Update and resubmit Schedule of Values when Change Orders or Construction Change Directives result in change in Contract Sum.

1.03 APPLICATIONS FOR PAYMENT

A. Coordination: Each application for payment shall be consistent with previous applications and payments as certified by Engineer and paid by Owner.

B. Application for Payment Forms: AIA Document G702 and Continuation Sheets G703.

C. Typical Application:
   1. Payment Application Times: Each progress payment date is indicated in either the Supplementary Conditions, the Agreement, or as set at the Preconstruction Meeting.
   2. Period of Work Covered: Length of time for construction Work covered by each Application for Payment is indicated in the Agreement or as set at the Preconstruction Meeting.
   3. Preparation:
      a. Complete every entry on form, including notarization and execution by person authorized to sign legal documents on behalf of Contractor.
      b. Incomplete applications will be returned without action.
      c. Entries must include data on Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
      d. Include amounts of Change Orders and Construction Change Directives issued prior to last day of construction period covered by application.
   4. Transmittal: Submit 4 executed copies of each Application for Payment to Engineer/Construction Manager by means ensuring timely receipt.

1.04 ADDITIONAL REQUIREMENTS

A. Initial Application for Payment:
   1. Applications for Payment will not be considered if copies of required submittals have not been received by Engineer.

B. Substantial Completion:
   1. Administrative actions which must precede or coincide with submittal of Substantial Completion Application for Payment include:
      a. On-site review with Owner/Engineer/Construction Manager.
   2. Following issuance of Certificate of Substantial Completion, submit Application for Payment.
   3. Applications for Payment will not be considered if copies of required submittals have not been received by Engineer.

C. Final Payment Application:
   1. Administrative actions which must precede or coincide with submittal of final Application for Payment include:
      a. Completion of Project requirements.
      b. Completion of items specified for completion after Substantial Completion.
      c. Assurance that unsettled claims will be settled.
      d. Assurance that Work not complete and accepted will be completed without undue delay.
      e. Removal of temporary facilities and services.
      f. Removal of surplus materials, rubbish, similar elements.
      g. Final cleaning.
   2. Applications for Payment will not be considered if copies of required submittals have not been received by Engineer.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 31 13

COORDINATION

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Project Coordination
   2. Job Site Administration

1.02 COORDINATION BY CONTRACT A PRIME CONTRACTOR

A. Coordinate use of premises under direction of Owner/Construction Manager.

B. Coordinate scheduling, submittals, and Work to ensure efficient and orderly sequence of installation.
   1. Coordinate activities for mutual benefit and cooperate to facilitate the general progress of the Work.
   2. Each subcontractor shall be thoroughly familiar with all provisions governing the Work of other contractors, and shall obtain from such contractors all information as may be required to coordinate Work with theirs.
   3. Each trade shall perform its Work in proper sequence and arrangement in relation to other activities and shall join his Work to that of others in accordance with the intent of the Drawings and specifications.
   4. Each trade shall give due notice and proper information for any special provisions necessary in the placing or setting of Work that may come in contact with Work of other contractors.

C. Inspect the Contract Documents for Work of others that is inter-related, and afford other trades every reasonable opportunity for the installation of their Work. Coordinate Work of various specification sections having interdependent responsibilities.

D. Prepare coordination drawings where off-site fabricated products and materials are by separate entities and must accurately interface. Coordination drawings shall indicate how Work, shown by separate Shop Drawings, will interface and shall indicate sequence for installation.

E. Coordinate space requirements and installation of mechanical and electrical Work.
   1. Follow routing shown for pipes, ducts, and conduit as closely as practicable; place runs parallel with line of building.
   2. Utilize space efficiently to maximize accessibility for other installations, maintenance, and repairs.
   3. Conceal pipes, ducts, and wiring within the construction in finished areas, except as otherwise indicated.
   4. Coordinate locations of fixtures and outlets with finish elements.
   5. All final decisions as to the right-of-way and run of interfering pipes, ducts, etc., shall be made by Engineer at Project meetings.

1.03 JOB SITE ADMINISTRATION

A. Supervise and direct the Work. Employ and maintain a full time, qualified supervisor or superintendent to act as Contractor’s representative at the Site.

B. Enforce good order and conduct among contractors, installers, and construction employees.

C. Require installers to inspect conditions under which Work is to be performed. Installer shall report all unsatisfactory conditions in writing to Contractor. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the Contract Documents. Where manufacturer provides contradictory instructions, notify Engineer immediately and request clarifications.

E. Recheck measurements and dimensions of the Work, as an integral step of starting each installation.

F. Coordinate enclosure of Work with required inspections and tests, so as to minimize necessity of uncovering Work for that purpose.

G. Where mounting heights are not indicated, mount individual units of work at industry recognized standard mounting heights for the particular application indicated. Refer questionable mounting height choices to Engineer.

H. Supervise performance of the Work to ensure that none of the Work, whether completed or in progress, will be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

I. Clean and perform maintenance as frequently as necessary throughout construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Coordinate completion and cleanup of Work.

1.04 SUBMITTALS

A. Provide listing of Contractor's principal staff assignments and consultants, including name, home and work addresses, and telephone numbers.

B. Provide supervisor's or superintendent's name, home and work address, and telephone numbers.

C. Provide names, work address, telephone numbers, samples of signature, and limits of authority of each individual authorized to sign change orders, field modifications, and monthly pay requests for Contractor.

1.05 FIELD CONDITIONS

A. Before ordering material or commencing Work, check and verify all dimensions and conditions. Notify Engineer of any omissions or discrepancies immediately.

B. Field measurements shall be furnished in a timely manner to suppliers and fabricators who require them to complete their Work. Ascertain the requirement for such measurements at the earliest practical date and make every reasonable effort to expedite the affected Work.

C. Conflicts: Engineer has exercised reasonable professional care to ensure there are no conflicts between the Work of the various trades. Such conflicts, however, may exist and no warranty to the contrary is made or implied.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 GENERAL

1.01 SUMMARY

A. Procedures for Administration of Project Meetings:
   1. Preconstruction Conference
   2. Progress Meetings
   3. Preinstallation Conferences

B. Related Sections:
   1. Section 01 31 13 - Coordination
   2. Section 01 33 00 - Submittal Procedures

1.02 PRECONSTRUCTION/SITE MOBILIZATION CONFERENCE

A. Scheduled by Owner/Construction Manager at Site after Notice of Award, prior to commencement of construction for:
   1. Execution of Owner-Contractor Agreement and exchange of preliminary submittals if not previously completed.
   2. Clarification of Owner and Contractor responsibilities in use of the Site and review of administrative procedures.

B. Attendees: Owner, Engineer, Consultants, Contractors, major subcontractors, other concerned parties represented by persons familiar with and authorized to conclude matters relating to Work.

C. Agenda:
   1. Items of significance that could affect progress including, but not limited to:
      a. Submittal of executed bonds and insurance certificates.
      b. Execution of Owner-Contractor Agreement if not previously completed.
      c. Distribution of Contract Documents.
      d. Use of premises by Owner and Contractor:
         1) Owner's requirements and occupancy.
         2) Construction facilities provided by Owner (if any).
         3) Temporary utilities provided by Owner (if any).
         4) Use of premises office, work, and storage areas.
      e. Security and housekeeping procedures.
      f. Submittals:
         1) Final list of subcontractors, suppliers, products.
         2) Schedule of Values.
         3) Progress Schedule.
         4) Designation of responsible personnel:
            a) Contractor's principal staff and consultants.
            b) Contractor's superintendent or job foreman acting as Contractor's Site representative.
            c) Owner's and Contractor's designated individuals authorized to sign Change Orders, field modifications, and monthly pay requests.
      g. Procedures for processing:
         1) Field decisions.
         2) Submittals:
            a) Shop Drawings.
            b) Product Data.
            c) Samples.
         3) Substitutions.

4) Applications for Payments.
5) Proposal requests.
6) Change Orders.
7) Contract Closeout.

h. Schedules:
1) Tentative construction schedule.
2) Critical Work sequencing.
3) Progress meetings.

i. Procedures for testing.

j. Procedures for maintaining Record Documents.

k. Requirements for startup of equipment: Inspection and acceptance of equipment put into service during construction period.

l. Equipment deliveries and priorities.

m. Contractor responsibilities:
1) Safety procedures.
2) First aid.

1.03 PROGRESS MEETINGS

A. Contract A Prime Contractor with Construction Manager:
1. Schedule and administer weekly construction progress meetings throughout progress of Work.
2. Make physical arrangements, prepare agenda and distribute with notice of each meeting to participants and to Engineer, 4 days in advance of meeting date.
3. Preside at meetings, record meetings and distribute copies (2 to Engineer) within 2 days to participants, and entities affected by decisions at the meetings.
4. If Contractor does not preside, record, and distribute meeting notes, Engineer will do so at Engineer's standard hourly rate submitted to Owner. An equivalent amount will be deleted from Contract by Construction Change Directive.

B. Attendees:
1. Contractor, job superintendent/Construction Manager, subcontractors and suppliers, other entity concerned with current progress or involved in planning, coordination or performance of future activities; Owner, Engineer, professional consultants as appropriate to agenda.
2. Attendees shall be familiar with Project and authorized to conclude matters relating to progress.

C. Agenda:
1. Items of significance that could affect progress, including topics for discussion as appropriate to current status of Project, minimally:
a. Approval of minutes of last meeting.
b. Review of Work progress.
c. Field observations, problems and decisions.
d. Identifications of problems which impede planned progress.
e. Review of submittal schedule and status of submittals.
f. Review of off-site fabrication and delivery schedules.
g. Maintenance of progress schedule.
h. Corrective measures to regain projected schedules.
i. Planned progress during succeeding Work period.
j. Coordination of projected progress.
k. Maintenance of quality and work standards.
l. Effect of proposed changes on progress schedule and coordination.
m. Other business relating to Work.

1.04 PREINSTALLATION CONFERENCES

A. When required in individual specification sections, or as requested by Contractor, convene a preinstallation conference at Site prior to commencing Work of the Section.

B. Attendees: Require attendance of entities directly affecting, or affected by, Work of the Section, including manufacturer's representative.

C. Notification: Notify Engineer 4 days in advance of meeting date.

D. Contractor Duties:
   1. Prepare agenda, preside at conference, record minutes, and distribute copies (2 to Engineer) within 2 days.
   2. If Contractor does not preside, record, and distribute meeting notes, Engineer will do so at Engineer's standard hourly rate submitted to Owner. An equivalent amount will be deleted from Contract by Construction Change Directive.

E. Agenda:
   1. Review conditions of installation.
   2. Review preparation and installation procedures.
   3. Coordinate with related Work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

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SECTION 01 32 16

PROGRESS SCHEDULES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Format
   2. Content
   3. Revisions to Schedules
   4. Submittals

B. Related Sections:
   1. Section 01 11 00 - Summary of Work
   2. Section 01 29 10 - Applications for Payment
   3. Section 01 33 00 - Submittal Procedures

1.02 FORMAT

A. Prepare schedules as a horizontal bar chart with separate bar for each major portion of Work or Operation, identifying first workday of each week.

B. Sequence of Listings: The Table of Contents of this Project Manual. The chronological order of the start of each item of work.

C. Scale and Spacing: To provide space for notations and revisions.

D. Sheet Size: Minimum 11 by 17 inches. Multiples of 8-1/2 by 11 inches.

1.03 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify each item by specification section number.

C. Identify Work of separate stages, separate floors, and other logically grouped activities.

D. Provide sub-schedules to define critical portions of the entire schedule.

E. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.

F. Provide separate schedule of submittal dates for Shop Drawings, Product Data, and Samples, including Owner furnished products and products identified under Allowances, and dates reviewed. Submittals will be required from Engineer. Indicate decision date for selection of finishes.

G. Indicate delivery dates for Owner furnished products and products identified under Allowances.

1.04 REVISIONS TO SCHEDULES

A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

C. Provide narrative report to define problem areas, anticipated delays, and impact on schedule. Report corrective action taken, or proposed, and its effect including the effect of changes on schedules of separate contractors.

1.05 SUBMITTALS

A. Submit initial schedules within 10 days after date of Owner-Contractor Agreement. After review, resubmit required revised data within 10 days.

B. Submit revised Progress Schedule with each Application for Payment.

C. Submit 4 copies which will be retained by Engineer.

D. Distribute copies of reviewed schedules to Site file, subcontractors, suppliers, and other concerned parties.

E. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. Requirements Included:
   1. Procedures
   2. Shop Drawings
   3. Product Data
   4. List of Proposed Subcontractors
   5. List of Proposed Suppliers
   6. Material Safety Data Sheets

1.02 PROCEDURES

A. Deliver submittals to Engineer at address listed in Project Manual with a Transmittal.

B. Transmit each item under Engineer-accepted form.
   1. Identify Project, Contractor, subcontractor, major supplier.
   2. Identify pertinent Drawing sheet and detail number, and specification Section number.
   3. Identify deviations from Contract Documents.
   4. Provide space for Engineer and consultant review stamps.

C. Submit initial progress schedules and schedule of values in duplicate within 10 days after date of Owner-Contractor Agreement. After review by Engineer, revise and resubmit as required.

D. Submit revised schedules with each Application for Payment, reflecting changes since previous submittal.

E. Comply with progress schedule for submittals related to Work progress. Coordinate submittal of related items.

F. After Engineer review of submittal, revise and resubmit as required, identifying changes made since previous submittal.

G. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report any inability to comply with provisions.

1.03 SHOP DRAWINGS

A. Shop Drawings will not be accepted for review by Engineer until after they have been checked and approved by the Contractor as evidenced by his approval stamp and signature.

B. Submit the number of opaque reproductions Contractor requires, plus 4 copies that will be retained by Engineer, plus copies to be included by Contractor in O&M Manuals.

1.04 PRODUCT DATA

A. Mark each copy to identify applicable products, models, options, testing compliance, warranty, and other data; supplement manufacturers' standard data to provide information unique to the Work.

B. Submit the number of copies which Contractor requires plus 4 copies that will be retained by Engineer, plus copies to be included by Contractor in O&M Manuals.

1.05 SAMPLES

A. Submit full range of manufacturer's standard colors, textures, and patterns for Engineer's selection. Submit samples for selection of finishes within 30 days after date of Contract.

B. Submit samples to illustrate functional characteristics of the product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing Work.

C. Include identification on each sample, giving full information.

D. Submit the number specified in respective specification section; 1 will be retained by Engineer. Reviewed samples that may be used in the Work are indicated in the technical sections.

E. Field Samples:
   1. Provide field samples of finishes as required by individual technical section.
   2. Install sample complete and finished.
   3. Acceptable samples in place may be retained in completed Work.

1.06 LIST OF PROPOSED SUBCONTRACTORS

A. Submit a list of subcontractors who will provide Work on the Project.

B. The submitted list shall include:
   1. Name of Subcontractor
   2. Address
   3. Type of work to be provided
   4. Contact list for administrative and supervisory personnel.

1.07 LIST OF PROPOSED SUPPLIERS

A. Submit a list of suppliers who will provide materials, equipment or components principle to the Work.

B. The submitted list should include:
   1. Name of supplier.
   2. Address.
   3. Equipment, material or component to be provided.
   4. Contact list for administrative and supervisory personnel.

1.08 MATERIAL SAFETY DATA SHEETS

A. Submit MSDS to the Site on all products with chemical emissions and as called for in individual technical sections.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 52 19

TEMPORARY SANITARY FACILITIES

PART 1 GENERAL

1.01 SUMMARY

A. Provide temporary closet or privy.

B. Maintain throughout Project duration.

C. Type and location subject to Engineer's approval.

D. Remove upon completion of Project.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

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SECTION 01 57 12

STORMWATER MANAGEMENT AND EROSION CONTROL
(MnDOT 1717.2)

PART 1 GENERAL

1.01 SUMMARY

A. Section includes temporary and permanent prevention and control of soil erosion.

B. Related Sections:
1. Section 01 55 15 - Maintenance and Restoration of Haul Roads
2. Section 31 22 10 - Site Grading
3. Section 31 22 20 - Earthwork for Building Sites
4. Section 31 23 10 - Excavation and Embankment
5. Section 31 23 33 - Trench Excavation and Backfill
6. Section 31 25 10 - Stormwater Management
7. Section 32 92 12 - Controlling Erosion and Establishing Vegetation
8. Section 32 92 30 - Turf Restoration
9. Section 33 05 50 - Surface Facility Restoration
10. Section 33 41 00 - Storm Sewer Systems

C. Basis of Payment:
1. All expenses shall be borne by Contractor with no direct compensation.
2. Failure to comply with established erosion control measures will result in withholding of progress payments by Owner.

1.02 REFERENCES

A. MnDOT 1717.2 - Stormwater Management and Erosion Control

B. MPCA:
1. Protecting Water Quality in Urban Areas, 2000
2. Minnesota Stormwater Manual

1.03 SUBMITTALS

A. Site plan and schedule for accomplishment of Work within, adjacent to, or affecting surface water.

B. Submit erosion control schedule weekly to Engineer.
1. Proposed installations and timing of installation.
2. Grading operations and incorporation of erosion control.
3. Repair or maintenance required on erosion control installations.
4. Proposed measures during periods of suspension of Work.

C. State of Minnesota, Form MN R100001 - NPDES Permit.

1.04 QUALITY ASSURANCE

A. Refer to “Protecting Water Quality in Urban Areas - Best Management Practices for Minnesota.

B. For operations that disturb 1 acre or more of land area, submit Form MN R100001 at least 7 days prior to start of construction.
1. Conduct inspections required in NPDES permit.
2. Maintain NPDES inspection log.

3. Complete and attach SWPPP to NPDES permit. Keep copy on Site. See MPCA website for more information: www.pca.state.mn.us.

C. Obtain all necessary permits from the responsible regulatory agencies.
   1. For erosion control measures not shown on Drawings.
   2. Before working in surface waters.

1.05 SEQUENCING AND SCHEDULING

A. Construct drainage facilities and turf establishment concurrently with earthwork operation.

B. Complete construction and finishing operation on a drainage area basis to minimize erosion.

C. Incorporate erosion control measures at the earliest practical time during construction.

D. Install erosion control measures as directed prior to disturbance of in-place ground cover in critical areas that are tributary to public waters.

1.06 EMERGENCY EROSION CONTROL

A. Emergency Basis:
   1. Sudden occurrence of a serious and urgent nature that is beyond normal maintenance of erosion control items and which requires immediate mobilization and movement of necessary personnel, equipment, and materials to emergency site.
   2. Emergency will require immediate corrective Work followed by installation of erosion control measures.

B. Mobilization: Within 24 hours of notice by Engineer.

1.07 MAINTENANCE

A. Maintain all erosion control facilities to provide proper function throughout Project.

B. Should Contractor fail to maintain erosion control measured specified, Owner may hire another firm to maintain the erosion control measures. Costs associated with hiring another firm will be deducted from Contract amount.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Ensure minimum interference with roads, streets, walks, adjacent occupied or used facilities. Do not close or obstruct without permission from authorities having jurisdiction.

B. Shape exposed soil areas to permit runoff with minimal erosion.

C. Install safeguards to prevent water pollution from haul roads, work platforms or other temporary construction facilities.

D. Restore all plant, equipment, or other supplementary operation sites to prevent siltation and erosion.

E. Repair any off-site damage resulting from failure to install or maintain erosion control measures.

3.02 PROTECTION

A. Contractor is advised to refer to “Protecting Water Quality in Urban Areas.”

END OF SECTION

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SECTION 01 57 19

AIR, LAND, AND WATER POLLUTION
(MnDOT 1717)

PART 1 GENERAL

1.01 SUMMARY

A. Provide control of pollution from construction sites and related activities.

B. Related Sections:
   1. Section 01 55 15 - Maintenance and Restoration of Haul Roads
   2. Section 01 57 12 - Stormwater Management and Erosion Control
   3. Section 31 25 10 - Stormwater Management

C. Basis of Payment:
   1. No direct payment will be made. All activities required by or relating to this section will be considered incidental.
   2. No additional compensation or time extension will be granted due to actions brought against the Contractor for failure to comply with pollution control requirements.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Conduct all operations to prevent, control and abate the pollution of air, land and water in accordance with the rules, regulations and standards adopted and established by the following agencies:
      a. Minnesota Department of Natural Resources
      b. Minnesota Pollution Control Agency
      c. Minnesota Department of Transportation
      d. U.S. Army Corps of Engineers

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 PROTECTION OF WATERS

A. Schedule and conduct all operations to minimize soil erosion and prevent siltation and the resultant turbidity of public waters.

B. Prevent pollution of flowing or impounded waters from particulate or liquid matter that may be harmful to fish and wildlife or detrimental to public use.

C. Remove sediment from aggregate wash operations by filtration or settlement prior to discharge into public waters.

D. Do not discharge wash water or waste from concrete mixing operations into streams or public waters.

3.02 SPECIAL REQUIREMENTS

A. Minimize crossing of streams and rivers with hauling equipment.

B. Provide temporary bridging where stream crossings are necessary.

C. Remove temporary bridging as soon as crossings are no longer necessary.

END OF SECTION

SECTION 01 71 13

MOBILIZATION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes preparatory Work for construction operations.

B. Related Sections:
   1. Section 01 52 19 - Temporary Sanitary Facilities

C. Basis of Payment:
   1. Payment for mobilization shall be at the contract unit price as listed on the Bid Form. Additional mobilizations that may be required for specific work items or to conform to the provisions of the Contract Times shall be included in this item.
   2. Payment will be made as follows:

Cost Percent of Contract Completed	Percent of Mobilization Item Paid
10	50
30	75
50	95
100	(Final) 100

1.02 REFERENCES

A. MnDOT 2021 - Mobilization

1.03 PERFORMANCE REQUIREMENTS

A. Movement of personnel, equipment, supplies, and incidentals to the Site.

B. Installation of temporary sanitary facilities.

C. Commencement of Work.

1.04 SUBMITTALS

A. Required Submittals Prior to Mobilization:
   1. Approved Project Schedule.
   2. Shop Drawing Schedule.
   3. List of Proposed Subcontractors.
   4. List of Proposed Suppliers.
   5. Material and Procedural Submittals as Required.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 75 00

STARTING AND ADJUSTING

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Starting systems.
   2. Testing, adjusting, and balancing.
   3. Demonstration and instructions.

B. Related Sections:
   1. Section 01 21 00 - Allowances
   2. Section 01 33 00 - Submittal Procedures
   3. Section 01 77 00 - Closeout Procedures
   4. Section 01 78 23 - Operation and Maintenance Data
   5. Individual Technical Sections

1.02 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment systems.

B. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

C. Verify wiring and support components for equipment are complete and tested.

D. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.01 DEMONSTRATION AND INSTRUCTIONS

A. A manufacturer's representative who is knowledgeable about the project shall meet with Owner's personnel prior to date of final inspection to provide instruction in proper operation and maintenance:
   1. Utilize operation and maintenance manuals as basis for instructions.
   2. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.
   3. Include a detailed review of the following items:
      a. Maintenance manuals.
      b. Record documents.
      c. Spare parts and materials.
      d. Tools.
      e. Lubricants.
      f. Control sequences.
      g. Hazards.
      h. Cleaning.
      i. Warranties.

j. Maintenance agreements and similar continuing commitments.

4. Manufacturer's representative shall demonstrate the following procedures to Owner's personnel prior to date of final inspection:
   a. Startup.
   b. Shutdown.
   c. Emergency operations.
   d. Noise and vibration adjustments.
   e. Safety procedures.
   f. Economy and efficiency adjustments.
   g. Effective energy utilization.
   h. Troubleshooting.
   i. Maintenance.

B. Prepare and insert additional data in operations and maintenance manuals if need for additional data becomes apparent during instructions.

C. Provide a video tape of above procedures.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 SUMMARY

A. Administrative and procedural requirements for contract closeout, including:
   1. Submittals.
   2. Inspection procedures.
   3. Warranties.
   4. Record document submittals.
   5. Final cleaning.

B. Related Sections:
   1. Section 01 78 23 - Operation and Maintenance Data
   2. Specific requirements for individual units of work are included in appropriate technical sections

1.02 SUBSTANTIAL COMPLETION

A. Complete the following before requesting Engineer's inspection for certification of Substantial Completion for each phase of work. List items that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Obtain, submit releases enabling Owner unrestricted use of the Work and access to services and utilities.
   3. Regulatory requirements:
      a. Where required, obtain occupancy permits, operating certificates, similar releases.
      b. Obtain elevator inspection from State Inspector.
   4. Bonding and insurance:
      a. Consent of Surety to Reduction In or Partial Release of Retainage.
      b. Advise Owner of pending insurance change-over-requirements.

B. Inspection Procedures:
   1. When prerequisites are complete, submit request in writing to Engineer stating that all requirements are satisfied, and requesting inspection.
   2. Upon receipt of Contractor's request for inspection, Engineer/Project Manager will either proceed with inspection or advise Contractor of unfilled prerequisites.
   3. Following initial inspection, Engineer will either prepare Certificate of Substantial Completion, or advise Contractor of work which must be performed before certificate will be issued. Engineer will repeat inspection when requested and when assured that work has been substantially completed.
   4. Results of completed inspection will form the basis of requirements for Final Acceptance.

1.03 FINAL ACCEPTANCE

A. Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Submittals:
      a. Certificate of Substantial Completion.
      b. Contractor's Affidavit of Payment of Debts and Claims.
      c. Contractor's Affidavit of Release of Liens.
      d. Consent of Surety (if Performance Bond provided).
         1) To Final Payment
      e. Assurance that unsettled claims will be settled.
      f. Proof that fees and similar obligations have been paid.
      g. Evidence of final, continuing insurance coverage complying with insurance requirements.

h. Form IC-134, Affidavit for Obtaining Final Settlement of Contract with State of Minnesota and any of its Political or Governmental Subdivisions.
i. Certified copy of Engineer's final punch list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by Engineer.

B. Record Drawings: Submit to Engineer a set of record prints marked to show "as-built" conditions for work of contract.

C. Adjusting:
1. Repair and restore marred exposed finishes.
2. Touch up of painting of marred surfaces.
3. Complete final cleaning requirements.

D. Final Payment Request:
1. Include certificates of insurance for products and completed operations where required.
2. Updated final statement, accounting for final additional changes to Contract Sum.
3. Final liquidated damages settlement statement, acceptable to Owner.

E. Re-inspection Procedure:
1. Engineer will re-inspect work upon receipt of notice that work, including punch list items resulting from earlier inspections, has been completed, except for items whose completion has been delayed because of circumstances that are acceptable to Engineer.
2. Engineer will either prepare a certificate of final acceptance, or will advise Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
3. If necessary, re-inspection procedure will be repeated.

1.04 TRANSFER OF SITE TO OWNER

A. Deliver tools, spare parts, extra materials and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

B. Change door locks to Owner's access. Advise Owner's personnel of changeover in security provisions.

PART 2 PRODUCTS

2.01 CLEANING AGENTS

A. Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned.

B. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 EXECUTION

3.01 FINAL CLEANING

A. Provide final cleaning, following manufacturer's written instructions.

B. Conduct cleaning and waste-removal operations to comply with local laws and ordinances, and federal and local environmental and antipollution regulations.

C. Employ experienced workers or professional cleaners for final cleaning.

D. Comply with safety standards for cleaning.
   1. Do not burn waste materials.
   2. Do not bury debris or excess materials on Owner's property.
   3. Do not discharge volatile, harmful, or dangerous materials into drainage systems.
   4. Remove waste materials from Site and dispose of lawfully.

E. Clean Site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

F. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program.
   1. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   2. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   3. Remove tools, construction equipment, machinery, and surplus material from Site.
   4. Remove snow and ice to provide safe access to building.
   5. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   6. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   7. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

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SECTION 03 11 00

CONCRETE FORMING

PART 1 GENERAL

1.01 SUMMARY

A. Design and installation of formwork with shoring, bracing and anchorage for cast-in-place concrete.

1.02 REFERENCES

A. ACI 347 - Recommended Practice for Concrete Formwork

1.03 SUBMITTALS

A. Submit Product Data for form ties.

1.04 QUALITY ASSURANCE

A. The design, engineering, and proper construction of all formwork shall be the responsibility of the Contractor.

B. Design formwork in accordance with ACI 347.

1.05 PRODUCT HANDLING

A. Do not store forms or equipment on finished slabs.

PART 2 PRODUCTS

2.01 FORM MATERIAL

A. Form Facing Material: Smooth faced, undamaged plywood or other panel type material approved by Engineer.

B. The form facing material shall produce a smooth, hard, uniform texture on the concrete.

C. The arrangement of the facing material shall be orderly and symmetrical with the number of seams kept to a minimum.

D. Do not use facing material with raised grain, torn surfaces, worn edges, patches, dents, or other defects which will impair the texture of the concrete surface.

E. Fiber Tube Forms: Continuous laminated fiber tube with exterior moisture protection and non-adhering interior surface similar to “A-Coated Sonotube” as manufactured by Sonoco Products, or approved equal.

F. Void Forms:
   1. Corrugated fiberboard forms impregnated with paraffin, as manufactured by firm regularly engaged in production of corrugated fiberboard forms.
   2. Design to safely support dead load of concrete and construction live loads for period of 2 weeks.
   3. Design to prevent leakage of concrete or backfill materials and treat to prevent loss of strength and softening of form material due to moisture absorption.
   4. Size as shown on Drawings.

2.02 FORM TIES

A. Form Ties: Factory fabricated, adjustable length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling concrete surfaces upon removal.

B. The portion of the tie remaining in the concrete after removal of the tie shall be at least 1 inch from the surface of the concrete.

C. Provide waterseals on all wall ties used in water containment structures and exterior walls.

2.03 FORM COATINGS

A. Form Coatings or Release Agents: Commercially formulated chemical release agents containing no lubrication oil, conventional form oil, fuel oil, or kerosene. Containers shall have manufacturer's instructions for use printed thereon.

B. The form coating shall not penetrate, stain, or leave a residual film on the concrete surface and shall not attract dirt or other deleterious material.

2.04 ACCESSORIES

A. Chamfer Strips: 3/4-inch by 3/4-inch wood or plastic strips.

B. Provide all anchorages, braces, and special forms required to construct cast-in-place concrete components shown on the Drawings.

PART 3 EXECUTION

3.01 GENERAL

A. Establish a benchmark in an accessible location and use as a reference point for various construction levels.

B. Verify lines, levels, and centers before proceeding with formwork.

C. Insure that dimensions agree with the Drawings. Report any discrepancies to Engineer before proceeding with Work.

3.02 FORMWORK DESIGN

A. The design and construction of the formwork shall be the responsibility of the Contractor.

B. Design formwork in accordance with ACI 347.

C. Formwork shall be designed, erected, supported, braced, and maintained to safely support all vertical and lateral loads that might be applied until such loads can be supported by the concrete structure.

D. Camber formwork to compensate for anticipated deflections in the formwork prior to hardening of the concrete.

E. Provide positive means of adjustment of shores and struts.
   1. Take up all settlement during concrete placing operations.
   2. Securely brace forms against lateral deflections.

3.03 FORMWORK CONSTRUCTION

A. Provide forms for all concrete work. Do not use earth cuts as forms for vertical surfaces.

B. Construct forms to conform to slopes, lines, and dimensions shown on the Drawings.

C. Forms shall be sufficiently tight to prevent loss of mortar from the concrete.

D. Place chamfer strips at all exposed corners.

E. Install all required openings, frames, pipe sleeves, cavities, slots, and other embedded items.

F. Cut all holes in forms required for installation or embedment of concrete reinforcement bars and ties.

G. Provide sharp clean corners at intersecting planes without visible edges or offsets. Back joints with extra studs or girts to maintain true, square corners.

H. Provide temporary openings at the base of column forms and wall forms to facilitate cleaning and observation immediately before concrete is placed.
   1. Construct closures to ensure a tight fit flush with the adjoining surfaces.

I. Provide runways for moving equipment.
   1. Provide runways with struts or legs and support directly on the formwork.
   2. Runways shall not rest on the reinforcing steel.

J. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris before concrete is placed.

K. Install Void Forms:
   1. Protect from moisture before concrete placement. Store above ground level in dry location.
   2. Do not use forms subjected to water, moist soils, or damp storage unless test loaded.
   3. Install on surface providing uniform support. Conform to recommendations of manufacturer.
   4. Protect from crushing and penetration of form at reinforcing steel supports and at other supports.

3.04 TOLERANCES

A. Construct formwork so that concrete surfaces will conform with the following tolerances:
   1. Variation from Plumb:
      a. In any 10 feet of length: 1/4 inch.
      b. Maximum for entire length: 1/2-inch.
   2. Variation from the Level or Specified Grade:
      a. In any 10 feet of length: 1/4 inch.
      b. Maximum for entire length: 1/2-inch.
   3. Variation of the Linear Building Lines from Established Position in Plan and Related Position of Columns, Walls, Grade Beams and Partitions:
      a. In any 20 feet of length: 1/2-inch.
      b. Maximum for entire length: 1 inch.
   4. Variation in the Sizes and Locations of Sleeves, Floor Openings, and Wall Openings: 1/4-inch plus or minus.
   5. Variation in Cross-sectional Dimensions of Columns and Beams and in the Thickness of Slabs and Walls:
      a. Minus: 1/4-inch.
      b. Plus: 1/2-inch.
   6. Footings (tolerances apply to concrete dimensions only, not to positioning of reinforcing steel):
      a. Variations in dimensions in plan:
         1) Minus: 1/2-inch.
         2) Plus: 1 inch.
      b. Misplacement: 1 inch.
      c. Thickness:
         1) Decrease in thickness: 1/2-inch.
         2) Increase in thickness: No limit

7. Variations in Steps:
    a. In flight of stairs:
        1) Rise: 1/8 inch plus or minus.
        2) Tread: 1/4 inch plus or minus.
    b. In consecutive steps:
        1) Rise: 1/16 inch plus or minus.
        2) Tread: 1/8 inch plus or minus.

3.05 FORM SURFACE PREPARATION

A. Clean surfaces of forms and embedded material of all accumulated mortar or grout from previous concreting and of all other foreign material before concrete is placed.

B. Before placing the reinforcing steel or the concrete, cover the surfaces of the forms with an acceptable coating material that will effectively prevent absorption of moisture, prevent bond with the concrete, and not stain the concrete surfaces.

C. Do not allow form coating material to stand in puddles in the forms.

D. Form coating material shall not come in contact with hardened concrete against which fresh concrete is to be placed.

E. Spray form coating on all concrete form surfaces, including wood forms for wall openings, keyway strips, and chamfer strips. Apply coatings in accordance with manufacturer's instructions.

3.06 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used.

B. Do not use split, frayed, delaminated, or otherwise damaged form facing material.

3.07 FORM REMOVAL

A. Time specified below in this Article represents cumulative time during which temperature of concrete is maintained above 50 degree F (10 degree C) and for concrete without set-controlling admixtures. For concrete containing fly ash, increase these times by 10 percent for each 10 percent of fly ash substituted for Portland cement.

B. Formwork for columns, walls, sides of beams, and other parts not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations, but not less than 24 hours after completing concrete placement and finishing.

C. Forms and shoring used to support the weight of concrete in beams, slabs, and other structural members shall not be removed in less than 10 days and not until the concrete has attained 3,500 psi minimum compressive strength. Determine compressive strength by field-cured specimens.

D. Once forms and shoring supporting beams, slabs, and other structural members have been removed, reshore concrete structural members at each level the same day such that all superimposed loads are uniformly distributed and transferred directly to the foundation through temporary supports.
    1. No construction or other live loads shall be permitted on the members, unless sufficient support is in place or concrete has attained full design strength and loads do not exceed the design maximum, as approved by Engineer.

E. Contractor shall be responsible for all damage resulting from removal of forms or premature overloading of structural members.

F. Loosen wood forms for wall openings as soon as possible without damage to the concrete.

END OF SECTION

SECTION 03 20 00

CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Furnish and install concrete reinforcement.

1.02 REFERENCES

A. ACI:
   1. 117 - Standard Specifications for Tolerances for Concrete Construction and Materials
   2. 301 - Specifications for Structural Concrete for Buildings
   3. 315 - Details and Detailing of Concrete Reinforcement

B. CRSI Manual of Standard Practice

1.03 SUBMITTALS

A. Submit complete Shop Drawings and bar lists of all material to be furnished and installed under this Section.
   1. Show bar sizes, spacings, locations, and quantities of reinforcing and bending details.

B. Provide Shop Drawings in accordance with ACI 315 and the CRSI Manual of Standard Practice.
   1. Show in detail the location, size, spacing, bends, and quantities of each and all reinforcing bars to be placed in the structure.
   2. Bars shall have unique identifying labels or marks for each size, length, bend configuration, etc.

C. Submit Product Data on threaded dowel inserts.

D. Submit mill certifications for concrete reinforcement at time of delivery.

E. Submit certification for the epoxy coating at the time of delivery.
   1. Documentation of certification data shall come directly from the manufacturing plant's quality control office.
   2. Certification data shall contain test data and measurements taken at times and locations approved by Engineer.
   3. Monitoring shall be done by personnel not directly involved in production and be sufficient for compliance with approved procedures.

1.04 QUALITY COMPLIANCE

A. Comply with ACI 117, ACI 301, and ACI 315, except as modified in this Section.

1.05 PRODUCT HANDLING

A. Deliver reinforcement to the Site bundled, tagged, and marked.
   1. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement Drawings.

B. Store reinforcement at the Site in a manner to prevent damage from drainage and accumulation of dirt and excessive rust.

C. Do not store reinforcement, supports, or equipment on finished slabs.

D. Store metal bar supports in a weather-proof shelter.

E. Repair coating damage due to shipping, handling, and placing with an epoxy paint or equivalent coating material approved by Engineer.
   1. Damaged areas shall not exceed 2 percent of the surface area per linear foot of each bar.
   2. Coating color fading will not be considered coating damage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Reinforcing Bars: Deformed billet steel bars conforming to ASTM A615, Grade 60.

B. Welded Wire Fabric: Steel wire spot welded at intersections conforming to ASTM A185. Use flat sheets only.

C. Epoxy-Coated Reinforcing Steel: Conform to ASTM A775.

2.02 ACCESSORIES

A. Bar Supports for Elevated Slabs, Walls, Columns, and Beams: All bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place shall be plastic protected, conforming to CRSI Class 1 protection for bar supports.

B. Ground Supported Reinforcing:
   1. All supports for ground supported reinforcement shall conform to CRSI Class 1 protection for bar supports.
   2. All supports shall be supplied with precast concrete blocks with a minimum bearing surface of 100 sq. inches to prevent the support from sinking.

C. Tie Wire for Reinforcing Bars: Black annealed wire, 16 gage or heavier.

D. Tie Wire for Epoxy-Coated Reinforcing Bars: 16 gage or heavier annealed wire epoxy-coated or other polymer approved by Engineer.

E. Threaded Dowel Inserts: Manufactured of minimum Grade 60 steel and shall be capable of achieving 125 percent of specified yield strength of reinforcement steel for the bar size indicated.

F. Mechanical Bar Splices:
   1. Manufactured of minimum Grade 60 steel.
   2. Shall achieve 125 percent of specified yield strength of reinforcement steel for the bar size indicated.

G. Wire Supports for Epoxy-Coated Reinforcement: Supports shall be coated with dielectric material including epoxy or other polymer for a minimum of 2 inches from the point of contact with epoxy-coated reinforcement.

2.03 FABRICATION

A. Shop fabricate reinforcing steel to required shapes and dimensions.

B. Do not rebend or straighten reinforcing steel.

C. Fabricate bars in accordance with the fabricating tolerances given in ACI 315.

2.04 FINISHES

A. Epoxy coating shall be applied in a fusion bonded coating plant that has been granted “Certification” by CRSI (Concrete Reinforcing Steel Institute).

PART 3 EXECUTION

3.01 PLACING

A. Place reinforcing steel in accordance with the Structural Drawings, approved Shop Drawings, and as specified herein.

B. Reinforcing steel shall have the following concrete cover, unless specifically noted differently on the Drawings:
   1. Concrete cast against earth 3 inches.
   2. All other concrete 2 inches.

C. Properly position reinforcing steel and wire it together at intersections and supports to ensure against displacement during concrete placing. Tie all reinforcing steel to wall forms.

D. Support reinforcing steel for slabs on grade by placing the top of precast concrete blocks, flush with grade, at all locations where chairs are to be located. Place chairs or standees over concrete blocks.

E. Wire dowels in place before placing concrete.

F. Place and tie all reinforcing steel before concrete is placed.

G. Do not bend reinforcing steel embedded in hardened or partially hardened concrete after placing.

H. Place wall chairs at the top and bottom of all walls and not greater than 6 feet on center horizontally.

I. All reinforcement at the time concrete is placed shall be free of mud, oil, or other materials that may adversely affect or reduce the bond.

J. Support the reinforcing steel closest to the formed surface with chairs and bolsters. Support beam stirrups and column ties by chairs.

K. After completing welds on epoxy-coated reinforcement, repair damaged coating in accordance with the requirements stated in Part 1 of this Section.

L. Reinforcement used as supports with epoxy-coated reinforcement shall be epoxy coated.

M. After field bending or straightening epoxy-coated reinforcing bars, repair coating damage in accordance with Part 1 of this Section.

N. When epoxy-coated reinforcing bars are cut in the field, coat the ends of the bars with the same material used for repair of coating damage, and repair any coating damage in accordance with Part 1 of this Section.

3.02 SPLICES

A. Provide reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying. Provide lap splice lengths as shown on the Drawings.

B. Provide splices only as shown on the Drawings or as authorized by Engineer.

C. Provide threaded or other approved mechanical bar splices:
   1. Where shown on the Drawings.

2. Elsewhere for the convenience of the Contractor at no additional cost to Owner if specifically requested of and approved by Engineer.

3.03 TOLERANCES

A. Place bars to the tolerances specified in ACI 117.

END OF SECTION

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Furnish and install all cast-in-place concrete and accessories.

B. Related Sections:
   1. Section 03 11 00 - Concrete Forming
   2. Section 03 20 00 - Concrete Reinforcing

1.02 REFERENCES

A. ACI:
   1. 301 - Specifications for Structural Concrete for Buildings
   2. 305 - Hot Weather Concreting
   3. 306 - Cold Weather Concreting
   4. 309 - Recommended Practice for Consolidation of Concrete
   5. 350 - Environmental Engineering Concrete Structures

B. ASTM:
   1. A36 - Carbon Structural Steel
   2. A307 - Carbon Steel Bolts and Studs
   3. A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
   4. C33 - Standard Specification for Concrete Aggregates
   5. C94 - Standard Specification for Ready-Mixed Concrete
   6. C171 - Standard Specification for Sheet Materials for Curing Concrete
   7. C260 - Standard Specification for Air-Entraining Admixtures for Concrete
   8. C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections
   9. C494 - Standard Specification for Chemical Admixtures for Concrete
   10. C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
   11. C989 - Standard Specification for Slag Cement for Use in Concrete and Mortars
   12. C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures
   13. D1741 - Test Method for Functional Life of Ball Bearing Greases (Withdrawn 1991)

1.03 SUBMITTALS

A. Submit manufacturer's data for concrete admixtures, liquid curing material, floor joint filler, finishing compounds, bonding agents, and adhesive anchoring material.

B. Submit concrete aggregate test reports and concrete mix designs at least 14 days prior to placement of concrete.

C. Submit results of project field and laboratory concrete tests (slump, air content, and compressive strength).

1.04 QUALITY ASSURANCE

A. Comply with ACI 301, except as modified in this Section.

B. For concrete mix designs and aggregate testing associated with the concrete mix designs retain an independent testing laboratory/agency, approved by Engineer, to perform the work listed below. All costs for this testing shall be paid by Owner:
   1. Test proposed aggregate.
   2. Design concrete mixes for each type of concrete specified.
   3. Test each type of concrete mixes proposed for slump, air content, temperature, & compressive strength.
   4. Cast concrete cylinders for strength tests.
   5. Test concrete cylinders.

C. Aggregate Tests: Test aggregates for compliance with ASTM C33.

D. Concrete Mix Design:
   1. Prepare mix designs for each type of concrete specified.
   2. Design concrete mixes in accordance with ACI 301.

E. Concrete Strength Tests:
   1. Mold and cure 4 specimens from each sample in accordance with ASTM C31. Any deviations from the requirements of ASTM C31 shall be recorded in the test report.
   2. Test specimens in accordance with ASTM C39. 2 specimens shall be tested at 28 days from acceptance and 1 shall be tested at 7 days for information. 1 specimen shall be tested at 56 days if desired by Engineer.
   3. Make at least 1 strength test for each 50 cu.yds. or fraction thereof of each mixture design of concrete placed in any 1 day.
   4. A copy of the test results shall be furnished to the Engineer as soon as available.
   5. Costs of concrete cylinder testing will be paid by Owner.
   6. Mold and field cure specimens as required in ASTM C31.
   7. The acceptance test results shall be the average strengths of the 2 specimens tested at 28 days.
   8. Failure on the concrete tested to meet the specified strength, in accordance with ASTM C42, will require a load test of test cores at Contractor's expense.
   9. Failure to meet strength requirements of the cores, shall constitute consideration for rejection by Engineer.
   10. The cost of all measures to make the work satisfactory shall be paid for by the Owner.

F. Adjustment to Concrete Mixes: May be requested when characteristics of materials, job conditions, weather, test results, other circumstances warrant, at no additional cost to Owner, it meets the requirements of 3.01.A, and as accepted by Engineer.

G. Concrete Slump Tests:
   1. The testing agency shall determine slump of concrete from each truck in accordance with ASTM C143.
   2. If slump significantly exceeds maximum allowed, remove batch from work and dispose of off Project Site.
   3. Slump shall be tested at end of conveying system.
   4. All costs of slump testing will be paid by Owner.

H. Concrete Air Content Tests:
   1. The testing agency shall determine air content of concrete from each truck in accordance with ASTM C231.
   2. If air content adjustments are allowed provided the maximum unloading time is not exceeded as specified in 3.01A. Otherwise remove batch from work and dispose of off Project Site.
   3. Air content shall be tested at end of conveying system.
   4. All costs of air content testing will be paid by Owner.

I. Concrete Temperature:
   1. The testing agency shall determine temperature of concrete from each truck in accordance with ASTM C31.
   2. The temperature shall be tested at end of conveying system.
   3. All costs of temperature testing will be paid by Owner.

J. Special Structural Testing and Inspection Program:
   1. Special inspections are required in accordance with Section 01 45 00. The Testing Agency will conduct concrete slump tests, concrete air content tests, concrete temperature tests, and concrete strength test periodically as required per the Special Structural Testing and Inspection Program Summary Schedule.
   2. Concrete floor slabs on grade less than 6 inches thick are exempt from Special Inspections requirements.

1.05 PRODUCT HANDLING

A. Do not store forms, shores, reinforcing, equipment, or other material on finished slab surfaces.

PART 2 PRODUCTS

2.01 CONCRETE MATERIAL

A. Cement: Conform to ASTM C150, Type I.
   1. Alkali content less than or equal to 0.6 percent (expressed as Na2O).
   2. Provide cement from one source of supply.

B. Aggregate:
   1. Coarse Aggregate: ASTM C33-5S
      a. Provide from 1 source of supply.
      b. For exterior exposed surfaces.
   2. Fine Aggregate: ASTM C33.
      a. Provide from 1 source of supply.
      b. For exterior exposed surfaces.
   3. Do not use fine or coarse aggregates containing spalling-causing deleterious substances.
   4. Local aggregates not complying with ASTM C33 but which have been shown by special test or actual service to produce concrete of adequate strength and durability may be used when approved by Engineer.
   5. Maximum Size:
      a. 1/5 the narrowest dimension of concrete member; nor
      b. 1/3 the depth of slab; nor
      c. 3/4 the clear spacing between reinforcement bars; nor
      d. 1-1/2 inches
   6. Gradation sizes 467, 57 or 67: ASTM C33, Table 2.

C. Water: Clean potable and free from deleterious amounts of oil, acid, alkali, or other foreign matter.

2.02 ADMIXTURES

A. Air Entraining Admixture: ASTM C260.

B. Water Reducing Admixture: ASTM C494, Type A.

C. High Range Water-Reducing Admixtures (Superplasticizer): ASTM C494, Type F and contain no chlorides.

D. Retarding Admixtures: ASTM C494, Types B and D.

E. Set-Accelerating Admixtures: ASTM C494, Type C. No chloride containing admixtures will be allowed.

F. Cortec MCI. Use in all concrete subject to de-icing salts. Base on manufacturer's suggested dosing rates.

G. Viscosity Modifying Admixture: Demonstrate compatibility with other admixtures.

H. Pozzolans:
   1. Fly Ash: ASTM C618, Class C or F. Loss on ignition shall be limited to 3 percent maximum.

2. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.
3. Silica Fume: ASTM C1240, 6 percent maximum.

2.03 MISCELLANEOUS MATERIAL

A. Burlap-Polyethylene Sheet: Burlap weighing not less than 10 ounces per linear yard, 40 inches wide impregnated on 1 side with white opaque polyethylene 0.006 inch thick. Sheeting shall conform to ASTM C171.

B. Liquid Curing Compound: ASTM C309, Type 1-D, Class B clear or translucent with fugitive dye. Do not apply to floor slabs or concrete surfaces against which other concrete is to be placed (such as tops of footings). Spray-on curing compound may be used only as a temporary protection until the burlap-poly moist cure can be placed.

C. Expansion Joint Material: Bituminous fiber type conforming to ASTM D1751 with bituminous or paraffin binder.

D. Interior Joint Filler: 1 part, self leveling, polymer reinforced joint filler.
   1. Everjoint manufactured by L&M Construction Chemicals, Inc., or approved equal.

E. Exterior Joint Sealant: 2 parts, self leveling, polyurethane sealant.
   1. Sonolastic SL2 manufactured by Sonneborn, or approved equal.

F. Bonding Agent: Acryl 60 manufactured by Thoro System Products, or approved equal.

G. Drilled-In Anchors:
   1. Cartridge Injection Adhesive Anchors: Threaded steel rod, inserts, or reinforcing dowels, complete with nuts, washers, polymer or hybrid mortar adhesive two component injected epoxy system, and manufacturer's preparation and installation instructions. Type and size indicated on Drawings.
      a. Where indicated on the Drawings, provide stainless steel anchors. Stainless steel anchors shall be AISI Type 316 stainless steel provided with stainless steel nuts & washers or matching alloy group and minimum proof stress equal or greater than specified minimum full-size tensile strength of externally threaded fastener. All nuts shall conform to ASTM F594 unless otherwise specified. Avoid installing stainless steel anchors in contact with galvanically dissimilar metals.
      b. Reinforcing dowels shall be ASTM A615, Grade 60.
      c. Acceptable adhesive anchor manufacturers are:
         1) Hilti HAS threaded rods, HIT-TZ rods, or reinforcing dowels with HIT HY-200/ HIT ICE Adhesive Anchorage System for anchorage to concrete or grouted masonry, ICC ER-5193, ICC ESR-1562.
         2) Hilti HAS threaded rods or reinforcing dowels with RE 500 SD Injection Adhesive Anchoring System for anchorage to concrete, ICC ESR-1682.
         3) Red Head threaded rods or reinforcing dowels with Red Head Adhesive Anchoring System C6 or G5 Adhesive.
         4) Threaded rods or reinforcing dowels with Simpson Strong-Tie Epoxy Tie Adhesive.
         5) Threaded rods or reinforcing dowels with Powers/Rawl Adhesive.
      d. Or approved equal.

H. Epoxy Injection: Sika 35, Hi-Mod, LV or equal with Sikadur 31 Paste Epoxy or equal to be installed according to manufacturer's recommendations.

I. Plastic Coated Manhole Rungs: Copolymer Polypropylene Plastic in accordance with ASTM C478 and ASTM A615 as manufactured by M.A Industries, Inc., or approved equal.

2.04 CONCRETE MIX PROPORTIONS

A. See Table 2.1 at the end of the Section.

PART 3 EXECUTION

3.01 CONCRETE PRODUCTION

A. Ready-mixed concrete: Comply with ASTM C94. From time that water and cement are combined, concrete shall be placed within 90 minutes.
   1. Concrete Temperature shall be taken at time of placement. For every degree that concrete temperature is above 75 degrees Fahrenheit, reduce mixing and delivery time by two minutes.
   2. Batch Ticket: Provide for each batch discharged and used in work, indicating project identification name and number date, mix type, mix time, quantity and amount of water introduced and available.

B. Mix concrete only in quantities for immediate use. Concrete which has set shall be discarded and shall not be retempered.

C. Do not add water at the Site without the approval of Engineer.

D. Add superplasticizer and mix concrete in accordance with manufacturer's specification.

3.02 ENGINEEREMBEDDED ITEMS

A. Place all sleeves, inserts, anchors, and embedded items required for adjoining work or for its support prior to placing concrete.

B. Position all embedded items accurately and supported against displacement.

C. Temporarily fill voids in sleeves, inserts, and anchor slots with readily removable material to prevent the entry of concrete into the voids.

D. General - Construction Joints:
   1. Locate joints as indicated on Contract Drawings or as shown on approved shop drawings.
   2. Make joints perpendicular to main reinforcement.
   3. Continue all reinforcement across joints.
   4. Allow a minimum of 48 hours before placement of adjoining concrete construction.

E. Construction Joints - Spacing:
   1. General - Structures not intended to contain liquid:
      a. Wall vertical construction joints:
         1) 60 feet maximum centers.
         2) At wall intersections, 30 feet maximum from corner.
      b. Wall horizontal construction joints: 20 - 25 foot centers.
      c. Base slab, floor, and roof slab construction joints:
         1) Placements to be approximately square and not to exceed 3500 square feet.
         2) Maximum side dimension of a slab pour to be 80 feet.

F. Bonding at Construction Joints:
   1. Obtain bond between concrete pours at construction joints by thoroughly cleaning and removing all laitance from construction joints. Before new concrete is placed, all construction joints shall be coated with bonding agent, cement grout, or dampened.
      a. General - Use cement grout or dampening for all construction joints except as noted in Article 3.03 - F.1.b. below, or at Contractor's option use bonding agent for all construction joints.
         1) Treatment of joint surfaces:
            a) Roughen the surface of the concrete to expose the aggregate uniformly.
            b) Remove laitance, loosened particles of aggregate or damaged concrete at the surface.
            c) Dampen the hardened concrete (but do not saturate) immediately prior to placing of fresh concrete or grout.
         2) Cover the hardened concrete of horizontal joints with a coat of cement grout of similar proportions to the concrete, except substitute fine aggregate for coarse aggregate.
            a) Place grout as thick as possible on vertical surfaces.

b) Place 3 inch layer of grout in bottoms of wall or column lifts immediately before placing concrete and at least 1/2 inch thick on other horizontal surfaces. Vibrate grout and first layer of concrete simultaneously.
c) Place fresh concrete before grout has attained its initial set.

b. Use bonding agent for walls and slabs of tanks and structures designed to contain liquids and at all joints in beams, girders, and slabs.
1) Joints receiving an adhesive shall be prepared, and the adhesive applied in accordance with the manufacturer's recommendations.

G. Joints in Slabs on Grade:
1. Locate joints in slabs on grade as indicated on Contract Drawings or as shown on approved shop drawings.
2. Maximum spacing of joints shall be at 24 to 36 times the slab thickness in both directions. As a general rule, ratios of the long to short side should not exceed 1.5.
3. Time cutting properly with set of concrete, if saw cut joints are required or permitted.
a. Start cutting as soon as concrete has hardened sufficiently to prevent aggregates being dislodged by saw.
b. Complete before shrinkage stresses become sufficient to produce cracking.

3.03 PREPARATION BEFORE PLACING

A. Complete formwork and secure all reinforcement and embedded items in place.

B. Formwork Erection (floor slab on grade):
1. Verify lines, levels, and measurement before proceeding with formwork.
2. Hand trim sides and bottom of earth forms; remove loose dirt.
3. Align form joints.
4. Slope floor as required per Drawings.

C. Remove all snow, ice, and mud prior to placing concrete.

D. Do not place concrete on frozen ground.

E. Do not place concrete on ground with standing water or when upper 2 inches of ground is saturated.

F. Do not place concrete during rain, sleet, or snow, or allow same to fall on uninsulated concrete within 48 hours.

3.04 CONCRETE CONVEYING

A. Deliver concrete from the mixer to the place of final deposit as rapidly as practical by methods, which will prevent segregation or loss of ingredients.

3.05 CONCRETE DEPOSITING

A. Deposit concrete continuously or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section.

B. Place concrete at such a rate that the concrete which is being integrated with fresh concrete is still plastic.

C. Do not deposit concrete which has partially hardened or has been contaminated by hardened materials.

D. Remove rejected concrete from the Site.

E. Deposit concrete as nearly as practicable in its final position to avoid segregation due to handling or flowing.

F. Free fall of concrete shall not exceed 4 feet. Use chutes equipped with hopper heads for placing where a drop of more than 4 feet is required.

3.06 PLACING CONCRETE SLABS

A. Deposit and consolidate concrete slabs in a continuous operation.

B. Consolidate concrete placed in slabs by vibrating bridge screeds, roller pipe screeds, or other methods acceptable to Engineer.
   1. Bring slab surfaces to the correct level with a straight edge and then strike off.
   2. Use bullfloats or darbies to smooth the surface, leaving it free from bumps and hollows.

C. Do not leave screed stakes in concrete.

D. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to start of finishing operations.

3.07 PLACING GROUT

A. Blast with water and clean all concrete surfaces to be in contact with grout overlay.

B. Apply proprietary bonding agent immediately before placement of grout.

C. Max. grout design f'g = 3000 psi. Max. cementitious content 500 lb/cy. Max. w/c ratio of 0.5.

3.08 COLD WEATHER PLACING

A. Do not place concrete when the air temperature is less than 40 degrees F. without the specific approval of Engineer.

B. Cold Weather Concrete Work: ACI 306.1, except as modified by the requirements of these Contract Documents.

C. Do not place concrete against any frozen substrate, including subgrade soils and surfaces of formwork.

D. Do not place concrete around any embedment, including reinforcing steel that is at a temperature below freezing.

E. The temperature of the concrete delivered at the site shall conform to the following limitations:

	Minimum Concrete Temperature	
Air Temperature	**< 12 Inches Thick**	**12-36 Inches Thick**
Above 30º F	60º F	55º F
0º to 30º F	65º F	60º F
Below 0º F	70º F	65º F

F. If water or aggregate is heated above 100 degrees F., combine water with the aggregate in the mixer before cement is added. Do not mix cement with water or with mixtures of water and aggregate having a temperature greater than 100 degrees F.

G. When the mean daily temperature is less than 40 degrees F., maintain the temperature of the concrete between 50 and 70 degrees F. for the required curing period.

H. Arrangements for Heating, Covering, Insulation, Or housing the Concrete Work:
   1. Made in advance of placement.
   2. Adequate to maintain the required temperature without injury due to concentration of cold or heat.
   3. Keep protection in place for a minimum of 3 days.

I. Do not use combustion heaters during the first 24 hours, unless precautions are taken to prevent exposure of the concrete to exhaust gases.

J. Once the cold weather concrete protection is removed, maintain insulation for a minimum of 24 hours to provide for gradual cool down, and continue concrete curing for the remainder of the 10 day curing period.

3.09 HOT WEATHER PLACING

A. Comply with ACI 305 when hot weather conditions exist.

B. Maintain concrete temperature at time of placement below 90 degrees F.

C. When the temperature of the steel is greater than 120 degrees F., spray steel forms and reinforcement with water prior to placing concrete.

D. Keep all surfaces protected from rapid drying. Provide windbreaks, shading, fog spraying, sprinkling, ponding, or wet covering in advance of placement.

3.10 CONSOLIDATION

A. Consolidate all concrete in accordance with provisions of ACI 309.

B. Consolidate each layer of concrete immediately after placing by use of internal concrete vibrators. Maintain a frequency of not less than 8,000 vibrations per minute for each internal vibrator.

C. Provide adequate number of units and power source at all times. Use a minimum of 2 vibrators for all work and maintain spare units to ensure adequacy.

D. Insert the vibrator so as to penetrate the lift immediately below the one being placed. Do not insert the vibrator into lower courses which have begun to set.

E. Limit spacing between insertions of the vibrator to 12-18 inches and do not exceed twice the radius of action as shown in ACI 309 or 18 inches.

F. Do not use vibrators to transport concrete inside the forms.

G. Vibrate concrete to minimize entrapped air and surface voids on formed surfaces.

3.11 CONCRETE SLAB FINISHING

A. Float Finish:
   1. Apply float finish to all slab surfaces.
   2. After placing and screeding concrete slabs, do not work the surface until ready for floating. Begin floating when the surface water has disappeared and when the concrete has stiffened sufficiently to permit operation of a power-driven float.
   3. Consolidate the surface with power-driven float or by handfloating if the area is small or inaccessible to power units.
   4. Check and level the surface plane to a tolerance not exceeding 1/4 inch in 10 feet when tested with a 10 foot straight-edge placed on the surface at not less than 2 different angles.
   5. Immediately after leveling, refloat the surfaces to a smooth, uniform, granular texture.

B. Trowel Finish:
   1. Do not apply steel trowel finish to any concrete with more than 2 percent air entrainment.
   2. Apply float finish to slabs as described above in Part 3.11.A.
   3. After floating, begin the first trowel finish operation using a power-driven trowel. Begin final troweling when the surface produces a ringing sound as the trowel is moved over the surface.

4. Consolidate the concrete surface by the final hand troweling operation, free from trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8 inch in 10 feet when tested with a 10 foot straight-edge.

C. Broom Finish:
   1. Apply non-slip broom finish to all exterior sidewalks and aprons.
   2. Apply float finish to slabs as described above in Part 3.11.A.
   3. Immediately after floating, slightly roughen the concrete surface by brooming in the direction perpendicular to the main traffic route. Use a fiber-bristle broom.

3.12 FINISHING FORMED SURFACES

A. Provide a smooth formed surface to all formed surfaces not exposed to view, unless otherwise noted in Paragraph B. Smooth formed finish shall consist of the following:
   1. Construct formwork in accordance with Section 03 11 00.
   2. Patch all tie holes and defects larger than 1/8-inch in diameter and/or 1/8-inch deep.
   3. Remove all fins, seams and concrete “buttons” protruding more than 1/16-inch.

B. Provide a special form finish to all formed surfaces exposed to view:
   1. Prepare 3 test samples of various textures for approval by Engineer. Each sample shall be approximately 6 feet by 6 feet in size and located on an unexposed wall surface as directed by Engineer.
   2. Perform all Concrete Crack Repairs in accordance with Article 3.14.B.
   3. Remove all form release agents, curing compounds, hardeners, salts, efflorescence, laitance, loose material, unsound concrete, and other foreign materials by sandblasting, shot blasting, mechanical scarification, or other suitable methods.
   4. Surface Preparation:
      a. Expose, but not undercut or loosen, aggregate.
      b. Expose all bugholes, cracks and subsurface voids.
      c. Provide a clean, sound substrate with sufficient surface profile.
   5. Filling of deep voids, bugholes, etc., exceeding 1/8-inch depth:
      a. Dampen surface with clean water to obtain saturated surface-dry (SSD) with no standing water.
      b. Brush-apply a small quantity of mixed patching material as a scrub coat to prepare substrate. Thoroughly key-in and work material throughout cavity to promote bond.
         1) If scrub coat dries out before wet mortar can be placed, remove scrub coat similar to laitance removal.
      c. Place repair mortar onto wet scrub coat using brush with firm trowel pressure.
         1) Completely fill voids.
         2) Key in and compact thoroughly to secure bond.
         3) Apply patching material in lifts of 1/4-inch (8mm) to 2-inches (51mm) and trowel to desired finish promptly after placing material.
      d. For successive lifts, thoroughly score each lift and allow reaching initial set before next layer is applied.
      e. Perform wet curing of patched areas for the following conditions:
         1) If temperature exceed 85 degrees F (29 degrees C).
         2) If relative humidity is below 30 percent.
         3) If wind speed exceeds 15 mph
         4) If patches are exposed to direct sunlight for 72 hours after placement.
      f. Special curing compounds are allowed with approval of Owner and Engineer. Do not use solvent-based curing compound.
   6. Dampen surface with clean water just prior to application of finishing compound.
   7. Mix 1 part bonding agent to 3 parts clean water for mixing liquid.
   8. Mix concrete finishing compound with mixing liquid as specified by the manufacturer.
   9. Apply 2 coats using a stiff fiber brush or textured spray equipment. Spray application of the first coat requires back brushing to properly fill voids, bugholes and nonmoving cracks.
      a. First coat: Apply at 2 pounds per sq. yd. and allow to cure a minimum 24 hours.
      b. Second coat: Apply at 2 pounds per sq. yd., allow to set and then float to a uniform finish.
   10. Perform damp curing to applied product.

3.13 CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Immediately after placement, damp cure all concrete for a minimum of 7 days.

C. Cover all slabs and topping with approved burlap-polyethylene film and keep in place throughout the curing period.

D. Immediately after forms are removed, cover walls, beams, columns and other formed surfaces with burlap-polyethylene film.

E. Anchor all burlap-polyethylene film at the edges to prevent moisture loss.

F. Rewet all surfaces at least once a day during the curing period.

3.14 PATCHING

A. Repair honeycomb and other defective areas, fill surface voids, and fill form tie holes and similar defects in accordance with ACI 301.

B. Inject concrete cracks as observed during construction and leak testing operations with epoxy to manufacturer's recommendations. Confirm procedures with Owner and Engineer prior to installation.

C. Reinforce or replace deficient work as directed by Engineer and at no additional cost to Owner.

D. The Contractor shall repair defects in existing concrete elements affected by the new construction in as directed by the Engineer.

3.15 CLEAN UP AND DISPOSAL

A. Upon completion of the walls and prior to any painting, thoroughly clean all exposed or painted concrete surfaces of all concrete spatters, form oil, or other foreign material detrimental to appearance or painting.

B. Remove all excess concrete debris remaining after completion of placement and form removal from the Site and dispose of in a proper and legal manner.

3.16 ANCHORING DOWELS

A. Drill hole in concrete to the size and depth recommended by the adhesive supplier and as approved by Engineer.

B. Clean hole with a nylon brush and use oil-free compressed air to blow out hole.

C. Fill hole with anchoring adhesive in accordance with manufacturer's recommendations.

3.17 FIELD QUALITY CONTROL

A. Concrete Strength Tests:
   1. Mold and cure 4 specimens from each sample in accordance with ASTM C31. Record any deviations from the requirements of ASTM C31 in the test report.
   2. Test specimens in accordance with ASTM C39. Test 2 specimens at 28 days for acceptance and 1 at 7 days for information. Test 1 specimen at 56 days if desired by Engineer.
   3. Conduct at least 1 strength test for each 50 cu.yds. or fraction thereof for each mixture design placed in any 1 day.
   4. Furnish a copy of the test results to Engineer as soon as available.
   5. Costs of concrete cylinder testing will be paid by Owner.

6. Mold and field cure specimens as required in ASTM C31.
7. Acceptance test results shall be the average strengths of the 2 specimens tested at 28 days.
8. Conduct load test on test cores of concrete that fail to meet the specified strength, in accordance with ASTM C42.
9. Failure to meet strength requirements of the cores, shall be a cause for rejection by Engineer.
10. The cost of remedial measures required due to test failures shall be paid for by Contractor.

B. Engineer may request adjustment to concrete mixes when characteristics of materials, job conditions, weather, test results, other circumstances warrant.

C. Concrete Slump Tests, Air Content Tests, and Temperature: See paragraph 1.04. All costs of initial testing will be paid for by owner.

Table 2-1

	f'c @ 28 days	**Maximum Water/Cement + Pozzolan Ratio**	**Maximum Pozzolan Content (percent of cement content)**	**Aggregate**	**Entrained Air Content (Refer to ACI 350, Moderate Exp.)**	**Slump (inches) before and after superplasticizer**
A. Concrete for walls, slabs, beams, base slabs, pads and all other concrete unless noted below.	4,000 psi	0.45	25% Fly Ash 40% Slag 50% combined	Section 2.01.B	6 percent plus/minus 1%	3 ± 1 before 6 ± 1 after
D. Grout - For Filling CMU	3,000 psi	0.50	25% Fly Ash	Section 2.01.B	None	6 ± 1[3]

END OF SECTION

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SECTION 03 41 00

PLANT-PRECAST STRUCTURAL CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Provide precast reinforced concrete units as follows:
   1. Deck and roof panels.
      a. Hollow-core slab units.
   2. Accessories.
      a. Bearing pads.
      b. Core end plugs.
      c. Clips, hangers.
      d. Joint sealant.

B. Furnish the following for other sections to install, including, but not limited to:
   1. Structural precast accessories to be embedded in cast-in-place concrete:
      a. Bearing plates.
   2. Structural precast accessories to be embedded in masonry:
      a. Bearing plates.

C. Install the following provided by others:
   1. Sleeves and imbedded items for plumbing, heating, or electrical distribution.

D. Perform the following:
   1. Provide openings as indicated on Drawings.

E. Related Sections:
   1. Section 03 30 00 - Cast-in-Place Concrete
   2. Section 04 20 00 - Unit Masonry Assemblies
   3. Section 05 12 00 - Structural Steel Framing
   4. Section 05 50 00 - Metal Fabrications
   5. Section 07 92 00 - Joint Sealants

1.02 REFERENCES

A. ACI:
   1. 301 - Specifications for Structural Concrete for Buildings
   2. 318 - Building Code Requirements for Reinforced Concrete

B. ANSI/AWS:
   1. D1.1 - Structural Welding Code - Steel
   2. D1.4 - Structural Welding Code - Reinforcing Steel

C. ASTM:
   1. A36 - Structural Steel
   2. A82 - Cold Drawn Steel Wire for Concrete Reinforcement
   3. A123 - Hot Dip Galvanized Coatings on Steel Products
   4. A153 - Zinc-Coating Iron and Steel Hardware
   5. A185 - Wire Fabric for Concrete Reinforcement
   6. A276 - Stainless Steel Bars and Shapes
   7. A416 - Undercoat Seven-Wire Stress-Relieved Strand for Prestressed Concrete
   8. A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
   9. A666 - Cold-Worked Austenitic Stainless Steel Sheets, Plates, Strips
   10. C33 - Concrete Aggregates

11. C144 - Aggregate for Masonry Mortar
12. C150 - Portland Cement
13. C260 - Air Entraining Admixtures for Concrete
14. C1107 - Packaged Dry Nonshrink Hydraulic Cement Grout
15. F593 - Stainless Steel Bolts, Hex Caps, Screws, Studs

D. CRSI - Manual of Standard Practice

E. PCI:
1. MNL 116 - Manual for Quality Control for Plants and Production of Precast Concrete Products
2. MNL 120 - Design Handbook-Precast and Prestressed Concrete
3. MNL 123 - Manual on Design of Connections for Precast Prestressed Concrete
4. MNL 124 - PCI Design for Fire Resistance of Precast Prestressed Concrete

1.03 SYSTEM DESCRIPTION

A. Critical Design Requirements for Structural Precast Plank Panels:
1. Allowable tolerances: Panels must comply with the maximum allowable tolerances listed in the *Guide Specifications* of the Precast/Prestressed Concrete Institute (PCI), latest edition.
2. Design Deviations:
   a. Permitted only after Engineer's written approval of manufacturer's proposed design supported by complete design calculations and drawings.
   b. Design deviations shall provide an installation equivalent to the basic intent without incurring additional cost to Owner.

B. Performance Requirements:
1. Size components to withstand design loads in an unrestrained condition according to State Building Code or the following, whichever is greater:
   a. Typical roof assembly superimposed load of 20 psf DL, 50 psf snow, plus snow drift and unbalanced.
2. Grout Keys: Capable of transmitting horizontal shear of 2,000 pounds per foot.

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Product Data: Submit manufacturer's current Product Data including specifications, concrete design mix, handling, storage and installation instructions, and maintenance and cleaning recommendations.

C. Shop Drawings: Show complete information for fabrication and installation of precast concrete units, including:
1. Member dimensions, cross-section, location, size, type of reinforcement, including special reinforcement, and lifting devices necessary for handling and erection.
2. Layout, dimensions, and identification of each unit corresponding to sequence and procedure of installation.
3. Welded connections by AWS standard symbols.
4. Detail inserts, connections, and joints; including accessories and construction at openings in precast units.
5. Location, details of anchorage devices to be embedded in other construction. Furnish templates if required for accurate placement.
6. Erection procedure for precast units and sequence of erection.

D. Samples:
1. Selection Samples: Submit manufacturer's standard color and textures with Product Data and Shop Drawings.
2. Color Verification: Prior to shipping, submit each type of finish indicated; in sets for each color, texture, and pattern specified, showing a full range of variations expected in these characteristics. Include notification to Engineer if selection is not within quoted price range.

3. Components: Submit samples of anchors, fasteners, hardware, and other materials and components if requested by Engineer.

E. Quality Assurance/Control Submittals:
1. Test Reports: Written report of proposed mix for each type of concrete and/or other materials at least 15 days prior to start of precast unit production if requested by Engineer.
2. Certificates:
   a. Certified design calculations: Prepared by structural engineer licensed in state where project is located.
   b. Submit certificates of approval in compliance with Section 01 33 00 and Conform to IBC code for state in which Project is located.
   c. Provide AWS D1.1 certification for welders.
3. Calculated fire-resistance analysis.
4. Material Certificates:
   a. Concrete materials.
   b. Reinforcing materials and prestressing tendons.
   c. Admixtures.
   d. Bearing pads.

F. Maintenance Manual: Provide to Owner, maintenance and warranty data in “Maintenance Manual” compliant with Section 01 77 00.

1.05 QUALITY ASSURANCE

A. Qualifications of Personnel/Firm:
1. Design Calculations: Professional Structural Engineer licensed in the state where project is located.
2. Fabricator: Firm with 5 years successful experience in fabrication of precast concrete units similar to units required for project; with sufficient production capacity to produce required units without delay in work; producer member of PCI and satisfactory participant in its Plant Certification Program.
3. Fabrication Plant: Plant engaged primarily in manufacturing of similar units.
4. Supervision: 1 person present during execution of work, thoroughly trained with 5 years experience in materials and methods required, to direct fabrication and installation.
5. Welder: Certified by AWS D1.1.

B. Codes and Standards: Comply with referenced standards unless otherwise indicated.

C. Testing: Perform following ASTM tests for each 150 cubic yards of concrete placed, minimum of weekly, and provide documentation of compliance:
1. Slump: C143
2. Compressive Strength: C31, C192, C39
3. Air Content: C231 or C173
4. Unit Weight: C138

D. Field Samples: Furnish sample of each type of finish to E/A for review prior to manufacture.

E. Plant Review: If requested by E/A, review precast products at plant prior to shipment to job site.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protection: Comply with manufacturer’s recommendations for job-site storage and protection.

B. Deliver precast structural concrete units to Site in such quantities and at such times to ensure continuity of installation.

C. Damaged Material: Replace damaged material prior to acceptance at no additional cost to Owner.

D. Lift and support units only at designated lifting and supporting points as shown on Shop Drawings.

E. Place stored units so that identification marks are discernible.

F. Separate stacked members by battens across full width of each bearing point.

G. Do not use upper member of stacked tier as storage area for shorter member or heavy equipment.

H. Protect units from contact with soil or ground.

1.07 PROJECT CONDITIONS

A. Environmental Requirements: Heat surfaces to be grouted to above freezing prior to installation of grout; keep temperature above 40 degrees F for 48 hours after completion of grouting.

B. Existing Conditions: Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

1.08 SEQUENCING

A. Coordination with Other Trades: Coordinate with installation of other materials and erection of other structural systems, including items to be cast in pre-cast units.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Precast Concrete Units:
   1. Standard of Quality: Design is based on products of Wells Concrete Products Company, Wells, MN www.wellsconcrete.com
   2. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
      a. Concrete Inc., Grand Forks, ND www.ciprecast.com
      b. County Materials, Eau Claire, WI www.countymaterials.com
      c. Fabcon, Savage, MN www.fabcon-usa.com
      d. Gage Bros. Concrete www.gagebrothers.com
      e. Hanson www.hansonspancretemidwest.com
      f. Molin, Lino Lakes, MN www.molin.com
      g. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

B. Metallic Grout:
   1. Acceptable manufacturers:
      a. Embeco 885, Master Builders, Inc.
      b. Ferrogrout, L & M Construction Chemicals. Inc.
      c. Vibra-Foil, Grace Construction Products
      d. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

C. Nonmetallic Grout:
   1. Acceptable manufacturers:
      a. Crystex, L & M Construction Chemicals, Inc.
      b. Masterflow 928, Master Builders, Inc.
      c. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 MATERIALS

A. Formwork:
   1. General Requirements: Provide forms and form facing materials of metal, plastic, wood, other acceptable material, non-reactive with concrete, which produces required finish surfaces.

2. Construction: Accurate, mortar-tight, of sufficient strength to withstand pressures due to concrete placing operations, temperature changes, and when prestressed, pretensioning and detensioning operations; completed units of shapes, lines, dimensions indicated, within fabrication tolerances specified in PCI MNL 116.
3. Design: Unless forms for plant manufactured prestressed concrete units are stripped prior to detensioning, design so stresses are not induced in precast units due to deformation of concrete under prestress or to movement during detensioning.

B. Reinforcing Materials:
1. Reinforcing Bars:
   a. Deformed billet-steel: ASTM A615, Grade 60.
   b. Deformed rail-steel: ASTM A616.
   c. Deformed axle-steel: ASTM A617.
   d. Deformed low-alloy steel: ASTM A706.
2. Steel Wire: Plain, cold-drawn, ASTM A82.
3. Wire Fabric:
   a. Welded Steel: ASTM A185.
   b. Welded Deformed Steel: ASTM A497.
4. Supports for Reinforcement:
   a. Bolsters, chairs, spacers, other devices for spacing, supporting, fastening reinforcing.
   b. Comply with CRSI recommendations.
   c. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, support with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).
5. Dove Tail Slots: 22-gage galvanized steel slots 1-inch-wide by 1-inch-deep with 3/4-inch throat, plastic foam filled.

C. Prestressing Tendons:
1. Uncoated, 7-wire stress-relieved strand complying with ASTM A416.
2. Either Grade 250 or Grade 270.
3. At manufacturer's option, similar strand, but with size and ultimate strength increased approximately 15 percent, or strand with increased strength but fewer number of wires.

D. Concrete Materials:
1. Portland Cement: ASTM C150, Type I or Type III; one brand and type throughout unless otherwise acceptable to E/A.
2. Aggregates: ASTM C33, and as specified, from single source for exposed concrete.
3. Lightweight Aggregate: ASTM C330.
4. Water: Drinkable, free from foreign materials in amounts harmful to concrete and embedded steel.
5. Admixtures: Certified by manufacturer to be compatible with other required admixtures.
   a. Air-entraining 6 percent, ASTM C260.
   b. Water reducing, accelerating, high range water reducing admixtures: ASTM C494 Type A.
   c. No other admixtures may be used without E/A's acceptance.
   d. Salts: The use of calcium chloride, chloride ions or other salts is not permitted.

E. Supplementary Cementitious Materials:
1. Fly Ash: ASTM C618, Class C or F, with maximum loss on ignition of 3 percent.
2. Metakaolin Admixture: ASTM C618, Class N.
3. Silica Fume Admixture: ASTM C1240, with optional chemical and physical requirement.
4. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.

F. Connection Materials:
1. Steel Plates: Structural quality, hot-rolled carbon steel, ASTM A283, Grade C.
2. Wide Flange Shapes: ASTM A992.
3. Miscellaneous Steel Shapes: ASTM A36.
4. Carbon-steel Headed Studs: ASTM A108, cold finished.
5. Stainless Steel: ASTM A240, 302 or 304.
6. Anchor Bolts: ASTM A307, low-carbon steel regular hexagon nuts, carbon steel washers.

7. High Strength Threaded Fasteners: Heavy hexagon structural bolts, and hardened washers complying with ASTM A325.
8. Finish of Steel Unit: Exposed units galvanized per ASTM A153; others painted with rust-inhibitive primer.

G. Bearing Pads:
1. Elastomeric: Vulcanized, chloroprene elastomeric compound, molded to size or cut from molded sheet, 50 to 70 Shore A durometer.
2. Laminated Fabric-rubber: Preformed, unused synthetic fibers, new, unvulcanized rubber, surface hardness 70 to 80 Shore A durometer.
3. Random-oriented, Fiber-reinforced Elastomeric: Preformed, fibers set in elastomer, 70 to 90 Shore A durometer.
4. Cotton-duck Fabric Reinforced Elastomeric: Preformed, horizontally layered fabric bonded to elastomer, 80 to 100 Shore A durometer.
5. Frictionless: Tetrafluoroethylene (TFE), with glass fiber reinforcing as required for service load bearing stress.
6. Tempered Hardboard: PS 58, smooth both sides.
7. Plastic: Multimonomer plastic strips, non-leaching, no visible overall expansion under construction loads.

H. Grout Materials:
1. Cement Grout: Portland cement, ASTM C150, Type I, and clean, natural sand, ASTM C144. Mix 1 part cement to 3 parts sand, by volume, with minimum water required for placement and hydration. See specification 033000.
2. Metallic Shrinkage-resistant Grout:
   a. Premixed factory packaged ferrous aggregate grouting compound.
   b. ASTM C1107, Grade B.
3. Nonmetallic Shrinkage-resistant Grout:
   a. Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents.
   b. ASTM C1107, Grade B.

2.03 PRECAST CONCRETE UNITS

A. General Requirements:
1. Free of voids or honeycomb, with straight true edges and surfaces.
2. Texture:
   a. Floor members: Broomed or raked top finish for bonding with concrete floor topping.
   b. Roof members: Smooth, float top finish.
3. Reinforcement: Adequate to resist transporting and handling stresses.
4. Cast-in Weld Plates: Provide where required for anchorage or lateral bracing to structural steel and adjacent precast members, including cast-in weld plate to provide connection of flanges of adjoining members.

B. Hollow Core Plank: Precast prestressed concrete units with open voids running full length of slabs.
1. Provide headers of cast-in-place concrete or structural-steel shapes for openings larger than 1 slab width, according to hollow-core slab unit fabricator’s written recommendations.
2. Provide solid, monolithic precast slab units forming an integral part of hollow slab unit system. Design and fabricate to dimensions and details indicated for hollow slab units.

2.04 ACCESSORIES

A. Joint Sealant: As recommended by precast concrete manufacturer for interior and exterior locations, or if no recommendation by manufacture, use multi-component polyurethane sealant, including backing rod.

B. Hollow Core Plank Core End Plugs: Glass fiber insulation.

C. Clips, hangers, other accessories required for installation and for support of subsequent construction or finishes.

D. Other Materials: Materials not specifically described but required for complete, proper installation of structural precast concrete, subject to acceptance of E/A.

2.05 MIXES

A. General Requirements: Prepared by independent testing facility or by qualified precast manufacturing plant personnel, at precast manufacturer's option for each type of concrete required.

B. Proportioning: By either laboratory trial batch or field experience methods, using materials to be employed for each type of concrete required. Comply with ACI 318.

C. Compressive Strength: 5,000 psi minimum at 28 days.

D. Release Strength for Prestressed Units: 3,500 psi minimum.

E. Curing Compression Test Cylinders:
   1. Use same methods as for precast concrete work.

2.06 FABRICATION

A. Comply with manufacturing and testing procedures, quality control recommendations, dimensional tolerances of PCI MNL-116, and as specified for types of units required.

B. Built-in Anchorages:
   1. Accurately position and secure to formwork.
   2. Locate where they do not affect position of main reinforcement or placing of concrete.
   3. Do not relocate bearing plates in units unless acceptable to E/A.

C. Openings:
   1. Cast-in holes for openings larger than 8-inch diameter or 8-inch square in accordance with final Shop Drawings.
   2. Other smaller holes may be field cut by trades requiring them, as acceptable to E/A.

D. Form Preparation:
   1. Coat surfaces with bond-breaking compound before reinforcement is placed, with commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces requiring bond or adhesion.
   2. Comply with manufacturer's instructions.

E. Installation of Reinforcement:
   1. Preparation: Clean off loose rust and mill scale, earth, other materials which reduce or destroy bond with concrete.
   2. Displacement: Accurately position, support, secure reinforcement against displacement by formwork, construction, or concrete placement operations.
   3. Support: Metal chairs, runners, bolsters, spacers, and hangers, as required.
   4. Place to obtain at least minimum coverages for concrete protection.
   5. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations.
   6. Wire Ties: Set so ends are directed into concrete, not toward exposed concrete surfaces.
   7. Cut ends of strands not enclosed or covered flush and cover with high strength mortar, bonded to unit with epoxy resin bonding agent.

F. Pretensioning:
   1. Single strand tensioning method or multiple-strand tensioning method.
   2. Comply with PCI MNL-116 requirements.

G. Concrete Placement:
   1. Continuous operation to prevent formation of seams or planes of weakness in precast units, complying with requirements of ACI 304.
   2. Thoroughly consolidate placed concrete by internal and external vibration without dislocation or damage to reinforcement and built-in items.

H. Identification:
   1. Permanent markings to identify pick-up points and orientation in structure, complying with markings indicated on final Shop Drawings.
   2. Imprint date of casting on each precast unit on a surface which will not show in finished structure.

I. Curing by Moisture Retention:
   1. Form cure minimum 20 hours by moisture retention (without heat) method or accelerated heat curing with low-pressure live steam or radiant heat and moisture.
   2. Do not subject concrete to steam or hot air until after the concrete has attained its initial set. Take precautions to prevent moisture loss from concrete if using hot air for curing.
   3. Do not allow temperature of concrete to exceed 160 degrees F.
   4. Keep wet continuously for at least 6 days after being removed from the forms.
   5. Following curing period, allow the units to air dry for minimum 4 days before shipping to Site.
   6. Extend curing period if air temperature is below 50 degrees F.

J. Detensioning:
   1. Timing: Delay until concrete has attained at least 70 percent of design stress, as established by test cylinders.
   2. Heat-cured Concrete: Perform while concrete is still warm and moist, to avoid dimensional changes which may cause cracking or undesirable stresses in concrete.
   3. Pretensioned Tendons: Gradual release of tensioning jacks or by heat cutting tendons, using sequence and pattern to prevent shock or unbalanced loading.

2.07 FINISHES

A. Formed Surfaces: For formed surfaces of precast concrete as indicated for each type of unit, and as follows:
   1. Standard Finish:
      a. Normal plant run finish produced in forms that impart smooth finish to concrete.
      b. Small surface holes caused by air bubbles, normal form joint marks, minor chips and spalls will be tolerated, but no major or unsightly imperfections, honeycomb, or structural defects will be permitted.
   2. Commercial Finish:
      a. Exposed-to-view precast-prestressed elements.
      b. Remove fins, large protrusions and fill large holes.
      c. Rub or grind ragged edges.
      d. Faces to be true, well-defined surfaces.

B. Unformed Surfaces:
   1. Apply trowel finish to unformed surfaces unless otherwise indicated.
   2. Consolidate concrete; bring to proper level with straightedge, float, and trowel to smooth uniform finish.

C. Exposed Textures: Fabricate precast units and provide exposed surface finishes:
   1. Steel Smooth Form Surface: Make surface free of pockets, sand streaks, honeycomb; with uniform color and texture.

D. Color:
   1. Natural gray.

2.08 SOURCE QUALITY CONTROL

A. Fabrication Tolerances: Conform to referenced standards.

B. Tests, Inspections:
   1. Testing: Unit dimensions smaller or greater than required, and outside specified tolerance limits are subject to additional testing as specified.
   2. Strength of Units: Strength of units will be considered potentially deficient if manufacturing processes fail to comply with any requirements which may affect strength, including following conditions:
      a. Failure to meet compressive strength tests requirements.
      b. Reinforcement, pretensioning and detensioning of tendons of prestressed concrete, not conforming to specified fabrication requirements.
      c. Failure to cure, protect units against extremes in temperature as specified.
      d. Precast units damaged during handling and erection.
   3. Suspected Non-compliance Testing: When there is evidence that strength of units does not meet specification requirements, the concrete testing service shall take cores drilled from hardened concrete for compressive strength determination, complying with ASTM C42 and as follows:
      a. At least 3 representative cores from units of suspect strength, from locations directed by E/A.
      b. Test cores in saturated surface dry condition per ACI 318 if concrete will be wet during use of completed structure.
      c. Test cores in air-dry condition per ACI 318 if concrete will be dry during use of completed structure.
      d. Strength of concrete for each series of cores will be considered satisfactory if average compressive strength is at least 85 percent of 28-day design compressive strength.
      e. Test results are to be made in writing on same day tests are made, copies given to E/A, Contractor, and precast manufacturer. Include project name, number, date, manufacturer's name, concrete testing service name, identification letter, name, type of member or members represented by core tests, design compressive strength compression breaking strength and type of break (corrected for length-diameter ratio), direction of applied load to core with respect to horizontal plan of concrete as placed, and moisture condition of core at time of bearing.
   4. Patching: Where core test results are satisfactory and precast units are acceptable for use in work, fill core holes solid with patching mortar. Finish to match adjacent concrete surfaces.
   5. Defective Work: Replace with units that meet requirements of this section. Make corrections to other work affected by or resulting from corrections to precast concrete work at no cost to Owner.

C. Verification of Performance:
   1. Owner may employ separate testing laboratory to evaluate manufacturer's quality control and testing methods.
   2. Allow access to materials storage areas, concrete production equipment, concrete placement and curing facilities.
   3. Cooperate, provide samples of materials and concrete mixes as requested.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that the structural precast concrete may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies:
   1. Immediately notify E/A.
   2. Do not proceed with installation in areas of discrepancy until fully resolved.
   3. Commencement of installation signifies acceptance of surface conditions.

3.02 PREPARATION

A. Protection: Protect installed work and materials of other trades.

B. Surface Preparation, Field Welding and Cutting: Protect units from damage, provide non-combustible shield as required.

3.03 ERECTION

A. Compliance: Comply with manufacturer's instructions, including product technical bulletin installation instructions and Shop Drawing details.

B. Bearing Pads:
   1. Where indicated, as precast units are being erected.
   2. Set on level, uniform bearing surfaces.
   3. Maintain in correct position until precast units are placed.

C. Powder-Actuated Fasteners: Do not use for surface attachment of accessory items in precast, prestressed unit unless otherwise accepted by precast manufacturer.

D. Installation Tolerances: Do not exceed following tolerance limits:
   1. Variation from plumb: 1/4-inch in 20-foot run or story height, 1/2-inch total in 40-foot or longer run.
   2. Variation from level or elevations: 1/4-inch in 20-foot run; 1/2-inch in 40-foot run; total plus/minus 1/2 inch any location.
   3. Variation from position in plan: plus/minus 1/2-inch maximum any location.
   4. Offset in alignment of adjacent members any joint: 1/16-inch in 10-inch run: 1/4-inch maximum.

E. Grouting Connections and Joints: After precast concrete units placed and secured, grout open spaces at connection and joints.
   1. Retain grout in place until sufficiently hard to support itself.
   2. Pack spaces with stiff grout material; tamp until voids completely filled.
   3. Finish smooth, plumb, level with adjacent concrete surfaces.
   4. Keep grouted joints damp for not less than 24 hours after initial set.
   5. Promptly remove grout material from exposed surfaces before it hardens.

F. Sealing Joints:
   1. Seal exposed and non-exposed, exterior and interior joints. Use primer and backer rod as recommended by sealant manufacturer.
   2. Seal joints between roof and wall elements.

3.04 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.

B. Field welds and connections using high-strength bolts will be subject to tests and inspections.

C. Testing agency to report tests results promptly in writing to Contractor and E/A.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.05 REPAIR/RESTORATION

A. Touch up marred finishes, but replace units that cannot be restored to factory-finished appearance. Use materials, procedures recommended or furnished by manufacturer.

B. Damaged Metal Surface: Clean, apply coat of liquid galvanized repair compound to galvanized surfaces, compatible primer to painted surfaces.

C. Units Having Dimensions Smaller or Greater Than Required and Outside Specified Tolerance Limits: If appearance or function of structure is adversely affected, or if larger dimensions interfere with other construction, repair, or remove and replace as required to meet construction conditions.

3.06 ADJACENT PANEL ALIGNMENT

A. Panels not in flush alignment with adjacent wall panels, and beyond allowable tolerance, must be replaced or, if possible, may be mechanically straightened and permanently fastened to remain at this intended alignment.

B. Fastener hardware for such corrections must be concealed and cast into the original panels to allow for such correction. See Drawings.

3.07 CLEANING

A. Site:
   1. Do not allow accumulation of scraps, debris arising from work of this section.
   2. Maintain premises in neat, orderly condition.

B. System:
   1. Remove temporary covering and other provisions made to minimize soiling of other work.
   2. Promptly clean, repair surfaces stained, marred or otherwise damaged during work.
   3. Clean exposed surfaces of structural precast concrete using materials and methods recommended by manufacturer.
   4. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes.
   5. When work is completed, remove unused materials, containers, equipment, and debris.

END OF SECTION

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SECTION 04 20 00

UNIT MASONRY ASSEMBLIES

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Concrete masonry:
      a. Concrete masonry units.
   2. Mortar and grout.
   3. Reinforcing steel.
   4. Joint reinforcement.
   5. Ties and anchors.
   6. Surface treatment.
   7. Masonry accessories.

B. Installation of material furnished by other sections, including, but not limited to:
   1. Loose steel lintels.
   2. Sleeves.
   3. Embedments.
   4. Structural steel coiling door frames in masonry walls.
   5. Hollow metal frames in masonry walls.

C. Perform the following:
   1. Preparation of openings in masonry for recessed items.
   2. Modifications of existing masonry in areas of new construction.

D. Related Sections:
   1. Section 06 10 53 - Miscellaneous Rough Carpentry
   2. Section 07 21 00 - Thermal Insulation
   3. Section 07 92 00 - Joint Sealants
   4. Section 08 11 13 - Hollow Metal Doors and Frames (Commercial)
   5. Section 10 44 00 - Safety Specialties

1.02 REFERENCES

A. ACI:
   1. 315, SP66 - Details and Detailing of Concrete Reinforcement
   2. 530.1 - Specifications for Masonry Structures

B. ASTM:
   1. A53 - Pipe, Steel, Hot-Dipped, Zinc Coated
   2. A153 - Zinc Coating, Hot Dip, on Iron and Steel Hardware
   3. A240 - Chromium and Chromium-Nickel Stainless Steel Plate
   4. A276 - Stainless Steel Bars and Shapes
   5. A307 - Carbon Steel Bolts and Studs.
   6. A479 - Stainless Steel Bars and Shapes for Use in Pressure Vessels (corrosive situations)
   7. A496 - Steel Wire, Deformed, for Concrete Reinforcement
   8. A580 - Stainless Steel Wire
   9. A615 - Deformed and Plain-Billet Steel Bars for Concrete Reinforcement
   10. A641 - Zinc Coated Galvanized Carbon Steel Wire
   11. A666 - Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar For Structural Applications
   12. A775 - Epoxy Coated Steel Reinforcing Bars
   13. A951 - Masonry Joint Reinforcement
   14. B370 - Copper Sheet

15. B633 - Electrodeposited Zinc on Iron or Steel
16. C40 - Test for Organic Impurities in Fine Aggregates for Concrete
17. C67 - Test for Sampling and Testing Brick and Structural Clay Tile
18. C90 - Load Bearing CMU
19. C91 - Masonry Cement
20. C129 - Non-Loadbearing Concrete Masonry
21. C140 - Concrete Masonry Units Testing
22. C144 - Aggregates for Masonry Mortar
23. C207 - Hydrated Lime for Masonry Purposes
24. C270 - Mortar for Unit Masonry
25. C395 - Chemical Resistant Resin Mortars
26. C404 - Aggregates for Masonry Grout
27. C476 - Grout for Masonry
28. C494 - Chemical Admixtures for Concrete
29. C150 - Portland Cement
30. C578 - Rigid Cellular Polystyrene Thermal Insulation
31. C780 - Mortar Mixes
32. C1019 - Grout Sampling and Testing
33. C1093 - Testing Agency Qualifications
34. C1142 - Ready-Mixed Mortar for Unit Masonry
35. C1314 - Prism Compressive Strength
36. C1329 - Mortar Cement
37. D226 - Asphalt Saturated Organic Felt for Roofing and Waterproofing
38. D1056 - Flexible Cellular Materials
39. D3278 - Flash Point of Liquids
40. E96 - Water Vapor Transmission
41. E119 - Fire Tests of Building Construction and Methods
42. E488 - Strength of Concrete and Masonry Anchors
43. E514 - Water Penetration and Leakage Through Masonry
44. F593 - Stainless Steel Bolts, Screws, Studs
45. F594 - Stainless Steel Nuts
46. F738 - Stainless Steel Metric Bolts, Screws, Studs
47. F836 - Stainless Steel Metric Nuts, Style 1

C. AWS D1.4 - Structural Welding Code - Reinforced Steel

D. BIA:
1. Technical Note No. 20 Revised - Cleaning Brick Masonry
2. M1 - Specifications for Portland Cement-Lime Mortar for Brick Masonry

E. IBC Code: Currently in effect and adopted by state in which Project is located

F. National Concrete Masonry Association: Tek 19-1 Water Penetration Resistance

1.03 SYSTEM DESCRIPTION

A. Performance Requirements:
1. Provide unit masonry that develops the following installed compressive strengths (f'm) at 28 days:
   a. For Concrete Unit Masonry: Based on net area: f'm = 2000 PSI.
2. Provide unit masonry that meets or exceeds fire resistance requirements.

1.04 SUBMITTALS

A. Product Data:
1. For each product indicated. Include size variation data verifying that actual range of sizes for brick falls within ASTM C216 dimension tolerances.
2. Mix designs for each type of mortar and grout, including description of type and proportions of ingredients.

B. Shop Drawings:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315.

C. Samples:
   1. Color Samples: Submit manufacturer's standard color samples with Product Data.

D. Quality Assurance/Control Submittals:
   1. Qualification Data:
      a. Manufacturers, Contractor: Include lists of completed, similar sized projects with project names and addresses, names and addresses of Engineers and Owners, and other information specified.
      b. Testing agency: ASTM C1093.
   2. Cold-weather Procedures: Describe methods, materials and equipment to be used to comply with cold-weather requirements, if applicable.
   3. Material certificates and test reports.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Provide materials made of components, with uniform texture and color or blend, furnished by one manufacturer for each type of masonry, mortar, aggregate and accessory.

B. Qualifications:
   1. Manufacturer: 5 years experience in the manufacture of unit masonry.
   2. Contractor: 3 years experience in the installation of unit masonry.
   3. Personnel:
      a. Foreman: Competent, in charge of work at all times, for duration of work unless otherwise permitted by Engineer.
      b. Installer of masonry units: Skilled journeyman masons.
      c. Mixer personnel: Thoroughly trained, with at least 1 person with 1 year experience (minimum) mixing mortar.

C. Regulatory Requirements: Comply with pertinent requirements of governing authorities and referenced portions of ACI, NCMA and BIA industry standards.

D. Certificate for Fire Performance and Characteristics: Certify materials and construction are in compliance with ASTM E119, by recognized testing and inspecting organization, or by other means, acceptable to authority having jurisdiction.

E. Field Samples: If requested, before masonry materials are delivered to job site, furnish sample of each type of unit masonry, including the full range of exposed color and texture expected in complete work, to Engineer for review prior to installation.

F. Material Certificates and Test Reports: Provide statements and tests of material properties indicating compliance with standards for each type and size of the following:
   1. Masonry Units:
      a. Material test reports and statement of compressive strength.
      b. Concrete masonry units: ASTM C140.
      c. Structural masonry units, including data and calculations establishing average net-area compressive strength of units.
   2. Cementitious materials.
   3. Mortar: ASTM C780.
   4. Preblended, dry mortar mixes.
   5. Grout mixes: ASTM C1019.
   6. Reinforcing bars.
   7. Joint reinforcement.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection:
   1. Assume responsibility for acceptance of masonry units delivered to site being in compliance with specified ASTM requirements for chippage and dimensional tolerances.
   2. Comply with manufacturer's recommendations for job-site storage and protection.
   3. Unit Masonry: Store off ground and protected from wetting or contaminants likely to cause staining or defects in the masonry.
   4. Cementitious Materials: Store off ground, under cover, in dry location.
   5. Aggregates: Store to maintain grading, other required characteristics, and avoid contamination.
   6. Preblended, Dry Mortar Mix: Deliver in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store on elevated platforms, under cover, and in dry location or metal dispensing silo with weatherproof cover.
   7. Masonry Accessories Including Metal Items: Store to prevent corrosion and accumulation of dirt and oil.

1.07 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Cold and Hot Weather Protection: Conform to recommendations for hot and cold weather masonry included in International Building Code.
      a. Do not lay wet or frozen masonry units.
      b. Ice or snow formed on masonry bed: Carefully apply heat until top surface is dry to touch.
      c. Remove masonry damaged by freezing conditions.
      d. If temperatures expected to fall below 40 degrees F within 12 hours, do not lay unless proper heated enclosures are provided.
      e. Minimum temperature of masonry: 40 degrees F for 48 hours after installation.
      f. In temperatures below 50 degrees F, use surface conditioner when installing flexible flashing.
      g. Hot weather: Keep masonry moist until mortar has cured.

B. Existing Conditions: Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

1.08 MAINTENANCE

A. Extra Materials:
   1. Provide for maintenance purposes, quantity unit masonry equal to 2 percent of each type of material installed.
   2. Package and mark to identify building and material type and color.
   3. Store as directed after completion of Work.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Concrete Masonry Units:
   1. Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
      a. Amcon Block and Precast Company, St. Cloud, MN www.amconblock.com
      b. Anchor Block Company, North St. Paul, MN www.anchorblock.com
      c. Arlington Concrete Products Inc., Arlington, MN
      d. County Materials, Marathon WI www.countymaterials.com
      e. W.W. Thompson Concrete Products, Brainerd, MN
      f. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

B. Mortar and Grout Materials:
   1. Portland Cement, Mortar Cement, Masonry Cement, and Lime: Acceptable manufacturers, subject to compliance with requirements, are:
      a. Lafarge Corporation, Dallas, TX www.lafargenorthamerica.com
      b. Lehigh Cement Company, Allentown, PA www.lehighwhitecement.com
      c. Manufacturer of comparable products submitted in compliance with Section 01 25 13.
   2. Premixed Mortar: Acceptable manufacturers, subject to compliance with requirements, are:
      a. Spec Mix www.specmix.com
      b. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

C. Joint Reinforcement:
   1. Standard of Quality: Design is based on products of Heckman Building Products, Inc., Chicago, IL www.heckmanbuildingprods.com
   2. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
      a. Dur-O-Wall Inc., Aurora, IL www.dur-o-wall.com
      b. Hohmann & Barnard, Hauppauge, NY www.h-b.com
      c. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

D. Insulation:
   1. Rigid Foundation Wall Insulation: Acceptable manufacturers, subject to compliance with requirements, are:
      a. DiversiFoam Products, Inc., New Brighton, MN www.diversifoam.com
      b. Dow Chemical Company, Midland, MI www.dow.com/styrofoam
      c. Foamular 250 by Owens Corning, Toledo, OH www.owenscorning.com
      d. Pactiv Corporation, Atlanta, GA www.pactiv.com
      e. Manufacturer of comparable products submitted in compliance with Section 01 25 13.
   2. Spray Foam Sealant: Acceptable manufacturers, subject to compliance with requirements, are:
      a. *Handi-Foam*, Fomo OProducts Inc. www.fomo.com
      b. *Polycel*, Polycel Foam Products, Sommerville, NJ www.polycel.com
      c. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

E. Masonry Cleaner:
   1. Standard of Quality: Design is based on products of ProSoCo, Inc., Lawrence, KS www.prosoco.com
   2. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
      a. Diedrich Technologies, Inc., Oak Creek, WI www.diedrichtechnologies.com
      b. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

F. Surface Treatments:
   1. Water Repellant: Acceptable manufacturers, subject to compliance with requirements, are:
      a. BASF Building Systems www.buildingsystems.basf.com
      b. Evonik/Degussa www.protectosil.com
      c. L&M Construction Chemicals www.lmcc.com
      d. Grace Construction www.graceconstruction.com
      e. Rainguard www.rainguard.com
      f. Manufacturer of comparable products submitted in compliance with

2.02 MATERIALS

A. Portland Cement: ASTM C150, Type I.

B. Lime: ASTM C207, Type S.

C. Mortar Cement: ASTM C1329.
   1. Comply with ASTM C270 for types of mortar indicated below.
      a. At or below grade: Type S.
      b. Above grade: Type N, except as noted.

D. Pre-Mixed Mortar:
   1. Meet ASTM C1142.
   2. Preblended, dry mortar mix
   3. Measure by weight to ensure accurate proportions.
   4. Thoroughly blend ingredients before delivering to Site.

E. Grout Design Mix:
   1. ASTM C476.
   2. Minimum Compressive Strength: 3000 psi at 28 days.
   3. Mix Proportion: Approximately 1 part portland cement, 2-1/2 parts sand, 1-1/2 parts pea gravel, and adequate water to produce a concrete of approximate 8-inch slump. Submit mix design for review and approval.

F. Masonry Cement: ASTM C91.

G. Aggregate:
   1. Mortar: ASTM C144, natural or manufactured sand.
   2. Grout: ASTM C404, natural or manufactured sand, gravel, crushed stone, or slag.

H. Water: If not potable, demonstrated to be clean and free of oils, acids, alkalis, salts, organic materials, or other substances in amounts that may be harmful to mortar, grout, or embedded metals.

I. Admixtures:
   1. Do not use air-entraining admixtures or materials containing air-entraining admixtures.
   2. Do not add set-retarding or set-accelerating, bond modifying, or corrosion-inhibiting admixtures to mortar or grout without written approval of Engineer.
   3. Do not use chloride or products containing chloride in mortar or grout in which metal reinforcement or accessories will be embedded.
   4. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

J. Mortar Pigments: Liquid or powdered pigments mixed in accordance with manufacturer's printed instructions.
   1. Pigments shall not exceed 5 percent of mortar cement by weight for mineral oxides, nor 1 percent for carbon black.
   2. Use only pigments with a record of satisfactory performance in masonry mortars.
   3. Provide natural color or white cement as required to produce mortar color indicated.
   4. Color: Color selected from manufacturer's standard formulations.

2.03 MANUFACTURED UNITS

A. Concrete Masonry Unit:
   1. Modular, hollow and solid load-bearing standard weight.
   2. Conforming to ASTM Standard C90, Type I, Grade N.
   3. Corner blocks, jamb units, bond beam units, and special sizes and shapes as indicated or otherwise required.
   4. Defects:
      a. Exposed common CMU: Limited to 1/2-inch diameter defect in no more than 5 percent of the block. 2 defects maximum per block.
   5. Block Types (normal weight unless otherwise specified):
      a. Block Type "A":
         1) Nominal block size: 8 inch by 16 inch face.
         2) Face style: Rock Face.
         3) Unscored where not exposed to view and 1 score (2 nominal 8 inch by 8 inch faces) where exposed.
         4) Block color: As selected by Architect from manufacturer's standard colors.

2.04 REINFORCEMENT

A. Reinforcing Steel:
   1. Reinforcing Bars:
      a. Epoxy coated deformed steel, ASTM A615, ASTM A775, Grade 60.

B. Joint Reinforcement:
   1. Meet ASTM A951.
   2. Prefabricated welded-wire units with deformed continuous side rods and plain cross rods, straight lengths of not less than 10'-0", with prefabricated corner and tee units.
   3. Width: Approximately 2 inches less than nominal width of walls and partitions.
   4. Mortar coverage: Minimum 5/8-inch on joint faces exposed to exterior and 1/2-inch elsewhere.
   5. Steel Wire Size:
      a. Standard: 9 gage side and cross rods.

C. Finishes:
   1. Exterior Walls, Foundations :
      a. Class B2 Hot Dipped Galvanized carbon.

D. Design:
   1. Single-Wythe Masonry: Truss or ladder type with single pair of side rods and continuous diagonal cross rods spaced not more than 16 inches on center.

2.05 TIES AND ANCHORS

A. Anchor Bolts:
   1. Steel bolts with hex nuts and flat washers.
   2. Carbon: ASTM A307, Grade A
      a. Hot-dip galvanized, Class C.
      b. In sizes and configurations indicated.

B. Shelf Angle Anchors: Unit type masonry inserts in concrete: cast iron or malleable iron inserts of type and size indicated.

C. Post-installed Anchors: Chemical or torque-controlled expansion anchors with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in concrete, per ASTM E488 testing by qualified testing agency. See Structural Notes.
   1. Corrosion Protection:
      a. Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5 for Class SC 1 service condition (mild).
      b. Stainless-steel components complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.
         1) Bolts and nuts ASTM F738 and ASTM F836.
         2) Anchors: ASTM A666 or ASTM A276 304 or 316.

2.06 INSULATION

A. Rigid Foundation Wall Insulation (extruded polystyrene):
   1. Rigid, cellular thermal insulation with closed-cells and integral high density skin, formed by expansion of polystyrene base resin in extrusion process complying with ASTM C578, type IV.
   2. Thermal Value: 5-year aged R-values of 5.4 and 5 at 40 and 75 degrees F respectively.
   3. Density: 1.6 pounds per cubic foot minimum density, unless otherwise indicated.
   4. Compressive Strength (foundation insulation): 25 pounds per square inch.
   5. Preformed Units: To fit applications indicated, selected from manufacturer’s standard thicknesses, widths, lengths.
   6. Thickness: As indicated on Drawings, or if not indicated, 2 inches.
   7. Adhesive: Include manufacturer’s recommended adhesive or other fasteners to make positive attachment to inner wythe or concrete masonry unit.

B. Spray Foam Sealant: Non-shrink closed cell expanding urethane.

2.07 Miscellaneous Masonry Accessories

A. Compressible Filler, Non-metallic Expansion Joint Strips:
   1. Premolded, flexible cellular neoprene rubber filler strips.
   2. ASTM D1056, Grade 2A1.
   3. Capable of compression up to 35 percent of width and thickness indicated.

B. Premolded Control Joint Gaskets:
   1. Designed to fit standard sash block and to maintain lateral stability in masonry wall.
   2. Size and configuration as indicated.

C. Bond Breaker Strips:
   1. Asphalt-saturated organic roofing felt.
   2. ASTM D226, Type I, (No. 15 asphalt felt).

D. Pipe Sleeves: 3-inch diameter Schedule 40, ASTM A53, 14 inches long, at locations above ceiling as directed by Architect. Provide and install as needed.

E. Pressure Treated Wood Blocking: See Section 06 10 53.

F. Isolation Sheet: 4 mil polyethylene; use to separate incompatible metals from direct contact.

G. Masonry Cleaners:
   1. Do not use cleaning agents other than water without approval of Architect and unit manufacturer.
   2. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gallon of water.

H. Surface Treatments:
   1. Water Repellant:
      a. Silane/Siloxane, bonds with silica.
      b. Solvent based.
      c. Clear, non-yellowing, non-staining.
      d. Penetrating, breathable.
      e. Minimizes efflorescence.
      f. VOC compliant.
      g. Repels water, mildew, dirt, and airborne contaminants.
      h. Meet ASTM D3278 for flash point, ASTM E96 for water vapor transmission, and ASTM E514 for water penetration.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect, with installer present, and verify that work is complete to point where this installation may properly commence. Examine surfaces that will support masonry work to ensure completion to proper lines and grades.

B. Verification of Conditions: Verify that unit masonry systems may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies:
   1. Immediately notify Engineer.
   2. Do not proceed with installation in areas of discrepancy until fully resolved.
   3. Commencement of installation signifies acceptance of surface conditions.

3.02 PREPARATION

A. Protection of Work:
   1. During erection, cover top of walls with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover minimum 24 inches down both sides and hold securely in place.
   2. Masonry to be exposed or painted: Prevent grout, mortar or soil from staining face. Immediately remove grout or mortar in contact with such masonry.
   3. Base of walls: Protect from rain-splashed mud, mortar splatter by spreading coverings on ground and over wall surface.
   4. Sills, ledges, projections: Protect from droppings of mortar.

B. Cleaning Reinforcing: Before placing, remove loose rust, ice, other coatings from reinforcing.

3.03 INSTALLATION, GENERAL

A. Wetting:
   1. Concrete Masonry Units: Do not wet.

B. Procedures:
   1. Cavity and composite walls, floors, other masonry construction: Build to full thickness shown.
   2. Single-wythe walls: Build to actual thickness of masonry units, using units of nominal thickness indicated.
   3. Chases and recesses: Build as shown or required for work of other trades, with at least 8 inches of masonry between chase or recess and jamb of openings, between adjacent chases, recesses.
   4. Use bullnose masonry at corners and jambs, unless detailed otherwise.
   5. Leave openings for equipment to be installed before completion of masonry work.
   6. After installation of equipment, complete masonry work to match work immediately adjacent to opening.

C. Cutting:
   1. Use motor-driven saws to provide clean, sharp, unchipped edges.
   2. Cut to provide continuous pattern and to fit adjoining work.
   3. Use full-size units without cutting where possible.
   4. Use dry cutting saws to cut concrete masonry units.

3.04 LAYING MASONRY UNITS

A. General:
   1. Do not install masonry units that are cracked, broken, or chipped in excess of ASTM allowances.
   2. When possible, orient units so that small chips and cracks are not on exposed side of wall.
   3. Align unit cells or cores that are to be grouted.
   4. Place units in final position while mortar is soft and plastic.
   5. Match approved mock-up panel to provide uniform color blending in walls of exposed brick or CMU and to avoid patchy effect.

B. Layout and Tolerances:
   1. Layout in advance for accurate spacing of surface bond patterns with uniform joint widths, accurate location of openings, movement-type joints, returns, and offsets.
   2. Avoid use of less- than-half-size units at corners, jambs, and wherever possible at other locations.
   3. Comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.
   4. Install masonry to distance from adjoining dissimilar materials as detailed or if not detailed, 3/4-inch maximum.

C. Pattern Bond:
   1. Match patterns as indicated. If not shown, lay in running bond with vertical joint in each course centered on units in courses above and below.

2. Concealed masonry: Lay with units in wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners.
3. Do not use units with less than nominal 4-inch horizontal face dimensions at corners, jambs.

D. Stopping and Resuming Work:
1. Rake back 1/2-unit length in each course; do not tooth.
2. Clean exposed surfaces of set masonry, wet units lightly (if required), remove loose masonry units and mortar prior to laying fresh masonry.

E. Built-in Work:
1. As work progresses, build-in items specified under this and other sections of these specifications.
2. Coordinate with any other trades involved.
3. Install all metal frames, bolts, inserts, sleeves, bearing plates, and other items required to be set in masonry.
4. Fill all hollow metal frames with concrete unless indicated otherwise. Rake out joint between frame and concrete masonry unit to create 3/8-inch reveal.
5. Fill in solidly with masonry around built-in items.
6. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
7. Built-in items to be embedded in cores of hollow masonry units: Place layer of metal lath in joint below, rod mortar or grout into core.
8. Embed anchors and ties at least 1/2 inch in mortar of outer face shell of hollow units and 1-1/2 inch in mortar of solid masonry.
9. Hollow concrete masonry units: Fill cores with grout 3 courses (24 inches) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
10. Do not disturb or bend ties or anchors after embedding in grout or mortar.

3.05 BEDDING AND JOINTING

A. Mortar Mixing:
1. Mix mortar in accordance with the requirements of ASTM C270.
2. Control batching procedure to ensure proper proportions by measuring materials by volume or weight as specified.
3. Control amount of mixing water and mortar consistency.
4. Discard mortar or grout that has partially set or is not used within 1-1/2 hours of mixing.
5. Re-temper with 1-1/2 hours of mixing to replace moisture lost by evaporation. Do not retemper colored mortars.

B. Hollow Concrete Masonry Units:
1. Lay full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout.
3. For starting course on footings where cells are grouted, spread out full mortar bed including areas under cells.

C. Joints:
1. Joint widths: Maintain as shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8-inch joints.
2. Masonry walls to be concealed or covered by other materials: Cut flush unless otherwise indicated.
3. Exposed joints: Tool brick or concrete masonry joint slightly concave using jointer larger than joint thickness, unless otherwise indicated.

D. Masonry Units Disturbed After Laying:
1. Clean, reset in fresh mortar.
2. Do not pound corners of jambs to shift adjacent stretcher units that have been set in position.
3. If adjustment required, remove units, clean off mortar, reset in fresh mortar.

3.06 REINFORCED MASONRY

A. Set reinforcing bars in grout; do not use mortar.

B. Schedule:
   1. Bond beams.
   2. Vertical cores at each side of lintels.
   3. Vertical reinforcing for walls.
   4. Mitered concrete masonry unit corners, every other course.
   5. Vertical reinforcing in parapets as indicated on Drawings, or if not indicated, 2'-8" on center.

3.07 HORIZONTAL JOINT REINFORCEMENT

A. Continuous Horizontal Joint Reinforcement as Indicated:
   1. Longitudinal side rods in mortar for entire length with minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere.
   2. Lap reinforcing minimum 6 inches.
   3. Cut or interrupt at control and expansion joints, unless otherwise indicated.
   4. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted to be omitted.
   5. Provide continuity at corners and wall intersections by use of prefabricated “L” and “T” sections.
   6. Cut, bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, other special conditions.
   7. Space continuous horizontal reinforcement as follows:
      a. Single-wythe walls: 16 inches on center vertically, unless otherwise indicated.

B. Reinforcement at Openings:
   1. Reinforce masonry openings greater than 1-foot wide with horizontal joint reinforcement placed in 2 joints approximately 8 inches apart, immediately above lintel and immediately below sill.
   2. Extend minimum 2 feet beyond jambs of opening except at control joints.

3.08 CONTROL AND EXPANSION JOINTS

A. Vertical and horizontal expansion, control, isolation joints in masonry where shown must be unobstructed by structure, mortar, or reinforcing. Build-in related items as masonry work progresses.
   1. Build flanges of metal expansion strips into masonry.
   2. Lap each joint 4 inches in direction of water flow.
   3. Seal joints below grade and at junctures with horizontal expansion joints, if any.
   4. Build flanges of factory-fabricated expansion joint units into masonry.
   5. Build in non-metallic fillers where indicated.
   6. Build in horizontal pressure relieving joints where indicated; construct joints by either leaving an air space or inserting non-metallic compressible joint filler of width required to permit installation of sealant and backer rod.
   7. Locate horizontal pressure relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.
   8. Space joints as indicated on Drawings, or if not indicated 16 feet (maximum) on center. Verify location in writing with Engineer.
   9. Offset control joints in wythes of dissimilar materials.

3.09 LINTELS

A. Steel Lintels: Install where indicated.

B. Masonry Lintels:
   1. Prefabricated or built-in-place from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout.
   2. Where shown and wherever openings of more than 12 inches for brick size units and 24 inches for block size units are shown without structural steel or other supporting lintels.
   3. Cure before handling and installing.
   4. Temporarily support built-in-place lintels until cured.

C. Hollow Concrete Masonry Unit Walls:
   1. Specially formed U-shaped lintel units, reinforcement bars placed as shown, filled with concrete.
   2. Match CMU in color, texture, and compressive strength.
   3. Where no reinforcement is shown, two Number 5 bars minimum.
   4. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.10 ADJUSTING

A. Remove damaged masonry units and units that do not match adjoining units as intended. Replace with new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes, except weep holes, and completely fill with mortar. Point-up joints including corners, openings, and adjacent work to provide a neat, uniform appearance, prepared for application of sealants. Tuck point and repair cracks or nail holes 1/32 of an inch or larger.

C. Shoring and Bracing: Provide temporary support for masonry elements such as lintels, beams, arches, and soffits. Do not remove until masonry has cured sufficiently to carry its own weight and other temporary loads that may be placed on it during construction.

3.11 FIELD QUALITY CONTROL

A. Site Tests: Comply with requirements of Section 01 45 00.

B. Construction Tolerances:
   1. Variation from plumb: Do not exceed 1/4 inch in 10 feet, or 3/8 inch in a story height not to exceed 20 feet, or 1/2 inch maximum.
   2. Variation from level:
      a. Bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, other conspicuous lines: Do not exceed 1/4 inch in 10 feet or 1/2 inch maximum.
      b. Top surface of bearing walls: Do not exceed 1/4 inch in 10 feet or 1/2 inch maximum.
   3. True to a line: Do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
   4. Variation in cross-sectional dimensions or elevations: Shall not exceed minus 1/4 inch, plus 1/2 inch.
   5. Alignment of columns and walls (bottom versus top):
      a. Bearing walls: 1/2 inch.
      b. Non-bearing walls: 3/4 inch.
   6. Grout space or cavity width: Minus 1/4 inch, plus 3/8 inch.
   7. Variation in mortar joint thickness:
      a. Do not exceed bed joint thickness indicated by more than plus/minus 1/8 inch, with maximum thickness limited to 1/2 inch.
      b. Do not exceed head or collar joint thickness indicated by more than minus 1/4 inch or plus 3/8 inch.

3.12 CLEANING

A. Dry brush masonry surfaces after mortar has set at end of each work day and after final pointing.

B. Clean exposed, unglazed masonry with stiff brush and clean water, or with mild cleaning agent approved by Engineer and unit manufacturer.

C. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.

D. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Engineer’s approval of sample cleaning before proceeding with cleaning of masonry.

E. Protect adjacent surfaces from contact with cleaner by covering with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

F. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.

3.13 SURFACE TREATMENTS

A. Sealing: Seal burnished concrete masonry work after curing with 1 coat of specified sealer applied in strict accordance with manufacturer's recommendations.

B. After masonry units have been cleaned, apply water repellent in accordance with manufacturer's instructions.

3.14 PROTECTION

A. Provide final protection and maintain conditions in manner acceptable to installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

B. Uniform floor, roof loading: Do not apply for at least 12 hours after building masonry walls or columns.

C. Concentrated loads: Do not apply for at least 3 days after building masonry walls or columns.

3.15 WASTE MANAGEMENT

A. Separate and recycle waste materials in accordance with the Waste Management Plan to the maximum extent economically feasible.

B. Fold up metal banding, flatten, and place in designated area for recycling.

C. Collect wood packing shims and pallets and place in designated area.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill or in landscaping of the Project, and other masonry waste, and legally dispose of off Owner's property.

E. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
   1. Crush masonry waste to less than 4 inches in each dimension.
   2. Mix masonry waste with at least 2 parts of specified fill material for each part of masonry waste.
   3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

END OF SECTION

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SECTION 05 12 00

STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SUMMARY

A. Provide structural steel:
   1. Columns.
   2. Beams.
   3. Shop priming.
   4. Auxiliary materials:
      a. Direct tension indicators.
      b. Electrodes for welding.
      c. Structural steel primer.
      d. Cement Grout:
         1) Portland cement, sand.
      e. Nonmetallic shrinkage-resistant grout:
         1) Premixed nonmetallic grouting compound, CE CRD-C621.

B. Furnish the following for other sections to install, including but not limited to:
   1. Embedments:
      a. Anchor bolts.

C. Perform the following:
   1. Touch-up primer paint.
   2. Finish paint.

   3.

D. Related Sections:
   1. Section 03 30 00 - Cast-in-Place Concrete
   2. Section 04 20 00 - Unit Masonry Assemblies
   3. Section 09 91 50 - Shop Painting

1.02 REFERENCES

A. AISC:
   1. Code of Standard Practice for Steel Buildings and Bridges
   2. Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings, including Commentary" and Supplements
   3. Specifications for Structural Joints using ASTM A325 or A490 Bolts, approved by Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation

B. ASTM:
   1. A6 - General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use
   2. A36 - Carbon Structural Steel
   3. A53 - Pipe, Steel, Black, Hot Dipped, Zinc Coated, Welded, Seamless
   4. A148 - High Strength Steel Castings, Carbon, Structural
   5. A307 - Carbon Steel Bolts and Studs
   6. A325 - Structural Bolts, Steel, Heat Treated
   7. A490 - Structural Bolts, Alloy Steel, Heat Treated
   8. A500 - Cold-Formed, Welded and Seamless Carbon Steel Structural Tubing
   9. A501 - Hot-Formed, Welded and Seamless Carbon Steel Structural Tubing
   10. A992 - Structural Steel Shapes

C. AWS:
   1. D1.1 - Structural Welding Code
   2. Standard Qualification Procedure

1.03 DEFINITIONS

A. Structural Steel Lintels: Lintels are included with structural steel only if attached to the structural steel frame.

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Product Data: Producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports, other data to show compliance with specifications (including specified standards):
   1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
   2. High-strength bolts (each type), including nuts and washers.
   3. Structural steel primer paint.

C. Shop Drawings:
   1. Prepare under supervision of Professional Engineer, registered in the state in which Project is located.
   2. Include complete details, schedules for fabrication, assembly of structural steel members procedures and diagrams; details of cuts, connections, camber, holes, other data.
   3. Indicate welds by standard AWS symbols; show size, length, and type of weld.
   4. Provide setting drawings, templates, directions for installation of anchor bolts, other anchorages to be installed by others.

1.05 QUALITY ASSURANCE

A. Codes and Standards:
   1. Comply with referenced standards, except as otherwise indicated.
   2. Delete the following sentence of Paragraph 4.2.1 - Code of Standard Practice for Steel Buildings and Bridges: "This approval constitutes Owner's acceptance of all responsibility for design adequacy of any connections designed by fabricator as a part of preparation of these Shop Drawings."

B. Conflicting Requirements: More stringent shall govern.

C. Qualifications for Welding Work:
   1. Qualify welding processes, operators in accordance with AWS "Standard Qualification Procedure".
   2. Provide certification that welders have satisfactorily passed AWS qualification tests.
   3. If recertification of welders required, retesting will be Contractor's responsibility.

D. Surveys:
   1. Owner may employ services of registered Professional Engineer or land surveyor to verify tolerance compliance.
   2. If out of compliance, Contractor responsible for payment.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Ensure uninterrupted progress of work.

B. Storage:
   1. Permit easy access for inspection and identification.

2. Keep steel members off ground, using pallets, platforms, or other supports.

C. Protection:
1. Protect steel members, packaged materials from erosion and deterioration.
2. Do not store materials on structure in manner that might cause distortion or damage to members or supporting structures.

D. Damaged Materials or Structures: Repair or replace as directed.

1.07 PROJECT CONDITIONS

A. Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with specified requirements, acceptable manufacturers and products are:
1. Non-shrink Nonmetallic Grouts:
   a. *Bonsal Construction Grout* by W. R. Bonsal Company www.bonsal.com
   b. *Hi-Flow Grout* by Euclid Chemical Company www.euclidchemical.com
   c. *Kemset* by ChemMasters Corporation www.chemmasters.net
   d. *Crystex* by L & M Construction Chemicals, Inc www.lmcc.com
   e. *Masterflow 713* by Unicon of BASF www.unicon.ca
   f. Sonogrout by BASF www.basfbuildingsystems.com
2. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 MATERIALS

A. General:
1. Materials to be smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled trade names, and roughness.
2. Remove blemishes by grinding, or by welding and grinding, prior to cleaning, treating, and application of surface finishes.

B. Wide Flange Shapes and Structural Tees cut from: ASTM 992.

C. Steel Pipe: ASTM A53, Grade B.

D. Cold-form Steel Tubing: ASTM A500, Grade B.

E. Hot-formed Steel Tubing: ASTM A501.

F. All Other Structural Steel Shapes, Plates, and Bars: ASTM A36.

G. Anchor Bolts: ASTM A307, non-headed type unless otherwise indicated.

H. Epoxy Adhesive Anchors:
1. Hilti: HY 200 Injection Adhesive Anchors, Hilti HVA Adhesive Anchor, Hilti HIT 70 Masonry Anchor, or approved equal.
2. If the embedment length is not shown on the Drawings, provide the embedment length recommended by the manufacturer to develop the full allowance strength of the bolt.

I. Unfinished Threaded Fasteners:
1. ASTM A307, Grade A.
2. Regular low-carbon steel bolts and nuts.

3. Provide hexagonal heads and nuts for all connections.

J. High-strength Threaded Fasteners:
1. Heavy hexagon structural bolts, heavy hexagon nuts, hardened washers.
2. Quenched and tempered medium carbon steel bolts, nuts, and washers.
3. Comply with ASTM A325.
4. Direct tension indicator washers may be used.

K. Electrodes for Welding: Comply with AWS.

L. Non-metallic Shrinkage-resistant Grout:
1. Pre-mixed, non-metallic, non-corrosive, non-staining.
2. Containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents.
3. Comply with CRD-C621.
4. Subject to compliance with requirements, products may include, but are not limited to:
   a. *Euco N.S.*; Euclid Chemical Co.
   b. *Crystex*; L&M Construction
   c. Chemicals Masterflow 713; Master Builders
   d. *Upcon*; Upco Chemical Division, USM Corporation.

2.03 FABRICATION

A. Shop Fabrication and Assembly:
1. Fabricate and assemble structural assemblies in shop to greatest extent possible in accordance with AISC Specifications and as indicated on final Shop Drawings.
2. Provide camber in structural members where indicated.
3. Where finishing is required, complete assembly, including welding of units, before start of finishing operations.
4. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

B. Marking and Delivery:
1. Mark and match-mark materials for field assembly.
2. Fabricate for delivery sequence that will expedite erection and minimize field handling of materials.

C. Connections:
1. Shop connections: Weld or bolt as indicated.
2. Field connections: Bolt, except where welded connections or other connections are indicated.
3. Principal bolted connections: Provide high-strength threaded fasteners except where unfinished bolts are indicated.
4. Bolted connections of secondary framing members to primary members. Provide unfinished threaded fasteners
5. Temporary bracing: Provide unfinished threaded fasteners.
6. Use stainless steel anchor bolts (Type 304) for galvanized construction, minimum 3/4 inch diameter, with head or nut at bottom end.

D. High-Strength Bolted Construction:
1. Install in accordance with AISC “Specifications for Structural Joints using ASTM A325 or A490 Bolts.”
2. Use galvanized bolts for galvanized construction.

E. Welded Construction: Comply with AWS Code for procedures, appearance, quality of welds, and methods used in correcting welding work.

F. Holes for Other Work:
1. Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final Shop Drawings.

2. Provide threaded nuts welded to framing, other specialty items as indicated to receive other work.
3. Cut, drill, or punch holes perpendicular to metal surfaces.
4. Do not flame cut holes or enlarge holes by burning.
5. Drill holes in bearing plates.

2.04 SHOP PAINTING

A. General Requirements:
1. Shop paint structural steel, except:
   a. Members or portions of members to be embedded in concrete or mortar.
   b. Members to receive fireproofing.
   c. Surfaces to be welded or high-strength bolted with friction-type connections.
2. Paint embedded steel that is partially exposed on exposed portions and initial 2 inches of embedded areas only.
3. Apply 2 coats to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

B. Materials:
1. Refer to Section 09 91 00.
2. Members to receive fireproofing: Primer approved by fireproofing or intumescent paint manufacturer in compliance with UL or FM assemblies.

C. Painted items shall be fully dry before handling or shipping.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that Structural Steel may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies: Immediately notify Engineer. Do not proceed with installation in areas of discrepancy until fully resolved. Commencement of installation signifies acceptance of surface conditions.

3.02 PREPARATION

A. Protection: Protect installed work and materials of other trades.

3.03 ERECTION

A. Surveys:
1. Employ registered Professional Engineer or land surveyor for accurate erection of structural steel if deemed necessary.
2. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Engineer.
3. Do not proceed with erection until corrections have been made, or compensating adjustments to structural steel work have been agreed upon with Engineer.

B. Temporary Shoring and Bracing:
1. Provide connections of sufficient strength to bear imposed loads. Remove when permanent members are in place and final connections are made.
2. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds. Provide temporary planking and working platforms as necessary to effectively complete work.

C. Anchor Bolts:
   1. Anchor bolts and other connectors: As required for securing structural steel to foundations and other in-place work.
   2. Templates and other devices: As necessary for presetting bolts and other anchors to accurate locations.
   3. Refer to Division 3 for anchor bolt installation requirements in concrete, and Division 4 for masonry installation.

D. Setting Bearing Plates:
   1. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
   2. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
   3. Tighten anchor bolts after supported members have been positioned and plumbed.
   4. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
   5. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain.
   6. Finish exposed surfaces, protect installed materials, and allow to cure.
   7. Comply with grout manufacturer's instructions.

E. Field Assembly:
   1. General requirements: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevation and alignment.
   2. Level and plumb individual members of structure within specified AISC tolerances.
   3. Establish required leveling and plumbing measurements on mean operating temperature of structure. Allow for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.
   4. Splice members only where indicated and accepted on Shop Drawings.

F. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds, grind smooth at exposed surfaces.
   1. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, removal of paint on surfaces adjacent to field welds.
   2. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

G. Gas Cutting:
   1. Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing.
   2. Cutting permitted only on secondary members that are not under stress, as acceptable to Engineer.
   3. Finish gas-cut sections equal to sheared appearance when permitted.

3.04 REPAIR/RESTORATION

A. Touch-up Painting:
   1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint.
   2. Apply paint to exposed areas using same material as used for shop painting, by brush or spray to provide minimum dry film thickness of 1.5 mils.
   3. Touch up marred finishes.
   4. Verify paint for areas to be fireproofed.

3.05 FIELD QUALITY CONTROL

A. Special Inspections: Comply with requirements of Specification.

3.06 ADJUSTING

A. Replace damaged materials with new materials complying with specified requirements.

3.07 CLEANING

A. Site: Do not allow accumulation of scraps, debris arising from work of this section. Maintain premises in neat, orderly condition.

B. Other Work:
   1. Remove temporary covering and other provisions made to minimize soiling of other work.
   2. Promptly clean surfaces soiled by this section, repair surfaces stained, marred or otherwise damaged during work.

C. Structural Steel:
   1. Clean exposed surfaces of structural steel using materials and methods recommended by manufacturer.
   2. When work is completed, remove unused materials, containers, equipment, and debris.
   3. Collect offcuts and scrap and place in designated areas for recycling.

3.08 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer to ensure work is without damage or deterioration at time of Substantial Completion.

END OF SECTION

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SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Miscellaneous framing and supports:
      a. Overhead door track support framing.
   2. Metal bar gratings.
   3. Steel tube and pipe railings.
   4. Steel framed stairs.
   5. Metal fabrication accessories including, but not limited to:
      a. Rough hardware.
      b. Grout and anchoring cement.

B. Furnish the following for other sections to install including, but not limited to:
   1. Structural steel overhead door frames.
   2. Trench cover and frame.
   3. Pipe bollards.
   4. Floor anchor pots and plates.
   5. Metal fabrication accessories including, but not limited to:
      a. Rough hardware.

C. Related Sections:
   1. Section 03 30 00 - Cast-in-Place Concrete
   2. Section 04 20 00 - Unit Masonry Assemblies
   3. Section 05 12 00 - Structural Steel Framing
   4. Section 07 92 00 - Joint Sealants
   5. Section 08 36 13 - Sectional Steel Overhead Doors
   6. Section 09 91 50 - Shop Painting

1.02 REFERENCES

A. Building Codes:
   1. International Building Code
   2. Minnesota State Building Code

B. AASHTO H20 - Loading Conditions for Gratings

C. ASTM:
   1. A27 - Steel Carbon Castings, General Applications
   2. A36 - Carbon Structural Steel
   3. A47 - Ferritive Malleable Iron Castings
   4. A48 - Gray Iron Castings
   5. A53 - Pipe, Steel, Black, Hot Dipped, Zinc Coated, Welded, Seamless
   6. A123 - Zinc Coatings on Iron and Steel Products
   7. A153 - Zinc Coatings on Iron and Steel Hardware
   8. A167 - Stainless and Heat Resisting Chromium Nickel Steel Plate, Sheet, and Strips
   9. A500 - Cold-Formed, Welded and Seamless Carbon Steel Structural Tubing
   10. A501 - Hot-Formed, Welded and Seamless Carbon Steel Structural Tubing
   11. A510 - Wire Rods and Coarse Round Wire, Carbon Steel
   12. A513 - Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
   13. A536 - Ductile Iron Castings
   14. A569 - Tables, Mess, Marine, Steel

15. A653 - Steel Sheet, Galvanized or Galvannealed by Hot Dip Process
16. A780 - Repair of Damaged Galvanized Coatings
17. A786 - Hot Rolled Carbon, Low Alloy, High Strength Low Alloy, and Alloy Steel Floor
18. A992 - Structural Steel Shapes
19. A1008 - Steel Sheet, Cold Rolled, Carbon, Structural High Strength, Low Alloy
20. B632 - Aluminum Alloy Rolled Tread Plates
21. E119 - Test Method for Fire Tests of Building Construction and Methods
22. E894 - Test for Anchorage of Permanent Metal Railing Systems and Rails for Buildings
23. E935 - Performance of Permanent Metal Railing Systems and Rails for Buildings
24. E985 - Permanent Metal Railing Systems and Rails for Buildings
25. E936 - Roof Systems Assemblies Employing Steel Deck, Preformed Insulation, and Bituminous Built-up Roofing
26. G90 - Standard for Performing Outdoor Weathering of Nonmetallic Materials Using Sun

D. AWS:
1. D1.1 - Structural Welding Code - Steel
2. D1.2 - Structural Welding Code - Aluminum
3. D1.3 - Structural Welding Code - Sheet Metal

E. NAAMM:
1. Metal Finishes Manual
2. MBG 532 - Heavy-Duty Metal Bar Grating Manual

F. SSPC:
1. PA1 - Paint Application Specification No. 1
2. SP3 - Power Tool Cleaning
3. SP6 - Commercial Blast Cleaning

1.03 DEFINITIONS

A. Metal Fabrications: Items made from iron and steel shapes, plates, bars, strips, tubes, pipes, castings not part of structural steel or other metal systems specified elsewhere.

1.04 SYSTEM DESCRIPTION

A. Design Requirements:
1. Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements of ASTM E985 for structural performance based on testing performed in accordance with ASTM E894 and E935.
2. Thermal Movement: Allow for thermal movement for exterior assemblies resulting from maximum 150 degree change in ambient temperature in design, fabrication, installation to prevent buckling, opening up of joints, over stressing of welds and fasteners.
3. Base design calculations on actual surface temperatures of metals due to solar heat gain and nighttime sky heat loss.

B. Performance Requirements: Design, engineer, fabricate, and install the following metal fabrications to withstand the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections.
1. Apply each load to produce the maximum stress in each respective component of each metal.
2. Top Rail of Guardrail Systems:
   a. Concentrated load of 200 pounds applied at any point nonconcurrently, vertically downward, or horizontally.
   b. Uniform load of 50 pounds per linear foot, applied nonconcurrently, vertically downward or horizontally.
   c. Concentrated and uniform loads above need not be assumed to act concurrently.
3. Handrails Not Serving as Top Rails:
   a. Concentrated load of 200 pounds applied at any point nonconcurrently, vertically downward or horizontally.

b. Uniform load of 50 pounds per linear foot applied nonconcurrently, vertically downward or horizontally.
c. Concentrated and uniform loads above need not be assumed to act concurrently.

4. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 pounds applied to one square foot at any point in the system including panels, intermediate rails balusters, or other elements composing the infill area.
5. Treads of Steel Stairs: Capable of withstanding a uniform load of 100 pounds per square foot or a concentrated load of 300 pounds on a area of 4 square inches located in the center of the tread, whichever produces the greater stress.
6. Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 feet per pound per square foot.
7. Metal Bar Gratings:
   a. Floors: Uniform load of 250 lbf/square foot or concentrated load of 3000 lbf.
   b. Limit deflection to 1/4 inch.

1.05 SUBMITTALS

A. Product Data: Data for products used, including paint products and grout.

B. Shop Drawings:
1. Detail fabrication, erection of each metal fabrication indicated. Include plans, elevations, sections, details of metal fabrications, their connections. Show anchorage and accessory items.
2. Provide templates for anchors, bolts specified for installation under other sections.

C. Calculations:
1. Where indicated to comply with certain design loadings, include structural computations, material properties, other information needed for structural analysis, signed and sealed by qualified professional engineer, registered in the state where project located, responsible for their preparation.
2. Provide structural calculations for bridge crane.

D. Welder Certificates: Signed by Contractor certifying that welders comply with specified requirements.

E. Qualification Data: For firms and persons specified, to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

1.06 QUALITY ASSURANCE

A. Qualifications:
1. Fabricator: Firm experienced in successfully producing metal fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.
2. Installer: Arrange for installation of metal fabrications specified in this section by same firm that fabricated them.
3. Welding Processes and Welding Operators:
   a. Qualify in accordance with AWS D1.1 “Structural Welding Code - Steel,” D1.3 “Structural Welding Code - Sheet Steel,” and D1.2 “Structural Welding Code - Aluminum.”
   b. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

B. Regulations:
1. Gratings:
   a. Meet ADA Section 4.5.4.
   b. Comply with NAAMM MBG 532: “Heavy-Duty Metal Bar Grating Manual.”

1.07 SITE CONDITIONS

A. Field Measurements:
   1. Check actual locations of walls, other construction to which metal fabrications must fit, by accurate field measurements before fabrication.
   2. Show recorded measurements on final Shop Drawings.
   3. Coordinate fabrication schedule with construction progress to avoid delay of Work.
   4. Where field measurements cannot be made without delaying Work, guarantee dimensions, proceed with fabrication without field measurements.
   5. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

1.08 SEQUENCING AND SCHEDULING

A. Handrails:
   1. Mount only on completed walls.
   2. Do not support temporarily by any means not satisfying structural performance requirements.
   3. Mount only on gypsum board assemblies reinforced to receive anchors, where location of concealed anchor plates clearly marked.

B. Metal Bar Gratings:
   1. Coordinate installation of anchorages for gratings, grating frames, and supports.
   2. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Alternating Stair Treads:
   1. Standard of Design: Design is based on Lapeyre Stair, New Orleans, LA www.lapeyrestair.com
   2. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
      a. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

B. Metal Bar Gratings: Available Manufacturers, subject to compliance with requirements and prior approval by Engineer, include the following:
   1. Alabama Metal Industries Corporation www.amico-online.com
   2. Ohio Gratings, Inc www.ohiogratings.com

C. Grout and Anchoring Cement:
   1. Approved Manufacturers: One of the following or approved in advance by Engineer.
   2. Non-shrink Metallic Grouts:
      a. *Metox RM* by ChemMasters Corporation www.chemmasters.net
      b. *Hi-Flow Metallic Grout* by Euclid Chemical Company www.euclidchemical.com
      c. *Embeco 636* by BASF www.basfbuildingsystems.com
   3. Non-shrink Nonmetallic Grouts:
      a. *Bonsal Construction Grout* by W. R. Bonsal Company www.bonsal.com
      b. *Hi-Flow Grout* by Euclid Chemical Company www.euclidchemical.com
      c. *Kemset* by ChemMasters Corporation www.chemmasters.net
      d. *Crystex* by L & M Construction Chemicals, Inc www.lmcc.com
      e. *Masterflow 713* by Unicon of BASF www.unicon.ca
      f. *Sonogrout* by BASF www.basfbuildingsystems.com
   4. Erosion-Resistant Anchoring Cement:
      a. “Super Por-Rok”; Minwax Construction Products Division
   5. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 FERROUS METALS

A. Metal Fabrications Exposed to View:
   1. Provide materials selected for surface flatness, smoothness, and freedom from surface blemishes.
   2. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

B. Wide flange shapes and structural tees cut from: ASTM A992.

C. Steel Shapes, Plates, and Bars: ASTM A36.

D. Rolled Steel Floor Plates: ASTM A786.

E. Wire Rod for Grating Cross Bars: ASTM A510.

F. Gray Iron Castings: ASTM A48, Class 30.

G. Malleable Iron Castings: ASTM A47, grade as recommended by fabricator for type of use indicated.

H. Ductile Cast Iron Castings: ASTM A536, grade 65-45-12.

I. Steel Tubing: Cold-formed, ASTM A500; or hot-rolled, ASTM A501. For exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A53.

J. Steel Bar Grating: ASTM A569 or ASTM A36 of size, design required for span indicated on Drawings.

K. Structural Steel Sheet: Hot-rolled, ASTM E936; or cold-rolled ASTM 1008, Class 1; grade required for design loading.

L. Galvanized Structural Steel Sheet: ASTM A653, grade required for design loading. Coating designation indicated; if not indicated, G90.

M. Steel Pipe:
   1. ASTM A53; Type, Grade B, as required for design loading.
   2. Black finish unless galvanizing is indicated.
   3. Galvanized finish for exterior installations and where indicated.
   4. Standard weight (Schedule 40) unless otherwise indicated.

N. All other steel shapes, plates and bars: ASTM A36.

O. Brackets, Flanges, and Anchors: Cast or formed metal of same type material, finish as supported rails, unless otherwise indicated.

P. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A47, or cast steel, ASTM A27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM 153.

Q. Stainless Steel: ASTM A167 W/No. 2B Mill Finish.

2.03 FINISHES

A. Steel and Iron Finishes:
   1. Galvanizing: Apply zinc-coating by the hot-dip process, complying with:
      a. ASTM A153 for galvanizing iron and steel hardware.
      b. ASTM A123 for galvanizing fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, forged shapes, plates, bars, and strips 0.0299 inch thick and heavier.

c. ASTM A386 for assembled steel products.

B. Preparation for Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated.

2.04 FABRICATION, GENERAL

A. Forming:
1. Form from materials of size, thickness, shapes indicated, complying with performance requirements indicated.
2. Work to dimensions indicated or noted on Shop Drawings.
3. Form exposed work true to line, level, with accurate angles and surfaces and straight sharp edges.

B. Cutting and Shaping:
1. Shear, punch metals cleanly, accurately. Remove burrs.
2. Ease exposed edges to radius of approximately 1/32 inch unless otherwise indicated.
3. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
4. Remove sharp or rough areas on exposed traffic surfaces.

C. Welding:
1. Comply with AWS recommendations.
2. Use materials, methods to minimize distortion, develop strength and corrosion resistance of base metals.
3. Fuse without undercut or overlap.
4. Remove welding flux immediately.
5. At exposed connections, finish exposed welds and surfaces smooth and blended.

D. Joints:
1. Form exposed connections with hairline joints flush, smooth, using concealed fasteners wherever possible.
2. Use exposed fasteners of type indicated or, if not indicated, Phillips flathead (countersunk) screws or bolts.
3. Locate joints where least conspicuous.

E. Anchorage:
1. Provide for type indicated; coordinate with supporting structure.
2. Fabricate, space anchoring devices to provide adequate support for intended use.

F. Joints: Fabricate joints exposed to weather in manner to exclude water, or provide weep holes where water may accumulate.

G. Shop Assembly:
1. Preassemble in shop to greatest extent possible.
2. Disassemble only as necessary for shipping, handling limitations.
3. Use connections that maintain structural value of joined pieces.
4. Clearly mark for reassembly and coordinated installation.
5. Cut, reinforce, drill, tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

H. Finishes:
1. Comply with referenced NAAMM manual.
2. Finish metal fabrications after assembly.

2.05 MISCELLANEOUS FRAMING

A. Overhead Door Track Supports: Fabricate rigid support of steel shapes of size required to rigidly brace overhead door track during all phases of operation.

2.06 STRUCTURAL STEEL DOOR FRAMES FOR OVERHEAD DOORS

A. Fabrication: Fabricate from structural shapes and bars of size and to dimensions indicated, fully welded together, with 5/8 inch by 1-1/2 inch steel bar stops, unless otherwise indicated. Plug weld built-up members; continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than 10 inches on center. Reinforce frames, drill and tap as required to accept finish hardware.

B. Anchorage: Provide steel strap anchors for securing door frames into adjoining concrete or masonry, using 1/8 inch by 2 inch straps of length required for minimum 8 inch embedment, unless otherwise indicated. Weld to frame jambs no more than 12 inches from both bottom and head of fame and space anchors not more than 30 inches apart.

C. Galvanize frames and anchors at exterior locations unless otherwise indicated.

2.07 METAL BAR GRATINGS

A. Produce metal bar gratings of description indicated per NAAMM marking system that comply with the following:
   1. Metal Bar Grating Standard “Standard Specifications for Metal Bar Grating and Metal Bar Grating Treads” published in ANSI/NAAMM A202.1 “Metal Bar Grating Manual.”
   2. Heavy Duty Metal Bar Grating Standard: “Guide Specifications for Heavy Duty Metal Bar Grating” published in NAAMM “Heavy Duty Metal Bar Grating Manual.”

B. Finish:
   1. Steel:
      a. Shop prime paint applied in accordance with manufacturer’s standard practice.
      b. Hot-dip galvanized with a coating weight of not less than 1.8 ounces per square feet of coated surface.
   2. Aluminum: Mill finish.

C. Fabrication:
   1. Fabricate removable grating sections with banding bars attached by welding to entire perimeter of each section.
   2. Include anchors and fasteners of type indicated, or if not indicated, as recommended by manufacturer, for attachment to supports.

D. Provide not less than 4 flange blocks for each section of aluminum I-bar grating, with block designed to fit over lower flange of I-shaped bearing bars. Furnish threaded bolts with nuts and washers for each clip required.

E. Cut Outs:
   1. Fabricate cutouts in grating sections for penetrations indicated.

2.08 STEEL TUBE AND PIPE RAILINGS AND HANDRAILS

A. Fabricate pipe railings and handrails to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of pipe, post spacings, and anchorage, but not less than that required to support structural loads.

B. Interconnections: Interconnect railing and handrail members by butt welding or welding with internal connectors, at fabricator’s option, unless otherwise indicated. At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.

C. Form changes in direction of railing members as follows:
   1. By insertion of prefabricated elbow fittings.
   2. By radius bends of radius indicated.
   3. By mitering at elbow bends.
   4. By bending.
   5. By any method indicated above, applicable to change of direction involved.

D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

E. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

F. Ends: Close exposed ends of pipe by welding 3/16-inch thick steel plate in place or by use of prefabricated fittings, except where clearance of end of pipe and adjoining wall surface is 1/4 inch or less.

G. Toe Boards:
   1. Where indicated, provide toe boards at railings around openings and at the edge of open-sided floors and platforms.
   2. Fabricate to dimensions and details indicated, or if not indicated, use 4 inches high by 3/8”min inches steel plate welded to, and centered between, each railing post.

H. Brackets, Flanges, Fittings, and Anchors:
   1. Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnections of pipe and attachment of railings and handrails to other work.
   2. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.

I. For railing posts set in concrete fabricate sleeves from steel pipe not less than 6 inches long and with an inside diameter not less than 1/2 inch greater than the outside diameter of post, with steel plate closure welded to bottom of sleeve.

J. Removable Railings:
   1. For removable railing posts, fabricate slip-fit sockets from steel pipe whose inside diameter is sized for a close fit with posts and to limit deflection of post without lateral load, measured at top, to not more than 1/12 of post height.
   2. Provide socket covers designed and fabricated to resist accidental dislodgment.

K. Fillers:
   1. Provide steel sheet or plate fillers of thickness and size indicated or required to support structural loads of handrails where needed to transfer wall bracket loads through wall finishes to structural supports.
   2. Size fillers to suit wall finish thicknesses. Size fillers to produce adequate bearing to prevent bracket rotation and over stressing of substrate.

L. Fittings: For interior steel railings formed from steel pipe with black finish, provide nongalvanized ferrous metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

M. For interior steel railings and handrails formed from steel pipe with galvanized finish, galvanize fittings, brackets, fasteners, sleeves, and other ferrous components.

2.09 STEEL FRAMED STAIRS

A. General:
   1. Construct stair to conform to sizes and arrangements indicated.
   2. Join pieces together by welding, unless otherwise indicated.

3. Provide complete stair assemblies, including metal framing, hangers, columns, railings, newels, balusters, struts, clips, brackets, bearing plates, and other components necessary for the support of stairs and platforms, and as required to anchor and contain the stairs on the supporting structure.

B. NAAMM Stair Standard: Comply with “Recommended Voluntary Minimum Standards for Fixed Metal Stairs” in NAAMM “Metal Stair Manual” for class of stair designated, except where more stringent requirements are indicated:
   1. Commercial class, unless otherwise indicated.
   2. Architectural class where indicated.

C. Stair Framing:
   1. Fabricate stringers of structural steel channels, or plates, or a combination thereof, as indicated.
   2. Provide closures for exposed ends of stringers.
   3. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated.
   4. Bolt or weld headers to strings, newels, and framing members to strings and headers.
   5. Fabricate and join so that bolts, if used, do not appear on finish surfaces.

D. Metal Pan Risers, Subtreads, and Subplatforms:
   1. Shape metal pans for risers and subtreads to conform to configuration shown.
   2. Provide thicknesses of structural steel sheet for metal pans indicated, but not less than that required, supporting total design loading.

E. Metal Pans: Form metal pans of uncoated hot-rolled steel sheet, unless otherwise indicated.

F. Fabrication: Directly weld risers and subtreads to stringers; locate welds on side of metal pans to be concealed by concrete fill.

G. Subplatforms:
   1. Provide subplatforms of configuration and construction indicated; if not indicated, of same metal as risers and subtreads, in thicknesses required to support design loading.
   2. Attach subplatform to platform framing members with welds.

H. Floor Grating Treads and Platforms:
   1. Provide patterns, spacing, and bar sizes indicated; fabricate to comply with NAAMM “Metal Bar Grating Manual.”
   2. Shop prime paint unless indicated otherwise.
   3. Fabricate grating treads with steel plate nosing on one edge and with steel angle or steel plate carrier at each end for stringer connections.
   4. Secure treads to stringers with bolts.
   5. Fabricate grating platforms, with nosing matching that on grating treads, at all landings.
   6. Provide toe plates at open-sided edges of grating platform.
   7. Secure grating to platform frame with welds.

I. Stair Railings and Handrails: Comply with applicable requirements specified elsewhere in this section for steel tube and pipe railings and handrails.

2.10 CAST TREADS AND THRESHOLDS

A. General:
   1. Fabricate units of material, sizes, and configurations indicated.
   2. If not indicated, provide cast-iron units with integral abrasive finish.
   3. Furnish in lengths as required to accurately fit each opening or conditions.

B. Abrasive Surface: Cast units with an integral abrasive grit consisting of aluminum oxide, silicone carbide, or a combination of both.

C. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with the manufacturer.

D. Drill for mechanical anchors with countersunk holes located not more than 4 inches from ends and not more than 12 inches on center, evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by the manufacturer.

E. Bottoms: Provide black asphaltic coating to concealed bottoms, sides, and edges of cast iron units set into concrete.

F. Surface: Provide a plain surface texture, except where fluted or cross-hatched surfaces are indicated.

2.11 PIPE BOLLARDS

A. Fabricate pipe bollards from:
   1. Schedule 80 steel pipe, 6 inch nominal diameter.
   2. Cap bollards with 1/4-inch minimum thickness steel top plate and 3/4 inch thickness base plate. Hot dip galvanize after fabrication.

B. Fabricate pier set bollards from:
   1. Schedule 80 steel pipe, hot dip galvanized.
   2. 6-inch I.D. black pipe.
   3. Length: 7'0".

2.12 GROUT AND ANCHORING CEMENT

A. Rough Hardware:
   1. Bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, other miscellaneous steel and iron shapes required for framing and supporting woodwork, anchoring or securing woodwork to concrete or other structures.
   2. Fabricate to sizes, shapes, dimensions required.
   3. Malleable-iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

B. Non-shrink Nonmetallic Grout: Premixed, factory-packaged, (non-staining, noncorrosive, nongaseous grout complying stain) with CE CRD-C 621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

C. Erosion-Resistant Anchoring Cement:
   1. Factory-prepackaged, non-shrink, non-staining, hydraulic expansion cement formulation for mixing with potable water at Site to create pourable anchoring, patching, and grouting compound.
   2. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

2.13 FINISHES

A. Comply with NAAMM “Metal Finishes Manual” for recommendations relative to application and designations of finishes.
   1. Refer to Section 09 91 00.

B. Finish metal fabrications after assembly.

C. Steel and Iron Finishes:
   1. Galvanizing: For those items indicated for galvanizing, apply zinc-coating by the hot-dip process in compliance with the following requirements:
      a. ASTM A153 for galvanizing iron and steel hardware.
      b. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299-inch thick and heavier.

c. Use process for galvanizing that will prepare item for painting

2. Primer Application:
   a. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finish or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated.
   b. Comply with requirements of SSPC-PA1 “Paint Application Specification No. 1” for shop painting.

D. Galvanizing Repair Paint: High zinc dust content; dry film containing at least 94 percent zinc dust by weight; comply with DOD-P-21035 or SSPC-Paint-20.

E. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint-12 except containing no asbestos fibers.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that Metal Fabrications may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies: Immediately notify Engineer. Do not proceed with installation in areas of discrepancy until fully resolved. Commencement of installation signifies acceptance of surface conditions.

3.02 PREPARATION

A. Coordination:
   1. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction.
   2. Coordinate delivery of such items to Site.

B. Utilize templates and other systems required to ensure accurate placement of items that will be embedded in concrete and masonry.

C. Sleeves: Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

3.03 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Temporary Bracing: Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

E. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, methods used in correcting welding work, and the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.

3.04 INSTALLATION OF MISCELLANEOUS FRAMING AND SUPPORTS

A. Anchor supports securely to, and rigidly brace from, building structure.

3.05 INSTALLATION OF METAL BAR GRATINGS

A. General: Install gratings to comply with recommendations of NAAMM grating standard referenced under Part 2 that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

B. Removable Units: Secure removable units to supporting members with type and size of clips and fasteners indicated, or if not indicated as recommended by grating manufacturer for type of installation conditions shown.

C. Non-removable Units: Secure non-removable units to supporting members by welding where both materials are the same; otherwise, fasten by bolting as indicated above.

3.06 INSTALLATION OF STEEL PIPE RAILINGS, HANDRAILS

A. Preparation: Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction.

B. Securing Posts and Railing Ends: Secure posts to building construction as follows:
   1. Anchor posts in concrete as indicated on Drawings.
   2. Anchor posts to steel with steel oval flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.
   3. Anchor rail ends into concrete and masonry with steel round flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
   4. Anchor rail ends to steel with steel oval or round flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.
   5. Install removable railing sections where indicated in slip-fit metal sockets cast into concrete. Accurately locate sockets to match post spacing.

C. Securing Handrails: Secure to wall with wall brackets and end fittings. Provide bracket with at least 1-1/2 inches clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure wall brackets and wall return fittings to building construction as follows:
   1. Bracket with flange tapped for concealed anchorage to threaded hanger bolt.
   2. Bracket with pre-drilled hole for exposed bolt anchorage.
   3. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
   4. For hollow masonry anchorage, use toggle bolts having square heads.
   5. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with stud installations for accurate location of backing members.
   6. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

D. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not exceeding 40 feet. Provide slip joint with internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of posts.

3.07 INSTALLATION OF CAST TREADS AND THRESHOLDS

A. Installation: Install cast treads and thresholds with anchorage system indicated to comply with manufacturer's recommendations.

B. Sealant: Seal thresholds exposed to exterior with elastomeric sealant complying with Section 07 92 00 to provide a watertight installation.

3.08 INSTALLATION OF BOLLARDS

A. Anchor bollards in concrete by means of pipe sleeves preset and anchored into concrete.
   1. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solid with non-shrink, nonmetallic grout, mixed and placed to comply with grout manufacturer's directions.
   2. Wrap bollard with bond breaker prior to installation of paving or slabs.

3.09 TOLERANCES

A. Install in required position and within following tolerances:
   1. Maximum variation from plumb: 1/4-inch.
   2. Maximum offset from true alignment: 1/4-inch.

3.10 ADJUSTING AND CLEANING

A. Touch-Up Painting: Cleaning touch-up painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Section 09 91 00 of these specifications.

B. Galvanizing: For galvanized surfaces clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A780.

C. Collect offcuts and scrap and place in designated areas for recycling.

END OF SECTION

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SECTION 06 10 00

ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Dimension lumber.
   2. Miscellaneous lumber.
   3. Plywood:
      a. Roof sheathing.
      b. Wall sheathing.

B. Related Sections:
   1. Section 06 17 53 - Shop-Fabricated Wood Trusses
   2. Section 07 21 00 - Thermal Insulation

1.02 REFERENCES

A. ANSI:
   1. A194 - Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature

B. ASTM:
   1. A153 - Zinc Coating, Hot Dip, on Iron and Steel Hardware
   2. D226 - Asphalt Saturated Organic Felt Used in Roofing and Waterproofing
   3. E84 - Surface Burning Characteristics
   4. E96 - Test for Water Vapor Transmission
   5. E1677 - Air Retarder Material or System for Low Rise Framed Building Walls

C. AWPA U1 - Preservative Treatment by Pressure Process

D. Engineered Wood Association (APA):
   1. E30 - Design/Construction Guide - Residential and Commercial
   2. E445 - Performance Standard and Policies for Structural-use Panels

E. NFPA:
   1. Recommended Nailing Schedule
   2. Manual for Wood Frame Construction
   3. National Design Specifications for Wood Construction
   4. Surface Burning Characteristics of Building Materials

F. UL 723 - Surface Burning Characteristics of Building Materials

G. U.S. Department of Commerce (DOC) National Institute of Standards and Technology:
   1. PS 1 - U.S. Product Standard for Construction and Industrial Plywood
   2. PS 20 - American Softwood Lumber Standard

1.03 DEFINITIONS

A. FRT: Fire-retardant treated wood

B. NDS: National Design Specifications

C. PT: Pressure treated

1.04 INSPECTION AGENCIES

A. NLGA: National Lumber Grades Authority

B. SPIB: Southern Pine Inspection Bureau

C. WCLIB: West Coast Lumber Inspection Bureau

D. WWPA: Western Wood Products Association

1.05 SUBMITTALS

A. Product Data:
   1. For construction adhesive, including printed statement of VOC content.
   2. For each composite wood product used indicating that bonding agent used contains no urea formaldehyde.
   3. Wood Treatment Data: Chemical treatment manufacturer's instructions for handling, storing, installation, finishing.

B. Certificates:
   1. Preservative Treatment: Treatment plant certification stating type of preservative solution and pressure process used, net amount of preservative retained, conformance with applicable standards.
   2. Waterborne Treatment: Statement that moisture content was reduced to levels indicated prior to shipment to Site.
   3. Fire-Retardant Treatment: Treatment plant certification that treatment material complies with specified standards and other requirements.
   4. For wood members treated with FRT chemicals, NDS for Wood Construction Section 2.3.4 requires submittal of design values, including connections, from the company providing the treatment and redrying service.
   5. Submit organic chemical formulation, third party inspected, ICBO and NER report, EPA registered as a preservative, with a builder's warranty.

C. Wood Treatment Data: Chemical treatment manufacturer's instructions for handling, storing, installation, finishing.

1.06 QUALITY ASSURANCE

A. Corrosion of steel is an issue when in contact with preservative-treated wood at high moisture content levels. For FRT wood, the company providing the treatment should be contacted.

B. Research/Evaluation Reports: Show compliance of following with building code in effect for Project:
   1. Preservative-treated wood.
   2. Fire-retardant-treated wood.
   3. Engineered wood products.
   4. Power-driven fasteners.
   5. Powder-actuated fasteners.
   6. Expansion anchors.
   7. Metal framing anchors.
   8.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Storage:
   1. Keep covered, dry.
   2. Protect against exposure to weather, contact with damp or wet surfaces.
   3. Stack lumber, plywood, and other panels; provide for air circulation within and around stacks, under temporary coverings including polyethylene and similar material.

4. For lumber and plywood pressure treated with waterborne chemicals, sticker between each course to provide air circulation.

1.08 PROJECT CONDITIONS

A. Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. FSC Certified Wood Products: Subject to compliance with specified requirements, acceptable manufacturers and products are:
   1. Certified Wood Products, Minnetonka and Maple Lake, MN www.certifiedwoodproducts.net
   2. Aitkin Hardwoods, Aitkin, MN www.aitkinhardwoods.com
   3. Other Minnesota providers: Upper Mississippi Certified Group (UMCG)
   4. Other states: www.fscus.org/certified_companies
   5. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 MATERIALS

A. Lumber, General:
   1. Lumber Standards: Manufacture lumber to comply with DOC PS 20, applicable grading rules of referenced inspection agencies certified by ALSC Board of Review.
   2. Grade Stamps: Factory-mark each piece with grade stamp of inspection agency evidencing compliance with grading rule requirements, grading agency, grade, species, moisture content at time of surfacing, and mill.
   3. Nominal Sizes:
      a. As indicated, except as shown by detail dimensions.
      b. Actual sizes required by PS 20, moisture content specified for each use.
      c. Dressed lumber, S4S, unless otherwise indicated.
      d. Seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less nominal thickness, unless otherwise indicated.

B. Dimension Lumber:
   1. Structural Framing: Hem Fir, No. 2 or as noted on Drawings; 2 inches to 4 inches thick, 2 inches or wider.
   2. Stud Framing: “Stud” grade lumber, Hem-Fir, 2 inches to 4 inches thick, 2 inches to 6 inches wide, 10 feet and shorter.
   3. Other Light Framing: “Construction” grade lumber, 2 inches to 4 inches thick, 2 inches or wider, Hem-Fir.

C. Miscellaneous Lumber: Wood for support or attachment of other work, of sizes indicated, worked into shapes shown, and as follows:
   1. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
   2. Grade:
      a. Standard grade light framing size lumber, any species or board size lumber as required.
      b. No. 3 Common or Standard grade boards per WCLIB or WWPA rules or No. 3 boards per SPIB rules.

D. Plywood Panels:
   1. Comply with PS 1. For products not manufactured under PS 1 provisions, comply with APA E445.
   2. Trademark: Factory-mark each panel with APA trademark evidencing compliance with grade requirements.
   3. Provide exterior grade plywood at all locations unless specified otherwise.

4. Concealed APA Performance-Rated Panels: Comply with requirements indicated for grade designation, span rating, exposure durability classification, edge detail where applicable, thickness.
5. Type of Use:
   a. Sheathing:
      1) Grade: APA C-D, exterior glue.
      2) Pressure preservative treated for roof parapet, curbs, etc.
      3) Thickness as indicated but at least 5/8 inch.
      4) Size: 4 feet by 8 feet.

E. Miscellaneous Materials:
1. Fasteners, Anchorages:
   a. Size, type, material, finish indicated and recommended by applicable standards, Federal Specifications, and manufacturer for each use, including recommended nails.
   b. Where rough carpentry work exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners, anchorages with hot-dip zinc coating (ASTM A153).
2. Building Paper:
   a. ASTM D226, Type I.
   b. Asphalt-saturated felt, non-perforated, 15-pound type.
3. Sill Sealer: Glass fiber wool blanket, 1/2-inch-thick by width of plates.
4. Plywood Sheathing Clips: *Simpson PSC*.

F. Wood Treatment by Pressure Process:
1. Preservative treatment for wood indicated as PT or specified to be treated:
   a. Mark each treated item with AWPA Quality Mark requirements.
   b. Complete fabrication of treated items prior to treatment whenever possible.
   c. It cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment.
   d. Inspect each piece after drying, discard damaged or defective pieces.
   e. For above ground items, kiln-dry to maximum moisture content of 19 percent or that allowed by National Grading Rules for the species and size specified to be dreid.
   f. Comply with the following AWPA U1 standards:
      1) UC3A: Exterior, above ground, coated and rapid water runoff, such as coated millwork, siding, and trim.
      2) UC3B: Exterior, above ground, uncoated or poor water runoff such as decking, railings, fence posts, uncoated millwork.
2. Use chemicals acceptable to authorities having jurisdiction and containing no chromium or arsenic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that rough carpentry may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies:
1. Immediately notify Architect.
2. Do not proceed with installation in areas of discrepancy until fully resolved.
3. Commencement of installation signifies acceptance of surface conditions.

3.02 INSTALLATION, GENERAL

A. Coordinate and fit carpentry work to other Work.
1. Scribe, cope as required for accurate fit.

2. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other Work.

B. Set carpentry work to required levels and lines, with members plumb and true to line, cut, and fitted.

C. Defective Units: Discard if defects might impair quality of work, or if units are too small to use in fabricating work with minimum joints or optimum joint arrangement.

D. Fastening:
1. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.
2. Countersink nail heads on exposed carpentry work, fill holes.
3. Make tight connections between members.
4. Install fasteners without splitting of wood, pre-drill as required.

3.03 WOOD FURRING

A. Installation:
1. Plumb, level with closure strips at edges and openings.
2. Shim with wood as required for tolerance of finished work.
3. Provide fire treated wood for all furring.
4. Firestop furred spaces on walls at each floor level and at ceiling line of top story, with wood blocking or noncombustible materials, accurately fitted to close furred spaces.

3.04 WOOD FRAMING, GENERAL

A. Framing Members:
1. Sizes, on spacings shown, frame openings as shown, or if not shown, comply with recommendations of NFPA “Manual for Wood Frame Construction.”
2. Do not splice structural members between supports.

B. Anchor and nail as shown, and to comply with “Recommended Nailing Schedule” of “Manual for Wood Frame Construction” and “National Design Specifications for Wood Construction” published by NFPA.

C. Firestop concealed spaces of wood framed walls and partitions at each floor level and at the ceiling line of the top story. Where firestops are not automatically provided by the framing system used, use closely fitted wood blocks of nominal 2-inch-thick lumber of the same width as framing members.

D. Install sill sealer under sills and where exterior wood framing abuts masonry or concrete.

3.05 STUD FRAMING

A. Unless otherwise shown, use 2 by 4 or 2 by 6 wood studs spaced 16 inches on center with wide face perpendicular to direction of wall or partition.

B. Provide single bottom plate and double-top plates 2 inches thick by width of studs. Nail or anchor plates to supporting construction.

C. Studs shall be doubled (1 stud and 1 trimmer at all door and window openings) to provide 1-1/2 inch lintel bearing at each end for full width of lintel, unless noted otherwise.

D. Construct corners and intersections with not less than 3 studs.
1. Provide miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items and trim.
2. Brace all corners with 20-gage metal strap bracing.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Plywood Installation:
   1. Comply with applicable recommendations contained in Form No. E30, “APA Plywood Design/ Construction Guide,” Residential and Commercial,” for types of plywood products and applications indicated. Comply with “CodePlus” provisions of above referenced guide.
   2. Fastening Methods:
      a. Sheathing: Nail to framing.

   3. Roof Sheathing:
      a. Install with face grain perpendicular to the direction of the framing members and with cross joints staggered. Panel and joints shall occur over framing.
      b. Allow 1/8 inch spacing at panel ends and edges.
      c. Nail 6 inches on center along panel edges and 12 inches at intermediate supports.
      d. Use 10d coated nails.
      e. Maximum edge distance for all nailings in plywood shall be 3/8-inch.

3.07 ASPHALT FELT

A. Install over gypsum sheathing or other substrates horizontally with upper courses lapping over lower by 2-inch minimum.

B. Lap end joints minimum 6 inches, stagger minimum 4 feet from course-to-course.

C. Fasten securely with corrosion resistant staples.

D. Leave bottom of felt loose to allow lapping over wall flashings where it occurs.

E. After flashing installed, securely anchor felt in place.

3.08 SCHEDULES

A. Nailing Schedule: Comply with “Nailing Schedule” in International Building Code 2304.9, unless more stringent requirements are specified.

B. Pressure Treated Wood Preservative: Where indicated on Drawings or if not indicated, including but not limited to:
   1. Sill plates in contact with concrete or masonry.
   2. Roof blocking and framing used for built-up roofing and single membrane roofing.

3.09 CLEANING

A. Do not allow accumulation of scraps and debris. Maintain premises in neat, orderly condition at all times.

END OF SECTION

SECTION 06 10 53

MISCELLANEOUS ROUGH CARPENTRY

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Miscellaneous lumber.
   2. Rooftop equipment bases and support curbs.
   3. Wood furring, grounds, nailers, and blocking.
   4. Sheathing.

B. Related Sections:
   1. Section 06 17 53 – Shop-Fabricated Wood Trusses
   2. Section 07 92 00 - Joint Sealants

1.02 REFERENCES

A. ASME:
   1. B18.6.1
   2. B18.2.1

B. ASTM:
   1. A153 - Zinc-Coating (Hot-Dip) of Iron and Steel Hardware
   2. A307 - Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
   3. A563 - Carbon and Alloy Steel Nuts
   4. A653 - Galvanized Steel Sheet
   5. A666 - Annealed or Cold-Worked Austenitic Stainless Steel Sheet
   6. B633 - Electrodeposited Coatings of Zinc on Iron and Steel
   7. C954 - Steel Drill Screws for Application of Gypsum Panel Products to Steel Studs
   8. D3498 - Adhesives for Field Gluing Plywood to Lumber Framing
   9. E488 - Strength of Fasteners in Concrete and Masonry
   10. F593 - Carbon and Alloy Steel Externally Threaded Metric Fasteners
   11. F594 - Stainless Steel Nuts
   12. F1667 - Driven Fasteners

C. AWPA U1 - Preservative Treatment by Pressure Process

D. APA The Engineered Wood Association Form E30 - APA Design/Construction Guide

E. Council of American Building Officials (CABO) NER-272 - Pneumatic or Mechanically Driven Staples, Nails, P-Nails and Allied Fasteners for Use in All Types of Building Construction

F. U.S. Department of Commerce (DOC), National Institute of Standards and Technology:
   1. PS1 - U.S. Product Standard for Construction and Industrial Plywood
   2. PS2 - Performance Standard for Wood-Based Structural-Use Panels
   3. PS20 - American Softwood Lumber Standard

G. Western Wood Products Association - Grading rules

1.03 DEFINITIONS

A. Miscellaneous Lumber: Surface nominal thickness of 2 to 4 inches and nominal width of 2 inches and wider.

1.04 SUBMITTALS

A. Refer to Section 01 33 00.

B. Product Data: Submit for each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Wood Treatment Data: Provide chemical treatment manufacturer's instructions for handling, storing, installation, finishing.

C. Quality Assurance/Control Submittals:
   1. Test Reports: Reports indicating and interpreting test results relative to compliance of fire-retardant-treated wood products with performance requirements indicated.
   2. Certifications:
      a. Preservative-treated wood products: For each type include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained, compliance with applicable standards, and instructions for handling, storing, installing, and finishing treated materials.
      b. Waterborne-treated products: Include certification that moisture content of treated materials was reduced to levels indicated before shipment to Site.
      c. Fire-retardant-treated wood products: Include certification by treating plant that treated materials comply with specified standard and other requirements as well as data relative to bending strength, stiffness, and fastener-holding capacities of treated materials.
      d. For wood members treated with FRT chemicals, NDS for Wood Construction Section 2.3.4 requires submittal of design values, including connections, from the company providing the treatment and redrying service.
      e. Submit organic chemical formulation, third party inspected, ICBO and NER report, EPA registered as a preservative, with a builder's warranty.

1.05 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer: 5 years experience in the manufacture of wood chemical treatment, with 6 projects of similar size, scope and type of which 3 have been in successful use for 3 years or longer.
   2. Contractor: 3 years experience in carpentry with 6 projects of similar size.
   3. Personnel: For actual installation, use personnel skilled in work required.

B. Preinstallation Meetings: Conduct conference at Site to comply with requirements of Section 01 31 19.

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver interior wood materials that are to be exposed to view only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

B. Protection:
   1. Keep materials under cover and dry.
   2. Protect from weather and contact with damp or wet surfaces.
   3. Stack lumber, plywood, and other panels, providing for air circulation within and around stacks and under temporary coverings.
   4. For lumber and plywood pressure- treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

1.07 PROJECT CONDITIONS

A. Existing Conditions: Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

PART 2 PRODUCTS

2.01 MATERIALS

A. Lumber, General:
   1. Lumber Standards: Comply with DOC PS 20, and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
   2. Grade Stamps:
      a. Factory mark each piece with grade stamp of inspection agency.
      b. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece.
   3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
   4. Provide dressed lumber, S4S, unless otherwise indicated.
   5. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2 inch nominal (38 mm actual) thickness or less, unless otherwise indicated, and lumber items not specified to receive wood preservative treatment.

B. Wood-preservative-treated Materials:
   1. Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA U1.
   2. Lumber not in contact with ground and protected from liquid water may be treated with inorganic boron (SBX).
   3. Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
   4. Use chemicals acceptable to authorities having jurisdiction and containing no chromium or arsenic.
   5. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
   6. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 pound per cubic foot. After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively.
   7. Treat indicated items and the following:
      a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
      b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
      c. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
      d. Wood framing members less than 18 inches above grade.
   8. Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to a minimum retention of 0.40 pound per cubic foot.

C. Miscellaneous Lumber:
   1. Provide lumber for support or attachment of other construction, including:
      a. Blocking.
      b. Nailers.
      c. Rooftop equipment bases and support curbs.
      d. Cants.
      e. Furring.
      f. Grounds.
   2. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
   3. Grade:
      a. For dimension lumber sizes, provide Grade 3 or Standard.
   4. Species:
      a. Douglas fir-larch.
      b. Hem-fir north.
      c. Spruce-pine-fir north.
      d. Southern pine.
   5. Select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

6. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

D. Wood-based Structural-use Panels:
1. Structural-Use Panel Standards: Provide either all-veneer, mat-formed, or composite panels complying with DOC PS 2, “Performance Standard for Wood-Based Structural-Use Panels,” unless otherwise indicated.
2. Provide plywood panels complying with DOC PS 1, “U.S. Product Standard for Construction and Industrial Plywood,” where plywood is indicated.
3. Trademark: Factory mark structural-use panels with APA trademark evidencing compliance with grade requirements
4. Span Ratings: Provide panels with span ratings required to meet “Code Plus” provisions of APA Form E30, “APA Design/Construction Guide: Residential & Commercial.”
5. Miscellaneous Concealed Plywood: C-D Plugged Exterior, thickness as indicated but not less than 3/4 inch.

E. Fasteners:
1. Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
2. Miscellaneous carpentry exposed to weather, in ground contact, or in area of high relative humidity: Provide fasteners with hot-dip zinc coating per ASTM A153 or of 304 stainless steel.
3. Nails, Wire, Brads, and Staples: ASTM F1667.
4. Power-Driven Fasteners: CABO NER-272.
5. Wood Screws: ASME B18.6.1.
6. Cold-Formed Metal Framing Screws: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
7. Lag Bolts: ASME B18.2.1.
8. Bolts: Steel bolts complying with ASTM A307, Grade A, with ASTM A563 hex nuts and, where indicated, flat washers.
9. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete, determined by testing per ASTM E488.
   a. Carbon-steel, zinc plated to comply with ASTM B633.
   b. Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 3, grade A1 or A4.

F. Accessories:
1. Adhesives for gluing furring and sleepers to concrete or masonry.
   a. Comply with ASTM D3498.
   b. Approved for use indicated by adhesive manufacturer.
   c. VOC content of 70 g/L or less.
2. Other Materials: Materials not specifically described but required for complete, proper installation of miscellaneous carpentry, subject to acceptance of Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that miscellaneous carpentry may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies:
1. Immediately notify Architect in writing.
2. Do not proceed with installation in areas of discrepancy until fully resolved.
3. Commencement of installation signifies acceptance of surface conditions.

3.02 PREPARATION

A. Protect installed work and materials of other trades.

B. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.
   1. Use inorganic boron for items that are continuously protected from liquid water.
   2. Use copper naphthenate for items not continuously protected from liquid water.

3.03 INSTALLATION

A. Installation, General:
   1. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
   2. Fit carpentry to other construction; scribe and cope as required for accurate fit.
   3. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
   4. Do not splice structural members between supports, unless otherwise indicated.
   5. Securely attach carpentry work as indicated and according to applicable codes & recognized standards.
   6. Countersink nail heads on exposed carpentry work and fill holes with wood filler.
   7. Use fasteners of appropriate type and length, complying with Table 2304.9.1 “Fastening Schedule” in IBC. Predrill members when necessary to avoid splitting wood.

B. Wood Grounds, Nailers, Blocking, and Sleepers:
   1. Install where shown and where required for screeding or attaching other work.
   2. Form to shapes indicated and cut as required for true line and level of attached work.
   3. Coordinate locations with other work involved.
   4. Attach to substrates to support applied loading.
   5. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
   6. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

C. Wood Furring:
   1. Install plumb and level with closure strips at edges and openings.
   2. Shim with wood as required for tolerance of finish work.

D. Installation of Structural-use Panels:
   1. Comply with applicable recommendations contained in APA Form No. E30, “APA Design/Construction Guide: Residential & Commercial,” for types of structural-use panels and applications indicated.

3.04 ADJUSTING

A. Replace damaged materials with new materials complying with specified requirements.

3.05 CLEANING

A. Site: Do not allow accumulation of scraps, debris arising from work of this Section. Maintain premises in neat, orderly condition.

B. System:
   1. Remove temporary covering and other provisions made to minimize soiling of other work.
   2. Promptly clean, repair surfaces stained, marred or otherwise damaged during Work.
   3. When Work is completed, remove unused materials, containers, equipment, and debris.

3.06 PROTECTION

A. Protect wood treated with inorganic boron (SBX) from weather. If it becomes wet, apply EPA-registered borate treatment by spraying.

B. Protect rough carpentry from weather. If it becomes wet, apply EPA-registered borate treatment by spraying.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer to ensure work is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 06 17 53

SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SUMMARY

A. Provide wood trusses:
   1. Common.
   2. Parallel chord trusses.
   3. Accessories including, but not limited to:
      a. Lateral bracing.
      b. Fasteners, connectors, anchorage devices, bolts, clips, etc.

B. Related Sections:
   1. Section 06 10 53 - Miscellaneous Rough Carpentry

1.02 REFERENCES

A. American Institute of Timber Construction - Timber Construction Standards

B. ASTM:
   1. A653 - Steel Sheet, Galvanized or Galvannealed by Hot Dip Process
   2. A666 - Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate
   3. A780 - Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings

C. Truss Plate Institute (TPI):
   1. TPI 1 - National Design Standard for Metal Plate Connected Wood Truss Construction
   2. TPI DSB - Recommended Design Specification for Temporary Bracing of Metal Plat Connected Wood Trusses
   3. TPI HIB - Commentary and Recommendations for Handling, Installing and Bracing Metal Plate Connected Wood Trusses

D. International Building Code

1.03 PERFORMANCE REQUIREMENTS

A. Structural Performance: Design, engineer, fabricate, and erect wood trusses to withstand specified design loads within limits and under conditions required.
   1. Design Loads: As specified. Note requirement for eave loading in Structural Notes.
   2. Deflections: Live load deflection meeting the following (unless otherwise specified):
      a. Floor trusses: Vertical deflection less than or equal to 1/480 of the span.
      b. Roof trusses: Vertical deflection less than or equal to 1/360 of the span.
   3. Design framing systems to provide for movement of framing members without damage or over-stressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 120 degrees F.

1.04 SUBMITTALS

A. Product Data:
   1. Complete materials list of items to be provided including manufacturer specifications and other data to prove compliance with specified requirements.

B. Shop Drawings: Show species, sizes, stress grades of lumber proposed to be used, pitch, span, camber, configuration, spacing of truss, connector type thickness, size, location, design value, splice and bearing details of trusses.

C. Installation Procedure: Manufacturer's complete recommended installation procedures that will become basis for accepting or rejecting actual installation.

D. Design Calculations: Submit complete design calculations for trusses as necessary to obtain building permits, other acceptance, signed by an engineer licensed in the state of the Project.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain metal connector plates from a single manufacturer.

B. Qualifications:
   1. Structural Engineer: Provided by manufacturer, registered to practice in Minnesota to design wood trusses to sustain indicated loads, specified or required by local codes, with spans, profiles, and arrangements shown on Drawings.
   2. Fabricator: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Engineer and authorities having jurisdiction.
   3. Installers: Only skilled workers completely familiar with requirements and methods needed for proper performance of work of this section.

C. Referenced Standards:
   1. Comply with pertinent provisions of *TPI 1, TPI DSB,* and *TIP HIB*.
   2. Comply with applicable requirements in AF&PA's *National Design Specifications for Wood Construction* and its *Supplement*.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work follows.

B. Storage and Protection:
   1. Protect materials before, during, after installation. Immediately brace after erection.
   2. Protect installed work, materials of other trades.
   3. Prevent contact with ground or other horizontal surface.
   4. Provide for air circulation around stacks and under coverings.

1.07 PROJECT CONDITIONS

A. Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Wood Trusses:
   1. Acceptable Manufacturers: Subject to compliance with specified requirements, acceptable manufacturers and products are:
      a. Fargo Truss Systems, Fargo, ND
      b. Littfin Truss, Winsted, MN
      c. Lloyd Trusses, Mankato, MN
      d. Mathew Hall Lumber Company, St. Cloud, MN
      e. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 PRODUCTS

A. Lumber: DOC PS 20 and applicable rules of grading agencies certified by ALSC Board of Review.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. Provide dressed lumber, S4S.
   4. Provide dry lumber with 15 percent maximum moisture content at time of dressing.

B. Grade and Species: For truss chord and web members, provide dimension lumber of any species, graded visually or mechanically, capable of supporting required loads without exceeding allowable design values, according to AF&PA.

C. Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 06 10 00.

D. Metal Connector Plates: Comply with TPI 1.
   1. Interior Locations:
      a. Hot-dip galvanized steel sheet meeting ASTM A653.
         1) Structural steel, high strength, low alloy Type A.
         2) High strength low alloy steel Type B.
         3) Not less than 0.036 inch thick.

2.03 ACCESSORIES

A. Fasteners:
   1. Provide fasteners of size and type indicated that comply with requirements for material and manufacture.
   2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153.

B. Anchor Clips: *Teco*, “Trip-L-Grip” galvanized framing anchor at each truss end, unless noted otherwise on Drawings.

C. Tie-Downs:
   1. Bent strap tie for fastening roof trusses to wall studs below.
   2. 1-1/2 inch wide by 0.05 inch thick **OR** 2-1/4 inches wide by 0.062 inch thick.

D. Other Materials: Other materials not specifically described, but required for complete and proper installation as selected by Contractor subject to acceptance of Architect.

2.04 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which work will be performed.

B. Discrepancies: Correct conditions detrimental to timely, proper completion of work. Do not proceed until unsatisfactory conditions are corrected.

3.02 COORDINATION

A. Coordinate with other trades performing Work that interfaces this Section.

B. Install trusses only after supporting construction is in place and is braced and secured.

3.03 INSTALLATION

A. Install work in strict accordance with original design, accepted Shop Drawings, pertinent requirements of governmental agencies having jurisdiction, TPI recommendations, and manufacturer's recommended installation procedures.

B. Hoist into position with proper bracing secured at designated lifting points.

C. Do not bend trusses. Install temporary, horizontal, cross bracing to hold trusses plumb and in safe condition until permanent bracing is installed.

D. Install permanent bracing, related components prior to application of loads to trusses.

E. Tighten loose connectors. Restrict construction loads to prevent over-stressing of truss members. Install within installation tolerances in TPI 1.

F. Do not cut, drill, or remove truss members.

G. Replace wood trusses that are damaged or do not meet requirements.

H. Do not alter trusses in field.

3.04 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

B. Protective Coating:
   1. Clean and prepare exposed surfaces of metal connector plates.
   2. Brush apply primer, when part of coating system, and 1 coat of protective coating to dry film thickness recommended by coating system manufacturer.

END OF SECTION

SECTION 07 21 00

THERMAL INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Batt insulation:
      a. Thermal.
   2. Vapor barrier membrane (above grade).
   3. Accessories including, but not limited to:
      a. Soffit vent chutes.
      b. Tape.

B. The following is not included in this section:
   1. Foundation insulation (Section 04 20 00).

C. Related Sections:
   1. Section 04 20 00 - Unit Masonry Assemblies
   2. Section 06 10 53 - Miscellaneous Rough Carpentry
   3. Section 07 21 19 – Foamed in Place Masonry Insulation

1.02 REFERENCES

A. ASTM:
   1.
   2. C272 - Water Absorption
   3. C518 - Thermal Transmission
   4. C1304 - Odor Emission of Thermal Insulation Materials
   5. C1338 - Fungi Resistance of Insulation Materials and Facings
   6. D882 - Tensile Properties of Thin Plastic Sheeting
   7. D1621 - Compressive Properties
   8. D1709 - Impact Resistance of Plastic Film
   9. D2126 - Dimensional Stability
   10. E84 - Surface Burning Characteristics of Building Materials
   11. E96 - Water Vapor Transmission of Materials
   12. E119 - Fire Tests of Building Construction and Materials
   13. E136 - Behavior of Materials in a Vertical Tube Furnace
   14. E970 - Critical Radiant Flux of Exposed Attic Floor Insulation
   15. E1643 - Standard for Installation of Water Vapor Retarders Under Concrete
   16. E1745 - Standard for Plastic Water Vapor Retarders Under Concrete

1.03 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Plenum Rating: Provide insulation where indicated in ceiling plenums whose test performance is rated as follows for use in plenums as determined by testing identical products per “Erosion Test” and “Mold Growth and Humidity Test” described in UL 181, or on comparable tests from another standard acceptable to authorities having jurisdiction.
   2. Mold Growth and Humidity Test Results: Insulation showing no evidence of mold growth, delamination, or other deterioration due to the effects of high humidity, after inoculation with Chaetomium globosium on all surfaces and storing for 60 days at 100 percent relative humidity in the dark.

1.04 SUBMITTALS

A. Product Data:
   1. Submit manufacturer's current Product Data including specifications, handling, storage and installation instructions, and maintenance recommendations.
   2. Include binders, additive, and expanding agent.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Provide building insulation system made of components of standard construction furnished by 1 manufacturer as coordinated assemblies.

B. Qualifications:
   1. Manufacturer: 5 years experience in the manufacture of building insulation.
   2. Contractor: 3 years experience in the installation of building insulation.
   3. Personnel: For actual installation of building insulation, use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, thoroughly familiar with requirements of work.

C. Regulatory Requirements:
   1. Use aged and settled values for thermal resistance factors (R-values), tested in accordance with ASTM C518 at 75 degrees F and 50 percent relative humidity for at least 6 months.
   2. Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products by test method indicated below:
      a. Surface-Burning Characteristics: ASTM E84.
      b. Fire-Resistance Ratings: ASTM E119.
      c. Combustion Characteristics: ASTM E136.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources

B. Store inside and in a dry location.

C. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

1.07 PROJECT CONDITIONS

A. Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Batt/Blanket Insulation:
   1. Fiberglass:
      a. Standard of Quality: Design is based on products of Owens-Corning Fiberglass, Toledo, OH www.owenscorning.com
      b. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
         1) CertainTeed, Valley Forge, PA www.certainteed.com
         2) Johns Manville www.jm.com
         3) Knauf Insulation, Shelbyville, IN www.knaufusa.com
         4) Manufacturer of comparable products submitted in compliance with Section 01 25 13.

B. Vapor Retarder:
   1. Standard of Quality: Design is based on products of Raven Industries, Sioux Falls, SD www.ravenind.com
   2. Other Acceptable Manufacturers: Subject to compliance with specified requirements, acceptable manufacturers and products are:
      a. Fortifiber Building Systems Group, Reno, NV www.fortifiber.com
      b. Reef Industries, Houston, TX www.reefindustries.com
      c. W.R. Meadows, Elgin, IL www.wrmeadows.com
      d. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

C. Tape:
   1. Standard of Quality: Design is based on *No. 8086 Contractor Sheathing Tape* by 3M, St. Paul, MN
   2. Other acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
      a. *Sheathing Tape 1585CW-2* by VentureTape, Rockland, MA www.venturetape.com
      b. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 MATERIALS

A. Batt Insulation:
   1. Glass Fiber Batts:
      a. Formaldehyde-free.
      b. Thermal resistance (R-Value): As shown in the drawings
      c. Combustion characteristics: Passes ASTM E136.
      d. Critical radiant flux: ASTM E970, greater than 0.11 btu/square foot s.
      e. Water vapor sorption: ASTM C1104, 5 percent or less.
      f. Odor emission: Passes ASTM C13047.
      g. Corrosiveness: Passes ASTM C665.
      h. Fungi resistance: Passes ASTM C1338.
      i. Thickness: As recommended by manufacturer unless stated differently on Drawings.
      j. Bi-component glass fiber: 2-part, irregularly twisted, glass fiber, not containing binders.
   2. Facing:
      a. Unfaced.

B. Vapor Retarders:
   1. Nominal 6 mil (minimum), continuous, clear polyethylene film (ceilings).

C. Accessories: All other materials not specifically described but required for complete and proper installation of building insulation subject to acceptance of Engineer including, but not limited to:
   1. Soffit Vent Chute: Preformed polystyrene.
   2. Adhesive:
      a. Product approved by insulation manufacturer.
      b. Low VOC.
   3. Spray Foam Sealant: Non-shrink closed cell expanding urethane.
   4. Tape:
      a. 2 inches wide.
      b. Self-adhesive vapor retarder tape.
      c. Flame spread index of 25 or less, smoke developed index of 50 or less.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades:
   1. Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.
   2. Verify substrates are properly prepared and clean.

B. Verification of Conditions: Verify that building insulation may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies:
   1. Immediately notify Architect.
   2. Do not proceed with installation in areas of discrepancy until fully resolved.
   3. Commencement of installation signifies acceptance of surface conditions.

3.02 INSTALLATION

A. General:
   1. Install in accordance with manufacturer's instructions.
   2. Where taped joints are specified, completely seal joints between adjacent vapor retarders and between vapor retarders and adjacent construction.
   3. Install sound control insulation in manner to achieve and maintain the sound ratings specified.
   4. Water-piping coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
   5. Install insulation that is undamaged, dry, and unsoiled, and that has not been left exposed at any time to ice and snow.
   6. Minimize the generation of offcuts and waste. Reuse insulation scraps to maximum extent feasible.

B. Batts/Blankets:
   1. Install snug fitting to completely fill cavities, without voids.
   2. Fill voids around windows, door frames, and miscellaneous exterior openings.
   3. Fit to exterior side of electrical devices and pipes.
   4. Fasten to vertical surfaces using 9/16-inch staples.
   5. Do not compress to fit.

C. Vapor Barrier: Comply with ASTM E1643.
   1. Ceiling:
      a. Insulation above deck:
         1) Apply continuous vapor retarder with minimum number of laps on roof deck prior to installation of insulation.
         2) Where necessary to lap vapor retarder, lap minimum of 6 inches and tape.
   2. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
   3. Repair any tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor retarder tape or another layer of vapor retarder.

D. Other Insulation: Apply as indicated on Drawings or required by construction in such a manner to provide continuous barrier to movement of heat and air.

E. Soffit Vent Chute:
   1. Install chute in each end of truss space.
   2. Staple chute to each side of truss.
   3. Turn chute down and staple to sill plate to ensure insulation does not filter into soffit.
   4. Chute shall extend to allow 14 inches of insulation to be placed in attic space.
   5. Multiple chutes may be needed to ensure coverage.

3.03 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes.

B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.04 INSPECTION AND TESTING

A. Inspect insulation for proper installation.

B. Correct defects such as voids, gaps, or insulation compressed behind pipes.

3.05 CLEANING

A. Clean construction area of all scrap insulation at the end of each working day.

END OF SECTION

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SECTION 07 21 19

FOAMED-IN-PLACE MASONRY INSULATION

PART 1 GENERAL

1.01 SUMMARY

A. Provide foamed-in-place insulation for concrete masonry units.

B. Related Sections:
   1. Section 04 20 00 - Unit Masonry Assemblies
   2. Section 07 21 00 - Thermal Insulation

1.02 REFERENCES

A. ASTM:
   1. C177 - Heat Flux Measurements and Thermal Transmission Properties
   2. E84 - Test Method for Surface Burning Characteristics of Building Materials
   3. E90 - Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions
   4. E119 - Methods for Fire Tests of Building Construction and Materials
   5. E136 - Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C

1.03 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Fire-Resistance Ratings: Minimum of 4-hour fire resistance wall rating (ASTM E119) for 8-inch and 12-inch concrete masonry units when used in standard 2 hour rated CMUs.
   2. Surface Burning Characteristics: Maximum flame spread, smoke developed and fuel contributed of 15, 75 and 0 respectively.
   3. Combustion Characteristics: Must be noncombustible, Class A building material.
   4. Thermal Values: R-value of 4.91/inch at 32 degrees F mean; ASTM C177. R-values for block as follows: 12-inch CMU - 10.0 (values based on 120 pound density).
   5. Sound Abatement: Minimum Sound Transmission Class (STC) rating of 53 and a minimum Outdoor Indoor Transmission Class (OITC) rating of 44 for 8-inch wall assembly (ASTM E90).

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's current Product Data including specifications, handling, storage and installation instructions, and maintenance and cleaning recommendations.

B. Quality Assurance/Control Submittals:
   1. Test Reports: Submit reports from independent testing laboratories indicating compliance of materials with the performance requirements.
   2. Provide insulation materials that are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.
      a. ASTM E84.
      b. ASTM E119.
      c. ASTM E136.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Provide materials made of components, with uniform texture and color or blend, furnished by one manufacturer for each different product required.

B. Qualifications:
   1. Manufacturer: 5 years experience in the manufacture of foamed-in-place insulation, with 6 projects of similar size, scope and type of which 3 have been in successful use for 3 years or longer.
   2. Contractor: 3 years experience in the installation of foamed-in-place insulation.
   3. Personnel: For actual installation of foamed-in-place insulation, use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, thoroughly familiar with requirements of work.

C. Certifications: Provide to Architect, certification of installer from manufacturer of foamed-in-place insulation.

1.06 PROJECT CONDITIONS

A. Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

1.07 WARRANTY

A. Warranty: Manufacturer will provide a 2-year warranty guaranteed by both the manufacturer and installer.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers: Subject to compliance with specified requirements, acceptable manufacturers and products are:
   1. *Core-fill 500* by Tailored Chemical Products, Hickory, North Carolina, www.tailoredfoam.net
   2. Core Foam Masonry Foam Insulation by cfiFOAM, Knoxville, TN www.cfifoam.com
   3. *Thermco* by Thermal Corp. of America, Mount Pleasant, IA www.thermcofoam.com
   4. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 MATERIALS

A. Foamed-In-Place Masonry Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly rationed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.

B. Other materials not specifically described but required for complete, proper installation of foamed-in-place insulation, subject to acceptance of Architect.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that foamed-in-place insulation may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies: Immediately notify Architect in writing. Do not proceed with installation in areas of discrepancy until fully resolved. Commencement of installation signifies acceptance of surface conditions.

3.02 PREPARATION

A. Protection: Protect installed work and materials of other trades.

3.03 INSTALLATION

A. Compliance: Comply with manufacturer's Product Data, including product technical bulletin installation instructions and details.

B. General: Install foamed-in-place insulation from interior, or as specified, prior to installation of interior finish work.

C. Installation:
   1. Fill all open cells and void in hollow concrete masonry walls where shown on Drawings.
   2. Pump foam insulation through a horizontal row of 5/8-inch holes drilled into the mortar joints every 8 inches on center at an approximate height of 5 feet from finished floor level around the entire wall area.
   3. Repeat this method at an approximate height of 10 feet above the first horizontal row of holes if the insulated wall height is higher than 16 feet above finished floor level.
   4. Patch all holes and retool course.

3.04 REPAIR/RESTORATION

A. Touch up marred finishes, but replace units that cannot be restored to factory-finished appearance. Use materials, procedures recommended or furnished by manufacturer.

3.05 CLEANING

A. Site: Do not allow accumulation of scraps, debris arising from work of this section. Maintain premises in neat, orderly condition.

B. System:
   1. Remove temporary covering and other provisions made to minimize soiling of other work.
   2. Promptly clean surfaces not to receive foamed-in-place insulation; repair surfaces stained, marred or otherwise damaged during work.
   3. When work is completed, remove unused materials, containers, equipment, and debris.

3.06 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer to ensure work is without damage or deterioration at time of Substantial Completion.

END OF SECTION

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SECTION 07 41 13

METAL ROOFING AND WALL PANELS

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Standing Seam Roofing Panels.
   2. Soffit and Fascia Panels and Trim.
   3. Concealed Fastener Wall Panels
   4. Flashings and trim.
   5. Water barrier membrane (membrane underlayment).
   6. Miscellaneous accessories including, but not limited to:
      a. Gaskets.
      b. Panel clips.
      c. Fasteners.
      d. Joint sealers for metal roof and wall panels.
      e. Snow guards.

1.02 SUBMITTALS

A. Product Data: Manufacturer's current product specifications, standard details, certified product test results, installation instructions, general recommendations, as applicable to materials and finishes for each component and for total system of preformed panels.

B. Samples:
   1. Manufacturer's standard color samples.

C. Shop Drawings:
   1. Small-scale layouts of panels on walls and columns, large-scale details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim flashings, closures, special details including side laps and end laps if any.
   2. Distinguish between factory and field assembly work.
   3. Coordination Drawings of roof or wall plans for metal panels, coordinating penetrations and roof-mounted or wall-mounted items.

1.03 QUALITY ASSURANCE

A. Manufacturer's Observation:
   1. Manufacturer's representative shall visit site while panels are being installed to observe methods.
   2. Manufacturer's representative shall submit log of visit, including instructions given to the installer, to the ARCHITECT's office within one week of visit.

1.04 PROJECT CONDITIONS

A. Existing Conditions:
   1. Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.
   2. Allow for trimming panel units where final dimensions cannot be established prior to fabrication.

1.05 WARRANTY

A. Manufacturer:
   1. Provide 20-year warranty for paint.

2. Provide 5 -year weather tightness warranty against leaks of the roof in writing, to be repaired or replaced at no cost to Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Roofing, Wall, and Soffit Panels: Standard of Quality: Design is based on products of Firestone Metal Products www.unaclad.com
   1. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
      a. Berridge Manufacturing, San Antonio, TX www.berridge.com
      b. Centria www.centria.com
      c. PAC-CLAD Peterson Aluminum, Elk Grove, IL www.pac-clad.com
      d. Metecno Morin, Bristol, CT www.morincorp.com

B. Water Barrier Membrane: Standard of Quality: Design is based on Carlisle, Capulpa, OK, *CCW WIP 300 HT* www.carlisle-ccw.com
   1. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
      a. CertainTeed, Valley Forge, PA, www.certainteed.com
      b. Grace Construction Products, www.graceconstruction.com

2.02 MATERIALS

A. Steel for Painting/Coating:
   1. G90 hot-dip zinc coated steel sheet compliant with ASTM A653, Grade A except where higher strength required by manufacturer for performance.

B. Water Barrier Membrane:
   1. ASTM D1970.
   2. 36-inch-wide, 0.004-inch thick.
   3. Cold-applied, self-adhering membrane.
   4. High-strength polyethylene film coated on one side with a thick layer of adhesive-consistency rubberized asphalt.
   5. Membrane to be able to withstand temperature of 200 degrees F without adhesive degradation.
   6. Provide complete with manufacturer's recommended primer.

2.03 FABRICATION

A. General:
   1. Fabricate panels to sizes on Drawings.
   2. Form siding panels with preformed corners fully welded and ground smooth.
   3. Fabricate and finish panels, accessories, at factory to greatest extent possible by manufacturer's standard procedures and processes, as required to fulfill indicated performance requirements which have been demonstrated by factory testing.
   4. Form panels to specified dimensions with tolerances to accommodate thermal expansion and contraction between panels and structural members.
   5. Fabricate panel joints with captive gaskets or separator strips, which provide tight seal and prevent metal-to-metal contact in manner to minimize noise from movements within panel system.
   6. Condensation: Fabricate panels for control of condensation, including vapor inclusion of seals and provisions for breathing, venting, weeping, and draining.
   7. Comply with indicated profiles and dimensional requirements, and structural requirements.

B. Panels:
   1. Standing Seam Roofing:
      a. Material Steel.

b. UL-90 rating.
c. 16-inch-wide panel with 1-1/2 inch rib.
d. Product: *Una-Clad UC-3.*
e. Color: As selected by Owner

2. Soffit Panels:
   a. Provide factory-formed vented panels designed to be field-assembled by lapping and interconnecting side edges of adjacent panels and mechanically attach to panel through supports, using concealed fasteners in side laps. Free area to account for minimum of 50% of the required venting of attic space.
   b. Factory-apply sealant within interlocking joint.
   c. Fabricate in lengths as long as possible.
   d. Material: Steel.
   e. Product: Una-Clad *UC-500V.*
3. Concealed Fastener Siding Panels:
   a. Steel – 22 Ga.
   b. 1 1/2-inch deep on 12-inch wide panel
   c. Product: Morin A-12.
4. Flashing, Trim and Fascia:
   a. J channel and all closure trim indicated or required for complete system.
   b. Materials shall be of same material and color as the wall and louver panels.
   c. Locations as shown on Drawings or otherwise required to make building watertight.
5. Accessories: Including but not limited to:
   a. Gaskets: As provided by metal panel manufacturer.
   b. Panel clips:
      1) As recommended by the panel manufacturer.
      2) 16 gage minimum.
      3) Full recessed to prevent sharp edges coming into contact with roof materials.
      4) Allow for expansion and contraction of panel through expected temperature range.
   c. Fasteners:
      1) Screw type.
      2) As recommended by panel manufacturer.
      3) Stainless steel.
      4) Interior liner panel exposed fastener heads shall be painted or pre-finished to match color of wall panel.
      5) Separate washers with hot bonded neoprene faces and pop rivets set in wet sealant.
   d. Joint sealers: As recommended by panel manufacturer or, if not specified, see Section 07 92 00.
   e. Snow guards: Provide snow guards recommended by roofing panel.

2.04 METAL FINISHES

A. General Requirements:
   1. Colors as selected by Architect from manufacturer's standard colors.
   2. Apply coatings either before or after forming and fabricating panels, as required by coating process and for maximum coating performance capability.
   3. Protect coating promptly after application and cure, by application of strippable film or removable adhesive cover. Retain until installation has been completed.
   4. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products."

B. Paint:
   1. Fluoropolymer Coating: Full-strength 70 percent *Kynar 500* coating baked-on for 15 minutes at 450 degrees F in dry film thickness of 1.0 mil, 30 percent reflective gloss (ASTM D523), over minimum 0.2 mil baked-on modified epoxy primer.
   2. Siliconized Polyester Finish:
      a. Total dry film thickness:
         1) Exterior: 1 mil.
         2) Interior: 0.5 mil.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that metal panels may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies:
   1. Immediately notify Architect in writing.
   2. Do not proceed with installation in areas of discrepancy until fully resolved.
   3. Commencement of installation signifies acceptance of surface conditions.

3.02 INSTALLATION

A. Water Barrier Membrane: Lay one layer horizontally over entire roof; lapping in accordance with manufacturer's written instructions.

B. Roofing Panels:
   1. Comply with panel fabricator's and material manufacturers' instructions for installation, as applicable to project conditions and supporting substrates.
   2. Field cutting by torch is not permitted.
   3. Install exterior wall panels over air barrier membrane (see section 06 10 00).
   4. Anchor panels and other components of work securely in place, with provisions for thermal/structural movement.
      a. Install panels with recommended fasteners.
      b. Separate dissimilar metals with bituminous paint, PVC shims, or separation tape/membrane wherever 2 dissimilar metals come in contact.

C. Metal Soffit Panels:
   1. Install as indicated on Drawings, or if not indicated, perpendicular to support framing.
   2. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

D. Accessories
   1. Snow Guards:
      a. Install snow guards above traffic areas (entrances, exits) as indicated on Drawings, or if not indicated, verify with Architect.
      b. Install as recommended by manufacturer in manner acceptable by panel manufacturer.
      c. Do not use fasteners that penetrate metal panels.
   2. Joint Sealers:
      a. Install gaskets, joint fillers, sealants where indicated and where required for weatherproof performance of panel systems.
      b. Provide types of gaskets, sealants/fillers indicated or, if not otherwise indicated, types recommended by panel manufacturer.
   3. Rooftop Equipment Crickets: Provide panel manufacturer's standard cricket to flash rooftop equipment and provide positive drainage.

3.03 FIELD QUALITY CONTROL

A. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4 inch in 20 feet on level/plumb/slope and location/line as indicated, within 1/8 inch offset of adjoining faces and of alignment of matching profiles.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 GENERAL

1.01 SUMMARY

A. Provide sealant and backup materials:
   1. Exterior construction joints.
   2. Interior concrete slab joints.
   3. Sheet metal joints.
   4. Interior joints.

B. Related Sections:
   1. Section 03 30 00 - Cast-in-Place Concrete
   2. Section 04 20 00 - Unit Masonry Assemblies
   3. Section 08 11 13 Hollow Metal Doors and Frames
   4. Section 08 90 00 Louvers & Vents

1.02 REFERENCES

A. ASTM:
   1. C834 - Latex Sealants
   2. C920 - Elastomeric Joint Sealants
   3. C1021 - Laboratories Engaged in Testing Sealants
   4. C1193 - Standard Guide for Use of Sealants
   5. C1521 - Evaluation of Adhesion of Installed Weatherproofing Sealant Joints
   6. E119 - Fire Tests of Building Construction and Materials
   7. E548 - Evaluation and Assessment of Analytical Chemical Laboratories

B. Sealant, Waterproofing, and Restoration Institute (SWRI)

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.04 SUBMITTALS

A. Product Data:
   1. Submit manufacturer's current Product Data including specifications, handling, storage and installation instructions, and maintenance recommendations.
   2. Provide Product Data on manufacturer's adhesion and stain testing.

B. Color Samples: Submit manufacturer's standard color samples with Product Data and Shop Drawings.

C. SWRI Validation Certificate: For each elastomeric sealant specified to be validated by SWRI's Sealant Validation Program.

D. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

E. Field Test Report Log: For each elastomeric sealant application.

F. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

1.05 QUALITY ASSURANCE

A. Provide joint sealants units made of components of standard construction furnished by 1 manufacturer as coordinated assemblies.

B. Qualifications:
   1. Manufacturer: 5 years experience in the manufacture of joint sealants.
   2. Contractor: 3 years experience in the installation of joint sealants.
   3. Personnel: For actual installation of joint sealants, use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, thoroughly familiar with requirements of work.

C. Product Testing: Obtain test results for Product Test Reports under Submittals Article from a qualified testing agency based on testing current sealant formulations within a 36-month period preceding the commencement of the Work.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated, as documented according to ASTM E548.
   2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
   3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
   4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:
   1. Below 40 degrees F ambient temperature, refer to manufacturer's recommendations.
   2. Ensure joint substrates are dry and frost-free.
   3. Remove contaminants from joint substrate capable of interfering with adhesion.

1.07 WARRANTY

A. Provide manufacturer's 5-year standard material warranty.

B. Include coverage for replacement of sealant materials which fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Joint Sealants:
   1. Standard of Quality: Design is based on products of Tremco, Beachwood, OH www.tremcosealants.com
   2. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
      a. Dow Corning, Midland, MI www.dowcorning.com
      b. Henkel Corporation, Avon, OH www.greenseries.com
      c. Silicone Sealants by Dow Corning www.dowcorning.com
      d. Silicone Sealants by GE www.geadvancedmaterials.com
      e. Sonneborn by BASF, www.basfbuildingsystems.com
      f. STS Coatings www.stscoatings.com

g. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

B. Backer Rod/Backup Filler Materials:
1. Acceptable Manufacturers; subject to compliance with requirements, acceptable manufacturers and products are:
a. Exterior Joints: Non-absorbent; *Sof-Rod* by Nomaco www.nomaco.com
b. Interior Joints: Open-cell, *Den-verfoam* by Backer Rod Manufacturing and Supply www.bayindustries.com/backerrod
c. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 MATERIALS

A. Do not use materials stored longer than their maximum recommended shelf life.

B. Exterior Construction Joint Sealant:
1. Silyl-terminated Polyether Sealant (MS polymer):
a. Low-modulus, high-movement, nonsag, fast-curing.
b. ASTM C920.
c. Type and grade: S (single component) and NS (nonsag).
d. Class: 100/50 for vertical joints.
e. Product:
1) *Sonolastic 150 with VLM Technology* by BASF.
2) *Great Seal PE-150* by STS Coatings.

C. Sheet Metal:
1. Silyl-terminated Polyether Sealant:
a. Low-modulus, high-movement, nonsag, fast-curing.
b. ASTM C920.
c. Type and grade: S (single component) and NS (nonsag).
d. Class: 100/50 for vertical joints.
e. Product:
1) *Sonolastic 150 with VLM Technology* by BASF.
2) *Great Seal PE-150* by STS Coatings.

D. Interior Joint Sealants:
1. Interior Dry Areas: Fast setting acrylic latex sealant meeting ASTM C834, Type P, Grade NF.
a. Product: *Tremflex 834*, by Tremco.
b. Maximum VOC content: 42 grams per liter.

E. Backup Filler Materials: Non-oily, non-staining, non-gassing, back-up filler or other filler completely compatible with sealant, approved by sealant manufacturer.

F. Other Materials: Other materials not specifically described but required for complete, proper installation of joint sealants, subject to acceptance of Architect.

G. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction and field tests.

H. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

2.03 EQUIPMENT

A. Must be specifically recommended for use by manufacturer of sealant being installed.

2.04 FINISHES

A. Exterior: Selected by Architect from manufacturer's standard colors.

B. Interior: Match paint color or adjoining substrate color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that joint sealants may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies: Immediately notify Architect. Do not proceed with installation in areas of discrepancy until fully resolved. Commencement of installation signifies acceptance of surface conditions.

3.02 PREPARATION

A. Surfaces to be Caulked: Verify that surfaces are sound, thoroughly dry, clean, free of oil, grease, laitance, rust, and other foreign material that would prevent proper adhesion, and that concrete and mortar are thoroughly cured.

B. Masonry Cleaning: Complete before surface preparation is begun.
   1. Prepare joints and surfaces to receive sealants according to sealant manufacturer instructions.
   2. Rake and clean out joints to full depth and width.
   3. Clean concrete, masonry, other porous materials by brushing, grinding, other mechanical means, to provide sound, clean surface.
   4. Remove dust, dirt, loose particles resulting from mechanical cleaning by vacuuming or blowing out joints with compressed air.

C. Clean metal, and non-porous surfaces.

D. Remove protective coatings on metal using solvent that leaves no residue.
   1. Use clean white cloths or lintless paper towels to apply solvent, and wipe surfaces dry with dry cloths or paper towels.
   2. Do not allow solvent to air dry without wiping.

E. Mask joints as necessary to protect adjacent surfaces.
   1. Apply masking tape in continuous strips and carefully align with edge of joint.
   2. Remove masking immediately after joints have been sealed and tooled.

3.03 BACK-UP MATERIALS

A. Verify compatibility of filler material with sealant before installation.

B. Install appropriate size backer rod directly into the control joint, larger than joint per manufacturer's recommendations, and in manner to provide concave sealant profile.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Where joint depth does not permit installation of backer rod, install adhesive-backed polyethylene bond-breaker tape along entire back of joint to prevent 3-sided adhesion of joint sealant.

E. Use filler about 1/3 to 1/2 wider than width of joint so filler exerts sufficient pressure to provide substantial resistance to displacement.

3.04 SEALANT PRIMER

A. Prime all joints. Do not allow primer to get outside of joints.

B. Apply as recommended by manufacturer of sealant.

C. Prime and seal on same workday.

3.05 APPLICATION OF SEALANT

A. Apply strictly according to manufacturer's instructions, using nozzle of sufficient size to fill joint completely.

B. Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: Comply with recommendations in ASTM C919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
   4. Install joint sealant to all joints except those that allow moisture to drain.
   5. Caulk wide joints with three passes.
   6. Run a bead at each inside corner, fill joint with third pass.

E. Tool joints immediately after application of material to ensure full contact with adjacent surfaces.

F. Strike off excess material. Finished bead is to be flush with adjoining surfaces, unless otherwise indicated on Drawings.

3.06 INSTALLATION OF PREFORMED FOAM SEALANTS

A. Install each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material, producing seal continuity at ends, turns, and intersections of joints.

B. For applications at low ambient temperatures where expansion of sealant requires acceleration to produce seal, apply heat to sealant in compliance with sealant manufacturer's written instructions.

3.07 CURING

A. Allow minimum 7 days for full cure.

B. Do adhesion testing after 7 days.

C. Painting Sealant:
   1. Allow 7 days to cure before applying paint.

3.08 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed elastomeric sealant joints as follows:
      a. Perform 10 tests for the first 1,000 feet of joint length for each type of elastomeric sealant and joint substrate.
      b. Perform 1 test for each 1,000 feet of joint length thereafter or 1 test per each floor per elevation.
   2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab or Method B, Exposed Surface Finish Hand Pull Tab or Method C, Field-Applied Sealant Joint Hand Pull Flap or Method D, Water Immersion in Appendix X1 in ASTM C1193, as appropriate for type of joint-sealant application indicated.
      a. For joints with dissimilar substrates, verify adhesion to each substrate separately; do this by extending cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
   4. Inspect tested joints and report on the following:
      a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
      b. Whether sealants filled joint cavities and are free of voids.
      c. Whether sealant dimensions and configurations comply with specified requirements.
   5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
   6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

3.09 ADJUSTING

A. Non-compliant Work: Allow inspections of Work and assist in testing requested by manufacturer's representative and Architect. Remove adjacent Work until location is reached where installation was performed properly.

B. Remove and replace uncured sealant.

3.10 CLEAN UP

A. Remove masking, excess material, and smears as work progresses.

B. Leave adjacent surfaces clean and free of sealant and primer.

3.11 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion.

B. If damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES (COMMERCIAL)

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Steel swing doors:
      a. Flush door.
   2. Steel frames:
      a. Door.

B. Furnish the following for other sections to install including, but not limited to:
   1. Masonry anchors.

C. Perform the following:
   1. Prepare the door for hardware.

D. Related Sections:
   1.
   2. Section 04 20 00 - Unit Masonry Assemblies
   3. Section 06 10 00 - Rough Carpentry
   4. Section 08 71 00 - Door Hardware
   5. Section 09 91 00 - Painting

1.02 REFERENCES

A. ASTM:
   1. A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware
   2. A653 - Steel Sheet Galvanized or Galvannealed by the Hot Dip Process
   3. A1008 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low Alloy
   4. A1011 - Steel, Sheet and Strip, Hot Rolled Carbon, Structural, High-Strength
   5. E136 - Combustion Properties of Materials

B. Door and Hardware Institute (DHI): Recommended Locations for Builder’s Hardware

C. SDI:
   1. 100 - Standard Steel Doors and Frames
   2. 105 - Erection Instructions for Steel Frames

1.03 SUBMITTALS

A. Product Data: Submit manufacturer’s current Product Data including specifications, handling, storage and installation instructions, and maintenance recommendations.

B. Schedule of steel doors and frames using same reference numbers for details and openings as those on Drawings.

C. Shop Drawings:
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details.
   3. Frame details for each frame type, including dimensioned profiles.
   4. Details of locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, accessories, joints, and connections.

D. Coordination Drawings: Drawings of each opening, including door and frame, drawn to scale and coordinating door hardware. Show elevations of each door design type, showing dimensions, locations of door hardware.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Provide steel door and frame units made of components of standard construction furnished by 1 manufacturer as coordinated assemblies.

B. Qualifications:
   1. Manufacturer: 5 years experience in the manufacture of steel door and frame.
   2. Contractor: 3 years experience in the installation of steel door and frame.
   3. Personnel: For actual installation of steel door and frame, use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, thoroughly familiar with requirements of work.

C. Regulatory Requirements:
   1. Steel Door Institute: Comply with standards of ANSI/SDI-100.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Storage:
   1. Store at building site under cover.
   2. Place on minimum 4-inch high wood blocking, with 1/4-inch space between stacked doors to promote air circulation.
   3. Avoid use of non-vented plastic, canvas shelters that would create humidity chamber.
   4. If cardboard wrapper on door becomes wet, remove immediately.

1.06 PROJECT CONDITIONS

A. Drawings do not purport to show actual dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

1.07 COORDINATION

A. Coordinate installation of anchorages for steel frames.

B. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in concrete or masonry. Deliver to Site in time for installation.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Hollow Metal Doors:
   1. Standard of Quality: Design is based on products of Steelcraft, Cincinnati, OH www.steelcraft.com
   2. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
      a. Amweld Building Products, Garretsville, OH www.amweld.com
      b. Ceco Door, Milan, TN www.cecodoor.com
      c. Curries, Mason City, IA www.curries.com
      d. Kewanee Corporation, Chicago, IL www.kewaneecorp.com
      e. Mesker Door, Huntsville, AL www.meskerdoor.com
      f. Pioneer Industries, Hackensack, NH www.pioneerindustries.com
      g. Windsor Republic Doors, McKenzie, TN www.republicdoor.com

h. Member of SDI; manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 MATERIALS

A. Hot-rolled Steel Sheets: Commercial steel (CS), pickled and oiled; comply with ASTM A1011, type B. Free of scale, pitting, or surface defects.

B. Cold-rolled Steel Sheets: Commercial steel (CS); comply with ASTM A1008, type B.

C. Galvanized Steel Sheets: Zinc-coated carbon, commercial steel (CS) type B; ASTM A653, with minimum A40 zinc-iron-alloy (galvannealed) coating designation.

D. Supports, Anchors: Fabricate of not less than 18-gage galvanized sheet steel. Galvanize units to be built into exterior walls according to ASTM A153, Class B.

E. Inserts, Bolts, Fasteners: Manufacturer's standard units, except hot-dip galvanized items to be built into exterior walls, comply with ASTM A153.

F. Shop Applied Primer Paint: Rust-inhibitive enamel or paint, air-drying or baking, suitable as base for specified finish paints.

G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur compounds, and other deleterious impurities.

2.03 FABRICATION

A. Steel Door and Frame Units: Rigid, neat in appearance, free from defects, warp or buckle. Where practicable, fit and assemble in manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment to assure proper assembly at the Site.

B. Cold-rolled Steel: Exposed faces of doors and panels, including stiles, rails of nonflush units.

C. Cold-rolled or hot-rolled steel at fabricator's option: Frames, concealed stiffeners, reinforcement, edge channels, louvers, moldings.

D. Exposed Fasteners: Countersunk flat phillips heads unless otherwise indicated.

E. Finish Hardware Preparation:
   1. Factory prepare steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08 71 00.
   2. Reinforce doors and frames to receive nontemplated mortised and surface-mounted door hardware.
   3. Comply with Door Hardware Institute specifications and ANSI A250 for door and frame preparation and location for hardware

F. Galvanizing: Exterior doors and frames

G. Weep Holes: Provide in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

H. Shop Painting:
   1. Clean, treat, paint exposed surfaces of units, including galvanized surfaces.
   2. Clean steel surfaces of mill scale, rust, oil, grease, dirt, other foreign materials.
   3. Correct minor irregularities with metallic putty sanded smooth before application of paint.
   4. Apply shop coat prime paint of even consistency to provide uniformly finished surface ready to receive finish paint.

2.04 STANDARD STEEL DOORS

A. Flush Swing Door Construction:
   1. Exterior Doors:
      a. Face sheets fabricated from metallic-coated steel sheet.
      b. Level: SDI Grade III (extra heavy duty).
      c. Model:
         1) Model 2 (16 gage): Full flush face , including top of door.
      d. Core: Polystyrene core.

B. End Closures:
   1. Close off top and bottom of doors with 18-gage (minimum) end closure channels, flush top, inverted bottom.
   2. Provide sealant at top of exterior doors for water-tight condition.

C. Edges: Bevel edges on both sides.

D. Swing Door Hardware - SDI recommended hardware reinforcing gages:
   1. Hinge Reinforcements: 10-gage: 1-1/2 inches by 9 inches.
   2. Lock Front and Flush Bolt Reinforcement: 14-gage, 1/2 inch by 3 inches.
   3. Cylindrical Lock Reinforcement Units: 14 gage.
   4. Closer Reinforcement: 14 gage channel, 14 inches long, or to suit closer length, install on all doors.
   5. Other Hardware: Refer to SDI recommendations (minimum).
   6. Through Bolting: Not allowed.

2.05 STANDARD STEEL FRAMES

A. General Requirements:
   1. Verify quantities and suitability of fasteners.
   2. Conceal fastenings, unless otherwise indicated.
   3. Exterior Frames: Metallic-coated steel sheet with mitered corners.
   4. Continuous welded and backwelded corners (through stops).
   5. Thickness: 0.053-inch-thick steel sheet.
   6. Reinforce for hardware using the SDI Hardware Reinforcing Gages as a minimum standard.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect, with Installer present, and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that steel doors and frames may be installed in accordance with original design, installation tolerances, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies:
   1. Immediately notify Architect.
   2. Do not proceed with installation in areas of discrepancy until fully resolved.
   3. Commencement of installation signifies acceptance of surface conditions

3.02 PREPARATION

A. Remove welded-in shipping spreaders installed at factory.

B. Prior to installation and with installation spreaders in place, adjust and securely brace steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated mortised and surface-mounted door hardware.

3.03 INSTALLATION

A. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Frames:
   1. Comply with SDI-105:
   2. Set accurately in position, plumbed, aligned, braced securely until permanent anchors set.
   3. Remove temporary braces and spreaders after wall construction is completed, leaving surfaces smooth and undamaged.

C. Anchors:
   1. Floor anchors: Provide for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.
   2. Masonry construction: Locate 3 wall anchors per jamb at hinge and strike levels.
   3. Apply bituminous coating to backs of frames that are filled with mortar, grout, and plaster containing antifreezing agents.

D. Door Installation:
   1. Fit accurately in frames within clearances specified in SDI-100.
   2. Shim as necessary.

3.04 ADJUSTING, CLEANING

A. Remove and replace defective work, including steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off doors and frames immediately after installation.

C. Prime Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat; apply touch-up of compatible air-drying primer.

D. Galvannealed Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Final Adjustments: Check, readjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition.

3.05 SCHEDULE

A. Furnish items in amounts indicated on Drawings or required for complete and operable facility.

B. Coordinate Schedule with Drawings and notify Architect of any door not scheduled.

END OF SECTION

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SECTION 08 33 00

COILING DOORS AND GRILLES

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Insulated overhead coiling door assembly:
      a. Curtain.
      b. Curtain guide jambs.
      c. Hood.
   2. Coiling door accessories including, but not limited to:
      a. Weather seals.

B. Related Sections:
   1. Section 04 20 00 - Unit Masonry Assemblies
   2. Section 06 10 00 - Rough Carpentry

1.02 REFERENCES

A. AAMA 611 - Test procedures and requirements for high performance (Class I) and commercial (Class II) architectural-quality aluminum oxide coatings for aluminum extrusions and panels

B. ASTM:
   1. A653 - Steel Sheet Galvanized or Galvannealed by the Hot Dip Process
   2. A666 - Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
   3. B221 - Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
   4. E152 - Detention Locks for Swinging Doors

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's current Product Data including specifications, handling, storage, and installation instructions, and maintenance recommendations.

B. Shop Drawings:
   1. Submit manufacturer's Shop Drawings showing system fabrication, installation drawings, including plans, elevations, sections details of components, configurations within system and between system and adjoining system.
   2. Inserts and Anchorages: For devices which must be set in concrete or built into masonry for installation of units, provide setting drawings, templates, instructions directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

C. Samples:
   1. Color Samples: Submit manufacturer's standard color samples with Product Data and Shop Drawings.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Provide coiling doors and grille units made of components of standard construction furnished by 1 manufacturer as coordinated assemblies.

B. Qualifications:
   1. Manufacturer: 5 years experience in the manufacture of coiling doors and grilles.
   2. Contractor: 4 years experience in the installation of coiling doors and grilles.

3. Personnel: For actual installation of coiling doors and grilles, use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, thoroughly familiar with requirements of work.

C. Certifications: Provide to Architect, certification of installer from manufacturer of coiling doors and grilles.

1.05 PROJECT CONDITIONS

A. Existing Conditions: Drawings do not purport to show actual dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

1.06 WARRANTY

A. Provide manufacturer's 2-year standard warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
1. Albany Door Systems, Lawrenceville, GA www.albanydoors.com
2. The Cookson Company, Phoenix, AZ www.cooksondoor.com
3. Cornell Iron Works, Mountaintop, PA www.cornelliron.com
4. Dynamic Closures, Ontario www.dynamicclosures.com
5. Overhead Door Corporation, Lewisville, TX www.overheaddoor.com
6. Raynor Garage Doors, Dixon, IL www.raynor.com
7. Rytec Corp, Jackson, WI www.rytecdoors.com
8. Windsor Republic Doors, Little Rock, AR www.windsordoor.com
9. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 COMPONENTS

A. Overhead Coiling Door:
1. Curtain: Formed of interlocking slats designed to withstand required loading, including wind loading for exterior applications; of continuous length for width of door without splices.
2. Unless otherwise indicated, provide slats as follows:
   a. Material:
      1) Standard 22 gage, or heavier if recommended by manufacturer; galvanized steel sheets complying with ASTM A123 or A653, Grade A, with hot dip or electrogalvanized and phosphated before fabrication.
   b. Slat Profile:
      1) Manufacturer's standard "flat-face" slat.
3. End Locks: Malleable iron castings galvanized after fabrication, secured to curtain slats with galvanized rivets. Provide locks on alternate curtain slats for curtain alignment and resistance against lateral movement.
4. Bottom Bar:
   a. Consisting of 2 angles, each not less than 1 inch by 1 inch by 1/8 inch thick, either galvanized or stainless steel or aluminum extrusions to suit type of curtain slat.
   b. Provide replaceable gasket of flexible vinyl or neoprene between angles as a weather seal and cushion bumper for manually operated doors.
5. Insulated Doors: Provide 3/4-inch (minimum) foamed in place polyurethane insulation; R-6.00 (minimum) with primed galvanized steel backer. Include positive thermal break at top and bottom of slat.

B. Door Curtain Guide Jambs:
   1. Fabricate jambs of steel angles or channels and angles with sufficient depth and strength to retain curtain loading.
   2. Build-up units with minimum 3/16-inch thick steel sections, galvanized after fabrication.
   3. Slot bolt holes for track adjustment.
   4. Secure continuous wall angle to wall framing by 3 per inch (minimum) bolts at 30 inches (maximum) on center, unless manufacturer recommends closer spacing.
   5. Extend wall angles above door opening head to support coil brackets, unless otherwise indicated.
   6. Place anchor bolts on wall guides so that they are concealed from exterior or corridor when door is in closed position.
   7. Provide removable stops on guides to prevent over-travel of curtain, and continuous bar for holding windlocks.

C. Counterbalancing Mechanism:
   1. Adjustable helical torsion spring counterbalance, with grease-sealed bearings or self-lubricating graphite bearings for rotating members.
   2. Barrel: Hot formed structural quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thickness to support roll-up of curtain without distortion of slats and limit barrel deflection to not more than 0.03 inch per foot of span under full load; one or more oil tempered torsion springs capable of counter balancing weight of unit.
   3. Brackets: Provide manufacturer's standard mounting brackets of cast iron or cold-rolled steel plate with guide groove for curtain.
   4. Hood:
      a. Form to entirely enclose coiled curtain and operating mechanism at opening head, and act as weather seal where required.
      b. Roll and reinforce top and bottom edges for stiffness.
      c. Provide closed ends for surface mounted hoods and any portion of between-jamb mounting beyond wall face.
      d. Provide intermediate support brackets as required to prevent sag.
      e. Finish:
         1) Fabricate steel hoods from 24 gage (minimum) hot dip galvanized steel with G-90 zinc coating to match galvanized steel curtains.

D. Accessories:
   1. Weather Seals:
      a. Provide vinyl or neoprene weatherstripping for exterior exposed doors.
      b. At door head use 1/8-inch thick continuous sheet secured to inside of curtain coil hood.
      c. At door jambs, use 1/8-inch thick continuous strip secured to exterior side of jamb guide.
   2. Lock: Provide lock to accept keyed cylinder provided by Section 08 71 00.

2.03 FABRICATION

A. Grille Curtain:
   1. Fabricate grille curtain of a network of 5/16-inch (minimum) diameter horizontal rods spaced approximately 2 inches on center.
   2. Interconnect rods by vertical links approximately 5/8-inch-wide, spaced approximately 9 inches apart and rotating on the rods.
   3. Bottom Bar: Manufacturer's standard extruded shape or two angles; materials to match grille.
   4. End Locks: Continuous end links or other devices at ends of rods, locking and retaining grille curtain in guides against excessive pressures, maintaining curtain alignment and preventing lateral movement.
   5. Guides:
      a. Manufacturer's standard extruded-aluminum shape having curtain groove with return lips or bars to retain curtain.
      b. Furnish pile strips, rigid vinyl liner, or other nonmetallic inserts to prevent metal-to-metal contact and minimize noise of travel.
      c. Furnish removable stops on guides to prevent overtravel of curtain.

2.04 OPERATION

A. Manual Chain Hoist Operation: Doors wider than 12 feet or more than 80 square feet: Provide manual chain hoist operator with endless steel hand chain, chain pocket wheel and guard, and geared reduction unit with maximum 35 pound pull.

2.05 FINISH

A. Prefinished Galvanized Steel: Powder coating on corrosion inhibiting primer on hot-dip galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that coiling doors and grilles may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies: Immediately notify Architect. Do not proceed with installation in areas of discrepancy until fully resolved. Commencement of installation signifies acceptance of surface conditions.

3.02 PREPARATION

A. Protection: Protect installed work and materials of other trades.

3.03 INSTALLATION

A. Door and Operating Equipment: Install complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, equipment supports in accordance with final Shop Drawings, manufacturer's instructions, and as specified.

3.04 REPAIR/RESTORATION

A. Touch up marred finishes, but replace units that cannot be restored to factory-finished appearance. Use materials, procedures recommended or furnished by manufacturer.

3.05 ADJUSTING

A. Doors: Upon completion of installation, including work by other trades, lubricate, test, adjust doors to operate in proper manner and easily without binding, free from warp, twist or distortion, fitting properly for entire perimeter.

B. Manual Push-up Operating Mechanism: Adjust so curtain can be easily stopped at any point in its travel and will remain in position until movement is reactivated.

3.06 CLEANING

A. Site: Do not allow accumulation of scraps, debris arising from work of this section. Maintain premises in neat, orderly condition.

B. System: Clean exposed surfaces of coiling doors and grilles using materials and methods recommended by manufacturer.

3.07 DEMONSTRATION

A. Startup Services: Provide the services of a factory-authorized service representative to provide start-up service and to demonstrate and train Owner's representative:
   1. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
   2. Train Owner's representative on procedures and schedules related to startup and shutdown, troubleshooting, servicing and preventative maintenance.
   3. Review data in the "Operating and Maintenance Manual."

B. Maintenance Instructions: Manufacturer's representative to schedule and attend meeting with Owner's representatives to explain:
   1. Maintenance and Care Instructions.
   2. Recommended Maintenance Program.
   3. Warranty Requirements.

END OF SECTION

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SECTION 08 45 00

TRANSLUCENT ROOF ASSEMBLIES

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Translucent panels.
   2. Structural grid.
   3. Battens and perimeter closure system including flashings.
   4. Translucent insulated plastic skylight system accessories including, but not limited to:
      a. Sealing tape.
      b. Fasteners.
      c. Insulation.

B. Related Sections:
   1. Section 06 10 00 - Rough Carpentry
   2. Section 07 92 00 - Joint Sealants
   3. –07 41 13 – Metal Roofing and Wall Panels

1.02 REFERENCES

A. AAMA:
   1. 1503 - Thermal Transmittance and Condensation Resistance of Windows, Doors, and Glazed Wall Sections
   2. 2604 - High Performance Organic Coatings on Aluminum Extrusions and Panels

B. ASTM:
   1. C297 - Test for Tensile Strength of Sandwich Construction
   2. D635 - Rate and Extent of Burning
   3. D1002 - Test for Shear Strength of Single Lap Joint Adhesively-Bonded Metal
   4. D1037 - Properties of Wood-Base Fiber and Particle Panel Materials
   5. D1183 - Resistance of Adhesives to Aging
   6. D2244 - Color Tolerances and Differences
   7. E84 - Surface Burning Characteristics
   8. E108 - Fire Tests of Roof Coverings

1.03 SYSTEM DESCRIPTION

A. Design Requirements:
   1. The translucent insulated panel system shall consist of factory prefabricated flat and/or curved sandwich panels including installation by a manufacturer's authorized contractor.
   2. Manufacturer shall be responsible for the design, configuration and fabrication of the translucent wall and skylight system.

B. Performance Requirements: Design to withstand 20 psf wind load and a 40 psf live load.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's current Product Data including specifications, handling, storage and installation instructions, and maintenance recommendations.

B. Shop Drawings:
   1. Submit Shop Drawings showing system fabrication, installation drawings, including plans, elevations, sections, details of components, joint locations and configurations within system and between system and adjoining system.
   2. Show details of fabrication and installation of panels, battens and closures.

C. Samples:
   1. Initial Color Selection: Submit manufacturer's standard color samples for each type of finish with Product Data and Shop Drawings.

D. Quality Assurance/Control Submittals:
   1. Test Reports: Certified by independent testing organization for each type and class of panel system. Reports shall verify that the materials will meet all performance requirements of this specification. Test reports required include:
      a. ASTM E84: Flame Spread and Smoke Development
      b. ASTM D635: Burn Extent
      c. ASTM D2244: Color Difference
      d. ASTM C297, ASTM D1002: Bond Strength
      e. ASTM D1037: Accelerated Aging
      f. ASTM E108: Class "A" Roof System

E. Maintenance Manual: Provide to Owner maintenance and warranty data in "Maintenance Manual" at Maintenance Demonstration at Substantial Completion.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Provide translucent insulated skylight system units made of components of standard construction furnished by 1 manufacturer as coordinated assemblies.

B. Qualifications:
   1. Manufacturer:
      a. 10 years experience in the manufacture of translucent insulated skylight system, with 6 projects of similar size, scope and type of which 3 have been in successful use for 5 years or longer.
      b. Manufacturer must be listed by a recognized building code authority such as ICBO, which requires quality control inspections by an approved agency.
   2. Contractor: 3 years experience in the installation of translucent insulated wall and skylight system.
   3. Personnel: For actual installation of translucent insulated skylight system, use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, thoroughly familiar with requirements of work.

C. Certifications: Provide to Architect, certification of installer from manufacturer of translucent insulated wall and skylight system.

D. Regulatory Requirements:
   1. Insulated skylight system must be listed by the ICC Evaluation Service (ICC-ES) which requires quality control inspections and fire, structural, and water infiltration testing of sandwich panel systems by an approved agency.
   2. Quality control inspections and required testing shall be conducted at least once each year and shall include manufacturing facilities, sandwich panel components, and production sandwich panels for conformance with "Acceptance Criteria for Sandwich Panels" as regulated by the ICC-ES.
   3. Skylight system shall pass Class A Roof Burning Brand Test by ASTM E108 or be UL listed as a Class A Roof by UL 790.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store panels according to manufacturer's recommendations.

B. Store panels on long edge, several inches above the ground, blocked and under cover to prevent warping.

1.07 PROJECT CONDITIONS

A. Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

1.08 WARRANTY

A. Provide manufacturer's 10-year limited warranty covering color stability, delamination, and fiber bloom.

B. Installer shall warrant system against water leakage and weather tightness for 10 years.

C. Warranties shall be provided in writing.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Standard of Quality: Design is based on products of Kalwall Corporation, Manchester, NH www.kalwall.com

B. Other Acceptable Manufacturers: Subject to compliance with specified requirements, acceptable manufacturers and products are:
   1. Structures Unlimited, Inc., Manchester, NH www.structuresunlimitedinc.com
   2. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 MATERIALS

A. Face Sheets:
   1. Glass fiber reinforced thermoset resins by insulated panel system fabricator for architectural use.
   2. Thermoplastic polycarbonate or acrylic faces are not acceptable.
   3. The exterior face shall have a permanent glass erosion barrier to provide maximum long term resistance to reinforcing fiber exposure. Plastic film overlays or coatings are not acceptable
   4. The exterior face shall have a self-cleaning thermoset acrylic urethane surface molecularly bonded under factory controlled conditions, and fully field restorable if worn or damaged. Tedlar film is not acceptable.
   5. Flammability:
      a. The interior face sheet shall have a flame spread rating no greater than 50 and smoke developed no greater than 250 when tested in accordance with ASTM E84.
      b. Burn extent by ASTM D635 shall be no greater than 1 inch.
      c. Faces shall not deform, deflect or drip when subject to fire or flame.
   6. Weatherability: The full thickness of the exterior face shall not change color more than 3.0 Adams Units (Delta E by ASTM D2244) after 5 years outdoor South Florida weathering at 7 degrees facing south, determined by the average of at least 3 white samples without a protective film or coating to insure maximum, long term stability.
   7. Appearance:
      a. Face sheets shall be uniform in color to prevent splotchy appearance.
      b. Faces shall be completely free of ridges and wrinkles that prevent proper surface contact in bonding to the aluminum grid core.
      c. Clusters of air bubbles/pinholes that collect dirt and moisture will not be acceptable.
   8. Strength: The exterior face sheet shall be uniform in strength and repel an impact equal to 70 foot pounds without fracture or tear in accordance with SPI Shatter Resistance Test.

B. Structural I-Beam Grid:
   1. Thermally broken aluminum of 6063-T6 or 6005-T5 alloy.

2. Provide for mechanical interlocking of muntin-mullion and perimeter to prevent high and low intersections which do not allow full bonding surface to contact with face material.
3. Width: No less than 7/16 inch.
4. Machined to tolerances of not greater than plus or minus 0.002 inch.
5. Thermal Break: Minimum 1 inch.

C. Battens and Perimeter Closure System:
1. Extruded 6063-T6 and 6063-T5 aluminum screw clamp-tight closure system.
2. Curved closure system may be roll formed.
3. Thermal break perimeter systems shall be factory prefabricated with perimeter closures factory sealed to panels.
4. “U” = 0.50 or less.
5. Fasteners: 300 series stainless steel screws (excluding final fasteners to the building).
6. Flexible Sealing Tape: Manufacturer’s standard pre-applied to closure system at the factory under controlled conditions.

D. Laminate Adhesives:
1. Heat and pressure resin type engineered for structural sandwich panel use.
2. Adhesive shall pass testing requirements specified by ICBO “Acceptance Criteria for Sandwich Panel Adhesive”
3. Minimum Strength:
   a. 750 PSI tensile strength by ASTM C297 after 2 exposures to 6 cycles each of the aging conditions prescribed by ASTM D1037.
   b. 500 PSI shear strength average of 5 exposures per ASTM D1002:
      1) 50 percent relative humidity at 73 degrees F: 540 PSI.
      2) Accelerated aging by ASTM D1183 at room temperature: 800 PSI.
      3) 182 degrees F: 100 PSI.
      4) 500 hour oxygen bomb by ASTM D572: 1400 PSI.

E. Condensation Drip Flashing:
1. Include manufacturer’s condensation flashing at sill of translucent wall panel.
2. Drain flashing to exterior.
3. Color: As selected by Architect from manufacturer’s standard range of colors.

F. Other Materials: Other materials not specifically described but required for complete, proper installation of translucent insulated skylight system, subject to acceptance of Architect.

2.03 FABRICATION

A. Panels:
1. Sandwich panels of flat fiberglass reinforced translucent face sheets laminated to a grid core of mechanically interlocking thermally broken aluminum I-beams.
2. Adhesive bonding line to be straight, cover the entire width of the I-beam, and have a neat, sharp edge.
3. Thickness: 4 inches.
4. Insulation: U factor 0.23 thermally broken.
5. Light Transmission: 20 percent.
6. Shading Coefficient: 0.12.
7. Thermally Broken Panels:
   a. Minimum Condensation Resistance Factor of 80 as measured by AAMA 1503 on the bond line.
   b. Minimum CRF of 90 at center of grid cell.
8. Grid Pattern: 12 inches by 24 inches nominal Reverse Shoji and symmetrical about the horizontal centerline of each panel.
9. To insure bonding strength, white spots at intersections of muntins and mullions shall not exceed 4 for each 40 square feet of panel, nor shall they be more than 3/64-inch in width.

B. Skylight System: Kalwall - Standard Flat Curb-type s-Line

2.04 FINISHES

A. All exposed aluminum to be acrylic/ urethane-based copolymer corrosion resistant finish.

B. Meet performance requirements of ANSI/AAMA 2604.

C. Face Sheets:
   1. Uniform in appearance.
   2. Color:
      a. Exterior face sheets: selected by E/A from manufacturer's standard colors.
      b. Interior face sheets: selected by E/A from manufacturer's standard colors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that system may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies:
   1. Immediately notify Architect in writing.
   2. Do not proceed with installation in areas of discrepancy until fully resolved.
   3. Commencement of installation signifies acceptance of surface conditions.

3.02 PREPARATION

A. Protection: Protect installed work and materials of other trades.

B. Metal Protection:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or apply sealant or tape recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint or method recommended by manufacturer.
   3. Where aluminum will contact pressure-treated wood, separate dissimilar materials by methods recommended by manufacturer.

3.03 INSTALLATION

A. Install translucent panel system in strict accordance with approved Shop Drawings as supplied by manufacturer.

B. Anchor component parts securely in place by permanent mechanical attachment system and to accommodate thermal and mechanical movements.

C. Set sill and curb members in a full bed of sealant compound, or with joint fillers or gaskets to provide weather-tight construction.

D. Install joint sealants at perimeter joints and within panel system in accordance with manufacturer's installation instructions.

E. Clean aluminum before sealants are applied.

3.04 FIELD QUALITY CONTROL

A. Water Test: Test according to procedures in AAMA 501.

B. After other trades have completed work on adjacent material, carefully inspect translucent panel installation and touch up marred finishes, but replace units that cannot be restored to factory-finished appearance.

3.05 ADJUSTING

A. Make adjustments necessary to ensure proper installation and weather-tight conditions.

3.06 CLEANING

A. Site: Do not allow accumulation of scraps, debris arising from work of this section. Maintain premises in neat, orderly condition.

B. System: Clean inside and outside of system surfaces using materials and methods recommended by manufacturer.

3.07 DEMONSTRATION

A. Maintenance Instructions: Manufacturer's representative to schedule and attend meeting with Owner's representatives to explain:
   1. Maintenance and Care Instructions.
   2. Recommended Maintenance Program.
   3. Warranty Requirements.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Finish door hardware.
      a. Hinges.
      b. Locksets/latchsets.
      c. Closers.
      d. Door trim:
         1) Kickplate.
      e. Stops and holders.
      f. Thresholds, weatherstripping, and rain drips.
      g. Latch guards.

B. Related Sections:
   1. Section 08 11 13 - Hollow Metal Doors and Frames (Commercial)

1.02 REFERENCES

A. ADA/ANSI A1117.1 - Accessibility and Usable Buildings and Facilities

B. ANSI/BHMA A156 - Standards for Builders' Hardware

C. Door and Hardware Institute (DHI) - Recommended Locations for Builder's Hardware for Standard Steel Doors and Frames

D. IBC Code: Currently in effect and adopted by state in which Project is located

E. UL - Building Materials Directory

1.03 DEFINITIONS

A. Construction Keying: Method independent of final keying system for securing building during construction in accordance with Owner's security requirements.

B. LDW: Less Door Width

C. NRP: Non-Removable Pin

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's current Product Data including individual catalog "cuts" and installation instructions.

B. Manufacturer's Templates: Finish door hardware supplier shall provide manufacturer's templates to each fabricator of doors, frames, and other work to be factory-prepared for the installation of the hardware, and to the jobsite for site installation of hardware.

C. Supplier Hardware Schedule:
   1. Coordination:
      a. Coordinate finish door hardware with doors, frames and related work to ensure proper size, thickness, hand, function and finish of hardware.
      b. Group together doors of same size and function.
   2. Content: Submit final hardware schedule organized into “hardware groups” in vertical format, indicating complete designations of every item required for each door or opening. Horizontal schedules will be rejected and re-submitted. Include the following information:
      a. Name and manufacturer of each item.
      b. Type, grade, style, function, size, and finish of each hardware item.
      c. Fastenings and pertinent information.
      d. Location of hardware set cross-referenced to indications on the Drawings, both on the floor plans and in the Door/Frame Schedule.
      e. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
      f. Mounting locations for hardware.
      g. Door and frame sizes and materials.
   3. Sequence: Submit schedule at earliest possible date, particularly where acceptance of hardware schedule must precede fabrication of other work critical in the project construction schedule.

D. Closeout Submittals: Provide to Owner, “Maintenance Manual” at Substantial Completion, including:
   1. Maintenance and warranty data.
   2. Catalog pages for each product.
   3. Name, address, phone number of local representative for each manufacturer.
   4. Parts list for each product.
   5. Copy of final hardware schedule.
   6. Copy of final keying schedule.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Provide similar units furnished by 1 manufacturer as coordinated assemblies.

B. Qualifications:
   1. Manufacturer: 5 years experience in the manufacture of finish door hardware.
   2. Supplier: A recognized architectural finish door hardware supplier, with warehousing facilities.
   3. Installer:
      a. 3 years experience in the installation of finish door hardware.

C. Regulatory Requirements:
   1. Furnish hardware that conforms to all applicable state and local building codes, including applicable IBC positive pressure testing requirements for state in which Project is located.
   2. ADA: Comply with relevant ADA requirements.
      a. Egress door locks shall not require use of key, tool, or special knowledge for operation.
   3. ANSI/BHMA: Test and comply with relevant A156 standards.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Pack each item complete with necessary pieces and fasteners, properly wrapped and cushioned to prevent scratches and damage during delivery and storage.

B. Identification: Furnish each unit clearly marked or numbered in accordance with hardware schedule.

C. Delivery: Hardware shall be delivered to the jobsite and door or frame manufacturers in manufacturer’s original cartons.

1.07 COORDINATION

A. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete.

B. Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware.

C. Deliver templates and physical hardware in timely manner to ensure orderly progress of total Work.

D. Coordinate door and frame preparations with door and frame suppliers.

1.08 PROJECT CONDITIONS

A. Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

1.09 WARRANTY

A. Warranty materials against defective workmanship and manufacture.

B. Repair or replace defective workmanship and material appearing within a period of 1 year after substantial completion.

C. Provide 10-year factory warranty on door closers against defects in material and workmanship from date of substantial completion of project.

D. Failures include, but are not limited to:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of doors or hardware.
   3. Deterioration of metals, metal finishes and other materials beyond normal weathering and use.

1.10 MAINTENANCE

A. Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: Beginning at Substantial Completion, provide 6 months' full maintenance by skilled employees of door hardware installer.
   1. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door hardware operation.
   2. Provide parts and supplies same as those used in the manufacture and installation of original products.

PART 2 PRODUCTS

2.01 MATERIALS

A. Do not provide products with manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.

B. Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness.

C. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

D. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.

2.02 FASTENERS

A. Furnish necessary screws, bolts, other fasteners of suitable size and type to anchor hardware in position for long life under hard use.

B. Furnish fastenings where necessary with expansion shields, toggle bolts, sex bolts, other anchors approved by Architect, according to material to which hardware is to be applied and recommendations of hardware manufacturer.

C. Use Phillips head for exposed screws.

D. Aluminum fasteners are not permitted.

E. Provide self-tapping fasteners (TEK for weatherstripping).

F. Harmonize fasteners with hardware material and finish.

2.03 HINGES

A. Test and comply with ANSI/BHMA standards for consistency, wear, and corrosion resistance.

B. Butt Hinges:
1. Acceptable manufacturers, subject to compliance with specified requirements, acceptable manufacturers and products are:

	Bommer	Hager	Ives	McKinney	PBB	Stanley
Type 4	BB5006	BB1199	5BB1HW	T4A3386	4B51	FBB199

2. Furnish ball bearing butts for exterior doors
3. Provide NRP for lockable doors opening outward.
4. Provide flat button tips, unless otherwise noted.
5. Types:
   a. Type 4: Grade 1
      1) Extra heavy, 4-BB, brass, bronze, or stainless steel.
      2) Out-swing exterior doors.
      3) Non-removable pin.
6. Quantities:
   a. 2 butts for doors up to 5 feet high.
   b. Provide 1 additional butt for every additional 30 inches in height or fraction thereof over 5 feet.
7. Sizes:
   a. 1-3/4 inch doors: 4-1/2 inches by 4-1/2 inches.
8. Butt Width: Provide proper butt width to clear trim and allow full 180-degree swing.

2.04 LOCKSETS AND LATCHES

A. Cylindrical Locks (Heavy Duty):
1. Acceptable manufacturers, subject to compliance with specified requirements, are:
   a. Best, 93K, Design 15D
   b. Corbin Russwin, CL3300, Design NZD
   c. Dorma CL800
   d. Sargent, 10-Line, Design LL
   e. Schlage, ND Series, Design RHO
   f. Yale 8800FL, Design AUR

Manufacturer of comparable products

B. Lock Cylinder:
1. Grade 2: Removable (interchangeable) small format core for exit devices and locksets.

2.05 DOOR CLOSERS

A. Heavy Duty: Acceptable manufacturers, subject to compliance with specified requirements, are:
   1. Corbin Russwin, DC6200
   2. Dorma 8900 Series
   3. LCN, 4040/4041 **OR** 4010/4110 Series
   4. Norton 7500
   5. Sargent 281/281-P10 Series
   6. Sargent, 351 Series
   7. Manufacturer of comparable products.

B. Components:
   1. Non-sized, adjustable, to meet opening force requirements of ADA.
   2. Heavy Duty: Cast iron or aluminum.
   3. Arm: Regular.
   4. Provide cast iron duty soffit bracket for heavy duty arms.
   5. Provide complete with plates, adapters and accessories as required by door and frame conditions and as recommended by manufacturer.
   6. Full rack and pinion mechanism with adjustable controls on Sweep, Latching, and Backcheck speeds, with tamper-proof tool and independent valve key adjusting features.

C. ADA: Closers shall meet ADA requirements for barrier free accessibility.

2.06 DOOR TRIM

A. Kickplates :
   1. Thickness: 16-gage (0.05 inch).
   2. Width: 2 inches LDW on single doors and 16 inches high.
   3. Beveled: Four edges.
   4. Countersinking.

2.07 STOPS AND HOLDERS

A. Standard of Quality: Design is based on products of Ives/Glynn-Johnson, subject to compliance with the specifications. Other acceptable manufacturers are:
   1. Overhead:
      a. Rixson: 9 Series
      b. Sargent: 590 Series
   2. Manufacturer of comparable products.

B. Requirements:
   1. Provide a stop arm or a stop arm/holder at doors with a parallel arm door closer requiring an overhead stop or stop/holder.

2.08 THRESHOLDS, WEATHERSTRIPPING, GASKETING, AND RAIN DRIPS

A. Standard of Quality: Design is based on products of National Guard, subject to compliance with the specifications. Other acceptable manufacturers are:
   1. Hager
   2. Pemko
   3. Reese
   4. Manufacturer of comparable products.

B. Thresholds and Weatherstripping: ADA compliant, as listed below at each exterior door, unless noted otherwise:
   1. Aluminum Thresholds: National Guard 8425.
   2. Sweeps: National Guard B606.
   3. Weatherstripping: National Guard 700NA.

4. Rain Drip: National Guard 16A full frame width.

2.09 LATCH PROTECTORS

A. Acceptable Manufacturers: Standard of Quality: Design is based on Ives LG1, subject to compliance with the specifications. Other acceptable manufacturers are:
   1. Don-Jo
   2. MAG
   3. Manufacturer of comparable products.

B. Provide stainless steel of the type required to work with the specified latch.

2.10 MISCELLANEOUS MATERIALS

A. Other materials, not specifically described but required for complete, proper installation, to be new, first quality of their respective kinds, Grade 1, subject to approval of Architect.

2.11 DOOR HARDWARE FINISHES

A. Unless otherwise indicated, finishes shall be as follows:
   1. Butts (exterior): US32D.
   2. Locksets: US26D.
   3. Latch Guards: US32D.
   4. Closers: Powder coated or painted aluminum.
   5. Overhead Controls (exterior): US32D.
   6. Kick Plates: US32D.
   7. Stops, Holders: US26D.
   8. Miscellaneous Items: US26D.
   9. Weatherstripping: Clear anodized aluminum.

B. Straight chrome-irons (magnetic) are not acceptable except as hinge pins. Items showing magnetic properties will be rejected.

2.12 KEYING

A. Final Keying:
   1. Systems: Locks and cylinders shall be keyed to a new master key system.
   2. Locks and cylinders shall be keyed to Owner's requirements.
   3. Keying shall include, but is not limited to, Grand Master keying, Master keying, and keying in groups.
   4. Provide 6 Grand Master keys marked "Do Not Copy."
   5. Provide 3 Master keys marked "Do Not Copy" for each Master key set.
   6. Provide 2 Change keys for each lock or cylinder.
   7. Ship keys to Owner, or as otherwise requested by Owner, via registered mail.

B. Maintenance: Provide 2 additional office function locksets for Owner's stock, with uncombinated cores for the Owner to key.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect the project prior to installation:
   1. Examine doors, frames, and related items, with hardware installer present, for conditions that would prevent the proper and timely application of finish hardware.
   2. If conditions do not meet approval, notify Architect.
   3. Do not proceed until defects and unsatisfactory conditions are corrected.
   4. Proceeding without notification implies acceptance of conditions.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturers' printed instructions at mounting heights described in the Door and Hardware Institute's "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames," unless otherwise noted.

B. Custom Doors and Frames: Use "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames" unless otherwise noted.

C. Mount locks so key enters the cylinder with smooth side down.

D. After hardware has been fitted, escutcheons and face-applied hardware shall be removed until final painting has been completed.

E. Hardware shall be reinstalled after painting is complete, properly adjusted, tested and left in perfect working condition.

F. Apply hinges that wrap the door with the "Adjusta-Screw" mounting method, to allow for proper adjustment of door in the opening.

G. Thresholds:
   1. Set exterior thresholds in 2 beads of polyurethane joint sealant to prevent moisture from entering the work. Completely fill void space under threshold.
   2. At openings with one or more mullions, install continuously with cut-outs for mullions.

H. Door Closers:
   1. Mount as follows unless details or other conditions dictate otherwise:
      a. Interior side of exterior doors.
      b. If conflict arises, verify with Architect.
   2. Verify need for through-bolting with door manufacturer.

I. Key Envelopes:
   1. After each lock has been reinstalled, the installer shall seal its keys in one of the supplied envelopes.
   2. The keys shall be delivered to the Owner together with surplus envelopes.

3.03 ADJUSTING

A. Ascertain that door closers are in adjustment so closer completes its full closing cycle without abrupt change of speed between sweep and latch speeds.

B. Adjust backcheck according to manufacturer's instructions.

C. Verify that levers are free from binding.

D. Ensure that latchbolts and deadbolts are engaged into strike and hardware is functioning.

E. Replace units that cannot be adjusted or lubricated to operate properly.

F. Occupancy Adjustment: Approximately 3 months after date of Substantial Completion, installer's hardware consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.04 CLEANING AND PROTECTION

A. Clean and restore hardware to the original finish.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper function and finish.

D. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DEMONSTRATION

A. Instruct the Owner's personnel in the proper adjustments of the hardware as needed.

B. Turn over wrenches and adjusting tools, provided with hardware, to Owner.

3.06 HARDWARE SCHEDULE

A. The following schedule of hardware groups shall be considered a guide only, and the supplier is cautioned to refer to the whole of this Section and other pertinent portions of the Project Manual.

B. Furnish items in amounts indicated on Drawings or required for complete and operable facility.

C. Verify quantities and suitability of fasteners.

D. Coordinate Schedule with Drawings and notify Architect of any door not scheduled for hardware.

E. Hardware Groups:

HW SET #1

	Hinge as required
1	Storeroom Lockset
1	Cylinder
1	Closer
1	Overhead Stop
1	Kickplate
1	Threshold
1	Latchguard
1	Weatherstripping
1	Sweep
1	Rain Drip

END OF SECTION

SECTION 08 90 00

LOUVERS AND VENTS

PART 1 GENERAL

1.01 SUMMARY

A. Provide metal wall louvers exposed to view in finish work, including:
   1. Formed metal louvers:
      a. Cold-rolled steel.
   2. Louver accessories including, but not limited to:
      a. Insect screen.

B. Installation of material furnished by others.
   1. Louvers and accessories.

C. Related Sections:
   1. Section 07 92 00 - Joint Sealants

1.02 REFERENCES

A. AAMA 2605 - Superior Performing Organic Coatings on Aluminum Extrusions and Panels

B. AMCA Standard 500 - Test Method for Louvers, Dampers, and Shutters

C. ASTM:
   1. E90 - Airborne Sound Transmission

1.03 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Withstand loads in compliance with Air Movement and Control Association (AMCA) Standard 500.
   2. Maintain performance criteria stated by manufacturer without defects, damage, or failure.
   3. Comply with airborne sound transmission loss ratings per ASTM E90.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer’s current Product Data including specifications, handling, storage and installation instructions, and maintenance recommendations.

B. Shop Drawings: Submit Shop Drawings showing system fabrication, installation drawings, including elevations, sections details of components, within system and between system and adjoining system.

C. Color Samples: Submit manufacturer’s standard color samples with Product Data and Shop Drawings.

1.05 QUALITY ASSURANCE

A. Single Source Responsibility: Provide louver units made of components of standard construction furnished by 1 manufacturer as coordinated assemblies.

B. Qualifications:
   1. Manufacturer: 5 years experience in the manufacture of louvers.

2. Personnel: For actual installation of louvers, use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, thoroughly familiar with requirements of work.

C. Certifications: Louvers shall bear the AMCA Certified Ratings Seal for both air performance and water penetration.

1.06 PROJECT CONDITIONS

A. Drawings do not purport to show actual field dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

1.07 WARRANTY

A. Provide manufacturer's written 20-year warranty for materials and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Standard of Quality: Design is based on products of Industrial Louvers, Delano, MN www.industriallouvers.com

B. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
1. *Airline* by Nystrom Building Products, Minneapolis, MN www.nystrom.com
2. Airolite Co., Marietta, OH www.airolite.com
3. American Warming and Ventilating (AWV) www.awv.com
4. Ruskin, Grandview, MO www.ruskin.com
5. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 MATERIALS

A. Aluminum Louvers:
1. Heavy duty, weather-resistant.
2. Sheet: ASTM B209 alloy 3003 or 5005 with temper as required for forming or recommended by metal producer to provide required finish.
3. Extrusions: ASTM B221, 0.081-inch extruded aluminum 6063-T5 alloy.

2.03 COMPONENTS

A. Louvers:
1. Extruded aluminum sections:
   a. Reinforcing bosses, heads, sills, jambs.
   b. One-piece structural members, with integral caulking slots and retaining beads.
   c. Provide invisible mullions as required.
2. Perimeter frame: Continuous channel frame; exposed surfaces matching louver finish.
3. Free area: 52 percent minimum.
4. Model: *Model 456XP*, 4-inch-deep

B. Louver Accessories:
1. Insect Screen:
   a. Aluminum louvers: 18 by 16 mesh, 0.012-inch aluminum wire.
   b.
   c. Color: Charcoal.
   d. All exterior locations unless indicated otherwise.
2. Fasteners:
   a. Steel: Zinc-coated or stainless steel screws and fasteners.

3. Other Materials: Other materials not specifically described but required for complete, proper installation of louver, subject to acceptance of Architect.

2.04 FABRICATION

A. All-welded construction with frame and blades welded in place.

2.05 FINISH

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products."

B. Shop Finish:
   1. Organic:
      a. Prefinished Kynar 500/Hylar 500 2-coat finish conforming to AAMA 2605; minimum DFT 1.2 mil.
      b. Color: Selected by Architect from manufacturer's standard colors.
      c. Free of scratches, blemishes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing Work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that louvers may be installed in accordance with original design, pertinent codes, regulations, and pertinent portions of referenced standards.

C. Discrepancies: Immediately notify Architect in writing. Do not proceed with installation in areas of discrepancy until fully resolved. Commencement of installation signifies acceptance of surface conditions.

3.02 INSTALLATION

A. Interface with Other Work: Communicate and coordinate with mechanical installer.

B. Louver Units:
   1. Install in accordance with manufacturer's approved Shop Drawings.
   2. Install plumb, level, in proper alignment with adjacent work.
   3. Form tight joints. Anchor firmly.

3.03 REPAIR/RESTORATION

A. Touch up marred finishes but replace units that cannot be restored to factory-finished appearance. Use materials, procedures recommended or furnished by manufacturer.

3.04 ADJUSTING AND PROTECTION

A. Adjust units to operate in proper manner and easily without binding.

B. Protect from corrosive or galvanic action by application of heavy coating of bituminous paint on surfaces in contact with concrete, masonry, or dissimilar metals.

C. Protect from damage during remainder of construction period.

3.05 CLEANING

A. Site: Do not allow accumulation of scraps, debris arising from work of this section. Maintain premises in neat, orderly condition.

B. System:
   1. Clean exposed surfaces of louvers to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
   2. Before final inspection, clean exposed surfaces using materials and methods recommended by manufacturer.

END OF SECTION

SECTION 09 91 00

PAINTING

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Paint:
      a. Exterior Substrates:
         1) Ferrous and zinc-coated metal.
      b. Interior Substrates:
         1) Concrete and masonry.
         2) Wood and hardboard.
         3) Ferrous and zinc-coated metal.

B. Perform the following:
   1. Surface preparation, priming, and finish coats for exposed surfaces and items including bare and primed mechanical and electrical equipment as scheduled or considered standard practice.
   2. In remodeled areas, paint items or areas indicated on the Drawings.

C. Do not paint the following:
   1. Prefinished items, except as noted.
   2. Concealed spaces, except as noted.
   3. Labels:
      a. Code requirements such as UL, FM.
      b. Equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections:
   1. Section 04 20 00 - Unit Masonry Assemblies
   2. Section 05 50 00 - Metal Fabrications
   3. Section 06 10 53 - Miscellaneous Rough Carpentry
   4. Section 08 11 13 - Hollow Metal Doors and Frames (Commercial)
   5. Section 08 33 00 – Coiling doors and Grilles

1.02 REFERENCES

A. ASTM:
   1. D16 - Standard Definitions of Terms
   2. D2047 - Slip Resistance of Coated Flooring Surfaces
   3. D3450 - Washability of Interior Architectural Coatings

B. Master Painters Institute (MPI): www.paintinfo.com
   1. Evaluation of Exterior Systems
   2. Evaluation of Interior Systems
   3. Surface Preparation

C. Painting and Decorating Contractors of America (PDCA) P5 - Sample Procedures for Paint and Other Decorative Coating Systems

D. Society for Protective Coatings (SSPC):
   1. SP 1 - Solvent Cleaning
   2. SP 13 - Surface Preparation of Concrete

1.03 DEFINITIONS

A. DFT: Dry Film Thickness

B. Minimum VS: Minimum Volume Solids

C. Paint: Any “decorative, protective, or otherwise functional coating applied to a substrate. This substrate may be another coat of paint.” The Paint Handbook, by Guy E. Weismantel.

D. Sheen: Standard coating terms defined in ASTM D16 apply.

E. VOC: Volatile Organic Compound

1.04 SUBMITTALS

A. Product Data:
   1. Submit manufacturer’s current Product Data including specifications, handling, storage and installation instructions, and maintenance recommendations.
   2. Provide schedule detailing the following:
      a. Specific products to be used for each coat, identified by manufacturer’s catalog number and general classification.
      b. Documentation that manufacturer has reviewed and approved each painting system.
      c. Cross reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
      d. Data pages for all products listed. Highlight the following:
         1) Type of resin.
         2) Dry film thickness.
         3) Volume solids.
         4) Units of sheen.
         5) VOC levels and MSDS.
         6) Other performance or descriptive data specified.

B. Samples:
   1. Color Selection:
      a. Submit manufacturer’s standard color drawdowns with Product Data for initial selection.
      b. Label each card with:
         1) Job name.
         2) Date.
         3) Product name and number.
         4) Color number stated in color schedule.
         5) Name, address, phone number of supplying company.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

B. Qualifications:
   1. Manufacturer: 5 years experience in the manufacture of coating systems.
   2. Applicator: 3 years experience in commercial application of coating systems.

C. Regulatory Requirements:
   1. Paint, stain, and wood preservative finishes and related materials are regarded as hazardous products and are subject to regulations for disposal.
   2. Products shall comply with the United States Clean Air Act for maximum VOC content.
   3. Clear wood finishes, floor coatings, stains, sealers, and shellacs applied to interior elements must meet the VOC content limits established in South Coast Air Quality management District, Rule 1113 for Architectural Coatings.

4. Comply with local Code requirements and authorities having jurisdiction for flame spread and smoke developed ratings of paints and coatings.
5. Conform to requirements of local authorities having jurisdiction in regard to the storage, mixing, application, and disposal of all paint and related waste materials.
6. All materials, preparation, and workmanship shall conform to requirements of the latest edition of the Architectural Paint Specification Manual by MPI.

D. Certifications: Manufacturer's certification that products supplied comply with local regulations controlling use of VOCs

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 degrees F.

B. Maintain containers in clean condition, free of foreign materials and residue.

C. Remove rags and waste from storage areas daily.

D. Containers shall bear the following information:
1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Volume solids, pigment, sheen, and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

1.07 ENVIRONMENTAL/PROJECT REQUIREMENTS

A. Job Conditions:
1. Paint: Apply only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F and 95 degrees F.
2. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.
3. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.08 WARRANTY

A. Provide minimum 5-year manufacturer's written warranty.

1.09 MAINTENANCE

A. Provide set of properly labeled drawdowns for future reorder of paint.

B. Provide not less than 1 quart for each paint and color used on site for Owner touch-up.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Paint:
1. Standard of Quality: Design is based on products of Sherwin-Williams Company (S-W), except as noted.

2. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers are:
   a. Glidden Professional/Devoe Coatings
   b. PPG Industries, Pittsburgh Paints www.ppg.com
   c. Diamond Vogel www.diamondvogel.com
   d. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 MATERIALS GENERAL

A. Material Compatibility: Provide blockfillers, primers, finish coat materials and related 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.

B. Material Quality:
   1. Provide manufacturer's best quality trade sale paint material of the various coating types specified.
   2. Paint containers not displaying manufacturer's product identification will not be acceptable.
   3. Paint shall be ready-mixed and pre-tinted.
   4. Colors: As selected by E/A from manufacturer's full range.
   5. Microban Antimicrobial Protection: Inhibits growth of stain and odor-causing bacteria, mold, mildew, and other fungal growth on the dried paint film. EPA approved; NSF approved (National Sanitation Foundation).

PART 3 EXECUTION

3.01 EXAMINATION

A. Test existing finishes (if any) for lead before sanding, scraping, or removing. If lead is present, notify Architect.

B. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work. Maximum acceptable moisture content of substrates:
   1. Concrete: 12 percent.
   2. Masonry (CMU): 12 percent.
   3. Wood: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Coordination of Work:
   1. Steel surfaces with less than 1.0 meter clear working access may necessitate applying material to inaccessible surfaces prior to erection of the finished steel members, either at the point of fabrication or on-site.
   2. Review other sections in which primers are provided to ensure compatibility of total systems for various substrates.
   3. On request of Architect, furnish information on characteristics of finish materials to ensure use of compatible primers.
   4. Notify Architect of problems anticipated using the materials specified.
   5. Commencement of installation signifies acceptance of surface conditions.

E. Factory-Primed Materials:
   1. Supplier shall disclose to the general contractor and to the painting contractor any pre-treatment and temporary coatings which have been applied.
   2. Manufacturer/supplier shall provide certification that the specified surface preparation and priming has been performed.
   3. Galvanized Metal:
      a. Remove pre-treatment and temporary coatings at no extra cost to painting contractor.

3.02 PROTECTION

A. Protect work of other trades and property of Owner against paint damage and overspray.

B. Sealants at expansion joints shall be masked prior to application of coating system.

C. Warning Signs: Provide “wet paint” signs to protect newly painted finishes.

3.03 SURFACE PREPARATION

A. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted.
   1. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
   2. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning General:
   1. Clean substrates of dust, dirt, grease, mildew, or other substances that could impair the bond of the various coatings according to manufacturer’s written instructions for each particular substrate condition and as specified.
   2. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
   3. Provide barrier coats over incompatible primers or remove and re-prime.

C. Cementitious Substrates:
   1. Comply with SSPC-SP13.
   2. Prepare concrete, concrete masonry block, surfaces to be painted.
   3. Determine alkalinity and moisture content of surfaces by performing appropriate tests.
      a. Perform pH test prior to application of coating system to ensure pH is within acceptable levels.
      b. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application.
      c. Do not paint surfaces where moisture content exceeds that permitted in manufacturer’s printed directions.
   4. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents.
   5. Roughen as required to remove glaze.
   6. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
   7. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.

D. Wood:
   1. Prime, stain, or seal scheduled wood immediately upon delivery.
   2. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   3. Sand surfaces that will be exposed to view, and dust off.
   4. Prime edges, ends, faces, undersides, and backsides of wood.
   5. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler.
   6. Sand smooth when dried.
   7. When transparent finish is required, backprime with spar varnish.
   8. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.

E. Ferrous Metal Substrates:
   1. Clean nongalvanized ferrous-metal surfaces that have not been shop coated.
   2. Remove oil, grease, dirt, loose mill scale, and other foreign substances.
   3. Surface shall be free of all visible rust.
   4. Use solvent or mechanical cleaning methods that comply with recommendations of the SSPC.

5. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.

3.04 APPLICATION

A. General:
   1. Apply paint in accordance with manufacturer's directions.
   2. Use applicators and techniques best suited for substrate and type of material being applied.
   3. Do not use heat guns with lead-based paints.
   4. Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

B. Multiple Coats:
   1. The number of coats and film thickness required is the same regardless of the application method.
   2. Do not apply succeeding coats until the previous coat has cured as recommended by manufacturer.
   3. Do not recoat until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
   4. Sand between applications where sanding is required to produce an even smooth surface in accordance with manufacturer's directions.

C. Tolerances:
   1. Match approved samples for color, texture, and coverage.
   2. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance.
   3. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.

D. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate. Provide a total dry film thickness (DFT) of the entire system as recommended by manufacturer.

E. Extent of Work:
   1. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.
   2. Paint surfaces behind movable equipment and furniture and wall-mounted items same as similar exposed surfaces.
   3. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.
   4. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
   5. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
   6. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
   7. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
   8. Sand lightly between each succeeding enamel or varnish coat.

F. Mechanical and Electrical Work:
   1. Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces including, but not limited to:
      a. Uninsulated metal piping.
      b. Uninsulated plastic piping.
      c. Pipe hangers and supports.
      d. Tanks that do not have factory-applied final finishes.
      e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
      f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

g. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
h. Switchgear.
i. Panelboards.
j. Electrical equipment indicated to have a factory-primed finish for field painting.

G. Prime Coats:
1. Before application of finish coats, apply a prime coat of material as recommended by manufacturer to material that is required to be painted or finished and has not been prime coated by others.
2. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

H. Pigmented (Opaque) Finishes:
1. Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.
2. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

3.05 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
1. Owner will engage the services of a qualified testing agency to sample paint materials being used.
2. Samples of material delivered to Site will be taken, identified, sealed and certified in presence of Contractor.
3. Testing agency will perform tests for compliance of paint materials with product requirements.
4. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements.
5. Contractor shall remove noncomplying paint materials from Site, pay for testing, and repaint surfaces painted with rejected materials.
6. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the 2 paints are incompatible.

3.06 CLEANING, ADJUSTING, AND PROTECTION

A. At the end of each workday, remove empty cans, rags, rubbish, wash water, solvents, and other discarded paint materials from the Site.

B. Do not clean painting equipment with free draining water. Retain cleaning water and filter out sediments to reduce contaminants entering waterways, drain systems, or into the ground.

C. Clean paint-spattered surfaces by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

D. Remove, refinish, or repaint Work not in compliance with specified requirements.

E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

F. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.07 WASTE MANAGEMENT

A. Separate waste in accordance with local recycling rules.
1. Recycle paint through local recycling or collection facilities, or donate to Habitat for Humanity, etc.
2. Dispose in accordance with the safety requirements of authorities having jurisdiction.

3. Solvent-based paints shall be stored and disposed of as hazardous materials.
4. Do not dispose of paints or solvents by pouring on the ground.

3.08 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal:
1. Primer coat: Rust-inhibitive waterborne self-cross-linking acrylic primer.
   a. Minimum DFT: 2.0 mils (over iron and steel).
   b. Minimum VS: 39 percent.
   c. S-W: Pro-Cryl Universal Primer B66.
2. 2-component acrylic polyurethane high gloss:
   a. 1 finish coat.
   b. Minimum DFT: 4.0 mils.
   c. Minimum VS: 57 percent.
   d. Sheen: 30 to 50 units at 60 degrees.
   e. S-W: Acrolon 218 HS Acrylic Polyurethane Semigloss B65.

3.09 INTERIOR PAINT SCHEDULE

A. Concrete Masonry Units:
1. Walls:
   a. Blockfiller: Latex-based, blockfiller:
      1) Minimum DFT: 8 mils.
      2) Minimum VS: 48 percent.
      3) Apply 2 coats if required by substrate.
      4) S-W: PrepRite Blockfiller B25W25.
   b. Low-luster acrylic-latex, interior enamel:
      1) 2 finish coats.
      2) Minimum DFT: 1.6 mils.
      3) Minimum VS: 37 percent.
      4) Sheen: 10 to 20 units at 85 degrees.
      5) S-W: ProMar 200 Latex Eg-Shel B20W, 1200 series.
   c. Semigloss interior latex enamel:
      1) 2 finish coats.
      2) Minimum DFT: 1.5 mils.
      3) Minimum VS: 38 percent.
      4) Sheen: Eggshell
      5) S-W: ProMar 200 Latex Semi-Gloss Interior B31-200.

B. Precast Concrete Panels:
1. Ceilings:
   a. Primer: Latex-based, interior primer.
      1) Minimum DFT: 1.1 mils.
      2) Minimum VS: 26 percent.
      3) S-W: PrepRite 200 Latex Wall Primer B28W200.
   b. Flat, vinyl acrylic interior paint.
      1) 2 finish coats.
      2) Minimum DFT: 1.2 mils per coat.
      3) Minimum VS: 37 percent.
      4) Sheen: 0 to 5 units at 85 degrees.
      5) S-W: ProMar 400 Flat Latex B30W400 Series.

C. Ferrous and Zinc-Coated Metal:
1. Primer: Quick-drying, rust-inhibitive, waterborne, self-cross-linking acrylic primer:
   a. Minimum DFT: 2.0 mils.
   b. Minimum VS: 39.
   c. S-W: Pro-Cryl Universal Primer B66.
2. Full-gloss, acrylic-latex, interior enamel:
   a. 2 finish coats.

b. Minimum DFT: 1.6 mils.
c. Minimum VS: 35 percent.
d. S-W: ProClassic Waterborne Gloss B21 Series.

END OF SECTION

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SECTION 10 44 00

SAFETY SPECIALTIES

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Fire extinguishers:
      a. Dry chemical extinguisher.
      b. Wall bracket.

B. Related Sections:
   1. Section 04 20 00 - Unit Masonry Assemblies

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's current Product Data including specifications, rating and classification, dimensions of individual components and profiles, finishes, handling, storage and installation instructions, and maintenance recommendations.

1.03 QUALITY ASSURANCE

A. Single Source Responsibility: Provide life protection specialties units made of components of standard construction furnished by 1 manufacturer as coordinated assemblies.

B. Qualifications:
   1. Manufacturer: 5 years experience in the manufacture of life protection specialties.
   2. For actual installation of life protection specialties, use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, thoroughly familiar with requirements of work.

C. Regulatory Requirements:
   1. UL Listing: Provide portable fire extinguishers which are UL listed and bear UL "Listing Mark" for type, rating and classification of extinguisher listed.
   2. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10 "Portable Fire Extinguishers."

1.04 WARRANTY

A. Provide manufacturer's 6-year warranty to repair or replace fire extinguishers and life safety equipment that fail in materials or workmanship.

B. Fire extinguisher failures include, but are not limited to, failure of hydrostatic test according to NFPA 10 and faulty operation of valves or release levers.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Standard of Quality: Design is based on products of J.L. Industries, Bloomington, MN www.jlindustries.com

B. Other Acceptable Manufacturers: Subject to compliance with requirements, acceptable manufacturers and products are:
   1. Amerex Corporation, Trussville, AL www.amerex-fire.com
   2. Larsens Manufacturing Company, Minneapolis, MN www.larsensmfg.com
   3. Nystrom, Brooklyn Park, MN www.Nystrom.com
   4. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 COMPONENTS

A. Fire Extinguishers:
   1. Fully charged and ready for use at final acceptance.
   2. Enameled-steel container with pressure-indicating gage.
   3. Size, type indicated in schedule at end of this section.
   4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Standard Wall Hanger Brackets:
   1. Size in accordance with fixture size where indicated by symbol on Drawings or as directed by Architect.
   2. Locate as indicated by Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify specialties may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Examine fire extinguishers and life safety equipment for proper charging and tagging. Remove and replace damaged, defective, or undercharged fire extinguishers.

D. Discrepancies: Immediately notify Architect. Do not proceed with installation in areas of discrepancy until fully resolved. Commencement of installation signifies acceptance of surface conditions.

3.02 INSTALLATION

A. Install in accordance with ADA code.

B. Install plumb, true, square in neat, rigid, substantial manner.

C. Install in compliance with requirements of authorities having jurisdiction.

D. Clean surfaces, adjust hardware, leave in good operating condition.

END OF SECTION

SECTION 26 00 01

CERTIFICATION

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.

TERENCE R. LARSON, P.E. **DATE** **10/22/14**

REGISTRATION NO. 17136

THIS CERTIFICATION COVERS DIVISION 26.

END OF SECTION

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SECTION 26 00 11
BASIC MATERIAL AND METHODS

PART 1 GENERAL

1.01 CONDITIONS OF THE CONTRACT

A. The Conditions of the Construction Contract and applicable provisions of Division I - General Requirements, as well as these General Provisions, shall apply to all of Division 26

B. All installations shall meet all Local, State and National Codes.

1.02 DEFINITIONS

A. Furnish: Under this Contract, Contractor shall deliver to the site item(s) specified, as well as additional specialized materials and/or accessories necessary for the use and operation of item or items specified.

B. Install: Under this Contract, Contractor shall set in position, connect (including sub-assemblies furnished), and adjust for use. Contractor shall furnish miscellaneous specialty items such as fittings, hangers, fastening devices, etc., as obviously necessary for a complete and operating installation.

C. Provide: Under this Contract, Contractor shall furnish and install item or items specified. Contractor shall perform all labor and furnish all materials and equipment necessary to that specified item or system will be complete and operational in every respect.

1.03 DRAWINGS

A. In general, the drawings of the Electrical Systems and Equipment are to scale, however, to determine exact locations of walls and partitions, the Contractor shall consult the Architectural and/or Structural Drawings which are dimensioned. Drawings shall not take precedence over field measurements. Plans showing circuiting or conduit routing, although shown on scale drawings, are diagrammatic only. They are intended to indicate the size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail or exact arrangement of construction.

B. If it is found before installation of any or all construction phases, that a more convenient, suitable or workable arrangement of any or all phases of the project would result by varying or altering the arrangement indicated on the drawings, the Engineer may require any or all Contractors to change the location or arrangement of their work without additional cost to the Owner. Such rearrangement shall be in accordance with directions from the Engineer.

C. Where discrepancies are discovered after certain portions or phases of any Contract have been installed, the Engineer reserves the right to have the Contractor make minor changes in conduit or duct, outlet, fixture or equipment locations or arrangements to avoid conflict with other work at no additional cost to the Owner. It shall be the responsibility of the contractor to provide written notification to the Engineer prior to making any changes or performing any additional work described in the plans and specifications. The Contractor may not be compensated for work done before notifying the Engineer.

D. Because the drawings are to a relatively small scale to show as large a portion as is practical, the fact that only certain features of the system are indicated does not mean that other similar or different features or details will not be required. The Contractor shall furnish all incidental labor, materials, or equipment for the systems under his control, so that each system is a complete and operating one unless otherwise specifically stipulated in the detailed body of the Specifications.

E. The Contractor shall be responsible for determining all field measurements before commencing construction, giving due consideration to building design and other equipment to be installed. Electrical equipment not dimensioned on the drawings shall be field located, giving due consideration to the work of other trades. The Contractor shall verify all dimensions before proceeding with the work. Where cutting and patching is required, each Subcontractor shall be responsible for his own work, unless otherwise determined by the Contractor.

F. Dimensions shall not be scaled from the drawings. If the Contractor discovers any discrepancy between actual measurements and those shown on the drawings which prevents good practice, good arrangement, or which is contrary to the intent of the drawings and specifications, he shall notify the Engineer before proceeding with the work.

1.04 SITE INSPECTION

A. Before submitting a proposal for the Work contemplated in these specifications and accompanying drawings, each bidder shall examine the site and familiarize himself with all the existing conditions and limitations, including the extent of demolition, cutting and patching to be done by the Subcontractor for Electrical Work. No extras will be allowed because of the Contractor's misunderstanding as to the amount of work involved, or his lack of knowledge of any condition in connection with the Work.

1.05 PRODUCT/ASSEMBLY/SYSTEM SUBSTITUTIONS

A. Where the Bid Documents stipulate a particular Product, substitutions will be considered by the Engineer up to 7 days before receipt of bids.

B. When a request to substitute a Product is made, the Engineer 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 Products as specified unless substitutions are submitted in this manner and subsequently accepted.

E. The cost of any changes of other trades as a result of use of the substitution material or equipment must be borne by the Subcontractor submitting such material or equipment.

F. Fax or telephone requests for substitution will not be accepted.

G. Those vendors wishing written approval shall include a return copy and a self-addressed stamped envelope with their request.

H. The listing of any manufacturer as "acceptable" does not imply automatic approval. It is the sole responsibility of the Contractor to ensure that any price quotations received and submittals made are for equipment which meet or exceed the specifications included herein.

1.06 EQUIPMENT

A. All equipment shall be new and in first-class condition. Equipment shall not be used for purposes other than intended by the manufacturer.

B. Manufacturer's nameplate, name or trademark shall be permanently affixed to all equipment and material furnished under this Specification. Nameplate of Subcontractor or distributor will not be acceptable. Nameplate shall be masked prior to any painting. Remove masking after completion.

C. Equipment specified and furnished shall be of a type and manufacturer that has a local representative and a local replacement and service outlet to give complete coverage on parts and service at all times.

1.07 WARRANTY

A. The Contractor shall be held responsible for any and all defects in equipment and workmanship which appear for one (1) full year after the date of Substantial Completion. All such defects must be repaired or defective equipment promptly replaced by the Contractor at no expense to the Owner.

1.08 INSPECTIONS AND FEES

A. The Contractor shall obtain all permits and licenses required in connection with the work under Division 26. Cost for such shall be paid by the Contractor.

B. When application for utility service is the Owner's responsibility, the Contractor shall be responsible for all phases of the installation other than the application itself and shall coordinate the utility's work with his installation.

1.09 SUBMITTALS

A. List of Suppliers & Subcontractors:
   1. The Contractor shall submit a list of suppliers, Subcontractors, and manufacturers for equipment installed under Division 26 for approval. Contractor shall make such submittal within 16 days after Notice to Proceed, prior to ordering any equipment. Approval of such list does not relieve the Contractor from submittal of shop drawings, nor shall it constitute final approval should the shop drawings be found not in agreement with the Specifications.
   2. If a list of materials is not submitted, it shall be assumed that the Contractor has waived his option of equipment selection in favor of selection by the Engineer.

B. Cost Breakdown:
   1. Before submittal of the first Request for Payment, the Contractor shall submit to the Engineer, an itemized cost breakdown, including separation of labor and material, for work under Division 26. The breakdown shall be divided in such detail as requested to aid in approval of Payment Requests based on work completed. Breakdown shall include, but not be limited to:
      a. Special Electrical Conditions (Bonds, Fees, Mobilization, etc.)
      b. Conduit, boxes, wire, etc.
      c. Panelboards, circuit breakers and disconnects.
      d. Devices
      e. Luminaires
      f. Motor Control

C. Shop Drawings:
   1. See Division 1 for submittals procedures. This section supplements the requirements of Division 1. In case of differences, the greater requirement applies.
   2. Shop drawings shall be submitted for all major equipment under each Section of this Specification.
   3. Shop drawings must first be checked by the Contractor for capacities and space conformance, and so stamped prior to submittal to the Engineer.
   4. Submit the signed and stamped electronic drawings or a minimum of eight (8) copies of paper shop drawings.

D. Operating and Maintenance Manuals:
   1. The Contractor shall prepare two (2) hard cover, looseleaf portfolios of all Electrical equipment furnished by him on the project. These portfolios shall include manufacturer's shop drawings, parts' lists, warranty information including dates, and operating and maintenance instructions of such equipment. Information shall be submitted neatly folded to approximately 8-1/2" x 11" size and shall be bound in indexed looseleaf binders of adequate size to contain the material. Upon completion of these portfolios, the Contractor shall turn over the same to the Engineer for approval and delivery to the Owner.
   2. Instructions shall include the following information:
      a. Manufacturer's recommended cleaning and maintenance procedures.
      b. List of materials recommended for maintenance.
      c. Complete operating instructions.
      d. Name and address of authorized service organization and parts depot.
   3. Where indicated in the Specifications, the Contractor shall provide the services of a factory trained representative to instruct the Owner's authorized personnel in the operation, control and maintenance of equipment.

E. Record Drawings:
   1. The Contractor shall keep a complete set of all Electrical drawings in his job site office for purposes of showing "As-Built" installation of Electrical systems and equipment.
   2. This set of drawings shall be used for no other purpose. Where any material, equipment or system components are installed different from that shown on the Drawings, such differences shall be clearly and neatly shown on this set of drawings using ink, or indelible pencil. The change notations shall be kept up-to-date on a daily basis. This set of

drawings shall be transmitted to the Engineer as directed, and after the Engineer has examined the drawings, the set will be returned to the Contractor for further use. At the completion of the project, the set of drawings shall be turned over to the Engineer for approval and delivery to the Owner.

1.10 TEMPORARY UTILITIES

A. Contractor shall refer to Division 1 for temporary electrical and telephone requirements during construction.

B. The Electrical Subcontractor shall coordinate with the Contractor for temporary service location and special power requirements.

C. Provide temporary lighting of not less than two footcandles throughout areas inside of buildings and 1/2 footcandle throughout the area needing security lighting.

D. Where it is permissible to use existing building power for construction, provide GFI protection for those circuits used for temporary power and lighting.

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Workmanship shall be first-class in every respect. Standard accepted practice in the various trades shall be considered as minimum. The Engineer reserves the right to reject any workmanship not in accordance with the specifications, either before or after installation of equipment.

3.02 COORDINATION

A. The Contractor shall coordinate locations and arrangements of his equipment with other Contractors and Subcontractors working on the project. Before starting work, the Contractor shall examine the Architectural, Structural and Electrical drawings and specifications, as well as shop and vendor drawings, for all divisions, to ascertain locations, levels, arrangements and dimensions of other work and shall confer and cooperate with all other Contractors or Subcontractors to avoid all interferences. He shall also provide Subcontractors for other trades with information regarding locations, arrangements and dimensions of his equipment. He shall also coordinate his own cutting and patching requirements with those of other Subcontractors, so that it will not be necessary for any Subcontractor to remove or re-do work improperly scheduled.

B. In cases of interferences between various items of equipment or between equipment and building members, if simplified construction is made possible by the relocation of certain equipment, changes in arrangements may be made, but only if authorized by the A/E.

C. Interferences between the work of different divisions which cannot be resolved by the parties involved shall be submitted to the Engineer who shall decide upon final location and arrangement without respect to which work was installed first.

3.03 JOB INSPECTION

A. Periodic job site observations will be made throughout the construction to review applications for payment, observe methods and materials of construction, and review requirements of the Bid Documents.

B. Contractor shall notify the Engineer, or authority having jurisdiction, and arrange for observation of installation prior to backfill or concealing of systems. Contractor shall, to the maximum practical extent, schedule work to allow for the observation of systems' installation in groups rather than individually.

C. Upon completion of all work, and submittal and approval of Test Reports, Maintenance Manuals and Record Drawings, Contractor shall notify the A/E and shall make arrangements for a Substantial Completion inspection.

D. After the inspection is made, the Contractor will receive a list of items requiring adjustment, correction, replacement or completion.

E. The Contractor shall promptly comply completely with all the listed requirements. Should the Contractor fail to perform promptly, the Engineer reserves the right to have the work completed by others and the cost deducted from the contract price.

F. The Contractor will be billed for projects which are not complete enough for a Substantial Completion Report (Punch List) by the Engineer when one is previously scheduled.

3.04 INSTRUCTION

A. Complete operating instructions composed of charts, diagrams, installation instructions, service instructions and wiring diagrams, shall be mounted in a conspicuous location on or immediately adjacent to the equipment concerned. Charts shall be in a glass or approved plastic-enclosed case.

B. Contractor shall instruct the Owner's personnel in the operation and maintenance procedures of all equipment and systems. Contractor shall confirm in writing prior to the final inspection that Owner has been instructed to his satisfaction in the operation of all systems. Coordinate with the Owner.

C. The Contractor shall obtain and maintain a list of all attendee in attendance at all training sessions. This list shall be submitted to the Engineer.

3.05 ENERGIZED EQUIPMENT

A. Electrical Equipment that is energized shall not be worked on in the energized state.

END OF SECTION

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SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Wiring connectors.

1.02 REFERENCE STANDARDS

A. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2011).

B. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy Wire for Subsequent Covering of Insulation; 2007 (Reapproved 2012).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

D. NECA 104 - Recommended Practice for Installing Aluminum Building Wire and Cable; National Electrical Contractors Association; 2012 (NECA/AA 104).

E. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; National Electrical Manufacturers Association; 2009 (ANSI/NEMA WC 70/ICEA S-95-658).

F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

H. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Armored cable is not permitted.

D. Metal-clad cable is not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:
   1. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.
   4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

H. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
   3. Color Code:
      a. 480Y/277 V, 3 Phase, 4 Wire System:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
         4) Neutral/Grounded: Gray.
      b. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      c. Equipment Ground, All Systems: Green.
      d. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:
   1. Feeders and Branch Circuits:
      a. Size 10 AWG and Smaller: Solid or Stranded .
      b. Size 8 AWG and Larger: Stranded.
   2. Control Circuits: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as shown on the drawings.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. Include circuit lengths required to install connected devices within 10 ft of location shown.
   3. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.

D. Install aluminum conductors in accordance with NECA 104.

E. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

H. Install conductors with a minimum of 12 inches of slack at each outlet.

I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

K. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
   5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.

L. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

M. Insulate ends of spare conductors using vinyl insulating electrical tape.

N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground rod electrodes.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Ground Rod Electrode(s):
      a. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.

E. Service-Supplied System Grounding:
   1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
   2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other

connections between neutral (grounded) conductors and ground on load side of service disconnect.

F. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
   2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
   3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
   4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
   5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
   6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in addition to requirements of Section 26 05 19:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Rod Electrodes:
   1. Comply with NEMA GR 1.
   2. Material: Copper-bonded (copper-clad) steel.
   3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as shown on the drawings.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install grounding and bonding system components in a neat and workmanlike manner in accordance with NECA 1.

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

D. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 05 53.

END OF SECTION

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SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 QUALITY ASSURANCE

A. Comply with NFPA 70.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
   2. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated, where applicable.
   3. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Comply with MFMA-4.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install support and attachment components in a neat and workmanlike manner in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
   2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners according to manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION

SECTION 26 05 34
CONDUIT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Intermediate metal conduit (IMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

G. Conduit fittings.

1.02 REFERENCE STANDARDS

A. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

C. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.

D. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); National Electrical Contractors Association; 2003.

E. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; National Electrical Manufacturers Association; 2003.

F. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2004.

G. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 651 - Schedule 40 and 80 Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

I. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or rigid PVC conduit.
   2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), or rigid PVC conduit.
   3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
   4. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.

C. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

D. Exposed, Exterior: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

E. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Transformers.
      b. Motors.

2.02 CONDUIT REQUIREMENTS

A. Electrical Service Conduits: Also comply with Section 26 21 00.

B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

C. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.

D. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 1/2 inch (16 mm) trade size.
   2. Control Circuits: 1/2 inch (16 mm) trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
   1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.07 ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression (gland) or set-screw type.
      a. Do not use indenter type connectors and couplings.

2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 80 unless otherwise indicated; rated for use with conductors rated 90 degrees C.

B. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated and routing is not shown, determine exact routing required.
   3. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
   4. Arrange conduit to maintain adequate headroom, clearances, and access.

G. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

H. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

I. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
8. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

J. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where conduits are subject to earth movement by settlement or frost.

K. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

L. Provide grounding and bonding in accordance with Section 26 05 26.

END OF SECTION

SECTION 26 05 37
BOXES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Underground boxes/enclosures.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; National Electrical Contractors Association; 2010.

C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. SCTE 77 - Specification for Underground Enclosure Integrity; Society of Cable Telecommunications Engineers; 2013 (ANSI/SCTE 77).

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
   4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
   5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
   6. Coordinate the work with other trades to preserve insulation integrity.
   7. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.04 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
   1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.

C. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.

2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable masonry type boxes where flush-mounted in masonry walls.
4. Use raised covers suitable for the type of wall construction and device configuration where required.
5. Do not use "through-wall" boxes designed for access from both sides of wall.
6. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
7. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
8. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
9. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
10. Wall Plates: Comply with Section 26 27 26.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA 250 Environment Type, Unless Otherwise Indicated:
3. Junction and Pull Boxes Larger Than 100 cubic inches:
   a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

D. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 18 inches.
3. Provide logo on cover to indicate type of service.
4. Applications:
   a. All areas :Use polymer concrete enclosures, with minimum SCTE 77, Tier 15 load rating.
5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

E. Install boxes plumb and level.

F. Install boxes as required to preserve insulation integrity.

G. Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches deep.
2. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
3. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

H. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

I. Close unused box openings.

J. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

K. Provide grounding and bonding in accordance with Section 26 05 26.

END OF SECTION

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SECTION 26 21 00

LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical service requirements.

1.02 DEFINITIONS

A. Service Point of Delivery: Point of electrical supply connection between equipment or conductors owned and maintained by the Utility Company and conductors or equipment owned and maintained by the Customer, as designated by the Utility Company.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:
   1. Verify the following with Utility Company representative:
      a. Utility Company requirements, including division of responsibility.
      b. Exact location and details of utility point of connection.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
   3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

E. Scheduling:
   1. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.05 SUBMITTALS

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

B. Shop Drawings: Include dimensioned plan views and sections indicating locations and arrangement of Utility Company and service entrance equipment, metering provisions, required clearances, and proposed service routing.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. The requirements of the Utility Company.

PART 2 PRODUCTS

2.01 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics:
   1. Service Type: Underground.
   2. Service Voltage: 480Y/277 V, 3 phase, 60 Hz.

C. Utility Company: Minnesota Power.

D. Division of Responsibility:
   1. Pad-Mounted Utility Transformers:
      a. Transformers: Furnished and installed by Utility Company.
      b. Transformer Grounding Provisions: Furnished and installed by Contractor per Utility Company requirements.
      c. Primary:
         1) Trenching and Backfilling: Provided by Utility Company.
         2) Conduits: Furnished and installed by Contractor.
         3) Conductors: Furnished and installed by Utility Company.
      d. Secondary:
         1) Trenching and Backfilling: Provided by Contractor.
         2) Conduits: Furnished and installed by Contractor.
         3) Conductors: Furnished and installed by Contractor (Service Point of Delivery at transformer).
   2. Terminations at Service Point of Delivery: Provided by Utility Company.
   3. Metering Provisions:
      a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.
      b. Metering Transformer Cabinets: Furnished and installed by Contractor per Utility Company requirements.
      c. Metering Transformers: Furnished and installed by Utility Company.
      d. Conduits Between Metering Transformers and Meters: Furnished and installed by Contractor per Utility Company requirements.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on drawings.

B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in a neat and workmanlike manner in accordance with NECA 1.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required trenching and backfilling.

E. Construct cast-in-place concrete pads for utility equipment in accordance with Utility Company requirements and Section 03 30 00.

F. Provide required support and attachment components in accordance with Section 26 05 29.

G. Provide grounding and bonding for service entrance equipment in accordance with Section 26 05 26.

H. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 05 53.

END OF SECTION

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SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Load centers.

C. Overcurrent protective devices for panelboards.

1.02 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; Federal Specification; Revision E, 2013.

B. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association; 2009.

C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.

D. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association; 2011.

E. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; International Electrical Testing Association; 2013 (ANSI/NETA ATS).

F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 67 - Panelboards; Current Edition, Including All Revisions.

J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.03 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

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, and installation of product.

E. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.04 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Siemens Industry, Inc: www.usa.siemens.com.

B. Eaton Corporation; Cutler-Hammer Products: www.eaton.com.

C. General Electric Company: www.geindustrial.com.

D. Schneider Electric; Square D Products: www.schneider-electric.us.

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

2.02 ALL PANELBOARDS

A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase and Neutral Bus Material: Aluminum.
2. Ground Bus Material: Aluminum.

D. Circuit Breakers:
1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:
1. Provide surface-mounted enclosures unless otherwise indicated.

2.04 LOAD CENTERS

A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.

B. Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
2. Bus Material: Aluminum or copper.

C. Circuit Breakers: Thermal magnetic plug-in type.

D. Enclosures:
1. Provide flush-mounted enclosures unless otherwise indicated.
2. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

2.05 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      2) 14,000 rms symmetrical amperes at 480 VAC.
   b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
   a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

C. Provide required supports in accordance with Section 26 05 29.

D. Install panelboards plumb.

E. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

F. Provide grounding and bonding in accordance with Section 26 05 26.

G. Install all field-installed branch devices, components, and accessories.

H. Provide filler plates to cover unused spaces in panelboards.

I. Identify panelboards in accordance with Section 26 05 53.

3.02 FIELD QUALITY CONTROL

A. Perform inspection in accordance with Section 01 40 00.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

D. Test GFCI circuit breakers to verify proper operation.

E. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.03 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

END OF SECTION

SECTION 26 27 17
EQUIPMENT WIRING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Disconnect Switches: As specified in Section 262913 .

B. Wiring Devices: As specified in Section 26 27 26.

2.02 EQUIPMENT CONNECTIONS

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

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SECTION 26 27 26
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

D. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.04 SUBMITTALS

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

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.05 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed and classified by Underwriters Laboratories Inc. or testing firm acceptable to authorities having jurisdiction as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

A. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.

B. Unless noted otherwise, do not use combination switch/receptacle devices.

2.02 WIRING DEVICE FINISHES:

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

2.03 ALL WIRING DEVICES

A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

B. Finishes:

2.04 WALL SWITCHES

A. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

2.05 RECEPTACLES

A. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:
   1. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, , listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

C. GFI Receptacles:
   1. All GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
   2. Weather Resistant GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.06 WALL PLATES

A. All Wall Plates: Comply with UL 514D.
   1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
   2. Size: Standard; _____.
   3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of wiring devices provided under this section.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

G. Provide GFI receptacles with integral GFI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

H. Install wiring devices plumb and level with mounting yoke held rigidly in place.

I. Install wall switches with OFF position down.

J. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

K. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

L. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.03 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 40 00.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

END OF SECTION

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SECTION 26 28 18
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break, enclosed safety switches complying with NEMA KS 1, type HD (heavy duty), and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

G. Provide with switch blade contact position that is visible when the cover is open.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

J. Enclosures: Comply with NEMA KS 1 and NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:

K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

L. Heavy Duty Switches:
   1. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install enclosed switches in accordance with manufacturer's instructions.

B. Install enclosed switches securely, in a neat and workmanlike manner in accordance with NECA 1.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required supports in accordance with Section 26 05 29.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

END OF SECTION

SECTION 26 29 13
ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Manual motor controllers.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. 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.

PART 2 PRODUCTS

2.01 MANUAL CONTROLLERS

A. Manual Motor Controllers: NEMA ICS 2, AC general-purpose, Class A, manually operated, full-voltage controller with overload element, red pilot light, NO auxiliary contact, and toggle operator.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.

B. Provide supports in accordance with Section 26 05 29.

C. Height: 5 ft to operating handle.

END OF SECTION

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SECTION 26 51 00
INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

1.02 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.03 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. LED Luminaire Components: UL 8750 recognized or listed as applicable.

2.03 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 _____, and listed and labeled as complying with UL 924.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

D. Install accessories furnished with each luminaire.

E. Bond products and metal accessories to branch circuit equipment grounding conductor.

F. Emergency Lighting Units:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

G. Install lamps in each luminaire.

END OF SECTION

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior luminaires.

1.02 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.

B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.03 SUBMITTALS

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

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. LED Luminaire Components: UL 8750 recognized or listed as applicable.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of luminaires provided under this section.

B. Install products according to manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).

D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. Install accessories furnished with each luminaire.

F. Bond products and metal accessories to branch circuit equipment grounding conductor.

G. Install lamps in each luminaire.

END OF SECTION

SECTION 31 23 16

STRUCTURE EXCAVATIONS AND BACKFILLS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Structure excavation.
   2. Foundation preparation.
   3. Backfill placement.
   4. Surplus excavated material disposal.

B. Related Sections:
   1. Section 31 11 00 - Clearing and Grubbing
   2. Section 31 22 10 - Site Grading
   3. Section 31 23 10 - Excavation and Embankment
   4. Section 31 25 10 - Stormwater Management

1.02 REFERENCES

A. Appendix A – Geotechnical Report

1.03 SEQUENCING AND SCHEDULING

A. Do not commence construction of structure foundation until soil test results are confirmed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Granular Backfill: MnDOT 3149D.

B. Aggregate Backfill: MnDOT 3149E.

C. Granular Bedding: MnDOT 3149F.

D. Aggregate Bedding: MnDOT 3149G.

E. Coarse Filter Aggregate: MnDOT 3149H.

F. Filter Aggregates: MnDOT 3149J.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that foundation soils are in suitable condition to begin construction.

B. Advise Engineer of soil types or conditions not in accordance with soil borings.

3.02 PREPARATION

A. Temporary Construction:
   1. Provide sheeting, shoring, or other temporary facilities as required to prosecute work.
   2. Provide warning signs, fencing or other temporary facilities as required to prevent unnecessary hazards to public.
   3. Provide pumping or other temporary means as required to establish and maintain dry conditions in excavation.

3.03 CONSTRUCTION REQUIREMENTS

A. Excavation:
   1. Excavate, shape, and prepare foundation soils to elevations and dimensions designated on Drawings.
   2. Perform additional excavation as required to permit erection of forms and other temporary construction and to provide for proper compaction of backfill materials.

B. Foundation Preparation:
   1. Compact foundation soils as necessary to achieve required stability.
   2. Replace unsuitable foundation soils with acceptable materials.
   3. Place and compact replacement materials in minimum 8-inch layers.
   4. Rock foundations:
      a. Remove loose or disintegrated rock material from excavation.
      b. Clean out rock seams and fill with CLSM (Controlled Low Strength Material).

C. Backfilling:
   1. Uniformly distribute backfill materials in maximum 8-inch layers and compact to 95 percent of Standard Proctor Density prior to placement of successive layers.
   2. Do not place backfill material on frozen foundations.
   3. Do not place material that will freeze during backfill or compaction.
   4. Dispose of suitable surplus materials as embankment for site grading.

3.04 FIELD QUALITY CONTROL

A. Soil Tests:
   1. Soil bearing test on foundation soils will be taken at Owner’s discretion.
   2. Soil density tests on backfill material will be taken at Owner’s discretion.

3.05 PROTECTION

A. Protect prepared foundation soils from freezing.

B. Protect and maintain prepared foundation soils during dewatering operations.

END OF SECTION

SECTION 32 15 00

AGGREGATE SURFACING
(MnDOT 2118)

PART 1 GENERAL

1.01 SUMMARY

A. Section includes construction of an aggregate wearing course on a prepared subgrade.

B. Method of Measurement:
   1. Measure by compacted volume of material acceptably placed in cubic yards based on planned dimensions.

1.02 REFERENCES

A. MnDOT:
   1. 2118 - Aggregate Surfacing
   2. 3138 - Aggregate for Surface and Base Courses

1.03 SUBMITTALS

A. Provide for each aggregate material:
   1. Name and location of source.
   2. Sample Gradation.

1.04 HANDLING AND DELIVERY

A. Stockpile and drain aggregate removed from below water for a minimum 24 hours prior to delivery.

1.05 SITE CONDITIONS

A. Deposit aggregate only on dry compact subgrade so that no rutting or displacement will occur under construction traffic.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate Surfacing Materials: MnDOT 3138.

B. Class of Aggregate: As indicated on the Bid Form.

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. Mix aggregate as required prior to spreading to produce and maintain uniform gradation.

B. Deposit and spread aggregate on driveways to achieve the required depth and coverage.

C. Compact aggregate with a steel-wheeled or pneumatic-tired roller until there is no further evidence of consolidation.

END OF SECTION

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SECTION 41 22 00

HOISTS AND TROLLEY

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Manual Chain Hoists, Hand Chained Geared Trolleys

1.02 REFERENCES

A. American National Standards Institute (ANSI):
   1. 30-11 - Safety Code for Underhung Bridge Cranes and Monorail Systems
   2. 3016 - Safety Code for Overhead Hoists

B. American Society for Testing and Materials (ASTM):
   1. A325-83 - Specification for High Strength Bolts, Structural Steel Joints

C. Hoists Manufacturers Association (HMA):
   1. Standard specifications for Electric Wire Rope or Chain Hoists and Hand Chain Hoists

1.03 SYSTEM DESCRIPTION

A. Bridge Crane Trolley Design Requirements.
   1. A 3 -ton capacity, hand chain geared trolley and manual hand chain hoist system.
   2. Trolley shall be compatible with the bridge crane girder (see section 41 22 13 – Bridge Cranes)

1.04 SUBMITTALS

A. Shop drawings in accordance with Section 01 33 00, and including:
   1. Details showing system fabrication, installation drawings.
   2. Drawing, plan, elevation, and section details of all hoist components.

B. Product Data:
   1. Submit manufacturer's detailed technical Product Data and installation instructions for each principal component or product, and include certified test reports on required testing.
   2. List and describe features of system, performances and operation characteristics.
   3. Submit manufacturer's specifications, handling, storage and installation instructions, and maintenance and cleaning recommendations.

C. Operating and maintenance data in accordance with Section 01 78 23, including:
   1. Key component breakaway pictures.
   2. Subassembly details.
   3. Periodic inspection and maintenance requirements.
   4. Provide to Owner maintenance and warranty data in Maintenance Manual compliant with Section 01 78 23 and Section 01 78 37.

D. Certified rated load test reports.

E. Quality Assurance/Control Submittals:
   1. Test Reports: Reports from independent testing laboratories approved by the Engineer indicating compliance with the above performance requirements.

1.05 QUALITY ASSURANCE

A. Codes and Definitions
   1. Definitions of terms used in this Section shall be as used in the glossary of the Monorail Manufacturers Association.

2. Equipment shall conform to ANSI B30.11, MMA Specifications for Crane and Monorail Systems, ANSI B30.16, and HMI Standard Specification for Electric Wire Rope or Chain Hoists and Hand Chain Hoists.

B. All materials shall be new and each completed overhead handling system shall be the product of one crane manufacturer regularly engaged in the production of such equipment. The General Contractor is encouraged to select one manufacturer (if possible) for multiple or all of the handling systems required for this Project (including bridge crane rail, crane girder, and all related materials listed but not limited to those mentioned in Section 41 22 13).

C. Qualifications:
1. Manufacturer: 5 years experience in the manufacturer of bridge crane trolleys with 6 projects of similar size, scope, and type of which 3 have been used for more than 3 years or longer.
2. Contractor: 3 years experience in the installation of bridge crane trolleys.
3. Personnel: For actual installation of bridge crane trolleys use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, thoroughly familiar with requirements of work.

D. Design equipment for ambient temperatures minus 40 to plus 100 degrees F and outdoor conditions.

E. Certifications: Provide to the Engineer, certification of installer from manufactures of bridge crane trolley.

F. Preinstallation Meetings: Conduct conference at Site to comply with requirements of Section 01 31 19.

1.06 ALLOWABLE TOLERANCES

A. Conform to AISC Code of Standard Practice.

B. Conform to CMAA No. 74 for installation, including runway beams.

1.07 PROJECT/SITE CONDITIONS

A. 3 -ton capacity hand chain geared trolley with manual hand chain hoist installed on the bridge crane girder where shown in the plans. Coordinate Work to prevent interferences with proposed construction.

1.08 WARRANTY

A. Manufacturer/s and installer/s shall guarantee all material and labor for a period of at least 1 year from date of substantial completion. This shall in no way limit manufacturers' warranties that may be valid for periods of time greater than 1 year.

1.09 MAINTENANCE

A. Maintenance Service: Provide warranty maintenance as required, but a minimum of one service trip to the Site 11 months following date of Substantial Completion to make adjustments and warranty repairs to the low head room monorail trolley along with all installed support systems. Document site visit/s and include signature from Owner personnel.

PART 2 PRODUCTS

2.01 BRIDGE CRANE TROLLEY

A. Install fone (1) 3- ton capacity low headroom hand chain geared bridge crane trolley as shown on the drawings.

B. Manufacturer:
1. Standard of Quality: Unless indicated otherwise, design is based on products of Columbus McKinnin Corporation www.cmworks.com

2. Acceptable Manufacturers: Subject to compliance with specified requirements, acceptable manufacturers and products are:
   a. Robbins & Meyers www.robbinsmyers.com
   b. Coffing Hoists www.coffinghoists.com
   c. Other manufacturers may be submitted for approval to engineer.

C. Components
1. Trolley:
   a. Furnish low headroom hand chain driven geared trolley.
   b. Construct yokes from malleable castings, fixture machined.
   c. Design trolleys to allow installation or removal of wheels at any point on track without removing carrier assembly.
   d. Construct trolley wheels from high alloy forged steel. Machine wheel tread to assume concentricity of axle and tread. Harden tread to 425-480 Brinell.
   e. Machine axles from high alloy, heat treated steel.
   f. Flangeless wheels with side guide rollers may be provided in lieu of flanged wheels.
2. Chains, Hoist, and Hooks:
   a. Chains shall be corrosion resistant zinc plated high strength hardened steel rated for a minimum 3 - ton capacity.
      1) Design chain with a minimum safety factor of 3.0
   b. Hook shall be bronze with stainless steel hook latch.
      1) Design hooks with a minimum safety factor of 3.0.
   c. Hook shall have adapter which allows hook to rotate 360 degrees.
   d. Hook to provide lift to a minimum of 15’-0” above finished floor elevation
   e. Trolley hand chain drop height to be 3’-0” above the Finished Floor Elevation.

D. Finishes
1. Trolley to be finished with manufacturer’s standard paint. All steel to be properly cleaned and prepared.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hoisting equipment in accordance with manufacturer's recommendations.

3.02 FIELD QUALITY CONTROL

A. Manufacturer’s authorized representative shall supervise critical installation procedures as necessary, inspect final installation, perform necessary calibration and adjustment, and start-up the equipment in accordance with manufacturer’s recommendations.

B. Operational Tests: Prior to initial use, cranes shall be tested to ensure compliance with following functions:
1. Hoisting and lowering.
2. Trolley travel.

C. Rated Load Tests:
1. Test hoisting equipment with loads of 125 percent of rated load, unless otherwise recommended by manufacturer.
2. Provide 2 copies of certified test reports to Engineer.
3. Tests shall be done after installation.

3.03 DEMONSTRATION

A. Provide operation and maintenance training in accordance with Section 01 75 00.

END OF SECTION

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SECTION 41 22 13

BRIDGE CRANES

PART 1 GENERAL

1.01 SUMMARY

A. Provide:
   1. Single girder, hand chain gear driven, top running crane.
   2. Runway rail ASCE 25 pounds per yard minimum.
   3. Crane accessories.

B. Perform the following:
   1. Commissioning of cranes.

C. The following is not included in this section:
   1. Bridge Crane Runway beam.
   2. Bridge Crane column.

D. Related Sections:
   1. Section 05 12 00 - Structural Steel Framing
   2. Section 05 50 00 - Metal Fabrications

1.02 SYSTEM DESCRIPTION

A. Design Requirements:
   1. The bridge crane with span as shown on the Drawings and the bridge crane rail with attachment to runway beam shall be supported by the runway beam as shown on the drawings.
   2. A 3-ton capacity, hand chain geared crane and hoist system.
   3. Runway beams and columns shall be sized and located as shown on the drawings.
   4. The supports shall be spaced as shown on the drawings, and the crane beams, crane girder and hoist shall be confined to the envelope as indicated on the drawings. The crane structure must be self-supporting and stable.
   5. Lowest obstruction is as shown on the drawings but no higher than 18’-0” above finished floor elevation.
   6. Minimum hook lifting height at top of lift shall be 15;-0” above finished floor elevation.
   7. Bridge crane components and finishes shall be designed for outdoor applications.

B. Performance Requirements:
   1. Deflection requirements are as follows:
      a. Deflection of the crane runway beams: The vertical deflection of crane runway beams under maximum wheel loads without vertical impact shall not exceed 1/1000 of the runway beam span. The horizontal deflection of crane runway beams with lateral forces shall not exceed 1/400 of the runway beam span.
      b. Sway: The maximum sway of the crane runway columns under lateral or longitudinal forces shall not exceed 1/120 of the height of the columns.

1.03 SUBMITTALS

A. Refer to Section 01 33 00.

B. Product Data:
   1. Submit manufacturer’s detailed technical Product Data and installation instructions for each principal component or product, and include certified test reports on required testing.
   2. List and describe features of the system with performances and operation characteristics.

3. Submit manufacturer's specifications, handling, storage and installation instructions, and maintenance and cleaning recommendations.

C. Shop Drawings:
1. Submit Shop Drawings showing system fabrication, installation drawings, including plans, elevations, sections, details of components, and configurations within system and between system and adjoining system.
2. Show crane girder and hoistattachment of crane rails to crane beams and supporting structure.

D. Engineering Calculations: Submit component engineering calculations and layoutalong with Shop Drawings.
1. All engineering work is to be signed and sealed by a professional engineer registered in Minnesota, along with Registration Number, and the name of the supplier of pre-engineered components.

E. Samples:
1. Components: Submit samples of anchors, fasteners, hardware, and other materials and components if requested Engineer.

F. Quality Assurance/Control Submittals:
1. Test Reports: Reports from independent testing laboratories approved by Engineer indicating compliance with the above performance requirements
2. Certificates: Hoist inspection test record, chain certificate, hook forging certificate.

G. Maintenance Manual: Provide to Owner maintenance and warranty data in "Maintenance Manual" compliant with at Maintenance Demonstration.

1.04 QUALITY ASSURANCE

A. Single Source Responsibility: Provide materials made of components, with uniform texture and color or blend, furnished by one manufacturer for each different product required

B. Qualifications:
1. Manufacturer: 5 years experience in the manufacture of traveling bridge cranes, with 6 projects of similar size, scope and type of which 3 have been in successful use for 3 years or longer.
2. Contractor: 3 years experience in the installation of traveling bridge cranes.
3. Personnel: For actual installation of traveling bridge cranes use personnel skilled in work required, completely familiar with manufacturer's recommended methods of installation, thoroughly familiar with requirements of work.

C. Regulatory Requirements:
1. To the extent applicable, comply with the requirements of the following:
   a. The Crane Manufacturer's Association of America.
   b. Hoist Manufacturer's Institute.
   c. The Occupational Safety and Health Act.
   d. American National Standards Institute.
   e. CMAA Specification 74.
   f. MI Specification 100-74 Standard Duty Class H3.

D. Certifications: Provide to Engineer, certification of installer from manufacturer of traveling bridge cranes.

E. Preinstallation Meetings: Conduct conference at Site.

1.05 PROJECT CONDITIONS

A. Existing Conditions: Field Dimensions: Drawings do not purport to show actual dimensions, but are intended only to establish location and scope of Work. Field-verify dimensions and assume full responsibility for their accuracy.

1.06 WARRANTY

A. Manufacturer and installer shall guarantee all material and labor for a period of at least 1 year from date of substantial completion. This shall in no way limit manufacturer's warranties that may be valid for periods of time greater than 1 year.

1.07 MAINTENANCE

A. Maintenance Service: Provide warranty maintenance as required, but a minimum of one service trip to the site 11 months following date of Substantial Completion to make adjustments and warranty repairs to the traveling bridge cranes. Document site visit and include signature from Owner personnel.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Standard of Quality: Unless indicated otherwise, design is based on products of *Superior Crain Corp.* www.superiorcrane.com/

B. Other Acceptable Manufacturers: Subject to compliance with specified requirements, acceptable manufacturers and products are:
   1. Robbins & Meyers www.robbinsmyers.com
   2. Columbus McKinnon Corp. www.cmworks.com
   3. Harrington Hoists and Cranes www.harringtonhoists.com
   4. Manufacturer of comparable products submitted in compliance with Section 01 25 13.

2.02 COMPONENTS

A. Rails: ASCE 25 pounds per yard.

B. The bridge beam as shown on the drawings.
   1. The distance from centerline of the rail to any obstruction shall be a minimum of 8 inches.
   2. The crane end tracks shall be designed to provide a minimum of 2-inch clearance from any obstruction.

C. Wheels shall be hi-carbon steel, double flanged, with heavy-duty roller bearings.

D. Crane:
   1. Hand chain gear driven.
      a. Chain shall be corrosion resistant zinc-plated suitable for outdoor applications.
   2. All gearing shall be enclosed in oil bath except final gear and pinion reduction at wheel.

E. Accessories and Other Materials: Materials not specifically described but required for complete, proper installation of traveling bridge cranes, subject to acceptance of Engineer.

2.03 FINISHES

A. Shop Priming: Runways to be properly prepared and finished with red oxide primer and finish coat of enamel. Mask running surface to prevent finishing that surface.

B. Shop Finishing: Crane to be finished with manufacturer's standard paint. All steel to be properly cleaned and prepared. Crane to be high visibility yellow or orange. Mask running surface to prevent finishing that surface.

PART 3 EXECUTION

3.01 EXAMINATION

A. Work of Other Trades: Prior to commencing work, carefully inspect and verify that work is complete to point where this installation may properly commence.

B. Verification of Conditions: Verify that traveling bridge cranes may be installed in accordance with original design, pertinent codes and regulations, and pertinent portions of referenced standards.

C. Discrepancies: Immediately notify Engineer in writing. Do not proceed with installation in areas of discrepancy until fully resolved. Commencement of installation signifies acceptance of surface conditions.

3.02 PREPARATION

A. Installer shall provide, unload and erect all components above the runway beam including but not limited to the crane rails and attachment to runway beam, crane girder, end stops and all related components.

3.03 INSTALLATION

A. Comply with manufacturer's written installation instructions.

B. Provide complete electrical installation.

C. Ensure proper start-up of equipment and that everything is in proper running order prior to turning over crane to Owner.

3.04 REPAIR/RESTORATION

A. Touch up marred finishes, but replace units that cannot be restored to factory-finished appearance. Use materials and procedures recommended or furnished by manufacturer.

3.05 CLEANING

A. Site: Do not allow accumulation of scraps, debris arising from work of this section. Maintain premises in neat, orderly condition.

B. System:
   1. Remove temporary covering and other provisions made to minimize soiling of other work.
   2. Clean exposed surfaces of traveling bridge crane using materials and methods recommended by manufacturer.
   3. When work is completed, remove unused materials, containers, equipment, and debris.

3.06 DEMONSTRATION

A. Provide video of demonstrations to Owner.

B. Startup Services: Provide the services of a factory-authorized service representative to provide start-up service and to demonstrate and train Owner's Representative:
   1. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
   2. Train Owner's Representative on procedures and schedules related to startup and shutdown, troubleshooting, servicing and preventative maintenance.
   3. Review data in the "Operating and Maintenance Manual".

C. Maintenance Instructions: Manufacturer's representative to schedule and attend meeting with Owner's representatives to explain:
   1. Maintenance and Care Instructions.
   2. Recommended Maintenance Program.
   3. Warranty Requirements.

3.07 PROTECTION

A. General: Provide final protection and maintain conditions, in a manner acceptable to manufacturer to ensure work is without damage or deterioration at time of Substantial Completion.

END OF SECTION

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SECTION 46 31 33

INSTALLATION OF PUMP STATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Requirements for installation of two (2) process pumping packages and associated equipment.
   2. Unload, inspect and properly store at the site manufactured equipment and accessories per owner instructions.
   3. Mechanical and electrical installation of all process pumping equipment and controls.
   4. Coordination and staging of construction of pump station buildings and manufactured equipment delivery to allow timely completion and enclosure.

1.02 PERFORMANCE CRITERIA

A. Contractor's with at least 5 years of experience in the installation of this type of equipment and materials are preferred.

1.03 REFERENCES

A. All materials and equipment shall conform to applicable ANSI, ASTM, NEC, and UL standards.

1.04 MATERIALS

A. Two new snowmaking pump skids, with accessories, will be supplied by Owner, under separate contract, and shipped F.O.B. to the site and installed by Contractor as specified herein;
   1. River Wet Well Pump Station a new, (3) pump wet well style prefabricated pump station, including water pumps and motors.
   2. Main Pump Station a new owner supplied (6) pump booster style prefabricated pump station, including water pumps and motors.

B. Reference drawings;
   a. Pump Station Reference Drawings, October 20, 2014 Torrent Engineering and Equipment, (21 sheets)

1.05 ASSEMBLY

A. Set Skids:
   1. Provide crane for unloading skids from trucks and setting within the building
   2. Provide anchorage as recommended by Manufacturer

B. Piping Connections
   1. Install water supply and discharge piping; from pump skid, within the building, under floor, through foundation walls and connect outside of building (approximately 5') or as shown on plans.
   2. All pipe welding to be performed by qualified welders and according to specification API 1104.

C. Electrical:
   1. Terminate pump motor leads, space heater and winding thermostat wiring (materials included with prefabricated pump station) on the prefabricated pump skid.
   2. Note: 120/208 V house transformer and panel board are supplied with and installed on the River prefab pump skid. Main pump station house transformer and panel board are supplied with the prefab pump skid but shipped loose for installation off-skid by the contractor.
   3. Items not part of the Section, but part of this Contract include:
      a. Supply and install building ventilation intake, exhaust fan, and unit heaters
      b. Transformer pads, meter cabinets, and incoming power wiring from new outdoor utility transformers to the pump station service entry
      c. Building lights, receptacles, conduit and wiring.

d. Bridge Crane at Main Pump Station.

D. Supply and install all network field wiring, conduit, and components per FJJ design drawings and specifications.

PART 2 PRODUCTS

2.01 STEEL PIPE (3” NOMINAL DIAMETER AND LARGER)

A. Service - Cold Water
B. Specification - APL 5L, Grade B (minimum)
C. Thickness, sizes and quantity - As noted on attached materials list
D. New black steel pipe, domestic
E. ERW - Electric resistance welded
F. Beveled ends for welding unless otherwise specified
G. Markings - Paint stenciled; mfg, specification, grade, diameter, wt/ft or wall thickness
H. Inspection by customer at delivery.

2.02 STEEL PIPE (2 ½” NOMINAL DIAMETER AND SMALLER);

A. Service - Cold Water
B. Specification - ASTM A-106, Grade B (minimum)
C. Thickness, sizes and quantity - As noted on attached materials list.
D. New black steel pipe, domestic
E. ERW - Electric resistance welded
F. Threaded ends for welding unless otherwise specified.
G. Markings - Paint stenciled; mfg, specification, grade, diameter, wt/ft or wall thickness.
H. Inspection by customer at delivery.

2.03 WELD FITTINGS

A. Specification - ASTM 234
B. Standard weight schedule (unless otherwise specified) per ANSI B36.10
C. Grade B carbon steel
D. Beveled ends for welding (30 deg. bevel)
E. Dimensions, tolerances, markings and weld bevel per ANSI B16.9
F. Pressure and temperature ratings equal to seamless pipe of equal size, wall and material grade.
G. All elbows to be long radius type unless otherwise specified.
H. Markings - size, wall thickness designation, mfg., grade
I. Domestic preferred

2.04 STEEL FLANGES

A. Forged carbon steel
B. Rating - As specified on drawings
C. Manufacture Specification;
D. Class 150 & 300 rated per ASTM A181, grade I
E. Class 400 & 600 rated per ASTM A105, grade I
F. Class 900 rated per ASTM A105, grade II
G. Pressure ratings, dimensions and tolerances per ANSI B16.5
H. Raised face
I. Slip on type (except where other types are specifically noted).
J. Gaskets; flat ring type with corresponding flange pressure rating.

2.05 THREADED FITTINGS

A. Specification - ASTM A197, malleable iron
B. Pressure/Temperature ratings and dimensional tolerances per ANSI B16.3 (to 3” size)
C. Threaded to NPT specifications

D. Class 150 (Std.) or Class 300 (XH) as specified
E. Unions - ANSI B16.39 specification
F. Finish - Black unless otherwise specified
G. Galvanizing - per ANSI A 153 (if specified).

PART 3 EXECUTION

3.01 GENERAL

A. Any persons performing electrical wiring are to be licensed within the applicable jurisdiction.
B. All installation shall conform to industry standards and applicable ANSI, ASTM, NEC and UL standards.
C. All installation to comply with applicable manufacturer's installation, operating and maintenance instructions.

3.02 PREPARATION

A. Painting
   1. All field piping is to be cleaned and painted with high performance industrial enamel paint per the color code on the drawings.
   2. After painting, field piping to be labeled with adhesive pipe markers and flow direction arrows.

3.03 FIELD QUALITY CONTROL

A. The contractor is responsible for protecting all equipment from damage related to construction activity and weather throughout the project.

3.04 CLOSEOUT

A. Collect and provide to owner all manufacturer's paperwork, instructions, and operating & maintenance manuals.

B. All construction debris should be cleaned up and removed on a regular basis and may not be left in the building.

END OF SECTION

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