



PROJECT MANUAL FOR

Marathon Cty. Sheriff's Dept TRC & Storage Bldg. Renovations

**Sheriff's Department TRC
7255 Stewart Avenue
Wausau, WI 54403**

Angus Young Project Number: 77081

**Sheriff's Department Storage Building
7015 Packer Drive
Wausau, WI 54403**

Angus Young Project Number: 77081

February 15, 2024



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Marathon Cty. Sheriff's Dept TRC & Storage Bldg. Renovations

Marathon County
1000 Lakeview Drive
Wausau, WI 54403

Angus Young Project No. 77081

Angus-Young Associates, Inc.
555 South River Street
Janesville, WI 53548-4783
608.756.2326
Attn: Jim Tibbetts

J.Tibbetts@angusyoung.com

www.angusyoung.com



February 15, 2024

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ADVERTISEMENT FOR BIDS
Marathon Cty. Sheriff's Dept TRC & Storage Bldg. Renovations

Marathon County Facilities and Capital Management Department is soliciting bids for the Marathon Cty. Sheriff's Dept TRC & Storage Bldg. Renovations. Bids shall be prepared in accordance with the contract documents prepared by Angus Young Associates, 555 South River Street, Janesville, WI 53548.

Time and Place for Receiving Bids: Marathon County will accept sealed bids at the Facilities and Capital Management Dept. office.

Bids Due: **March 7, 2024 02:00 PM**
Marathon County
Facilities and Capital Management Department
1000 Lakeview Drive
Wausau, WI 54403

Bid Opening: Public
Basis of Bid: Single Lump Sum

Bids received after 2:00 p.m. will not be accepted. Actual receipt by said time is required and deposit in the U.S. mail is insufficient. The envelope containing the sealed Bid shall bear the name and address of the interested firm and the notation **Marathon Cty. Sheriff's Dept TRC & Storage Bldg. Renovations** on the **OUTSIDE** of the envelope. Bids will be read publicly after the 2:00 p.m. Deadline. E-mail bids must have **Marathon Cty. Sheriff's Dept TRC & Storage Bldg. Renovations** in the subject line Attn: craig.christians@co.marathon.wi.us.

BIDDING DOCUMENTS: The Bidding Documents will be on file after February 15, 2024 , for inspection at Marathon County, Facilities and Capital Management Department Offices, 1000 Lakeview Drive, Wausau, WI 54403. And are available on the Marathon County Website.

Pre-Bid Walk Through: Mandatory Pre-bid Meeting: February 27, 2024 10:00 AM , Meeting at the TRC Building 7255 Stewart Avenue, Wausau, WI. A walk-thru at the Storage Building Renovation 7015 Packer Drive, Wausau, WI. will follow.

RESERVATIONS: Marathon County reserves the right to reject in whole or in part any and all bids, to waive any informalities, and to accept the bids determined to be in the best interest of the County. This advertisement may be canceled if determined to be in the best interest of the County.

ETHICS: The General Code of the County of Marathon contains various procurement policies which are applicable to this proposed procurement. These include prohibitions against gratuities and kickbacks. This request is governed by the Marathon County Procurement Code, a copy of which is available at the County Clerk's office in the Courthouse.

SECURITY DEPOSIT: Bids shall be accompanied by a security deposit in the form of a Bid Bond or certified check in the amount of no less than **ten percent (10%)** of the Bid Sum. Endorse the Bid Bond or certified check in the name of the Owner as obligee, signed and sealed by the Contractor as principal and the Surety.

After a Bid has been accepted, all securities will be returned to the respective Bidders. For the accepted Bidder, the security deposit will be returned after execution of the Contract. If no contract is awarded, all security deposits will be returned. Include the cost of the Bid security in the Bid Sum.

BID WITHDRAWAL: No bid shall be withdrawn for a period of Sixty (60) days after the scheduled opening of the bids without the consent of the Owner or Architect.

Date: **February 12, 2024**
County of Marathon, Wisconsin
By: Craig Christians, Facility Planner
Facilities & Capital Management Dept.

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**SECTION 00 21 13
INSTRUCTIONS TO BIDDERS**

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PART 1 - GENERAL

- A. Base bids and alternates will include single prime contracts for the construction specified herein and as shown on the Drawings.
- B. Bidders shall indicate change order percentage as indicated on the bid form. The percentage fee to cover overhead and profit and required supervision on top of costs established by; payroll plus fringes, material invoices and equipment costs or rentals. Further information regarding changes in the work can be found in Section 00 73 00 Supplemental /General Conditions to AIA-A201.
- C. General Construction Contract shall include all work in Divisions 0, 1 through 41 of Project Manual, and Drawings.
- D. Applicable provisions of Bidding Requirements and Conditions of the Contract, and Division One of the Technical Specification shall apply to all Contractors and Sub-Contractors.
- E. The "General Conditions of the Contract for Construction" AIA Document A201, 2007 Edition and Supplementary/Special Conditions to AIA Document A201, General Specifications, and Information for Bidders are hereby, made a part of this entire Project Manual. When an interpretation is required between the provisions of any of the Contract documents, the more restrictive provision shall govern.
- F. "General Conditions" apply with equal force to Contractor, Sub-Contractors' work, extra work and the like that may be specified herein or performed in or about building or site under this Contract.

PART 2 - INTERPRETATION

- A. No verbal explanation or instructions will be given in regard to the meaning of the Drawings or Specifications during the bid period. Bidders shall bring inadequacies, omissions or conflicts to the Architect/Engineer's attention at least ten days before the date set for bid opening. Clarification will be supplied to all bidders of record by addendum.

PART 3 - WITHDRAWAL OF BIDS

- A. Bids may be withdrawn by written request received from Bidder or an authorized representative thereof prior to the time fixed for opening of bids, without prejudice to the right of the Bidder to file a new bid.
- B. No bid may be withdrawn for a period of **60 days** after the date set for the opening thereof.

PART 4 - TAXES

- A. The County is a tax-exempt entity.

PART 5 - SUBMISSION OF BIDS

- A. Bidders shall submit a single Base Bid for all construction.
- B. Bid amounts shall be inserted in words and in figures in spaces provided on the Bid Form; in

case of conflict, written word amounts will govern.

- C. Addenda issued during the time of bidding shall become a part of the Contract Documents. Bidders shall acknowledge receipt of each addendum in the appropriate space provided on the Bid Form. Bid will be rejected if receipt of addendum applicable to award of Contract has not been acknowledged on Bid Form.
- D. Provide a proposed Construction Schedule with major milestones.
- E. Submit one copy of the Bid Form sealed with original signature and stamp.

PART 6 - SUBSTITUTION LISTING

- A. A list of substitutions will be required to be submitted with the Bid.

PART 7 - PAY REQUESTS

- A. The successful bidder shall submit to the Architect an example of a pay request itemizing every Section of the Project Manual including, but not necessarily limited to, material, product, and fixture breakdown, labor breakdown, taxes, equipment rental, overhead and profit.
- B. The Architect will review the breakdown for the pay request and respond accordingly with corrections and comments.

PART 8 - COMMENCEMENT AND COMPLETION

- A. Out for bid: **February 15, 2024**
- B. **Mandatory Pre-bid Meeting: February 27, 2024 10:00 AM**
 - 1. Meeting at the TRC Building 7255 Stewart Avenue, Wausau, WI. A walk-thru at the Storage Building Renovation 7015 Packer Drive, Wausau, WI. will follow.
- C. Bid Due Date: **March 7, 2024 02:00 PM**
- D. Award of Contract: **March 15, 2024**
- E. Commencement of Construction: **March 25, 2024**
- F. Substantial Completion of Construction: **Specified Date from Bid Form.**
- G. Final Completion: **November 8, 2024**

PART 9 - SPECIAL INSTRUCTIONS

- A. Special Time Periods during which the Contractor cannot perform Construction: Power tools, equipment, and hammering shall not be performed between the hours of *7 p.m. to 7 a.m.*

END OF SECTION

**SECTION 00 26 00
SUBSTITUTION LIST**

TO: Craig Christians, Facility Planner
Marathon County
1000 Lakeview Drive
Wausau, WI 54403

Pursuant to bidding requirements for the Work:

The Contract sum proposed by the undersigned on the Bid Form is for the Work as shown on the Drawings, described in the Project Manual, and otherwise defined in the Contract Documents. The undersigned proposes the following substitutions for the Owner's consideration. Should the Owner accept any or all the proposed substitutions, the bidder's proposed contract sum will be reduced or added to be the amount shown.

Specified Product or Material	Drawing or Spec. Section	Proposed Substitution	Proposed Add/Deduct in Contract Sum

END OF SECTION

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**SECTION 00 41 13
BID FORM**

Marathon Cty. Sheriff's Dept TRC & Storage Bldg. Renovations
Bids Due: March 7, 2024 02:00 PM

To: Craig Christians, Facility Planner
Marathon County
1000 Lakeview Drive
Wausau, WI 54403

We _____ (a corporation)
_____ (a partnership)
(cross out inapplicable) _____ (an individual)

of _____
Street City

_____ State Zip Code Area Code Telephone No.

hereby agree to execute the proposed Contract specified herein and to furnish all labor and materials required to complete this Project in accordance with the Drawings and Project Manual and other Contract Documents, dated 02/15/2024, prepared by Angus-Young Associates, Inc., 555 South River Street, Janesville, Wisconsin 53548-4783.

BID NO. 1 – Sheriff's Department TRC - DRAWINGS AND DIVISIONS 0 - 33 OF THE PROJECT MANUAL

For the sum of _____
_____ Dollars (\$ _____)

BID NO. 2 – Sheriff's Department Storage Building - DRAWINGS AND DIVISIONS 0 - 33 OF THE PROJECT MANUAL

For the sum of _____
_____ Dollars (\$ _____)

TOTAL LUMP SUM OF BIDS (BID NO. 1 + BID NO. 2) -

For the sum of _____
_____ Dollars (\$ _____)

ALTERNATE BID 77081-A1 TOILET ROOM REMOVAL -

For the sum of _____
_____ Dollars (\$ _____)

ADDENDUM RECEIPT

We acknowledge receipt of the following Addenda:
Number & date

inclusively.

COMMENCEMENT AND SUBSTANTIAL COMPLETION OF CONTRACT WORK

The undersigned agrees, if awarded the Contract, to commence the Contract upon execution of the agreement, and to complete the Work within the time stated below by the Bidder.

This Project shall be completed within _____ (insert no.) calendar days.

INSTRUCTION TO BIDDER

The undersigned understands and agrees to comply with and be bound by Section 00 21 13, Instruction to Bidders issued for this Work.

If a Corporation, name the State of Incorporation

_____.

If a Partnership, state full names of all partners.

Firm Name:

Area Code & Telephone Number: _____

By: _____ Notary Seal

Title: _____

By: _____ Name:

Title: _____ Commission Expires:

Dated: _____

END OF SECTION

**SECTION 00 43 13
BID BOND**

Per Wisconsin Statutes 62.15 (3) or as required by the Owner. No bid shall be received unless accompanied by a certified check or a bid bond equal 10 percent of the bid payable to the Owner as a guaranty that if the bid is accepted the bidder will execute and file the proper contract and bond within the time limited by the Owner.

Accompanying this proposal is a _____ (Bid Bond or Certified Check) in the amount _____ DOLLARS and _____ CENTS

(\$ _____) being 10% of the bid amount as required by the advertisement for bids.

It is hereby expressly agreed that the Marathon County has the right to reject any and all bids.

Bidders should not add any conditions or qualifying statements to this proposal, or otherwise the proposal may be declared irregular as being not responsive to the Advertisement.

I hereby certify that all statements herein are made on behalf of

(Name of corporation, partnership, or person submitting bid);

- 1) a corporation organized and existing under the laws of the state of _____;
- 2) a partnership consisting of _____;
- 3) as an individual trading as _____;
of the city of _____;
state of _____;

(Contractor)

(Seal)

END OF SECTION

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**SECTION 00 43 36
SUBCONTRACTORS LIST**

GENERAL

A list of subcontractors will not be required to be submitted with the bid; however, the successful bidder(s) shall submit w/in 24-hrs. in writing the names of prospective subcontractors and material suppliers for the owner's approval, as outlined in the Instructions to Bidders. The owner will review, approve, or disapprove all subcontractors for prime contractors.

Use subcontractors who have adequate numbers of skilled workman that are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work.

SUBMITTAL

Each Prime Contractor shall submit a complete listing of subcontractors and product suppliers to be used, for each item specified in each section indicated below. Enter the contract amount included in base bid.

SUBCONTRACTOR / SUPPLIER		
SECTION	NAME & CITY	BASE BID AMOUNT
3 Concrete Work	_____	_____
5 Structural Steel	_____	_____
7 Metal Wall Panels	_____	_____
7 Metal Roofing	_____	_____
22 Plumbing	_____	_____
23 Mechanical	_____	_____
26 Electrical	_____	_____

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**SECTION 00 48 10
AFFIDAVIT AND STATEMENT
ON PLANS AND SPECIFICATIONS**

_____ being first duly sworn on oath deposes and says that he is
(Capacity) for _____ and makes this statement on behalf of; that
(Contractor) has examined and carefully prepared his bid from the Plans and Specifications and has
checked the same in detail before submitting said proposal or bid to the Marathon County, and that the
products and processes used in the preparation of his proposal are available at competitive prices.

(Contractor)

Subscribed and sworn to before me

this _____ day of _____, 20____.

Notary Public, _____ County,
Wisconsin.

My Commission Expires _____.

That attached hereto, and made a part hereof, by reference is a list of the subcontractors
_____ proposes to contract with, and the class of work to be performed by each,
which list will not be added to nor altered without the written consent of the Owner.

NAME OF SUBCONTRACTOR

CLASS OF WORK TO BE PERFORMED

NAME OF SUBCONTRACTOR	CLASS OF WORK TO BE PERFORMED
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

(Attach additional pages if necessary)

END OF SECTION

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SECTION 00 61 13
PERFORMANCE AND PAYMENT BONDS

1.01 SURETY BONDS

- A. Refer to Document 00 73 00, Paragraph 11.5.
- B. Form of bond shall be "Public Improvement Performance/Labor and Material Payment Bond," pursuant to Section 779.14 Wisconsin Statutes, and WIS. AIA Document WIS A312, published by the Wisconsin Chapter of the American Institute of Architects.
- C. All bonds shall be signed by an agent or official of the surety company and shall include the certified Power of Attorney provided by the surety company showing that the person who signs the bonds has the power of attorney to so sign for the surety company. Such certification shall be signed by the Secretary or Assistant Secretary of the company and not by an attorney-in-fact. This certification shall bear the same or earlier date as the bonds.
- D. Surety Company shall have a B, or better, rating by the "Best Guide", licensed to do business in the state of Wisconsin.
- E. Provide three copies each of the bonds and the Power of Attorney for attachment to each copy of the agreement.
- F. Contractor shall pay the premiums for the surety bonds.
- G. Date of agreement and surety bonds shall be the same.
- H. Contractor shall sign the bonds, consistent with the following, as applicable:
 - 1. Under a partnership or a joint venture, the agreement may be signed by one partner of the partnership, or one partner of each firm comprising the joint venture, but the surety bonds shall be signed by all partners.
 - 2. Under a corporation, the bonds shall be signed by the official signing the agreement and the corporate seal affixed to the agreement and the surety bonds. If the corporation has no seal, include a statement to the effect that the corporation has no seal.

1.02 AVAILABILITY OF FORMS

- A. Document forms as specified above may be examined at the Office of the Architect and may be purchased directly from:

AIA WISCONSIN
321 South Hamilton Street
Madison, WI 53703
Telephone: (608) 257-8477

END OF SECTION

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**SECTION 00 73 00
SUPPLEMENTARY CONDITIONS**

The following Supplementary Conditions modify the "GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION", stated in Division 00 – Section 00 72 00 General Conditions. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect.

ARTICLE 1 GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.2 THE CONTRACT

Add the following subparagraphs:

- .1 The Agreement which records the facts of the contractual relationship agreed upon by the parties thereto and the stipulations thereof take precedence over all other Contract Documents.
- .2 Supplementary General Conditions delete, revise, or supplement one or more of the Articles of the AIA Document A201: "General Conditions of the Contract for Construction."
- .3 Special Conditions cover provisions of a general nature peculiar to the Project which are not related to subjects included in the standard AIA Document A201: "General Conditions of the Contract for Construction."

1.1.6 THE SPECIFICATIONS

Add to the end of this paragraph:

"and coordinates their location in the Project with the working drawings."

Add the following paragraph:

1.1.7 INSTRUMENTS OF SERVICE

Add to the end of this paragraph:

Addenda record modifications to the working drawings and specifications made prior to the signing of agreement for the construction of the Project by the Owner and the Contractor.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

1.2.2 Delete the words "Contractor in dividing the" and substitute therefore the words "Division of".

Add the following paragraph:

1.2.4 The precedence of the Contract Documents is in the following sequence:

- .1 Addenda or modifications of any nature to the Drawings and Specifications take precedence over the original construction documents.
- .2 The Specification: Where specified differently than shown on Drawings, the Architect shall decide which stipulation will provide the best installation; where specified but not

shown on Drawings and Architect deems installation necessary, the Specifications takes precedence.

- .3 The Working Drawings: The precedent shall be drawings of larger scale over those of smaller, figured dimensions over scaled dimensions, and noted materials over graphic indications; where installation is shown or noted, but not specified and Architect deems installation necessary, Drawings take precedence.
- .4 When remodeling is contemplated to existing, and noted on Drawings, all work required to execute the complete installation, whether or not completely shown, shall be by that particular Contractor involved unless otherwise noted, and the Drawings shall take precedence if the work is not specifically specified for complete installation. Further, when only mechanical or electrical work is required, and "patch and match" is noted or obviously required, the Contractor(s) involved shall pay the cost of the required "patch and match". All work shall meet with approval of the Architect.
- .5 When a duplication of material or equipment occurs in Drawings or Specifications in separate prime contracts, each prime contractor shall furnish this material or equipment. Architect will decide which contract amount shall be adjusted, for not incorporating material or equipment into the Project.

1.2.5 Material and equipment incorporated into the Project, which by their nature are governed by OSHA regulations, shall conform to said OSHA regulations, for both manufacture and installation. If, during the progress of the work, it is discovered that material and/or installation does not conform to said OSHA regulations, the Contractor shall take such steps as necessary to comply, **at no additional cost to the Owner or Architect.**

ARTICLE 3 CONTRACTOR

3.1 GENERAL

Add the following paragraph:

3.1.4 There may be more than one Contractor required to perform the work necessary to complete the Project.

3.7 PERMITS, FEES AND NOTICES

3.7.1 Add the following subparagraph:

- .1 The Contractor shall submit final component designs and drawings stamped and signed by an Engineer legally authorized to practice in the jurisdiction where the Project is located, ~~and submittal fees to the Architect/Engineer~~ as required by local, state, and federal rules and regulations applicable to the work and Project location.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.1 Add the following to the end of this paragraph:

Shop drawings must be complete and accurate with regard to concealed items such as pipe, drains, mains, conduit, raceways, temperature control piping or wiring, and all like equipment or devices. Unless shop drawings are sufficiently accurate to permit immediate location and identification of concealed items, with a minimum of cutting, shop drawings will be considered inadequate and the contract work deemed incomplete.

3.15 CLEANING UP

3.15.1 Delete this paragraph and substitute therefore the following:

Each Contractor is morally and financially responsible for his own clean-up operations. Clean-up must be timely as well as thorough in order to meet safety regulations and permit other contractors to perform without hindrance from dirt and debris. The Architect and the Owner will police project housekeeping and take appropriate steps to maintain clean, safe working conditions. The General Contractor will provide a Dumpster on site for this purpose.

ARTICLE 5 SUBCONTRACTORS

5.2.1 Add the following subparagraph:

.1 Not later than ten working days after the Notice of Award of the Work, the Contractor shall furnish in writing to the Owner through the Architect the names of persons or entities proposed as manufacturers for each of the products identified in the Specifications and, where applicable, the name of the installing Subcontractor.

Add the following paragraph:

5.5 PAYMENTS TO SUBCONTRACTORS

5.5.1 The Contractor, within thirty days of the receipt of any payment from the Owner, shall pay all Subcontractors and material suppliers with whom the Contractor has contracted, their share of the payment the Contractor received based upon the service performed by the Subcontractor. The Contractor shall also require each Subcontractor to make similar payments to his Sub-subcontractors. The Contractor shall furnish a sworn statement that material suppliers have received their share of the previous payment to the Contractor.

ARTICLE 7 CHANGES IN THE WORK

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.3 Delete the present subparagraph 7.3.3.3 in its entirety and substitute the following:

.3 By cost as established by payroll plus fringes, material invoices and equipment costs or rentals, plus a percentage as indicated on the bid form, on the established costs accumulated, to cover overhead and profit.

7.3.8 In this paragraph, delete the words "the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change" and substitute therefore the words "the allowance for overhead and profit shall be as indicated by the bidding contractor on the basis of net increase, if any, with respect to that change."

Add the following:

7.3.11 The amount of mark-up or down shall be set forth as follows: In subparagraphs 7.3.3 and 7.3.6 the percentage fee allowances for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:

- .1 for the Contractor, for work performed by the Contractor's own forces, 10% of the cost.
- .2 for the Contractor, for work performed by the Contractor's Subcontractor, 7% of the amount due the Subcontractor.

ARTICLE 8 TIME

8.2 PROGRESS AND COMPLETION

Add the following paragraph:

- 8.2.4** If the Contractor shall fail to complete his work at the time specified in the Contract, the Owner shall have the right to occupy the building and neither partial nor entire occupancy shall be construed as indicating substantial completion, and the Owner will not be liable for any inconvenience to the Contractor by Owner's occupancy.

8.3 DELAYS AND EXTENSIONS OF TIME

- 8.3.1** Add to the end of the paragraph:

An extension of time shall not entitle the Contractor extra compensation from the Owner.

ARTICLE 9 PAYMENTS AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT

- 9.3.1** Delete this paragraph in its entirety, and substitute therefore the following:

Approximately twenty (20) days before each progress payment falls due, or not later than the tenth (10th) day of the month, the Contractor and Architect shall decide upon percentage completion for his portions of the work for the previous month. The Lump Sum Cost Report indicating the Schedule of Values to be used for billing purposes shall be used for this purpose. In the absence of the Contractor, the Architect and Owner's determination shall be binding upon the Contractor.

- .1** Provided that an Application for Payment is received by the Architect not later than the fifth (5th) day of a month, the Owner shall make payment to the Contractor not later than the last day of the same month. If the Architect receives an Application for Payment after the application date fixed above, the Owner not later than twenty-five (25) days shall make payment after the Architect receives the Application for Payment. The forms required will be AIA Documents G702 and G703.
- .2** Progress payments to the Contractor will be made for ninety percent (95%) of the cost of labor and material actually incorporated into the Project during the period covered by the pay request. Payments will also be made in the amount of seventy-five percent (75%) for materials properly stored off-site.

9.4 CERTIFICATES FOR PAYMENT

- 9.4.1** Delete this paragraph in its entirety, and substitute therefore the following:

Upon receipt from the Contractor of the properly executed documents as provided above, the Architect will certify the Contractor's Application and Certificate of Payment and forward to the Owner for payment or, in writing, state his reasons for withholding a Certificate as provided in Subparagraph 9.5.1.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

- 10.2.1** Add the following subparagraphs:

- .4 all work, materials apparatus and fixtures, which may be damaged by weather (rain, winds, storms, frost and heat).
- .5 building elements and equipment when subjected to damage. Should workmen or other persons employed or commissioned by the one Contractor be responsible for damage, the entire cost of repairing said damage shall be assumed by said individual Contractor. Should damage be done by a person or persons not employed or commissioned by any contractor, the respective contractors shall make all repairs and charge the cost to the guilty person or persons. The affected contractors shall be responsible for collecting such charges.

Add the following at the end of paragraph:

10.2.8 Contractors requiring barricades, railings, obstructions in streets, roads, or sidewalks, and trenches and pits adjacent to public walks or roads shall provide, operate, and maintain guard lights as required by local codes and regulations.

Additional protection shall be as follows:

- .1 When utilities cross existing streets, drives, lawns, shrubs, etc., repair or replace to original conditions as approved by the Owner and Architect/Engineer. In street, roads, highways, work to be as directed by city engineer, county or state highway department.
- .2 Respective contractors shall protect all materials and equipment prior to installation and/or final acceptance. Storage shall be dry, clean, and safe. Materials or equipment damaged, deteriorated, rusted, or defaced due to improper storage shall be fully repaired, refinished, or replaced, as directed by the Architect/Engineer. Material or equipment lost through theft or mishandling shall be replaced by Contractor without cost to Owner.

ARTICLE 11 INSURANCE AND BONDS

11.1 CONTRACTOR’S LIABILITY INSURANCE

The following insurance shall be maintained in effect with limits not less than those set forth below at all times during the term of this Agreement and thereafter as required:

Insurance	Coverage/Limits	Other Requirements
Commercial General Liability (Occurrence Basis)	<ul style="list-style-type: none"> ▪ \$1,000,000 Per Occurrence ▪ \$2,000,000 General Aggregate ▪ \$2,000,000 Products/Completed Operations Aggregate ▪ \$1,000,000 Personal And Advertising Injury ▪ Designated Construction Project(s) General Aggregate Limit ▪ \$1,000,000 Electronic Data Liability 	<ul style="list-style-type: none"> ▪ Current ISO edition of CG 00 01 ▪ The personal injury contractual liability exclusion shall be deleted. ▪ Additional insured shall be provided in favor of Contractor Parties on ISO forms CG 20 10 10 01 and CG 20 37 10 01, or substitute endorsement(s) providing “equivalent” coverage. For purposes of this additional insured requirement, “equivalent” coverages means coverage for liability arising out of Subcontractor’s work performed for Contractor, including coverage for the negligence or fault of Contractor or Owners as to bodily injury or death of an employee or

		<p>agent of Subcontractor or Subcontractor's subcontractor, including products-completed operations.</p> <ul style="list-style-type: none"> ▪ This coverage shall be endorsed to provide primary and non-contributing liability coverage. ▪ The following exclusions/limitations (or their equivalent(s), are prohibited: <ul style="list-style-type: none"> ○ Contractual Liability Limitation CG 21 39 ○ Amendment of Insured Contract Definition CG 24 26 ○ Limitation of Coverage to Designated Premises or Project, CG 21 44 ○ Exclusion-Damage to Work Performed by Subcontractors On Your Behalf, CG 22 94 or CG 22 95 ○ Any Construction Defect Completed Operations exclusion ○ Any endorsement modifying or deleting the exception to the Employer's Liability exclusion ○ Any endorsement modifying or deleting Explosion, Collapse or Underground coverage ○ Any Habitational or Residential exclusion ○ Any "Insured vs. Insured" exclusion ○ Any Punitive, Exemplary or Multiplied Damages exclusion ○ Any Subsidence exclusion
Business Auto Liability	\$2,000,000 Per Accident	<ul style="list-style-type: none"> ▪ Current ISO edition of CA 00 01 ▪ Arising out of any auto (Symbol 1), including owned, hired and non-owned
Workers' Compensation and Employer's Liability	<ul style="list-style-type: none"> ▪ Statutory Limits ▪ \$100,000/\$500,000/\$100,000 Each Accident and Disease ▪ Alternate Employer endorsement ▪ USL&H must be provided where such exposure exists. 	<ul style="list-style-type: none"> ▪ The State in which work is to be performed must listed under Item 3.A. on the Information Page ▪ Such insurance shall cover liability arising out of the Contractor's employment of workers and anyone for whom the Contractor may be liable for workers' compensation claims. Workers' compensation insurance is required, and no "alternative" forms of insurance shall be permitted.

		<ul style="list-style-type: none"> ▪ Where a Professional Employer Organization (PEO) or “leased employees” are utilized, Contractor shall require its leasing company to provide Workers’ Compensation insurance for said workers and such policy shall be endorsed to provide an Alternate Employer endorsement in favor of Contractor and Owner. Where Contractor uses leased employees with Workers’ Compensation insurance provided by a PEO or employee leasing company, Contractor is strictly prohibited from subletting any of its work without the express written agreement of Owner.
Excess/Umbrella Liability (Occurrence Basis)	\$5,000,000 Each Occurrence	<ul style="list-style-type: none"> ▪ Such insurance shall be excess over and be no less broad than all coverages described above. ▪ Such insurance shall be endorsed to be primary and non-contributing to any liability insurance, whether primary, umbrella or excess, held by the Contractor Parties. ▪ Drop-down coverage shall be provided for reduction and/or exhaustion of underlying aggregate limits and shall include a duty to defend any insured.
Professional Liability	<ul style="list-style-type: none"> ▪ \$ 2,000,000 Each Occurrence ▪ Such insurance shall cover all services rendered by the Contractor and its consultants under the Agreement, including but not limited to design or design/build services. ▪ Renewal policies written on a Claims-Made basis shall maintain the same retroactive date as in effect at the inception of this Agreement, or in the event of the application of a later retroactive date, Contractor agrees to purchase an Extended Reporting Period effective for two (2) full years after the expiration or cancellation of this policy. 	<p>This insurance is not permitted to include any type of exclusion or limitation of coverage applicable to claims arising from:</p> <ul style="list-style-type: none"> ▪ bodily injury or property damage where coverage is provided in behalf of design professionals or design/build contractors ▪ habitational or residential operations ▪ mold and/or microbial matter and/or fungus and/or biological substance ▪ punitive, exemplary or multiplied damages.
Pollution Liability	<ul style="list-style-type: none"> ▪ \$1,000,000 Each Occurrence ▪ Such insurance must provide third party liability coverage for bodily injury, property damage, clean up 	<ul style="list-style-type: none"> ▪ This insurance is not permitted to include any type of exclusion or limitation of coverage applicable to claims arising from:

	<p>expenses, and defense arising from the operations.</p> <ul style="list-style-type: none"> ▪ All coverage provided in the policy shall apply to operations and completed operations of the firm without separate restrictions for either of these time frames. ▪ Mold and/or microbial matter and/or fungus and/or biological substance shall be specifically included within the definition of Pollutants in the policy. 	<ul style="list-style-type: none"> ▪ asbestos or lead ▪ contractual assumption of liability ▪ impaired property that has not been physically injured ▪ materials supplied or handled by the named insured. However, exclusions for the sale and manufacture of products are allowed. Exclusionary language pertaining to materials supplied by the insured shall be reviewed by the certificate holder for approval. ▪ property damage to the work performed by the contractor ▪ punitive, exemplary or multiplied damages ▪ work performed by subcontractors
<p>Builders Risk</p>	<ul style="list-style-type: none"> ▪ Coverage shall be provided in an amount equal at all times to the full replacement value, including change orders, and cost of debris removal for any single occurrence. ▪ Coverage shall be at least as broad as an unmodified ISO Special form, shall be provided on a completed-value basis, and shall be primary to any other insurance coverage available to the named insured parties, with that other insurance being excess, secondary and non-contributing. ▪ Additional expenses due to delay \$TBD <ul style="list-style-type: none"> in completion of project (where applicable) ▪ Agreed Value Included ▪ Damage arising from error, omission Included efficiency in construction methods, design, specifications, workmanship materials, including collapse <ul style="list-style-type: none"> ▪ Debris removal additional limit \$TBD ▪ Earthquake \$TBD ▪ Earthquake sprinkler leakage \$TBD 	<ul style="list-style-type: none"> ▪ Insureds shall include Owner, General Contractor, all Loss Payees and Mortgagees, and subcontractors of all tiers in the Work as Insureds. ▪ Such insurance shall cover: <ul style="list-style-type: none"> ○ all structure(s) under construction, including retaining walls, paved surfaces and roadways, bridges, glass, foundation(s), footings, underground pipes and wiring, excavations, grading, backfilling or filling; ○ all temporary structures (e.g., fencing, scaffolding, cribbing, false work, forms, site lighting, temporary utilities and buildings) located at the site; ○ all property including materials and supplies on site for installation; ○ all property including materials and supplies at other locations but intended for use at the site; ○ all property including materials and supplies in transit to the site for installation by all means of transportation other than ocean transit; and ○ other Work at the site identified in the Agreement to which this Exhibit is attached.

	<ul style="list-style-type: none"> ▪ Flood \$TBD ▪ Freezing Included ▪ Mechanical breakdown, including Included & cold testing ▪ Ordinance or law Included ▪ Pollutant clean-up and removal \$TBD ▪ Preservation of property Included ▪ Theft Included ▪ Deductible shall not exceed <ul style="list-style-type: none"> ○ All Risks of Direct Damage, Per \$5,000 	<ul style="list-style-type: none"> ▪ No protective safeguard warranty shall be permitted. ▪ The termination of coverage provision shall be endorsed to permit occupancy of the covered property being constructed This insurance shall be maintained in effect, unless otherwise provided for the Agreement Documents, until the earliest of: <ul style="list-style-type: none"> ○ the date on which all persons and organizations who are insureds under the policy agree that it shall be terminated; ○ the date on which final payment, as provided for in the Agreement to which this Exhibit is attached, has been made; or ○ the date on which the insurable interests in the Covered Property of all insureds other than Contractor have ceased. ▪ A waiver of subrogation provision shall be provided in favor of all insureds.
	<ul style="list-style-type: none"> ○ Delayed Opening Waiting Period 5 days ○ Earthquake and Earthquake \$25,000 ○ Fire Sprinkler Leakage, Per Occurrence <ul style="list-style-type: none"> ○ Flood, Per Occurrence \$25,000 	
	<ul style="list-style-type: none"> ○ Excess 	<ul style="list-style-type: none"> or
	<ul style="list-style-type: none"> if 	<ul style="list-style-type: none"> of NFIP
	<ul style="list-style-type: none"> Zone A 	<ul style="list-style-type: none"> in Flood
	<ul style="list-style-type: none"> or V 	

1. General Insurance Requirements

A. Definitions. For purposes of this Agreement:

- i. "ISO" means Insurance Services Office.
- ii. "Contractor" shall include subcontractors of any tier.
- iii. "Owner Parties" means (a) _____ ("Owner"), (b) the Project, (c) any lender whose loan is secured by a lien against the Work, (d) their respective shareholders, members, partners, joint venturers, affiliates, subsidiaries, successors and assigns, (e) any directors, officers, employees, or agents of such persons or entities, and (f) others as required by the Construction Documents.

B. Policies.

- i. Contractor shall maintain such General Liability, Excess/Umbrella Liability, Professional and Pollution insurance in identical coverage, form and amount, including required endorsements, for at least ten (10) years

following Date of Substantial Completion of the Work to be performed under this Agreement. Contractor shall provide written representation to Owner stating Work completion date.

- ii. It is the intent of the parties to this Agreement that all General Liability and Excess/Umbrella insurance coverage required herein shall be primary and non-contributory to any liability insurance, whether primary, excess or umbrella, held by the Contractor Parties. It is the specific intent that all insurance held by the Contractor Parties shall be excess, secondary and non-contributory.
- iii. All policies must:
 - a. Be written through insurance companies authorized to do business in the State in which the work is to be performed and rated no less than A-: VII in the most current edition of A. M. Best's Key Rating Guide.
 - b. Provide a waiver of subrogation in favor of Owner Parties on all insurance coverage carried by Contractor, whether required herein or not
 - c. Contain an endorsement providing for thirty (30) days prior written notice to Owner of cancellation or material change of coverage.
 - d. Be provided to the Owner Parties in compliance with the requirements herein and shall contain no endorsements that restrict, limit, or exclude coverage required herein in any manner without the prior express written approval of the Owner.
- iv. Failure of any Owner Party to demand such certificate or other evidence of full compliance with these insurance requirements or failure of any Owner Party to identify a deficiency from evidence that is provided shall not be construed as a waiver of the Contractor's obligation to maintain such insurance.
- v. Contractor shall provide to the Owner a certified copy of all insurance policies required herein within ten (10) days of any such request. Renewal policies, if necessary, shall be delivered to the Owner prior to the expiration of the previous policy.
- vi. Commencement of Work without provision of the required certificate of insurance, evidence of insurance and/or required endorsements, or without compliance with any other provision of this Agreement, shall not constitute a waiver by any Owner Party of any rights. The Owner shall have the right, but not the obligation, of prohibiting the Contractor or any subcontractor from performing any Work until such certificate of insurance, evidence of insurance and/or required endorsements are received and approved by the Owner.

C. Limits, Deductibles and Retentions

- i. The limits of liability may be provided by a single policy of insurance or by a combination of primary and excess/umbrella policies, but in no event shall the total limits of liability available for any one occurrence or accident be less than the amount required herein.
- ii. No deductible or self-insured retention shall exceed \$25,000 without prior written approval of the Owner, except as otherwise specified herein. All deductibles and/or retentions shall be paid by, assumed by, for the account of, and at the Contractor's sole risk. The Contractor shall not be reimbursed for same

D. Forms

- i. If the forms of policies, endorsements, certificates or evidence of insurance required by this Exhibit are superseded or discontinued, Owner will have the right to require other equivalent forms.
- ii. Any policy or endorsement form other than a form specified in this Exhibit must be approved in advance by Owner.
- iii. If the Additional Insured requirements are deemed to violate any law, statute or ordinance, the additional insured requirements, including any additional insured policy provision or endorsements procured pursuant to his Agreement, shall be reformed to provide the maximum amount of protection to the Contractor Parties as allowed under the law.

E. Evidence of Insurance. Insurance must be evidenced as follows:

- i. ACORD Form 25 Certificate of Liability Insurance, or any other form approved by the Texas Department of Insurance for liability coverages.
- ii. ACORD Form 28 Evidence of Commercial Property Insurance, or any other form approved by the Texas Department of Insurance for commercial property coverages.
- iii. Evidence shall be provided to Owner prior to commencing Work and prior to the expiration of any required coverage.
- iv. Approved certificate form(s) shall specify:
 - a. Owner as certificate holder at Owner's mailing address;
 - b. Insured's name, which must match that on this Agreement;

- c. Insurance companies producing each coverage and the policy number and policy date of each coverage;
- d. Producer of the certificate with correct address and phone number and have the signature of the authorized representative of the producer;
- e. Additional Insured status in favor of Owner Parties;
- f. Amount of any deductible or self-insured retention in excess of \$25,000;
- g. Designated Construction Project(s) General Aggregate Limit;
- h. Personal Injury Contractual Liability;
- i. Primary and non-contributory status;
- j. Waivers of subrogation; and
- k. All exclusions and limitations added by endorsement to the General Liability coverage. This can be achieved by attachment of the Schedule of Forms and Endorsements page.
- v. Copies of the following policy provisions and/or endorsements shall also be provided:
 - Additional Insured status;
 - 30 Day Notice of Cancellation; and
 - Schedule of Forms and Endorsements pages applicable to the General Liability and Excess/Umbrella policies.

F. Contractor Insurance Representations to Owner Parties

- i. It is expressly understood and agreed that the insurance coverages required herein (a) represent Owner Parties' minimum requirements and are not to be construed to void or limit the Contractor's indemnity obligations as contained in this Agreement nor represent in any manner a determination of the insurance coverages the Contractor should or should not maintain for its own protection; and (b) are being, or have been, obtained by the Contractor in support of the Contractor's liability and indemnity obligations under this Agreement. Irrespective of the requirements as to insurance to be carried as provided for herein, the insolvency, bankruptcy or failure of any insurance company carrying insurance of the Contractor, or the failure of any insurance company to pay claims accruing, shall not be held to affect, negate or waive any of the provisions of this Agreement.
- ii. Failure to obtain and maintain the required insurance shall constitute a material breach of, and default under, this Agreement. If the Contractor shall fail to remedy such breach within five (5) business days after notice by the Owner, the Contractor will be liable for any and all costs, liabilities, damages and penalties resulting to the Owner Parties from such breach, unless a written waiver of the specific insurance requirement(s) is provided to the Contractor by the Owner. In the event of any failure by the Contractor to comply with the provisions of this Agreement, the Owner may, without in any way compromising or waiving any right or remedy at law or in equity, on notice to the Contractor, purchase such insurance, at the Contractor's expense, provided that the Owner shall have no obligation to do so and if the Owner shall do so, the Contractor shall not be relieved of or excused from the obligation to obtain and maintain such insurance amounts and coverages.
- iii. This Exhibit is an independent contract provision and shall survive the termination or expiration of the Construction Agreement.

G. Insurance Requirements of Contractor's Subcontractors

- i. Insurance similar to that required of the Contractor shall be provided by all subcontractors (or provided by the Contractor on behalf of subcontractors) to cover operations performed under any subcontract agreement. The Contractor shall be held responsible for any modification in these insurance requirements as they apply to subcontractors. The Contractor shall maintain certificates of insurance from all subcontractors containing provisions similar to those listed herein (modified to recognize that the certificate is from subcontractor) enumerating, among other things, the waivers of subrogation, additional insured status, and primary liability as required herein, and make them available to the Owner upon request.
- ii. The Contractor is fully responsible for loss and damage to its property on the site, including tools and equipment, and shall take necessary precautions to prevent damage to or vandalism, theft, burglary, pilferage and unexplained disappearance of property. Any insurance covering the Contractor's or its subcontractor's property shall be the Contractor's and its subcontractor's sole and complete means or recovery for any such loss. To the extent any loss is not covered by said insurance or subject to any deductible or co-insurance, the Contractor shall not be reimbursed for same. Should the Contractor or its subcontractors choose to self insure this risk, it is expressly agreed that the Contractor hereby waives, and shall cause its subcontractors to waive, any claim for damage or loss to said property in favor of the Owner Parties.

H. Use of the Owners Equipment

The Contractor, its agents, employees, subcontractors or suppliers shall use the Owners equipment only with express written permission of the Owners designated representative and in accordance with the Owners terms and condition for such use. If the Contractor or any of its agents, employees, subcontractors or suppliers utilize any of the Owners equipment for any purpose, including machinery, tools, scaffolding, hoists, lifts or similar items owned, leased or under the control of the Owner, the Contractor shall defend, indemnify and be liable to the Owner Parties for any and all loss or damage which may arise from such use.

I. Release and Waiver

The Contractor hereby releases, and shall cause its subcontractors to release, the Owner Parties from any and all claims or causes of action whatsoever which the Contractor and/or its subcontractors might otherwise now or hereafter possess resulting in or from or in any way connected with any loss covered by insurance, whether required herein or not, or which should have been covered by insurance required herein, including the deductible and/or uninsured portion thereof, maintained and/or required to be maintained by the Contractor and/or its subcontractors pursuant to this Agreement.

11.3 PROPERTY INSURANCE

11.3.1.1 Add the following sentence to Clause 11.3.1.1:

The form of policy for this coverage shall be completed Value.

Delete Clause 11.3.1.4 and substitute the following:

11.3.1.4 The Contractor shall provide insurance coverage for portions of the Work stored off the site after written approval of the Owner at the value established in the approval, and also for portions of the Work in transit.

11.4 PERFORMANCE BOND AND PAYMENT BOND

Delete subparagraph 11.4.1 and substitute the following:

11.4.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds may be obtained through the Contractor's usual source and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 110% percent of the Contract Sum.

Add the following sub-paragraph:

11.4.1.1 The Contractor shall deliver the required bonds to the Owner not later than three days following the date the Agreement is entered into, or if the Work is to be commenced prior thereto in response to a letter of intent. The Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

11.4.1.2 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the Power of Attorney.

ARTICLE 15 CLAIMS AND DISPUTES

15.1 CLAIMS AND DISPUTES

15.1.610 Claims for Consequential Damages

Add the following subparagraph:

.3 The waiver does not apply to such claim for damages as are covered by insurance.

15.3 MEDIATION

15.3.2 Shall be revised as follows:

The parties are encouraged to resolve claims, disputes and other matters in questions between them by mediation which, unless the parties mutually agree otherwise, shall be in accordance with the Construction Industry Mediation Rules of the American Arbitration Association currently in effect.

15.4 ARBITRATION

15.4.1 Shall be revised as follows:

Any Claim arising out of or related to the Contract, except Claims relation to aesthetic effect and except those waived as provided for in Subparagraphs 15.1.6, 9.10.4 and 9.10.5, shall, after decision by the Architect or 30 days after submission of the Claim to the Architect, be subject to Litigation. Prior to Litigation, the parties are encouraged to resolve disputes by mediation in

accordance with the provisions of Paragraph 15.3. The venue for all disputes shall be the Circuit Court for Milwaukee County, State of Wisconsin.

15.4.1.1 Delete the paragraph in its entirety.

15.4.2 Delete the paragraph in its entirety.

Add the following Articles:

ARTICLE 16 MONUMENTS AND MEASUREMENTS

16.1 MONUMENTS

16.1.1 The Contractor shall carefully protect monuments, stakes and benchmarks. If destroyed or disturbed by the Contractor or his employees, the cost to the Owner of replacing them shall be charged against the Contractor and shall be deducted from the payments for the Work.

16.2 MEASUREMENTS

16.2.1 The Contractor shall obtain his own field measurements and establish lines, grades, levels and measurements shown on the Drawings. The Contractor shall reconcile all measurements and conditions shown on the Drawings with existing conditions at the site from the site survey provided by the Owner, and from the established benchmarks and control points.

16.2.2 Before performing any work or ordering any materials, the Contractor shall verify all dimensions of any existing and new work and shall be responsible for their accuracy. Any differences found shall be submitted to the Architect for consideration before proceeding with the Work. No extra compensation will be permitted because of differences between actual dimensions and measurements indicated on the Project Drawings.

ARTICLE 17 COOPERATION AND DISPUTES

17.1 COOPERATION

17.1.1 Inasmuch as the completion of the Project within the prescribed time is dependent very largely upon the close and active cooperation of all those engaged therein, it is, therefore, expressly understood and agreed that each Contractor shall lay out and install his work at such time or times and in such manner as not to delay or interfere with the carrying forward of the work of other Contractors.

17.1.2 In the event of any dispute arising as to possible or alleged interference between the various contractors which may retard the progress of the Work, the same shall be adjusted by the Owner and Architect, whose decision as to the party or parties at fault and as to the manner in which the matter may be adjusted shall be binding and conclusive on all parties.

ARTICLE 18 JOB MEETINGS

18.1 MEETINGS

18.1.1 Meetings shall be conducted periodically by the Owner and Architect for the purpose of coordinating and expediting the Work. It shall be mandatory that each Contractor, Subcontractor and/or his superintendent be in attendance.

18.1.2 Progress and Project Meetings shall be held at the Project site on a regularly scheduled basis. The date and hour will be announced by the Owner and Architect.

18.1.3 The essence of the discussion of each meeting will be entered into the minutes and copies of the minutes will be furnished to all interested parties.

END OF SECTION

MARATHON COUNTY STANDARD TERMS AND CONDITIONS

- 1.0 SPECIFICATIONS:** The specifications in any request for bids or proposal which forms the subject of this contract are the minimum acceptable. When specific manufacturer and model numbers are used, they are to establish a design, type of construction, quality, functional capability and/or performance level desired. When alternates are bid/proposed/provided, they must be identified by manufacturer, stock number, and such other information necessary to establish equivalency. Marathon County shall be the sole judge of equivalency. Contractors are cautioned to avoid bidding/proposing alternates to the specifications which may result in rejection of their bid/proposal.
- 2.0 DEVIATIONS AND EXCEPTIONS:** Deviations and exceptions from original text, terms, conditions, or specifications shall be described fully, on the Contractor's letterhead, signed, and attached to the response to request. In the absence of such statement, the bid/proposal shall be accepted as in strict compliance with all terms, conditions, and specifications and the Contractor shall be held liable.
- 3.0 ACCEPTANCE-REJECTION OF BIDS OR PROPOSALS:** Marathon County reserves the right to accept or reject any or all bids/proposals, to waive any technicality in any bid/proposal submitted, and to accept any part of a bid/proposal as deemed to be in the best interests of Marathon County. Bids/proposals MUST be date and time stamped by the office of the soliciting purchasing agent on or before the date and time that the bid/proposal is due. Bids/proposals date and time stamped in another office will be rejected. Receipt of a bid/proposal by the mail system does not constitute receipt of a bid/proposal by the purchasing agent's office.
- 4.0 METHOD OF AWARD:** Award of bids shall be made to the lowest responsible, responsive bidder unless otherwise specified. Award of proposals shall be subject to criteria set for in the request for proposal.
- 5.0 QUALITY:** Unless otherwise indicated in the request, all material shall be first quality. Items which are used, demonstrators, obsolete, seconds, or which have been discontinued are unacceptable without specific prior written approval by the Marathon County.
- 6.0 WARRANTY:** Unless otherwise specifically stated by the bidder/proposer, equipment purchased as a result of this request shall be warranted against defects by the bidder/proposer for one (1) year from date of receipt. The equipment manufacturer's standard warranty shall apply as a minimum and must be honored by Contractor.
- 7.0 DELIVERY:** Deliveries shall be F.O.B. destination freight prepaid and included unless otherwise specified. Failure of the Vendor to adhere to delivery schedules as specified or to promptly replace rejected materials shall render Contractor liable for all costs in excess of the contract price when alternate procurement is necessary. Excess costs shall include the administrative costs.
- 8.0 ORDERING:** Purchase orders shall be placed directly to Contractor by authorized departments or purchasing agents who have issued the request for bids or proposal. No other purchase orders are authorized.
- 9.0 PAYMENT TERMS AND INVOICING:** Marathon County normally will pay properly submitted Contractor invoices within thirty (30) days of receipt providing goods and/or services have been delivered, installed (if required), and accepted as specified.
- 9.1 Invoices presented for payment must be submitted in accordance with instructions contained on the purchase order including reference to purchase order number and submittal to the correct address for processing.
- 9.2 A good faith dispute creates an exception to prompt payment.
- 10.0 TAXES:** Marathon County and its departments are exempt from payment of all federal tax and Wisconsin state and local taxes on its purchases except Wisconsin excise taxes as described

below. Marathon County, including all its departments, is required to pay the Wisconsin excise or occupation tax on its purchase of beer, liquor, wine, cigarettes, tobacco products, motor vehicle fuel and general aviation fuel. However, it is exempt from payment of Wisconsin sales or use tax on its purchases. Marathon County may be subject to other states' taxes on its purchases in that state depending on the laws of that state. Contractors performing construction activities are required to pay state use tax on the cost of materials.

11.0 CONTRACT INTEGRATION: These Standard Terms and Conditions shall apply to any contract or order awarded as a result of a request except where special requirements are stated elsewhere in the request; in such cases, the special requirements shall apply. The documents constituting the contract between Marathon County and Contractor are intended to be complementary so that what is required by any one of them shall be as binding as if called for by all of them. In the event of any conflicting provisions or requirements within the several parts of the Contract Documents, they shall take precedence in the following order: Change Orders (with the most recent taking precedence); Contract Document Amendments; the Contract Document as described in this signed Agreement; Request for Proposal Addenda; Request for Proposal; and Firm's Proposal. Any terms of any other documents concerning this agreement are superseded by the terms set forth herein.

12.0 APPLICABLE LAW AND COMPLIANCE: This contract shall be governed under the laws of the State of Wisconsin. Contractor shall at all times comply with and observe all federal and state laws, local laws, ordinances, and regulations which are in effect during the period of this contract and which in any manner affect the work or its conduct. Marathon County reserves the right to cancel this contract if Contractor fails to follow the requirements of s. 77.66, Wis. Stats., and related statutes regarding certification for collection of sales and use tax.

13.0 SAFETY REQUIREMENTS: All materials, equipment, and supplies provided to Marathon County must comply fully with all safety requirements as set forth by the Wisconsin Administrative Code and all applicable OSHA Standards.

13.1 Contractor shall execute and maintain its work so as to avoid injury or damage to any persons or property. Contractor shall comply with the requirements and specifications relating to safety measures applicable in particular operations or kinds of work. In carrying out its work, Contractor shall, at all times, exercise all necessary precautions for the safety of employees appropriate to the nature of the work and the conditions under which the work is to be performed and be in compliance with all applicable federal, state and local statutory and regulatory requirements including Wisconsin Labor Code and the U.S. Department of Transportation Omnibus Transportation Employee Testing Act, including the obligation to conduct safety inspections to verify said compliance by its employees, agents, and/or subcontractors.

13.2 Contractor is specifically notified that it is subject to federal requirements listed under Title 29, Chapter 15 of the United States Code (Occupational Health and Safety Act) by virtue of its contract with Marathon County, a public entity. Contractor shall provide a similar notice to all its subcontractors.

13.3 SAFETY DATA SHEET: If any item(s) on an order(s) resulting from this award(s) is a hazardous chemical, as defined under 29CFR 1910.1200, provide one (1) copy of a Material Safety Data Sheet for each item with the shipped container(s) and one (1) copy with the invoice(s).

14.0 INSURANCE REQUIREMENTS: Contractor shall not commence work under this contract until all insurance required under this paragraph is obtained, and such insurance has been approved Marathon County, nor shall Contractor allow any subcontractor to commence work on their subcontract until all similar insurance requirements have been obtained and approved.

14.1 Maintain worker's compensation insurance as required by Wisconsin Statutes, for all employees engaged in the work. In case any work is sublet, Contractor shall require the

subcontractor similarly to provide statutory Workers' Compensation Insurance for all of the latter's employees, unless such employees are covered by the protection afforded by Contractor.

14.2 General Liability, Professional Liability and Property Damage Insurance. Contractor shall secure and maintain in force throughout the duration of this contract such General Liability, Professional Liability (if necessary), and Property Damage Insurance as shall protect itself and any subcontractor performing work covered by this contract from claims for damages for personal injuries including accidental death, as well as from claims for property damage, which may arise from operations under this contract, whether such operations be by Contractor, or by any subcontractor or by anyone directly or indirectly employed by either of them; and the amount of such insurance shall be as follows:

- Comprehensive General Liability \$1,000,000 per occurrence and \$2,000,000 in aggregate for bodily injury and Property Damage.
- Professional Liability Coverage, \$1,000,000 per occurrence and \$2,000,000 in aggregate.
- Automobile Liability \$1,000,000 per occurrence and \$2,000,000 in aggregate for bodily injury and property damage.
- Excess Liability Coverage, \$1,000,000 over the General Liability and Automobile Liability Coverage.
- If aircraft are used in conjunction with this project, \$2,000,000 per occurrence and in aggregate for bodily injury and property damage.

14.3 Marathon County reserves the right to require higher or lower limits where warranted.

14.4 Marathon County reserves the right to require additional security, including, but not limited to, bid bonds or performance bonds as specifically set forth in its request for bids or proposals.

14.5 **PROOF OF INSURANCE:** Contractor shall furnish the County with a Certificate of Insurance countersigned by a Wisconsin Resident Agent or Authorized Representative of the insurer indicating that Contractor meets the insurance requirements identified above. The Certificates of Insurance shall include a provision prohibiting cancellation of said policies except upon 30 days prior written notice to the County and specify the name of the contract or project covered. The Certificate of Insurance shall be delivered to the Authorized Purchasing Agent, with a copy of the Certificate of Insurance to be delivered to the Marathon County Risk Manager for approval prior to the execution of this contract. Upon renewal of the required insurance, and annually thereafter, the County shall receive a new Certificate of Insurance for three years after completion of the project. The Certificates shall name Marathon County as an additional insured and describe the contract by name and or identification number in the "Description of Operations" section of the form.

15.0 CANCELLATION / TERMINATION: Marathon County reserves the right to:

15.1 **NONAPPROPRIATION OF FUNDS.** Cancel any contract in whole or in part without penalty due to non-appropriation of funds or for failure of the Contractor to comply with terms, conditions, and specifications of this contract.

15.2 Terminate this contract, for the County's convenience, at any time by a notice in writing from the County to Contractor by certified mail. If the Contract is terminated by the County as provided herein, Contractor shall be paid an amount which bears the same ratio to the total compensation as the services actually performed bear to the total services of Contractor covered by this Contract, unless payments of compensation have previously been made.

16.0 CONTRACT MODIFICATIONS: The scope of the services to be performed under this Contract may be amended or supplemented by mutual written agreement between the parties to the Contract. This amendatory provision shall not operate to prevent Marathon County from exercising its reserved right to establish reasonable time schedules for any of the work or

services to be performed by or deliveries to be received from Contractor hereunder. Furthermore, this amendatory provision shall not operate to prevent the County from canceling any of the services not yet performed or any deliveries no yet made at the time notice is given to Contractor of the cancellation of such services or portion of the work to be performed hereunder.

17.0 ASSIGNMENT: No right or duty in whole or in part of the scope of work under this contract may be assigned or delegated without the prior written consent of Marathon County.

18.0 PATENT INFRINGEMENT: The Contractor selling articles to Marathon County as described herein guarantees the articles were manufactured or produced in accordance with applicable federal labor laws. Further, that the sale or use of the articles described herein will not infringe any United States patent. The Contractor covenants that it will at its own expense defend every suit which shall be brought against Marathon County (provided that such contractor is promptly notified of such suit, and all papers therein are delivered to it) for any alleged infringement of any patent by reason of the sale or use of such articles, and agrees that it will pay all costs, damages, and profits recoverable in any such suit.

19.0 PUBLIC RECORDS ACCESS: Marathon County is a political subdivision of the State of Wisconsin and as such is subject to the Wisconsin Public Records Law. It is the policy of Marathon County to maintain an open and public process in the solicitation, submission, review, and approval of procurement activities. Bid openings are public unless otherwise specified. Evaluations of responses to requests for proposals are subject to further discussion, clarification and negotiation. Records of bids and responses to requests for proposal will not be available for public inspection prior to issuance of the award of the contract.

20.0 PROPRIETARY INFORMATION: Any restrictions on the use of data contained within a response to request, must be clearly stated in the bid/proposal itself. Proprietary information submitted in response to a request will be handled in accordance with the Wisconsin Public Records Law. Proprietary restrictions normally are not accepted. However, when accepted, it is Contractor's responsibility to defend the determination in the event of an appeal or litigation.

20.1 Data contained in a bid/proposal, all documentation provided therein, and innovations developed as a result of the contracted commodities or services cannot be copyrighted or patented. All data, documentation, and innovations become the property of Marathon County.

20.2 Any material submitted by Contractor in response to Marathon County's request that the vendor considers confidential and proprietary information and which qualifies as a trade secret, as provided in s. 19.36(5), Wis. Stats., or material which can be kept confidential under the Wisconsin Public Records Law, must be identified and include citation to the specific provisions of law that preclude disclosure and any factual or background information necessary to establish that the identified provisions of the law apply to that particular information. Bid/proposal prices cannot, under any circumstances, be held confidential.

20.3 In the event Marathon County becomes involved in litigation due to Contractor's refusal of permission to release information identified as confidential or proprietary, Contractor agrees to indemnify, defend and hold harmless Marathon County for any costs associated with said litigation.

21.0 CONFIDENTIALITY OF MARATHON COUNTY'S DATA: In the event work conducted under this contract requires Contractor to have access to Marathon County's database via Internet, direct contact or other connection to allow the provision of installation, support and maintenance services, Contractor agrees to keep all such data confidential and to execute any reasonable agreement to assure Marathon County that Contractor will comply with all state and federal confidentiality laws and/or regulations. These restrictions herein shall survive the termination of this contract, regardless of the reason for termination, and shall continue in full force and effect and shall be binding upon Contractor or its agents, employees, successors, assigns or subcontractors. Contractor shall defend and incur all costs, if any, for actions that arise as a result

of noncompliance by Contractor, its agents, employees, successors, assigns and subcontractors regarding the confidentiality restrictions herein.

22.0 PROMOTIONAL ADVERTISING / NEWS RELEASES: Reference to or use of Marathon County, any of its departments, agencies or other subunits, or any county official or employee for commercial promotion is prohibited. News releases pertaining to this procurement shall not be made without prior approval of Marathon County. Release of broadcast e-mails pertaining to this procurement shall not be made without prior written authorization of Marathon County's purchasing agent.

23.0 MUTUAL HOLD HARMLESS/INDEMNIFICATION: Contractor hereby agrees to release, indemnify, defend, and hold harmless Marathon County, its officials, officers, employees and agents from and against all judgments, damages, penalties, losses, costs, claims, expenses, suits, demands, debts, actions and/or causes of action of any type or nature whatsoever, including actual and reasonable attorney's fees, which may be sustained or to which they may be exposed, directly or indirectly, by reason of personal injury, death, property damage, or other liability, alleged or proven, which is determined to be caused by the negligent or intentional acts or omissions of Contractor's officers, officials, employees, agents or assigns. Marathon County hereby agrees to release, indemnify, defend, and hold harmless Contractor, its officials, officers, employees and agents from and against all judgments, damages, penalties, losses, costs, claims, expenses, suits, demands, debts, actions and/or causes of action of any type or nature whatsoever, including actual and reasonable attorney's fees, which may be sustained or to which they may be exposed, directly or indirectly, by reason of personal injury, death, property damage, or other liability, alleged or proven, which is determined to be caused by the negligent or intentional acts or omissions of Marathon County's officers, officials, employees, agents or assigns. Marathon County does not waive, and specifically reserves, its rights to assert any and all affirmative defenses and limitations of liability as specifically set forth in Wisconsin Statutes, Chapter 893 and related statutes.

24.0 FORCE MAJEURE: Neither party shall be in default by reason of any failure in performance of this Agreement in accordance with reasonable control and without fault or negligence on their part. Such causes may include, but are not restricted to, acts of nature or the public enemy, acts of the government in either its sovereign or contractual capacity, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes and unusually severe weather, but in every case the failure to perform such must be beyond the reasonable control and without the fault or negligence of the party.

25.0 GRATUITIES AND KICKBACKS: It shall be unethical for any person to offer, give, or agree to give any elected official, employee or former employee, or for any elected official, employee or former employee to solicit, demand, accept, or agree to accept from another person, a gratuity or an offer for employment in connection with any decision, approval, disapproval, recommendation, preparation or any part of a program requirement or a purchase request, influencing the contents of any specification or procurement standard, rendering of advice, investigation, auditing, or in any other advisory capacity in any proceedings or application, request for ruling, determination, claim or controversy, or other particular matter, pertaining to any program requirement or a contract or subcontract, or to any solicitation or proposal therefore. It shall be unethical for any payment, gratuity, or offer of employment to be made by or on behalf of a subcontractor under a contract to the prime contractor or a higher tier subcontractor or any person associated therewith, as an inducement for the award of a subcontract, or order.

26.0 DISPUTE RESOLUTION: This Contract and the performance of the parties' obligations hereunder will be governed by and construed and enforced in accordance with the laws of the State of Wisconsin, including conflict of law provisions. Contractor consents to personal jurisdiction in the State of Wisconsin. The venue of any action hereunder shall be in Marathon County, Wisconsin. If a dispute related to this agreement arises, all parties shall attempt to resolve the dispute through direct discussions and negotiations. If the dispute cannot be resolved

by the parties, and if all parties agree, it may be submitted to either mediation or arbitration. If the matter is arbitrated, the procedures of Chapter 788 of the Wisconsin Statutes or any successor statute shall be followed. If the parties cannot agree to either mediation or arbitration, any party may commence an action in court as set forth above. If a lawsuit is commenced, the parties agree that the dispute shall be submitted to alternate dispute resolution pursuant to §802.12, Wis. Stats., or any successor statute. Unless otherwise provided in this contract, the parties shall continue to perform according to the terms and conditions of the contract during the pendency of any litigation or other dispute resolution proceeding.

27.0 INDEPENDENT CONTRACTOR STATUS: The parties hereto agree that Contractor, its officers, agents and employees, in the performance of this Contract, shall act in the capacity of an independent contractor and not as an officer, employee or agent of Marathon County. The Contractor shall not be entitled to any of the rights, benefits, salaries, wages or fringe benefits which employees of Marathon County are eligible to receive. No federal, state, or local taxes or social security deductions or contributions shall be made by Marathon County on behalf of the Contractor. Neither Marathon County nor Contractor will represent itself as the agent or legal representative of the other or as partner or joint venture for any purpose whatsoever, and neither shall have any right to create or assume any obligation of any kind, express or implied, for or on behalf of the other in any way whatsoever. Furthermore, Contractor agrees to take such steps as are necessary to ensure that each of its subcontractors, if any, will not be considered to be an agent, servant, joint venture with, or partner of, Marathon County.

28.0 NON-DEBARMENT CLAUSE: Contractor hereby certifies that neither it nor any of its principal officers or officials has ever been suspended or debarred, for any reason whatsoever, from doing business or entering into contractual relationships with any governmental entity. Contractor further agrees and certifies that this clause shall be included in any subcontract of this contract. . Marathon County also reserves the right to cancel this contract with any federally debarred contractor or a contractor that is presently identified on the list of parties excluded from federal or State of Wisconsin procurement and non-procurement contracts.

29.0 STATEMENT OF COMPLIANCE: Contractor has carefully reviewed Marathon County's required contract language, as set forth in the Request for Proposal/Bid pertaining to termination of contract, change orders, gratuities and kickbacks, non-appropriation of funds, hold harmless/indemnification, insurance requirements/proof of insurance, dispute resolutions, and non-debarment, and is in full compliance with all statements and requirements.

30.0 WAIVER/SEVERABILITY: No waiver of any default hereunder shall be deemed as a waiver of any prior or subsequent default of the same or other provisions of this contract. If any provision of this contract is held invalid by a court of competent jurisdiction, such invalidity shall not affect the validity or operation of any other provision and said provision shall continue to apply to the extent allowed by said court or, if not so allowed, be deemed severed from this contract entirely.

END OF SECTION

**SECTION 00 73 83
ELECTRONIC MEDIA TRANSMITTANCE**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Electronic media may be provided to the Contractor or sub-contractors hired for the Project named herein only. Angus-Young Associates, Inc. (AYA) has the right to deny provision of electronic media for any or no reason.
- B. AYA shall provide via fax or e-mail to the Contractor a 'Use of Electronic Media Agreement' completed with Project information, list of sheets and media format for signature by Contractor.
- C. Electronic media will be sent via e-mail at no additional cost to the Contractor.
- D. Media provided will not be modified, edited, or manipulated by AYA employees for contractors other than to provide desired format.
- E. The Floor plan and Reflected Ceiling Plan Model files will be available at no cost to the contractor by contacting Angus Young Associates and following the correct procedures which are listed below.

1.02 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall e-mail request for electronic media to Angus-Young Associates, Inc. (AYA). The request shall include:
 - 1. Contractor's name
 - 2. Contractor's address
 - 3. Contractor's phone number, fax number, and e-mail address
 - 4. Project owner's name
 - 5. Project name
 - 6. AYA's project number
 - 7. Requested media format
 - a. **NOTE:** Request of media format does not insure that AYA can provide that format.
 - 8. A list of the individual sheets requested
- B. The Contractor obtaining electronic media shall be responsible for adherence to the provisions of the 'Use of Electronic Media Agreement' issued prior to the transfer of electronic media.
- C. The Contractor obtaining electronic media shall provide copies of agreement to staff or agents using electronic media. Any misuse of electronic media by staff or agents shall be the responsibility of the Contractor.
- D. The Contractor shall not provide electronic data, whether modified or not, to any other organization, company, individual or entity in electronic form.
- E. The Contractor shall be responsible for verifying and/or making corrections as required for actual construction dimensions, conditions or application of materials.
- F. All Contractors shall use electronic media at their own risk and assume all liability.

1.03 USE OF ELECTRONIC MEDIA AGREEMENT

- A. When requested, Angus-Young Associates, Inc. (AYA) will provide electronic files for the requesting Contractor's convenience and use in the preparation of shop drawings related to the Project, subject to the following terms and conditions:
 - 1. AYA's electronic files are compatible with:

- a. Microstation versions V7, V8
 - b. AutoCad (*.dwg) versions 14, 2000/2000i/2002, 2004/2005/2006, 2007/2008/2009, 2010/2011/2012, 2013
 - c. Drawing Exchange Format (ASCII) (*.dxf) versions 11/12, 2000/2000i/2002, 2004/2005/2006, 2007/2008/2009, 2010/2011/2012, 2013
 - d. **NOTE:** AYA makes no representation as to the compatibility of these files with your hardware or your software beyond the specified release of the referenced specifications.
2. Data contained on electronic files is part of AYA's instruments of service and shall not be used for any purpose other than as a convenience in the preparation of shop drawings for the referenced Project. Any other use or reuse will be at Contractor's sole risk and without liability or legal exposure to AYA.
 3. The Contractor agrees to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against AYA, its officers, directors, employees, agents or sub-consultants which may arise out of or in connection with use of the electronic files.
- B. The Contractor shall, to the fullest extent permitted by law, indemnify and hold harmless AYA from all claims, damages, losses and expenses, including attorney's fees arising out of or resulting from use of these electronic files.
 - C. These electronic files are not Contract Documents. Significant differences may exist between these electronic files and corresponding hard copy Contract Documents due to addenda, change orders or other revisions. AYA makes no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed Contract Documents prepared by AYA and electronic files, the signed Contract Documents shall govern. The Contractor is responsible for determining if any conflict exists. Use of electronic files does not relieve the Contractor of the duty to fully comply with the Contract Documents, including and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate work with that of other contractors for the Project named herein.
 - D. Because of the potential that information presented on the electronic files can be modified, unintentionally or otherwise, AYA reserves the right to remove all indicia of its ownership and/or involvement from each electronic display.
 - E. AYA will furnish you electronic files of the Drawing sheets.
 - F. Under no circumstances shall delivery of the electronic files be deemed a sale by AYA. AYA makes no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall AYA be liable for any loss of profit or any consequential damages.

END OF SECTION

**SECTION 00 91 00
ADDENDA AND MODIFICATIONS**

1.01 DESCRIPTION

- A. Addenda are written or graphic instruments issued by the Architect prior to Bid Date. Addenda add to, delete from, clarify, or correct the Bidding Documents.
- B. Addenda are included in the Bidding Documents and shall be included in the Contract Documents.
- C. Addenda will be mailed or delivered to all who are known by the issuing office to have received a complete set of Bidding Documents.
- D. Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.
- E. No Addenda will be issued later than four days prior to the date for receipt of bids except an Addendum withdrawing the request for bids or one which includes postponement of the date for receipt of bids.

1.02 BIDDERS' AND CONTRACTORS' RESPONSIBILITIES

- A. Every Bidder shall be responsible for taking the provisions of all Addenda issued prior to the Bid Date into account when submitting his bid.
- B. The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the bid is submitted, shall examine the Project site and local conditions, and shall at once report to the Architect any errors, inconsistencies or ambiguities discovered.
- C. Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least ten days prior to the date for receipt of bids.
- D. Each Bidder shall ascertain prior to submitting a bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt on the Bid Form where called for.
- E. All Contractors shall perform their work in accord with all Addenda.

END OF SECTION

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**SECTION 01 11 00
SUMMARY OF WORK**

PART 1 - GENERAL

- A. For determining the Scope of the Work, this Section shall be used in conjunction with the Drawings and with corresponding Sections of the Technical Specifications, Conditions of the Contract, and issued Addenda. This Project is being bid as a single bid package. Bid form is to be filled out as indicated. Pricing is separate for accounting purposes and will not be let out to two separate contractors.
- B. Under this bid package, Contractor shall provide the necessary trades, for which bids are asked including, but not necessarily limited to, furnishing all labor, materials, tools, and equipment necessary for the construction of a Marathon Cty. Sheriff's Dept TRC & Storage Bldg. Renovations;
 - 1. Sheriff's Department TRC; 7255 Stewart Avenue, Wausau, WI 54403: The project consists of renovation of the existing 17,600 sq.ft. building with a 960 sq.ft. addition. Kitchen.
 - 2. Sheriff's Department Storage Building; 7015 Packer Avenue, Wausau, WI 54401: The project consists of renovation of the existing 7,000 sq.ft. building.
- C. Work includes selective demolition, exterior paving & concrete, pre-engineered metal building, metal wall panels standing seam metal roofing, aluminum doors & frames, hollow metal doors and frames, insulation, interior metal panels, insulated overhead doors, Mechanical, Electrical and Plumbing as indicated on the drawings. To ensure proper coordination and completion of each bid package under this Project, the Contractor shall collaborate with all trades and material suppliers. The Contractor shall generate a single submittal log and single construction schedule. The intent is to complete the work at the Sheriff's Department Storage Building prior to work starting at the Sheriff's Department TRC building.
- D. When successful bidders have been awarded the Contract, commencement and completion shall be as stated under the Instructions to Bidders and the Subcontractors Bid Form.
- E. Temporary services shall comply with, but not limited to, the Special Conditions and Section 01 50 00. The Contractor shall coordinate temporary service connections with local utilities and all regulatory agencies.
- F. The Owner reserves the right to contract separately other work not specifically stated in the Project Manual. The construction coordination shall adapt to the Work.
- G. After final cleaning and upon written notice from the Contractor to the Architect that the Work is completed, the Architect will make a punch list of deficiencies and request their completion prior to final payment. Final payment will be made to the Contractor in accordance with the Conditions of the Contract. Upon completion of the Work, the Contractor shall remove from the Project site all material, tools and equipment belonging to him, and leave the Project site with an appearance acceptable to the Owner.

END OF SECTION

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**SECTION 01 23 00
ALTERNATES**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. To enable the Owner to compare total costs where alternative areas, materials, and methods might be used, Alternates have been established as described on the Drawings and in this Section of these Specifications.
- B. Related Work Described Elsewhere:
 - 1. Materials and methods to be used in the Base Bid and in the Alternates have been described on the Drawings and in pertinent Sections of these Specifications.
 - 2. Method for stating the proposed Contract Sum is described in the Bid Form.

1.02 SUBMITTALS

- A. All Alternates described in this Section are required to be reflected in the appropriate section on the Bid Form as submitted by bidders.

1.03 PRODUCT HANDLING

- A. If the Owner elects to proceed on the basis of one or more of the described Alternates, make all modifications to the Work required in furnishing and installing the selected Alternate or Alternates to the approval of the Architect/Engineer and at no additional cost to the Owner, other than as proposed on the Bid Form.

PART 2 - PRODUCTS

2.01 DEFINITIONS

- A. The Base Bid for the Project shall, in general, include all of the work necessary to complete, as per Drawings and Specifications, the site and building Work. Alternate Bid prices shall also be based on complete areas and systems following all requirements of the Drawings and Specifications for all site and building Work.

END OF SECTION

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**SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION**

PART 1 - GENERAL

1.01 GENERAL

- A. Submittals: Submit the following:
 - 1. Submittals Schedule: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category (action or informational).
 - d. Name of subcontractor.
 - e. Description of the work covered.
 - f. Scheduled date for Architect's final release or approval.
- B. Contractor's Construction Schedule: Submit two printed copies of initial schedule large enough to show entire schedule for entire construction period.
- C. Daily Construction Reports: Submit two copies at monthly intervals.
- D. Field Condition Reports: Submit two copies at time of discovery of differing conditions.
- E. Coordination: Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, submittals schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.01 SUBMITTALS SCHEDULE

- A. Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
- B. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
- C. Submit within seven days after Award of Contract.

2.02 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Submit a Contractor's Construction Schedule within major milestones as required under section 00 21 13 Instruction to Bidders.
- B. Once the project has been awarded the General Contractor to submit a comprehensive, fully developed, horizontal Gantt-chart-type Contractor's Construction Schedule within twenty-one days of date established for commencement of the Work.
- C. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
- D. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in ten percent increments within time bar.
- E. Time Frame: Extend schedule from date established for commencement of the Work to date

of Substantial Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early or late completion date, unless specifically authorized by Change Order.
- F. Activities: Treat separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
1. Activity Duration: Define activities so no activity is longer than twenty days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Tabulation:
 - a. Furnish a tabulation of each activity. Show the following information as a minimum for each activity:
 - i. Preceding and following event numbers.
 - ii. Activity description.
 - iii. Estimated duration of activities.
 - iv. Earliest start date (by calendar date).
 - v. Earliest finish date (by calendar date).
 - vi. Latest start date (by calendar date).
 - vii. Latest finish date (by calendar date).
 - viii. Slack or float (in calendar days).
 4. Submittal Review Time: Include review and re-submittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 5. Startup and Testing Time: Include the number of days for startup and testing.
 6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 7. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
 - a. Phasing: Arrange list of activities on schedule by phase.
 - b. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - c. Work Restrictions: Show the effect on the schedule of limitations of continued occupancies, uninterruptible services, use of premises restrictions, and provisions for future construction.
 - d. Work Stages: Indicate important stages of construction for each major portion of the Work.
 - e. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, interim milestones, Substantial Completion, and Final Completion.
 8. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.
- G. Daily Construction Reports: Prepare a daily construction report recording events at Project site, including list of subcontractors; high and low temperatures and general weather conditions; accidents; stoppages, delays, shortages, and losses; meter readings; orders and

requests of authorities having jurisdiction; and equipment or system tests and startups.

- H. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate actual completion percentage for each activity.
 - 4. Distribution: Distribute copies of schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - a. Post copies in Project meeting rooms and temporary field offices.
 - b. When revisions are made, distribute updated schedules to the same parties and post in the same locations.

END OF SECTION

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**SECTION 01 32 13
SCHEDULING OF CONSTRUCTION**

PART 1 - GENERAL

1.01 SUMMARY

- A. To assure adequate planning and execution of the Work so that the Work is completed within the number of calendar days allowed in the Contract, and to assist the Architect in appraising the reasonableness of the proposed schedule and in evaluating progress of the work, prepare a manpower loading chart.
- B. Related Work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Requirements for Progress Schedule: Refer to General Conditions.
 - 3. Construction Period: Refer to Form of Agreement.
- C. Definitions:
 - 1. "Day," as used throughout the Contract unless otherwise stated, means "calendar day."

1.02 SUBMITTALS

- A. Comply with pertinent provisions of Section 01 33 00.
- B. Preliminary Man-loading Chart: Prior to construction start, General Contractor shall submit a manloading chart by crafts for duration of Contract.
- C. Man-loading Chart: Within 10 calendar days after receipt of Notice to Proceed, submit one reproducible copy of the manloading chart prepared in accordance with Article 3.1 below.
- D. Revised Analysis: Within ten calendar days after receipt of the Architect's review comments, submit one reproducible copy of the network analysis revised in accordance with those comments.
- E. Periodic Reports: On the first working day of each month, the General Contractor shall submit a 3-month manpower loading chart by craft and major work item to the Owner and Architect.

1.03 QUALITY ASSURANCE

- A. Perform data preparation, analysis, charting, and updating in accordance with pertinent recommendations contained in current edition of "CPM In Construction" manual of the Associated General Contractors.

PART 2 - PRODUCTS

2.01 MANLOADING CHART

- A. Diagram:
 - 1. Graphically show the order and interdependence of all activities necessary to complete the Work, and the sequence in which each such activity is planned to be accomplished, as planned by each contractor and their project field superintendents in coordination with all subcontractors and materials suppliers whose work is shown on the diagram.
 - 2. Include, but do not necessarily limit to, indicated activities for:
 - a. Project mobilization;
 - b. Submittal and approval of shop drawings;
 - c. Procurement of equipment and critical materials;

- d. Fabrication of special equipment and material, and its installation and testing;
 - e. Final cleanup;
 - f. Final inspecting and testing; and
 - g. All activities of the Owner and the Architect which affects progress and/or affect required dates for completion of all or part of the Work.
3. Show information in such detail that duration times of activities will range normally from one to 15 calendar days.
 4. Show on the diagram, as a minimum for each activity, preceding and following event numbers, description of each activity, cost, and activity duration in calendar days.
- B. Tabulation:
1. Furnish a tabulation of each activity. Show the following information as a minimum for each activity:
 - a. Preceding and following event numbers.
 - b. Activity description.
 - c. Estimated duration of activities.
 - d. Earliest start date (by calendar date).
 - e. Earliest finish date (by calendar date).
 - f. Latest start date (by calendar date).
 - g. Latest finish date (by calendar date).
 - h. Slack or float (in calendar days).

PART 3 - EXECUTION

3.01 MANLOADING CHART

- A. Submit in accordance with Article 1.02 above.

3.02 REVISIONS TO APPROVED SCHEDULE

- A. Method:
1. Following approval of the schedule, if the Contractor desires to make changes in his method of operating and scheduling, they shall so notify the Architect in writing their reasons.
 2. If the Architect considers these changes to be of a major nature, he may require the Contractor to revise and submit for approval, without additional cost to the Owner, all of the affected portions of the detailed diagrams and summary diagram to show the impact on the entire Work.
- B. Major Change:
1. A change may be considered of a major nature if the time estimated to be required or actually used for an activity, or the logic of sequence of activities, is varied from the original plan to a degree that the Architect has reasonable doubt as to completion of the Work within the Contract Time.
 2. Changes which affect activities with adequate slack time shall be considered a major change when their cumulative effect may affect the Contract completion date.

3.03 PERIODIC REPORTS

- A. Contents:
1. Report actual progress by updating the manloading chart.
 2. Note on the summary chart, or clearly show on a revised chart issued of affected portions of the detailed chart, all revisions causing changes in the detailed chart.
 3. Revise the summary chart as necessary for clarity.

4. Activities or portions of activities completed during the reporting period, and their total value as basis for Contractor's periodic request for payment. Payment made pursuant to the Agreement may, when the Architect so directs, be based on the total value of such activities completed or partially completed after verification.
 5. State the percentage of the Work actually completed and scheduled as of the report date, and the progress along the critical path in terms of days ahead of or behind the allowable dates.
 6. If the work is behind schedule, also report progress along other paths with negative slack.
 7. Include written narrative report which shows, but is not necessarily limited to:
 - a. A description of problem areas, anticipated and current;
 - b. Delaying factors and their impact;
 - c. An explanation of corrective actions taken or proposed.
 8. Show the date of latest revision.
- B. Submit in accordance with Article 1.02 above.

END OF SECTION

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**SECTION 01 33 00
SUBMITTAL PROCEDURES**

PART 1 - GENERAL

1.01 SUMMARY

- A. Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined by manufacturer's name and product catalog number, reference to recognized industry and government standards, or description of required attributes and performance. To ensure that the specified products are furnished and installed in accordance with design intent, procedures have been established for advanced submittal of design data and its review by the Architect/Engineer. Make all submittals in strict accordance with the procedures defined in this Section.
- B. Related Sections
 - 1. Individual requirements for submittals are described in the pertinent Sections of these Technical Specifications.
 - 2. Division 0 Section 00 73 00 - Supplementary Conditions.
 - 3. Division 1 Section 01 78 36 - Warranties

1.02 SUBMITTAL REQUIREMENTS

- A. Make all submittals required by the Contract Documents, revise, and re-submit as necessary to establish compliance with the specified requirements.
- B. Each submittal shall contain the number of copies which are required to be returned, plus three copies which will be retained by the Architect/Engineer unless indicated otherwise in other portions of this Section.
 - 1. Alternatively, a single electronic copy in Adobe Acrobat format can be submitted if allowed by the Architect/Engineer. Required samples and final component submittals cannot be submitted electronically. Only electronic copies will be returned (no paper copies).
- C. Each submittal shall indicate project name and location, Architect/Engineer contact information, and Contractor contact information. Contact information shall include name, project number, address, telephone and facsimile numbers.
- D. Additional Submittal Requests
 - 1. The Architect/Engineer may request additional supporting data at any time to help determine compliance of submittals with the Contract Documents.

1.03 QUALITY ASSURANCE

- A. Qualifications
 - 1. Professional or Structural Engineer Qualifications:
 - a. Legally authorized to practice in the jurisdiction where the project is located and who is experienced in providing engineering services to the kind indicated that have resulted in installations similar to those required on this project and with a record of successful in-service performance.
- B. Review and Coordination of Submittals
 - 1. Prior to each submittal, carefully review and coordinate all aspects of each item being submitted including, but not necessarily limited to:
 - a. Determine and verify all interface conditions, catalog numbers, and similar data.
 - b. Coordinate with other trades as required.
 - c. Clearly indicate all deviations from requirements of the Contract Documents.
 - 2. Verify the submittal contains all required information. Partial submittals will not be accepted.

3. Verify dimensions and completeness of each submittal. The Architect/Engineer review is limited as defined in the General Conditions of the Contract for Construction and does not include dimensions and items not included on the submittals.
4. All corrections to submittals shall be made directly on the submittal literature or drawings (not loose leaf documents) and shall be copied word for word to all copies.
5. Verify that each item and the submittal conforms in all respects with the requirements of the Contract Documents
6. Attach the Contractor's stamp of approval and signature to each submittal to certify that this coordination has been performed. Submittals transmitted to the Architect/Engineer without the Contractor's stamp will be returned without review, and shall be re-submitted when the Contractor's review has been completed and the stamp applied.

1.04 TIMING OF SUBMITTALS

A. General

1. Submittals shall be made far enough in advance of scheduled dates for installation to provide necessary time required for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery.
2. The Contractor shall make the required submittals within the time required to meet the construction schedule or shall present, in writing, valid reasons for any delay. It shall be the contractor's responsibility to ensure that delivery of the submittals to the Architect/Engineer has been completed.
3. Obtain acceptance of all submittals prior to fabrication.

PART 2 - PRODUCTS

2.01 SUBMITTAL SCHEDULE

A. General

1. Compile a complete and comprehensive schedule of all submittals anticipated to be made during progress of the Work. Include a list of each item for which shop drawings, product data, samples, certificates of compliance, warranties, or other types of submittals are required. The Contractor shall adhere to the schedule except when specifically otherwise permitted in writing by the Architect/Engineer. The Contractor's failure to submit the aforementioned schedule will be grounds for withholding certification of payment.

B. Coordination

1. Coordinate the schedule with all necessary subcontractors and material suppliers to ensure their understanding of the importance of adhering to the approved schedule and their ability to so adhere. Coordinate as required to ensure the grouping of submittals as described below.

2.02 SHOP DRAWINGS

- A. Sufficient data in each set of shop drawings shall be included to permit a detailed study of the system submitted.
- B. Scale and Measurements: Make all shop drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work.
- C. Maximum sheet size for shop drawings shall be 24" by 36".
- D. Shop drawings shall be specially drawn for this Project, including detailed erection and production drawings, setting drawings, diagrammatic drawings, material schedules, and samples. Copying the Architect/Engineer drawings is not permitted.
- E. Shop drawings for all equipment in a given system shall be submitted at one time, with each complete set in a separate brochure.

- F. Each sheet of shop drawings shall identify the Project name and location; the Architect/Engineer's name, Architect/Engineer's Project number, and contact information including address, telephone, and facsimile numbers; and the Contractor's name, Contractor's project number, and contact information including address, telephone, and facsimile numbers. In addition to the Contractor, the subcontractor/fabricator/manufacturer name, project number, and contact information shall be indicated.
- G. All shop drawings shall be numbered in consecutive sequence, and each sheet shall indicate the total number of sheets in the set. Each set shall be bound.
- H. Each sheet shall indicate the date issued and any revisions. If the submittal is permitted to be phased or revisions are made, the provisions for phased submittals below shall be followed.
- I. The shop drawings shall indicate types, shapes and sizes, and finishes of all materials. Where a shop coat of paint/primer is required, its brand name and manufacturer's identification number of type shall be indicated.
- J. Erection Drawings - Detail product installation including:
 - 1. Each member's designation (identification or piece mark), shape and size shall be clearly indicated and completely dimensioned.
 - 2. Plans and elevations shall locate each member by designation, define all work provided, and indicate sequence of erection for stability, handling requirements, or for other special conditions.
 - 3. Sections and details shall show member connections and relationship of members to adjacent materials, to the structure, and other construction.
 - 4. Indicate all loading used in the design
- K. Production Drawings - Detail product fabrication including:
 - 1. Each member's designation (identification or piece mark), shape and size shall be clearly indicated and completely dimensioned.
 - 2. Indicate methods for storage and transportation.

2.03 PRODUCT DATA

- A. General
 - 1. Submit manufacturer's literature, brochures, technical data, MSDS, etc., to permit a detailed study of the product submitted.
 - 2. Where contents of submitted literature from manufacturers include data not pertinent to the submittal, clearly indicate which portion of the contents is being submitted for review.

2.04 SAMPLES

- A. Samples shall be of the precise article proposed to be furnished.
- B. Submit two samples, unless otherwise requested.
- C. Colors and Patterns: Unless the precise color and pattern is specifically described in the Contract Documents, and whenever a choice of color or pattern is available in a specified product, submit two copies of accurate color and pattern charts to the Architect/Engineer for review and selection.

2.05 CERTIFICATES OF COMPLIANCE

- A. Certify that all materials used in the Work comply with all specified provisions thereof. Certification shall not be construed as relieving the Contractor from furnishing satisfactory materials if, after tests are performed on selected samples, the material is found not to meet specified requirements.
- B. Show on each certificate the name and location of the Project, name and address of

Contractor, quantity and date or dates of shipment or delivery to which the certificate applies, and name of the manufacturing or fabricating company. Certification shall be in the form of a letter or company-standard forms containing all required data. Certificates shall be signed by an officer of the manufacturing or fabricating company.

- C. In addition to the above information, all laboratory test reports submitted with Certificates of Compliance shall show the date or dates of testing, the specified requirements for which testing was performed, and results of the test or tests.
- D. Upon completion of the Work, and as a condition of its acceptance, submit to the Architect/Engineer all Certificates of Compliance.

2.06 WARRANTIES

- A. All warranties shall be compiled and submitted.
- B. Submit three (3) copies.

2.07 OPERATION AND MAINTAINANCE DATA

- A. All operational items of equipment require the manufacturer's operation and maintenance data information and parts lists. The information contained therein shall be in agreement with approved shop drawings, wiring diagrams, etc.

PART 3 - EXECUTION

3.01 IDENTIFICATION OF SUBMITTALS

- A. General:
 - 1. Consecutively number all submittals. Accompany each submittal with a Letter of Transmittal containing all pertinent information required for identification and checking of submittals.
 - 2. Include on the Letter of Transmittal the Technical Specification Section number under which the submittal is made.
- B. Internal Identification:
 - 1. On at least the first page of each copy of each submittal, and elsewhere as required for positive identification, clearly indicate the submittal number in which the item was included.
- C. Re-submittals
 - 1. When material is re-submitted for any reason, transmit under a new Letter of Transmittal and with a new submittal number.
- D. Submittal Log:
 - 1. Maintain an accurate submittal log for the duration of the Contract, showing current status of all submittals at all times. Make the submittal log available for the Architect/Engineer's review upon request.

3.02 COORDINATION OF SUBMITTALS

- A. Grouping of Submittals:
 - 1. Unless otherwise specified, make all submittals in groups containing all associated items to ensure that information is available for checking each item when it is received. Partial submittals may be rejected as not complying with the provisions of the Contract Documents and the Contractor shall be strictly liable for all delays so occasioned.
- B. Phasing of Submittals:
 - 1. Phasing of submittals shall not be permitted unless written permission has been given by the Architect/Engineer.

2. Phased submittals when permitted shall follow the sequence below:
 - a. First submittal
 - b. All subsequent submittals
 - i. Newly detailed items shall be easily identified with clouds around the new items (when placed on sheets that were included in the first submittal) or shall be submitted on new drawing sheets.
 - ii. When changed items are not identified on the submittal, the items will not be reviewed for conformance and the Architect/Engineer notations will not apply to the changes. Refer to the General Conditions of the Contract for Construction for changed items other than those requested by the Architect/Engineer.
- C. Transmit required submittals to the Architect/Engineer for review. After review, the Architect/Engineer will return the number of submittals required to be returned marked with notations as follows:
 1. The notations "Processed" or "Processed with Notations" authorize the Contractor to proceed with the purchase and/or fabrication of the items so noted, subject to the revisions, if any, required by the Architect/Engineer's review comments. Upon receipt, the Contractor shall have sufficient sets of prints made for distribution to appropriate subcontractors, fabricators, manufacturers, and suppliers who require them for coordination of their work.
 2. The notation "Re-submit" requires the submittal to be corrected and re-submitted. The Contractor shall not proceed with purchase and/or fabrication of items marked "Re-submit".
 3. Corrected and re-submitted items shall not be purchased and/or fabricated until the Architect/Engineer has marked the submittals "Processed" or "Processed with Notations".
- D. Revisions after Approval:
 1. When a submittal has been reviewed by the Architect/Engineer, re-submittal for substitution of materials or equipment will not be considered unless accompanied by an acceptable explanation as to why the substitution is necessary. All decisions by the Owner and Architect are final.

END OF SECTION

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**SECTION 01 42 00
REFERENCE STANDARDS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
1. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and type of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics.
 2. Where materials or workmanship are required by these Contract Documents to meet or exceed the specifically named code or standard, it is the Contractor's responsibility to provide materials and workmanship, which meet or exceed the specifically named code or standard.
 3. It is also each Contractor's responsibility, when so required by the Contract Documents or by written request from the Owner, to deliver to the Owner all required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard. Such proof shall be in the form requested in writing by the Owner, and generally will be required to be copies of a certified report of tests conducted by a testing agency approved for that purpose by the Owner.
- B. Related Work Described Elsewhere:
1. Specific naming of codes or standards occurs on the Drawings and in other Sections of these Specifications.

1.02 QUALITY ASSURANCE

- A. Familiarity with Pertinent Codes and Standards:
1. In procuring all items used in this Work, it is each Contractor's responsibility to verify the detailed requirements of the specifically named codes and standards and to verify that the items procured for use in this work meet or exceed the specified requirements.
- B. Rejection of Non-Complying Items:
1. The Owner reserves the right to reject items incorporated into the Work which fail to meet the specified minimum requirements.
 2. The Owner further reserves the right, and without prejudice to other recourse the Owner may take, to accept non-complying items subject to an adjustment in the Contract Amount as approved by the Owner.
- C. Applicable standards listed in these Specifications include, but are not necessarily limited to, standards promulgated by the following agencies and organizations:
1. AAMA: American Architectural Manufacturers Association, Schaumburg, IL 60173-4268, (847) 303-5664; www.aamanet.org.
 2. AASHTO: American Association of State Highway and Transportation Officials, Washington, DC 20001, (202) 624-5800; www.aashto.org.
 3. ACI: American Concrete Institute International, Farmington Hills, MI 48333, (248) 848-3700; www.aci-int.org.
 4. ADA(G): Americans with Disabilities Act, and Accessibility Guidelines.
 5. AISC: American Institute of Steel Construction, Inc., Chicago, IL 60601-2001, (312) 670-2400; www.aisc.org.
 6. ANSI: American National Standards Institute (successor to USASI and ASA0), New York, NY 10036, (212) 642-4900; www.ansi.org.
 7. ASTM: American Society for Testing and Materials/ ASTM International, West Conshohocken, PA 19428-2959, (610) 832-9585; www.astm.org.

8. AWS: American Welding Society, Inc., Miami, FL 33126, (305) 443-9353; www.aws.org.
9. AWWA: American Water Works Association, Inc., Denver, CO 80235, (303) 794-7711; www.awwa.org.
10. BOCA: Buildings Officials & Code Administrators International, Inc., (now International Code Council.)
11. CRSI: Concrete Reinforcing Steel Institute, Schaumburg, IL 60173-4758, (847) 517-1200; www.crsi.org.
12. CS: Commercial Standard of National Bureau of Standards, U.S. Department of Commerce, Government Printing Office, Washington, DC 20402.
13. WisDOC: Department of Commerce, 201 W. Washington Ave., Madison, WI 53702, (608) 226-1018.
14. WisDNR: Department of Natural Resources, P.O. Box 7921, Madison, WI 53707-7921, (608) 266-2621.
15. FGMA: Flat Glass Marketing Association, (now Glass Association of North America,) Topeka, KS 66614-5321, (785) 271-0208; www.glasswebsite.com.
16. GA: Gypsum Association, Washington, DC 20002, (202) 289-5440; www.gypsum.org.
17. ICC: International Code Council, Falls Church, VA 22041, (703) 931-4533; www.iccsafe.org.
18. KCMA: Kitchen Cabinet Manufacturers Association, Reston, VA 20191-5435, (703) 264-1690; www.kcma.org.
19. NAAMM: The National Association of Architectural Metal Manufacturers, Chicago, IL 60603, (312) 332-0405; www.naamm.org.
20. NEC: National Electrical Code (see NFPA).
21. NEMA: National Electrical Manufacturers Association, Rosslyn, VA 22209, (703) 841-3200; www.nema.org.
22. NFPA: National Fire Protection Association, Quincy, MA 02169-7471, (617) 770-3000; www.nfpa.org.
23. SDI: Steel Deck Institute, Fox River Grove, IL 60021-0025, (847) 458-4647; www.sdi.org.
24. SJI: Steel Joist Institute, Myrtle Beach, SC 29577-6760, (843) 626-1995; www.steeljoist.org.
25. SSPC: Society for Protective Coatings, Pittsburgh, PA 15222-4656, (412) 281-2331; www.sspc.org.
26. TCA: Tile Council of America, Inc., Anderson, SC 29625, (864) 646-8453; www.tileusa.com.
27. UL: Underwriters Laboratories, Inc., Northbrook, IL 60062-2096, (847) 272-8800; www.ul.com.
28. UBC: Uniform Building Code, International Conference of Building Officials, (now International Code Council).
29. WCSBMPH: Wisconsin Construction Site Best Management Practice Handbook, Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, WI 53707-7921
30. Federal Specifications and Federal Standards: Specifications Sales (3FRI), Building 197, Washington Navy Yard, General Services Administration, Washington, DC 20407.

END OF SECTION

**SECTION 01 45 00
QUALITY CONTROL**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Work under this section includes all labor, materials, equipment, facilities, and services necessary to complete the quality control work as shown on the drawings and herein specified.
- B. Related Sections
 - 1. Individual requirements for quality control are defined in other pertinent sections of these Specifications.
- C. Payment Procedures
 - 1. Contractor shall provide quality control services specified.
 - 2. Contractor shall provide quality control services required by authorities having jurisdiction whether specified or not.
 - 3. Contractor shall pay for tests and inspections performed by the testing agency unless the Owner has indicated otherwise.
 - 4. Obtain costs for all specified testing and inspections performed by the testing agency and include costs as a line item in Division 01 – Section 00 41 16 Material or Subcontractor Bid Form. Tests and Inspections not specified and estimated costs for re-testing and re-inspection shall not be included in the line item.
 - 5. Testing and inspecting requested by the Contractor and not required by the Contract Documents are the Contractor's responsibility.
 - 6. Contractor shall bear all costs of removal and replacement of material for items that do not remain accessible and exposed for testing and inspections.
 - 7. Contractor shall bear all costs made necessary by non-compliance with the Contract Documents or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc., including those of repeated procedures and compensation for Design Professional's services and expenses.
 - 8. Even if the Owner pays for original testing and inspections performed by the testing agency, the Contractor shall bear the costs for the following:
 - a. Re-testing due to failure of initial test or due to non-compliance with Contract Documents.
 - b. Re-inspection of Work due to failure of Work to pass initial inspection or due to non-compliance with Contract Documents.

1.02 DEFINITIONS

- A. Quality Assurance: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and to substantiate that proposed construction will comply with requirements.
- B. Quality Control: Tests, inspections, procedures, and related activities and actions performed during or after execution of the Work to evaluate that actual products incorporated into the Work and completed construction complies with requirements.
- C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- D. Source Quality Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- E. Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the work and for completed Work.

1.03 SYSTEM DESCRIPTION

- A. Testing and inspecting services are required to verify compliance with specified requirements and governing rules and regulations, i.e., codes, laws, ordinances, etc. These services do not relieve the Contractor of responsibility for compliance with the Contract Documents.
- B. Portions of the Work which do not comply with requirements established by the Contract Documents or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc., shall be made to comply.
- C. Required Testing and Inspections:
 - 1. Individual requirements for testing and inspection are defined in other pertinent sections of these Specifications.
 - 2. Local, state, and federal jurisdiction inspections vary. Confirm the required inspections with the individual authorities.
 - 3. The following testing and inspections shall be performed by a testing agency:
 - a. Site excavation inspection, rough grading inspection, and bearing capacity testing: Section 31 00 00 Earthwork.
 - b. Soil compaction testing and inspection and pavement base course testing and inspection: Section 31 00 00 Earthwork, 32 11 23 Aggregate Base Course, and Section 32 12 16 Bituminous Concrete Paving.
 - c. Concrete reinforcing inspection: Section 03 20 00 Concrete Reinforcement.
 - d. Concrete testing: Section 03 30 00 Cast-in-Place Concrete.
 - e. Masonry construction testing and inspection: Section 04 21 00 Clay Masonry Units and Section 04 22 00 Concrete Masonry Units.
 - f. Structural steel welding, bolts, and stud testing and inspection (except testing to qualify welders): Section 05 12 00.
 - g. Metal roof deck inspection: Section 05 31 00.
 - h. Underground piping inspection and Water supply testing: Section 33 00 00 Utility Services, Section 33 21 00 Water Supply, Section 33 21 00 Water Supply Wells, and Section 33 36 00 Septic Tank Systems.
 - i. Others, if required by the individual sections of these Specifications.
 - 4. Re-testing/Re-inspecting is required for construction that replaced work that failed to comply with the Contract Documents or the provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc.
- D. Specified testing and inspecting does not limit the Contractor's other quality assurance and quality control procedures that facilitate compliance with the Contract Documents.
- E. Work shall be subject to testing and inspection by the Owner, Design Professional, testing agency, inspectors, and public authorities having jurisdiction.
- F. Approval as a result of testing or inspection shall not be construed to be an approval of a violation of provisions of the Contract Documents or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc.
- G. Testing, inspections, or approvals presuming to give authority to violate or cancel the provisions of the Contract Documents or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc., shall not be valid.

1.04 SUBMITTALS

- A. Submittals shall be in accordance with Division 01 – Section 01 33 00 Submittal Procedures.
- B. Quality Assurance/Control Submittals
 - 1. Certificate from qualified accreditation authority showing Testing and Inspection Agency's compliance with ASTM Standard E329 for each testing agency used.
 - 2. Certificate issued by each Testing and Inspection Agency used that states the agency

is independent and is not associated with the Contractor performing the work by any means and will remain independent and not associated with the Contractor for the duration of the project. It shall also state that all results and recommendations provided by the agency will be unbiased and impartial toward any party involved for the duration of the project.

- C. Schedule of Testing and Inspecting
 - 1. Prepare a Master Schedule of all items to be tested and inspected. By coordination with the construction schedule, establish tentative dates for each such activity.
 - 2. Submit for the Design Professional's review. Make any agreed upon revisions and resubmit.
- D. Prepare the schedule including items specified in Division 01 – Section 01 33 00 Submittal Procedures. Also include the following in tabular form:
 - a. Specification section number and title
 - b. Description of test and/or inspection required
 - c. Identification of applicable standard
 - d. Identification of test and/or inspection method required
 - e. Number of tests and/or inspections required
 - f. Time schedule and time span for tests and/or inspections
 - g. Entity responsible for performing tests and/or inspections
 - h. Requirements for obtaining samples
 - i. Unique characteristics/requirements for tests and/or inspections
 - 2. Include in the schedule anticipated tests and/or inspections by manufacturer's representatives and any authorities having jurisdiction.
 - 3. Resubmit schedule when revisions are proposed.
- E. Reports
 - 1. Prepare all reports including items specified in Division 01 – Section 01 33 00 Submittal Procedures. Submit certified reports that include the following:
 - a. Date of issue.
 - b. Project name and location.
 - c. Testing and Inspecting Agency contact information including name, project number, address, telephone and facsimile numbers.
 - d. Dates and locations of tests and/or inspections.
 - e. Names of individuals making tests and/or inspections.
 - f. Record of field conditions (temperature & weather) at time of test/inspection.
 - g. Product identification and applicable specification section.
 - h. Type and description of test/inspection method.
 - i. Complete test/inspection data.
 - j. Test and inspection results and interpretation of results.
 - k. Comments/professional opinions on compliance with the Contract Documents.
 - l. Recommendations on re-testing/re-inspection.
 - m. Signatures of individuals making tests and/or inspections.
 - 2. Report test results as called for and, in the form, specified by the test method.
- F. Jurisdictional Compliance Paperwork: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Minimum qualification levels are established in individual specification sections in addition to the minimum qualifications specified herein.
2. Testing and Inspecting Agency Qualifications:
 - a. Testing and Inspecting Agency qualified according to ASTM Standard E329 and with additional qualifications specified in other pertinent individual Specification sections.
 - b. Testing and Inspecting Agency shall be accredited through an accreditation authority to meet ASTM Standard E329.
 - i. Accreditation authority shall be acceptable to the Owner, Design Professional, and authorities having jurisdiction.
 - ii. Pre-approved accreditation authorities acceptable to the Design Professional include:
 - (a.) American Association for Laboratory Accreditation (A2LA)
 - (b.) International Accreditation Service (IAS)
 - (c.) National Voluntary Laboratory Accreditation Program (NVLAP)
 - (d.) AASHTO Accreditation Program (AAP)
 - iii. Pre-approval by the Design Professional does not automatically mean the Testing and Inspecting Agency is acceptable to the Owner or authorities having jurisdiction. The Contractor shall verify acceptability.
 - c. Testing and Inspection Agency shall be independent and shall not be associated with the Contractor performing the work by any means. Agency shall also be able to provide unbiased and impartial results and recommendations to all parties involved in the project.
 - d. Testing and Inspecting Agency shall be acceptable to the Owner, Design Professional, and authorities having jurisdiction.
 - i. Pre-approved Testing and Inspecting Agencies acceptable to the Design Professional include:
 - (a.) CGC, Inc.
2921 Perry Street
Madison, WI 53713
Phone: (608) 288-4100
Fax: (608) 288-7887
 - (b.) ECS Illinois, LLC
1575 Barclay Blvd.
Buffalo Grove, IL 60089
Phone: (847) 279-0366
Fax: (847) 279-0369
 - (c.) Professional Service Industries, Inc. (PSI)
W237 N2878 Woodgate Road – Suite 2
Pewaukee, WI 53072
Phone: (262) 347-0898
Fax: (262) 347-2256

- (d.) Gestra Engineering Inc.
Offices in Madison, Milwaukee, and Kenosha
1626 W. Fond Du Lac Ave.
Milwaukee, WI 53205
Phone: (414) 933-7444 ext. 11
Fax: (414) 933-7844
- (e.) Soils & Engineering Services, Inc.
1102 Stewart Street
Madison, WI 53713-4648
Phone: (608) 274-7600
Fax: (608) 274-7511
- (f.) Terracon Consultants, Inc.
4836 Colt Road
Rockford, IL 61109
Phone: (815) 873-0990
Fax: (815) 873-0991

ii. Pre-approval by the Design Professional does not automatically mean the Testing and Inspecting Agency is acceptable to the Owner or authorities having jurisdiction. The Contractor shall verify acceptability.

B. Regulatory Requirements

1. Conform to requirements of local, state, and federal rules and regulations applicable to work and project location.
2. Conform to the applicable requirements and recommendations of the following codes, specifications, and standards except as modified by the Contract Documents and herein:
 - a. ASTM Standard E329, 2009, "Standard Specification for Agencies Engaged in Construction Inspection and/or Testing"; ASTM International, West Conshohocken, PA, 2009, DOI: 10.1520/E0329-09, www.astm.org.
3. Where provisions of pertinent regulations, codes, and standards conflict with each other or this specification, the more stringent provisions shall govern. Refer uncertainties and requirements that are different, but apparently equal, to the Design Professional for a decision before proceeding.

PART 2 - PRODUCTS

2.01 SOURCE QUALITY CONTROL

- A. Minimum levels of source quality control are established in individual specification sections.

PART 3 - EXECUTION

3.01 ADMINISTRATION

- A. Testing and Inspecting Schedule
1. Maintain the schedule for testing and inspecting to accurately reflect progress of the Work.
 2. Resubmit the testing and inspecting schedule to the Design Professional for review when revisions are proposed. Transmit in adequate time to permit proper rescheduling of activities in connection with inspection and tests.
 3. Do not decrease the testing and inspecting activity without written permission from the Design Professional.

- B. Test and Inspection Log
 - 1. Prepare a record of tests and inspections that includes the following:
 - a. Date test/inspection was conducted.
 - b. Description of the Work tested or inspected.
 - c. Date test or inspection results were transmitted to the Design Professional.
 - d. Name of testing agency or special inspector conducting test or inspection.
 - e. Test result – either compliant or noncompliant
 - f. Date of re-test/re-inspection.
 - 2. Maintain log at the Project site and provide access to the log for Owner's and Design Professional's reference. Post changes and modifications as they occur.
- C. Reports
 - 1. Promptly secure, process, and distribute copies of test and inspection reports and related instructions to ensure necessary retesting, replacement of materials, or both, as required, and with the least possible delay in progress of the Work.
 - 2. Transmit copies of reports created by the testing agency to any public authorities having jurisdiction when they so direct.
 - 3. Transmit copies of reports created by entities other than the testing agency to any public authorities having jurisdiction when they so direct and to the Design Professional.
 - 4. Promptly secure, process, and distribute copies of certificates of testing, inspection or approval to any public authorities having jurisdiction when they so direct and to the Design Professional.

3.02 PROTECTION AND REPAIR/RESTORATION

- A. Protect construction exposed by or for quality control services.
- B. Upon completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other specification sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with Division 01 – Section 01 73 29 Cutting and Patching as applicable.
- C. Protection and Repair are the Contractor's responsibility, regardless of whether the Owner directly employs any testing and inspection services.

3.03 FIELD QUALITY CONTROL

- A. Coordination
 - 1. Coordinate sequence of activities to accommodate required quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. Contractor shall cause the Work to remain accessible and exposed for testing and inspection purposes.
 - 2. Contractor shall make arrangements for all quality control to be completed including the tests and inspections to be performed by testing agencies, inspectors, and public authorities having jurisdiction.
 - 3. For testing and inspecting specified to be performed by a testing agency, contractor personnel are not allowed to perform these services without direct supervision from testing agency personnel.
 - 4. Provide preliminary information about materials requiring testing and inspection to the testing agency or other entities requiring it.

- B. Notification
 - 1. Notify appropriate testing agency, inspector, or public authorities having jurisdiction sufficiently in advance of operations that require tests and/or inspections or when the Work is ready for testing and/or inspection. If sufficient notice is not given, reschedule the operations so the appropriate testing and inspections can be completed. Contract time will not be extended to accommodate inadequate notice.
 - 2. To permit the Design Professional to witness tests and/or inspections when desired, notify the Design Professional not less than 24 hours in advance.
- C. Associated Services: Cooperate with testing agency personnel, inspectors, and public authorities having jurisdiction. Provide reasonable auxiliary services as requested along with the following:
 - 1. Access to and means for testing and inspections of Work and manufacturer's operations promptly upon request.
 - 2. Incidental labor and facilities needed to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting.
 - 4. Storage and field curing facilities.
 - 5. Provide transportation of test materials if necessary.
 - 6. Security and protection for samples and testing and inspecting equipment at Project site.
- D. Perform indicated testing and inspections at the appropriate time using methods specified and documented in the schedule of testing and inspections. Provide labor to aid in the testing and inspecting services if necessary.
- E. Provide testing laboratory facilities required to perform the off-site testing.
- F. Report each test and inspection result as indicated.
- G. Portions of the Work which do not comply with requirements established by the Contract Documents or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc., shall be made to comply and such portions shall not be covered or concealed until authorized by testing agency, inspector, and public authorities having jurisdiction.
- H. Re-test and re-inspect portions of the Work which did not comply with requirements established by the Contract Documents or provisions of governing rules and regulations, i.e., codes, laws, ordinances, etc. Report results as indicated.
- I. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results as indicated.

3.04 TESTING AGENCY RESPONSIBILITIES AND LIMITATIONS OF AUTHORITY

- A. Cooperate with Design Professional and Contractor in performance of duties.
- B. Provide qualified personnel to perform required tests and inspections in a reasonable time frame upon notice.
- C. Promptly notify Design Professional and Contractor of irregularities, or deficiencies of Work which are observed during performance of services.
- D. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
- E. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from specified requirements.
- F. Submit a certified written report of each test, inspection, and similar quality control service to the Design Professional and Contractor. Reports shall be submitted in a prompt manner and shall be submitted within 7 days after the test, inspection, or similar quality control service was

performed.

- G. Testing agency is not authorized to:
1. Release, revoke, alter, or increase any requirements of the Contract Documents.
 2. Approve or accept any portion of the Work.
 3. Perform any duties of Contractor.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
1. Temporary facilities and controls required for this Work include, but are not necessarily limited to:
 - a. Temporary utilities such as water, electricity, and heat
 - b. Temporary stairs and scaffolding
 - c. Temporary signs
 - d. Fire protection
 - e. Watchmen
 - f. Storage of materials
 - g. Glass replacement
 - h. Cleaning up
 - i. Enclosures
 2. Related Work Described Elsewhere:
 - a. Except that all equipment furnished by Contractors shall comply with all requirements of pertinent safety regulations, the ladders, planks, hoists, and similar items normally furnished by the individual trades in execution of their own portions of the work are not part of this Section.
 - b. Permanent installation and hook-up of the various utility lines are described in other pertinent Sections.

1.02 PRODUCT HANDLING

- A. Use all means necessary to maintain temporary facilities and controls in proper and safe conditions throughout progress of the Work.

1.03 JOB CONDITIONS

- A. Make all required temporary connections to existing utility systems with minimum disruption to services in the existing utility systems. When disruption of the existing service is required, do not proceed without the Architect/Engineer's approval and Owner's consent and, when required, provide alternate temporary service.

PART 2 - PRODUCTS

2.01 UTILITIES

- A. General:
1. All temporary facilities shall be subject to the Architect/Engineer's approval.
- B. Temporary Water:
1. The Plumbing Trade shall furnish and install all necessary temporary water lines and water sources and, upon completion of the Work, remove all such temporary facilities as specified herein and in accordance with the Supplementary Conditions. The temporary sources shall be installed within 5'- 0" of the building at a minimum of two locations.
 2. Each trade requiring water shall provide their own hoses from source to point of use.
 3. The Owner shall pay for all water consumed throughout the duration of construction.
- C. Temporary Lights and Power:

1. The Electrical Trade shall provide temporary service for power and lighting required in construction for all trades until construction has been completed, and approved service connections from the service board. The Electrical Trade shall provide the following facilities:
 - a. Approved service connections from the service board. Confirm size of temporary service required and meter and install them accordingly. Provide temporary service from existing electrical service off-site. The new temporary service shall be located overhead on wooden power poles or direct buried into the ground and positioned to avoid conflict with construction equipment and personnel. Electrical Trade shall provide temporary service connection to a rain-tight service head 16'- 0" above grade.
 - b. Provide 120 volt lighting and small power tool outlets throughout the Project site.
 - c. Provide general lighting consisting of 150 watt (minimum) lamps and weatherproof sockets, and provide power outlets consisting of 120 volt pendant type cord connectors, and with ground fault circuit interrupters, for fractional horsepower electrical tools.
 - d. 120 volt outlets shall be located such that no point in the Project site would make portable cord lengths excessive.
 2. Each trade shall provide and maintain their own extension cords.
 3. Use of in-place building switches or circuit breakers shall not be permitted. All construction power tools shall be fed from temporary power source with ground fault interrupter protection only.
 4. Complete installation shall be in compliance with all applicable codes. The Electrical Contractor shall remove and salvage the temporary service when it is no longer required.
 5. Trades requiring temporary three-phase power service shall make arrangements with the Electrical Trade through the General Contractor.
 6. The Owner shall pay for all electricity consumed throughout the duration of construction.
- D. Temporary Heat and Cold Weather Protection
1. Cold Weather Protection:
 - a. All heating or covering, or both, required to protect the Project site from damage due to freezing during construction period prior to enclosure of building shall be provided by the General Contractor.
 - b. Cold weather protection shall be provided by General Contractor.
 2. Temporary Heating:
 - a. When required, until time of substantial completion.
 - b. In all areas and spaces that are roofed and have all exterior openings suitably enclosed.
 3. General Contractor:
 - a. Provide temporary window and door closures as required and closures for all other temporary openings. Supervise effectiveness of all closures and see that every reasonable precaution is used to prevent escape of heat.
 - b. Permanent heating system may be used for temporary heating once the permanent heating system, heating controls, concrete installation, concrete curing, concrete saw-cutting, and masonry saw-cutting have been completed.
 - c. If the permanent system is not operable and the building is enclosed and heating is required, then the General Contractor shall furnish and install a temporary heating system.
 - d. All portable heating units shall be properly ventilated to prevent combustion gases from remaining in the heated area.

- e. The General Contractor shall ascertain if temporary heating equipment will operate on the temporary electrical service available. If service is insufficient to operate equipment, the General Contractor shall make all other arrangements at no additional cost to the Owner.
 - f. The temporary heating system shall be removed by the General Contractor after the permanent heating system has been installed, is operating, and balanced. Temporary heating equipment shall be relocated by the General Contractor as required during construction to prevent interference with new construction.
 - g. Temperatures: Except as otherwise specified, a minimum temperature of 45 degrees F for the building shall be maintained until completion of the Project.
 - h. Operation: Supervise and be responsible for operation of temporary heating system as required by weather and building conditions through the duration of construction. Be responsible for maintenance of temporary heating systems during period of construction and do any emergency repair work required during temporary operation.
4. The Contractor shall pay for all fuel consumed and temporary heating equipment cost throughout the duration of construction until Substantial Completion at no additional cost to the Owner.

2.02 TOILETS

- A. The General Contractor shall provide and maintain temporary sanitary toilets, located where directed, in sufficient number required for the force employed. The toilets shall comply with the requirements of the Wisconsin Department of Commerce, General Orders on Sanitation. Toilets shall be self-contained chemical type.
- B. The General Contractor shall maintain the temporary toilets in a sanitary condition at all times and shall supply toilet paper and hand sanitizer dispenser until completion of the Project.

2.03 STAIRS & SCAFFOLDS

- A. The Contractor shall:
 - 1. Furnish and maintain equipment such as temporary stairs, fixed ladders, ramps, chutes, runways and the like as required for proper execution of work by all trades.
- B. Underlay interior scaffolds with planking to prevent uprights from resting directly on the floor construction.

2.04 SIGNS

- A. No individual advertising signs, plaques or credits, temporary or permanent, will be permitted on the building or premises, except the Contractor's name on his office or material shed.
- B. General Contractor shall handle ordering and erection of a Project sign, traffic control signs for the temporary haul road in accordance with local regulations, construction parking signs, and temporary posts for the signs.
- C. The General Contractor shall arrange for a suitably constructed Project sign, giving the name of the Project, Owner, Architect/Engineer, General Contractor, Mechanical Contractor, Electrical Contractor, Plumbing Contractor, and Fire Protection Contractor as shown on the Drawings. No other signs will be permitted on the site without written approval of Marathon County. The sign shall be installed within two weeks after the Notice to Proceed and shall be maintained in good condition throughout the period of construction at the location shown on the Drawings.
- D. Sign contractor shall obtain all necessary county and state sign permits.

2.05 FIRE PROTECTION

- A. The General Contractor shall provide and maintain in working order during the entire construction period within the construction area, trailers & storage sheds. Fire extinguishers to be the size, number and type as required by local fire Marshalls.
- B. The fire extinguishers and cabinets specified under Technical Specification Section 10 44 00 shall not be used for this purpose.

2.06 WATCHMEN

- A. Watchmen will not be furnished by Owner. The Contractor shall provide such precautionary measures, to include the furnishing of watchmen if deemed necessary, to protect persons and property from damage or loss where the Contractor's work is involved.

2.07 STORAGE OF MATERIALS

- A. The Contractor shall confine equipment, apparatus, storage of materials and operations to limits indicated by directions of the Architect/Engineer and shall not bring material onto the site until they are needed for the progress of the Work.
- B. The storage of materials on the site and within the building shall be in strict accordance with the instructions of the Architect/Engineer. Storage of materials within the building shall at no time exceed the design carrying capacity of the structural system.
- C. Provide and maintain watertight storage sheds on the premises where directed, for storage of materials that might be damaged by weather. Sheds shall have wood floors raised at least 6" above the ground.
- D. All materials affected by moisture shall be stored on platforms and protected from the weather.
- E. During the construction of this Project, materials, construction sheds and earth stockpiles shall be located so as not to interfere with the installation of the utilities nor cause damage to existing lines.
- F. The Contractor shall allot space to others for storage of their materials and erection of their sheds.
- G. Should it be necessary at any time to move material sheds or storage platforms, the Contractor shall move the sheds at the Contractor's expense, when directed by the Owner or Architect/Engineer.
- H. The Owner assumes no responsibility for materials stored in building or on the site. The Contractor assumes full responsibility for damage during the storing of materials.

2.08 GLASS REPLACEMENT

- A. The Contractor shall assume all costs of replacement of glass broken, cracked, or damaged by him. Glass scratched through improper cleaning shall be considered damaged and shall be replaced by the party that caused the damage.

2.09 CLEANING UP

- A. The Contractor shall be financially responsible for clean-up operations. Clean-up must be timely as well as thorough in order to meet safety regulations and permit trades to perform without hindrance from dirt and debris. The Owner will police housekeeping and take appropriate steps to maintain clean, safe working conditions. If the Contractor fails to meet acceptable housekeeping requirements, then the Contractor shall be charged for services arranged for by the Owner.
- B. The Contractor shall provide dumpsters throughout the site, schedule periodic removal of all construction waste, and remove all construction waste.
- C. "Housekeeping" and clean-up shall be listed on the Schedule of Values and on the

Applications and Certificates for Payment as an item of work.

2.10 ENCLOSURES

- A. Furnish, install, and maintain for the duration of construction all required tarpaulins, barricades, canopies, warning signs, steps, bridges, platforms, fences and other temporary construction necessary for proper completion of the Work in compliance with all city, safety and other regulations.

END OF SECTION

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**SECTION 01 71 00
SITE CONDITIONS**

PART 1 - GENERAL

1.01 SITE CONDITIONS

- A. All Contractors shall examine the site of the Project construction for ground structures and all other pertinent conditions under which work is to be performed.
- B. Exercise extreme caution while performing work in the area of existing underground utility services and/or recently installed underground work.
- C. Locate all underground utilities by careful hand excavation and provide all necessary and proper protection from damage during construction operations.
- D. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Owner immediately for directions as to procedure. Cooperate with the Owner and public and private utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.
- E. Do not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Owner, and then only after temporary utility services have been provided.
- F. Under no circumstances shall existing trees be damaged or removed without the consent of the Owner, or as indicated on the Drawings.

1.02 CHECKING LINES AND LEVELS

- A. All Contractors shall thoroughly examine the existing conditions and be familiar with the work to be performed as hereinafter specified and as outlined on Drawings.
- B. Each Contractor shall compare all levels given on Drawings with actual levels and shall call attention to discrepancies if any occur.
- C. Each Contractor shall verify and document with the Architect/ Engineer all lines and levels and be responsible for the proper location of all his work.

END OF SECTION

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**SECTION 01 73 29
CUTTING AND PATCHING**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. This Section establishes general requirements pertaining to cutting (including excavating), fitting, and patching of the work required to:
 - a. Make the several parts fit properly.
 - b. Uncover work to provide for installation, inspection, or both, of ill-timed work.
 - c. Remove and replace work not conforming to requirements of the Contract Documents.
 - d. Remove and replace defective work.
- B. Related Work Described Elsewhere:
 - 1. In addition to other requirements specified, upon the Owner's request, uncover work to provide for inspection by the Owner's Representative of covered work, and remove samples of installed materials for testing.
 - 2. Do not cut or alter work performed under separate contract without the Owner's written permission.

1.02 QUALITY ASSURANCE

- A. Perform all cutting and patching in strict accordance with pertinent requirements of these Specifications and, in the event no such requirements are determined, in conformance with the Owner's written direction.

1.03 SUBMITTALS

- A. Request for the Owner's Consent:
 - 1. Prior to cutting, which affects structural safety or does not affect structural safety, submit written request to the Owner for permission to proceed with cutting.
 - 2. Should conditions of the work, or schedule, indicate a required change of materials or methods for cutting and patching, so notify the Owner and secure his written permission prior to proceeding. Changes in materials and methods will be at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. For replacement of work removed, use materials, which comply with the pertinent Sections of these Specifications.
- B. Material used for infill shall match surrounding construction unless noted otherwise.

PART 3 - EXECUTION

3.01 CUTTING & PATCHING

- A. During Construction:
 - 1. All openings, chases and lintels in new construction shown on Architectural and Structural Drawings shall be provided by the General Contractor. The mechanical, electrical, fire protection trades, and plumbing trades shall be responsible for providing sleeves, anchors, and inserts for establishing sizes and locations at proper time as to avoid cutting and patching.

- B. Work In Place and Existing Construction:
1. For openings, anchors, and inserts required in new construction in place and in existing construction, the following will apply.
 - a. Perform cutting and removal by methods, which will prevent damage to other portions of the work and will provide proper surfaces to receive installation of repair and new work. Perform fitting and adjustments of products to provide specified tolerances and finishes.
 - b. Unless noted otherwise, the Contractor shall do all cutting required for installation of his work. Patching required because of such cutting shall be performed as follows:
 - i. Wherever cutting occurs within unexposed materials, or in materials, which are to remain unfinished when completed, patching shall be performed by Contractor who did cutting.
 - ii. Wherever cutting occurs in interior and mortar surfaces scheduled to remain exposed to view, the cutting and patching shall be performed by the Mason through the General Contractor and paid for by Contractor requested cutting. The masonry and mortar shall be cut and patched in toothed pattern matching the material and bond characteristics of the work in place or the existing masonry construction. Cross cutting of masonry units is not permitted.
 - iii. Wherever cutting occurs in finished surfaces, patching shall be performed by appropriate Trade Contractor and paid for by Contractor requested cutting. This includes, but is not limited to, painting of plastered and finished surfaces, ceramic tile, and acoustic materials and their supports.
- C. Inspection:
1. Inspect existing conditions, including elements subject to movement or damage during cutting, excavating, backfilling, and patching.
 2. After uncovering the work, inspect conditions affecting installation of new work.
- D. Discrepancies:
1. If uncovered conditions are not as anticipated, immediately notify the Owner and secure needed directions.
 2. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 PREPARATION PRIOR TO CUTTING

- A. Provide all required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the work.

3.03 PERFORMANCE

- A. Perform all required excavating and backfilling as required under pertinent Sections of these Specifications. Perform cutting and removal by methods, which will prevent damage to other portions of the work and will provide proper surfaces to receive installation of repair and new work.

END OF SECTION

**SECTION 01 74 00
CLEANING**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. Throughout the construction period, each Contractor shall maintain the Project site in a standard of cleanliness as described in this Section.
 - 2. In addition to standards described in this Section, comply with all requirements for cleaning up as described in various other Sections of these Specifications.

1.02 QUALITY ASSURANCE

- A. Inspection:
 - 1. Conduct daily inspection, and more often if necessary, to verify that requirements of cleanliness are being met.
- B. Codes and Standards:
 - 1. In addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.

PART 2 - PRODUCTS

2.01 CLEANING MATERIALS AND EQUIPMENT

- A. Provide all required personnel, equipment, and materials needed to maintain the specified standard of cleanliness.

PART 3 - EXECUTION

3.01 FINAL CLEANING

- A. "Clean," for the purpose of this Article, and except as may be specifically provided otherwise, shall be interpreted as meaning the level of cleanliness generally provided by skilled commercial quality building maintenance equipment and materials.
- B. Provide final cleaning of the work, at time indicated, consisting of cleaning each surface or unit of work to normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturer's instructions for cleaning operations.
- C. Employ experience personnel or professional cleaners for final cleaning.
- D. Comply with manufacturers' instructions for cleaning operations.
- E. Remove labels which are not required as permanent labels.
- F. Clean transparent materials (mirrors, window/door glass) to a polished condition; remove substance which are noticeable as vision obscuring.
- G. Clean exposed exterior and interior hard-surfaced finishes, including metals, masonry, stone, concrete, painted surfaces, plastics, tile, wood, special coatings, and similar surfaces, to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances.
- H. Remove debris and surface dust from limited-access spaces; roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
- I. Broom clean concrete floors in non-occupied spaces; vacuum clean carpeted and similar soft surfaces.
- J. Clean light fixtures, lamps and diffuser lenses.

- K. Prior to completion of the Work, remove from the Project site all tools, surplus materials, equipment scrap, debris, and waste.
 - 1. Interior:
 - a. Visually inspect interior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
 - b. Remove all traces of splashed materials from adjacent surfaces.
 - c. Remove paint drippings, spots, stains, and dirt from finished surfaces.
 - 2. Remove all packing materials and dispose of properly.
 - 3. Polished surfaces: To surfaces requiring routine application of buffed polish, apply the polish recommended by manufacturer of the material being polished.
- L. Schedule final commercial cleaning as approved by the Architect to enable the Owner to accept a completely clean building and site.

END OF SECTION

**SECTION 01 74 20
CONSTRUCTION WASTE MANAGEMENT**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Owner has established that this project shall include proactive measures for waste management participation by all parties to the contract.
1. The purpose of this program is to ensure that during the course of the Project all diligent means are employed to pursue practical and economically feasible waste management and recycling options.
 2. Upon award, each subcontractor shall be required to furnish documentation from suppliers or manufacturers regarding waste management and recycling options for those products and procedures furnished.
 3. Waste disposal to landfills shall be minimized.
- B. Definitions:
1. Waste: Any material that has reached the end of its intended use. Waste includes salvageable, returnable, recyclable and reusable construction materials that would otherwise be discarded or destroyed.
 2. Construction waste: Solid wastes including, but not limited to, building materials, packaging materials, debris and trash resulting from construction operations.
 3. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
 4. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
 5. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
 6. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the work.
 7. Hazardous waste: Any material or byproduct of construction that is regulated by the Environmental Protection Agency and that may not be disposed in any landfill or other waste end-source without adherence to applicable laws.
 8. Trash: Any product or material unable to be returned, reused, recycled or salvaged.
 9. Landfill: Any public or private business involved in the practice of trash disposal.
 10. Waste Management Plan: A Project-related plan for the collection, transportation, and disposal of the waste generated at the construction site.

1.02 PERFORMANCE REQUIREMENTS

- A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of a minimum of 50% by weight of total waste generated by the Work.
- B. Salvage/Recycle Requirements: Owner's goal is to salvage and recycle as much non-hazardous construction waste as possible including the following materials:
1. Site clearing waste
 2. Masonry and CMU
 3. Lumber
 4. Wood sheet material
 5. Wood trim
 6. Metals
 7. Roofing

8. Insulation
9. Carpet and pad
10. Gypsum Board
11. Piping
12. Electrical conduit
13. Packaging: Regardless of salvage/recycle goal indicated above, salvage and recycle 100% of the following uncontaminated packaging materials:
 - a. Paper
 - b. Cardboard
 - c. Boxes
 - d. Plastic sheet and film
 - e. Polystyrene packaging
 - f. Wood crates
 - g. Plastic pails

1.03 SUBMITTALS:

- A. Project information: Construction Waste Management Plan.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit copies of report. Include the following information:
 1. Material category
 2. Generation point of waste
 3. Total quantity of waste in tons
 4. Quantity of waste recycled, both estimated and actual in tons.
 5. Total quantity of waste recovered in tons.
 6. Total quantity of waste recovered as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for Substantial Completion, submit copies of calculated and of Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Record of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Record of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and processing Facility Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifest, weight tickets, receipts, and invoices.
- G. Qualification data: For refrigerant recovery technician.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Environmental Project Manager shall conduct conference at Project site to review methods and procedures related to waste management including but not limited to, the following:
 1. Review and discuss Waste Management Plan.
 2. Review requirements for documenting quantities of each type of waste and its disposition.
 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.05 CONSTRUCTION WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be recycled, or disposed in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling of transportation procedures.
 1. Recycled Materials: Assign recycling to recycling subcontractor. Or list local receivers and processors, and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility. List hazardous material waste and disposal separately.
 3. Handling and Transportation Procedures: include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
 1. Total quantity of waste.
 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 3. Total cost of disposal (with no waste management).
 4. Revenue from salvaged materials.
 5. Revenue from recycled materials.
 6. Savings in hauling and tipping fees by donating materials.
 7. Savings in hauling and tipping fees that are avoided.
 8. Handling and transportation costs. Include cost of collection containers for each type of waste.
 9. Net additional cost or net savings from waste management plan.
- E. Waste Management plan shall include locations of sorting and waste storage facilities on Site Plan of Project.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 CONSTRUCTION WASTE MANAGEMENT PLAN IMPLEMENTATION:

- A. Implement waste management plan as approved by Construction Manager. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract. Comply with the following procedures:
 1. Define specific areas to facilitate separation of materials for recycling, salvage, reuse or return.

2. Separate construction waste by type at Project site to maximum extent practical.
 3. Recycle and waste bin areas are to be maintained in an orderly manner and clearly marked to avoid contamination of materials. Inspect containers and bins weekly for contamination and remove contaminated materials found.
 4. Do not mix recyclable materials.
 5. Stockpile processed materials on site without intermixing with other materials. Place, grade, and shape stockpile to drain surface water. Cover to prevent windblown dust.
 6. Store materials away from construction area. Do not store within drip line or remaining trees.
 7. Store components off the ground and protect from weather.
 8. Remove construction waste off Owner's property and transport to appropriate receiver or processor.
- B. Hazardous Wastes: Store in secure areas and comply with following:
1. Hazardous wastes shall be separated, stored and disposed of in accordance with local and EPA regulations and additional criteria listed below:
 - a. Building products manufactured with PVC or containing chlorinated compounds shall not be incinerated.
 - b. Disposal of fluorescent tubes to open containers is not permitted.
- C. Unused fertilizers shall not be co-mingled with construction waste.
- D. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at the Project site.
1. Distribute waste management plan to everyone concerned within seven days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on the site. Review plan procedures and locations established for salvage, recycle, and disposal.
- E. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with environmental controls specified in Division 1 Section 01 50 00 "Temporary Facilities, Construction Controls and Facilities."
- F. Submit "Waste Reduction Progress Reports" each month as part of Application for Payment.
1. Materials identified in Report shall be reported by weight.
 2. Where weight is not applicable, Contractor shall report materials by units applicable to material recipient.
 3. Procure receipts or other validation of waste management procedures and include them as part of the submittal.

3.02 RECYCLING CONSTRUCTION WASTE – GENERAL

- A. General: Recycle paper and beverage containers used by on site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall be shared equally by owner and Contractor.

3.03 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials on site.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

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**SECTION 01 77 00
CLOSEOUT PROCEDURES**

PART 1 - GENERAL

1.01 GENERAL

- A. Substantial Completion: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below 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. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, Certificate of Occupancy from local jurisdiction, and similar documents.
 2. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities.
 3. Prepare and submit Project Record Documents, Operation and Maintenance Manuals, and similar final record information.
 4. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 5. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 6. Complete start-up testing of systems.
 7. Submit test/adjust/balance reports.
 8. Terminate and remove temporary facilities from Project site, along with mock-ups, construction tools, and similar elements.
 9. Advise Owner of changeover in heat and other utilities.
 10. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 11. Complete final cleaning requirements, including touch-up painting.
 12. Touch-up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Substantial Completion Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Re-inspection: Request a single re-inspection when the Work identified in the previous inspection as incomplete is completed or corrected.
 2. Additional Re-inspections: If additional re-inspections due to incomplete work are necessary, the Architect will be compensated on a time and material basis. The value of the work, performed by the Architect and its staff, shall be deleted from the Contractor's Contract in the form of a Change Order. The Owner will then compensate the Architect directly.
 3. Results of completed inspection will form the basis of requirements for Final Completion.
- C. Final Completion: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 1 Section 01 29 00 - Payment Procedures.
 2. Submit copy of Architect's substantial completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The copy of the list shall state that each item has been completed or otherwise resolved for

- acceptance.
3. Submit three copies of completed "Contractor's Affidavit of Payment of Debts and Claims", AIA Document G706, with supporting documents attached thereto including:
 - a. Three copies of completed "Contractor's Affidavit of Release of Liens", AIA Document G706A.
 - b. Three copies of completed "Consent of Surety to Final Payment", AIA Document G707.
 - c. Three copies of completed "Consent of Surety to Reduction in or Partial Release of Retainage", AIA Document G707A.
 - d. Contractor's release or waiver of liens, conditional upon receipt of final payment.
 - e. Separate releases or waivers of liens from subcontractors and material and equipment suppliers.
 4. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 5. Submit pest-control final inspection report and warranty.
 6. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- D. Final Completion Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate of Final Acceptance after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Re-inspection: Request a single re-inspection when the Work identified in the previous inspection as incomplete is completed or corrected.
 2. Additional Re-inspections: If additional re-inspections due to incomplete work are necessary, the Architect will be compensated on a time and material basis. The value of the work, performed by the Architect and its staff, shall be deleted from the Contractor's contract in the form of a Change Order. The Owner will then compensate the Architect directly.
- E. List of Incomplete Items (punch list): Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
- F. Project Record Documents: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- G. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings. Label marked-up Contract Drawing set as "Record Prints."
- H. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
1. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - a. Mark Record Prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

- b. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- I. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
- J. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
 - 1. Operation Data: Include emergency instructions and procedures, system and equipment descriptions, operating procedures, and sequence of operations.
 - 2. Maintenance Data: Include manufacturer's information, list of spare parts, maintenance procedures, maintenance and service schedules for preventive and routine maintenance, and copies of warranties and bonds.
 - 3. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.
- K. Warranties: Submit written warranties to the Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
 - 1. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 2. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
- L. Submit to WDNR for applicable Construction Site Storm Water Permit termination and certifications.
 - 1. Provide copy of DNR accepted "Notice of Termination" to Architect and Owner.
 - 2. For Tier 1 and Tier 2 Industrial Facilities, submit the "No Exposure Certification" to the DNR prior to starting facility operations.

PART 2 - GENERAL

2.01 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.01 CLOSEOUT PROCEDURES

- A. Demonstration and Training: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
 3. Schedule training with Owner, through Architect, with at least seven days advance notice.
 4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
 5. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for system design and operational philosophy, review of documentation, operations, adjustments, troubleshooting, maintenance, and repair.
- B. Final Cleaning: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and federal and local environmental and antipollution regulations.
- C. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
- D. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
1. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 2. Sweep paved areas broom clean. Remove spills, stains, and other foreign deposits.
 3. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 4. Remove construction equipment and surplus material from Project site.
 5. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains.
 6. Remove debris and surface dust from limited access spaces.
 7. Sweep concrete floors broom clean in unoccupied spaces.
 8. Vacuum carpet and similar soft surfaces; shampoo if visible soil or stains remain.
 9. Clean transparent materials, including mirrors and glass. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken transparent materials. Polish mirrors and glass.
 10. Remove labels that are not permanent.
 11. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored.
 - a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - b. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication and foreign substances.
 - c. Clean plumbing fixtures to a sanitary condition, free of stains.
 - d. Replace disposable air filters and clean permanent air filters.
 - e. Clean light fixtures, lamps, globes, and reflectors. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 12. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
 13. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or

dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

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**SECTION 01 78 23
OPERATION AND MAINTENANCE DATA**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. To aid in the continued instruction of operating and maintenance personnel, and to provide a positive source of information regarding the products incorporated in the Work, furnish and deliver the data described in this Section and in pertinent other Sections of these Specifications.
- B. Related Work Described Elsewhere:
 - 1. Make all submittals in strict accordance with the provisions of Section 01 33 00 and the Special Conditions of the Contract.
 - 2. Required contents of submittals may also be amplified in other pertinent Sections.

1.02 QUALITY ASSURANCE

- A. In preparation of data required by this Section, use only personnel who are thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with the requirements of this Section, and skilled in technical writing to the degree needed for communicating the essential data.

1.03 SUBMITTALS

- A. Preliminary:
 - 1. Submit two copies of a preliminary draft of the proposed manual or manuals to the Architect/Engineer for review and comments. Architect will submit one manual to the Owner for its review.
- B. Final:
 - 1. Unless otherwise directed in other pertinent Sections, or in writing by the Architect/Engineer, submit three copies of the final manual to the Architect/Engineer prior to indoctrination of operation and maintenance personnel.

PART 2 - PRODUCTS

2.01 INSTRUCTION MANUAL(S)

- A. General:
 - 1. Where instructions are required to be submitted under other Sections of these Specifications, prepare in accordance with the following:
- B. Format (One Complete Set):
 - 1. Size: 8-1/2" x 11".
 - 2. Paper: White bond, at least 20 lb. weight.
 - 3. Drawings: 11" in height preferable; bind in with text; foldout acceptable; larger drawings acceptable, but fold to fit within the manual and provide a drawing pocket inside rear cover or bind in with text.
 - 4. Flysheets:
 - a. Separate each portion of the manual with neatly prepared flysheets briefly describing contents of the ensuing portion; flysheets may be in color.
 - 5. Binding:
 - a. Use heavy-duty plastic or cardboard covers with binding mechanism concealed inside the manual; 3-ring binders will be acceptable; all binding shall be subject to the Architect's approval.

6. Measurements:
 - a. Show the U.S. measurements plus the SI equivalents.
- C. Covers:
 1. Provide front and back covers for each manual, using durable material approved by the Architect/Engineer and clearly identified on or through the front cover with at least the following information:
 - a. PROJECT NAME
 - b. PROJECT OWNER
 - c. LOCATION
 - i. (general subject of this manual)
 - ii. (space for approval signature of the Architect/Engineer and approval date)
- D. Contents: Include at least the following:
 1. Index near the front of the manual, giving immediate information as to location within the manual of all emergency data regarding the installation.
 - a. Complete instructions regarding operation and maintenance of all equipment involved, including lubrication, disassembly, and reassembly.
 - b. Complete nomenclature of all parts of all equipment.
 - c. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other pertinent data regarding procurement procedure.
 - d. Copies of all guarantees and warranties issued.
 - e. Manufacturers' bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturer's data with which this installation is not concerned.
 - f. Such other data as required in other pertinent Sections of these Specifications.

2.02 ELECTRONIC FORMAT

- A. The following language will be included minimally in the project specification section and supplemental to language normally supplied by the design team. The project team is to modify and/or expand the language as appropriate to the project.
- B. All O&Ms will be submitted electronically in Adobe .pdf format.
- C. Create at least one electronic .pdf file for each CSI division. Where file size does not exceed the size limitation, a single combined .pdf file will also be submitted for the entire O&M manual
- D. No single .pdf file will exceed 60MB in size. If a single CSI division file is greater than the 60MB size limitation, the file must be split into the CSI sub-sections.
- E. Each .pdf file created will be "OCR" keyword-searchable and also have bookmarks for each section, equipment manual/brochure, and other inserts. If the entity responsible for making the O&Ms does not have the in-house capability for creating the OCR searchable .pdf files, they must use AMS Imaging for this work.
- F. The O&M metadata.xls file will be completed with each O&M submittal. The O&M metadata.xls file can be obtained from the Brown project manager. Instructions for completing the metadata information is contained in the workbook.
- G. Assemble a complete electronic operations and maintenance (O&M) manual indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- H. Include product data (including final approved submittal data detailing equipment

performance data and features) and related information appropriate for the maintenance and operation of all products submitted on and furnished under the contract. System and product data shall be included for all equipment and systems indicated in Section 01 17 72 – Brown Building Equipment Data Sheet.

- I. Produce and submit one draft of the electronic O&M manual to the Director of Maintenance Operations four (4) weeks before substantial completion. The draft O&M submittal shall be reviewed by the Facilities Management Maintenance Operations staff for completeness of content. Any missing or incorrect information shall be corrected by the contractor.
- J. The electronic manual is to include, but is not limited to, the following minimum requirements and table of contents (additional requirements for the O&M may be found in the respective sections):
 1. Emergency contact list with contact names and twenty-four (24) hours contact information for use during the guarantee/maintenance period.
 2. Project directory with contact information including firm name, contact names, addresses and phone numbers, for the following:
 - a. owner's representative
 - b. architect,
 - c. design sub-consultants such as mechanical and electrical engineers, contractor, subcontractors
 - d. vendors and commissioning agents
 3. Summary of the scope of work of the project including any changes
 4. Schedule summary including start date, completion date, and start and end date of the project guarantee
 5. Copy of Certificate of Occupancy (if applicable)
 6. Copy of the executed Certificate of Substantial Completion (if applicable).
 7. Contractor's project warranty letter
 8. Subcontractor warranty letters.
 9. Special guarantees and warranties such as roofing, waterproofing, windows and doors as applicable.
- K. MATERIALS & FINISHES MANUALS:
 1. The materials and finishes information shall include details about products, applied materials and finishes as applicable:
 - a. Manufacturer's data, giving full information on products:
 - i. Catalog number, size, and composition
 - ii. Color and texture designations
 - iii. Information required for re-ordering specially-manufactured products
 - iv. Instructions for care and maintenance
 - b. Manufacturer's recommendations for types of cleaning agents and methods
 - c. Cautions against cleaning agents and methods which are detrimental to the product
 - d. Recommended schedule for cleaning and maintenance
 - e. Final as-built surfaces and finish schedule, keyed to reduced size floor plans included
- L. ROOFING SYSTEMS & BUILDING ENVELOPE MANUALS:
 1. The roofing systems and building envelope information shall include details for architectural products, such as doors and windows, roofing systems, waterproofing membranes and related materials; content to include based on project deliverables, as a minimum the following shall be required:
 - a. Manufacturer's data or copies of project submittals and shop drawings giving

- full information on products
 - b. Applicable standards
 - c. Details of installation
 - d. Instructions for inspection, maintenance, and repair
- M. EQUIPMENT SPECIFIC MANUALS:
 1. Information submitted shall include the following as applicable:
 - a. Normal operating characteristics and limiting conditions
 - b. Performance curves, engineering data and performance tests including HVAC system tests and balancing (TAB) reports, motor alignment test etc.
 - c. Electrical short circuit studies, circuit protection coordination studies and arc flash studies
 - d. Electrical panelboard and switchboard schedules
 - e. As installed schedules for lighting fixtures, lamps and ballasts
 - f. Nomenclature and catalog number of all replaceable parts
 - g. Manufacturer's printed instructions and operating procedures:
 - i. Start-up, break-in, routine and normal operating instructions
 - ii. Regulation, control, stopping, shut down and emergency instructions
 - iii. Summer and winter operating instructions
 - iv. Special operating instructions
 - h. Maintenance requirements and procedures:
 - i. Routine operations
 - ii. Guide to "troubleshooting"
 - iii. Illustrations, assembly drawings and diagrams required for maintenance, disassembly, repair and reassembly
 - iv. Alignment, adjusting and checking
 - i. Predicted life of parts subject to wear
 - j. Recommended spare parts
 - k. Maintenance agreements
 - l. Servicing and lubrication schedule; list of lubricants required
 - m. Equipment wiring and controls diagrams
 - n. One line and process flow diagrams submittals for applicable sub-systems:
 - i. Mechanical (heating, cooling, piping, process water and specialty systems)
 - ii. HVAC (Air handlers, ductwork, piping)
 - iii. Plumbing
 - iv. Electrical (normal, standby power systems and specialty systems)
 - v. Fire Alarm
 - vi. Security and Telecom
 - o. Charts of valve tag numbers, with location and function of each valve
 - p. Other data as required under pertinent sections:
 - i. Fire alarm system information – section 28 31 10
 - ii. Lighting controls information – section 26 50 00 and 26 56 00
 - iii. Grounding and bonding test report – section 26 05 26
- N. SYSTEM CONTROLS & SEQUENCE OF OPERATIONS MANUALS:
 1. System controls descriptions for normal operation and failure modes for large or complex systems that are comprised of multiple subsystems (such as building-wide

smoke control systems with standby power sources, fire alarm and building automation system interfaces)

2. Sequence of operations: include description of normal mode sequences and operation in all failure modes
3. As-built control diagrams and interconnection wiring information
4. One line and process flow diagrams submittals for applicable sub-systems

O.

P. BUILDING EQUIPMENT LISTS:

1. The project team shall utilize and complete the standard Building Equipment (section 01_17_72) data sheet template, in electronic Excel spreadsheet format, for all new equipment provided under the project. For renovation projects, include a separate spreadsheet for all equipment removed under the project.
2. The spreadsheet template includes required equipment specification data as well as information relating to the installed equipment location and building areas served by the equipment. This document also details the equipment type descriptions and keywords for use in the University's Facility Asset Management Information System (FAMIS).
3. At the time of delivery of the O&M manual the equipment list shall be updated with the as built information and included with the O&M delivery
4. DESIGN PHASE:
 - a. During the design phase, the project design team shall utilize and fill out the building equipment data sheet template, identifying and labeling all referenced equipment, equipment locations and other equipment reference data. The Microsoft Excel based version of the building equipment data sheet will create the required equipment tag numbers for all equipment and shall be filled out in coordination with record drawing version equipment nomenclature. Each equipment item shall be assigned a unique identification tag which is easily merged with existing equipment identifiers in the same building; generic common equipment designations are not acceptable.
 - b. A completed draft Brown building equipment data sheet Excel file for both new equipment and equipment to be removed shall be project deliverables, for completion by the contractor during construction.
5. CONSTRUCTION PHASE:
 - a. During the project design phase, the Engineer of Record shall utilize the Brown building equipment data sheet for identification of equipment to be removed from service. The building equipment data sheet shall also be completed with the initial information for all new equipment to be installed during the project.
 - b. During the construction phase, the general contractor shall utilize the Brown building equipment data sheet for updates to the list of equipment being removed and added and shall be responsible for completion of all remaining data sheet information.

PART 3 - EXECUTION

3.01 INSTRUCTION MANUALS

- A. Preliminary:
 1. Prepare a preliminary draft of each proposed manual. Show general arrangement, nature of contents in each portion, probable number of drawings and their size, and proposed method of binding and covering. Secure the Architect/Engineer's approval prior to proceeding with final.
- B. Final:
 1. Complete the manuals in strict accordance with the approved preliminary drafts and

the Architect/Engineer's review comments.

C. Revisions:

1. Following the indoctrination and instruction of operation and maintenance personnel, review all proposed revisions of manuals with the Architect/Engineer. If the Contractor is required by the Architect to revise previously approved manuals, compensation will be made as provided under "Changes to the Contract" in the General Conditions.

END OF SECTION

**SECTION 01 78 36
WARRANTIES**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.
 - 1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section 01 33 00 "Submittal Procedures" specifies procedures for submitting warranties.
 - 2. Divisions 2 through 48 Sections for specific requirements for warranties on products and installations specified to be warranted.
 - 3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- C. Disclaimers and Limitations: Manufacturers' disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturers' disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- D. Separate Prime Contracts: Each Prime Contractor is responsible for warranties related to its own Contract.

1.03 DEFINITIONS

- A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.04 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the work through a portion of its anticipated useful service life.

- D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
- E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.05 SUBMITTALS

- A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.
 - 1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within 15 days of completion of that designated portion of the Work.
- B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
- C. Prepare a written document utilizing the appropriate form, ready for execution by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
 - 1. Refer to Divisions 2 through 48 Sections for specific content requirements and particular requirements for submitting special warranties.
- D. Form of Submittal: At Final Completion compile 3 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the Table of Contents of the Project Manual.
- E. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the installer.
 - 2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
 - 3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS

2.01 Not Used

PART 3 - EXECUTION

3.01 LIST OF WARRANTIES

- A. Schedule: Provide warranties on products and installations as specified in the following Sections:
 - 1. Section 7 Roofing
 - 2. Section 7 Metal Siding
 - 3. Section 23 Mechanical / HVAC

END OF SECTION

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**SECTION 02 41 00
SELECTIVE DEMOLITION**

PART 1 - GENERAL

1.01 CODES

- A. All work shall comply with the applicable requirements of the local building code and accident and fire prevention regulations.

1.02 SCOPE

- A. The Work covered by this Section of Specifications includes, but is not limited to, the following:
 - 1. Demolish and remove existing construction materials as shown on the Drawings and noted in the Project Manual and as required for a proper installation.
 - 2. Cover holes and other hazardous openings with approved materials and barriers.
 - 3. Remove all demolition materials and debris from the Project site and dispose of in a legal manner.
- B. Protect adequately the Project site, adjoining property, and utility services as work proceeds through all stages.

1.03 QUALITY ASSURANCE

- A. Contractor's staff responsible for demolition shall be experienced in this type of work. Equipment is to be of suitable type, in good working condition, and operated by skilled mechanics.

PART 2 - PRODUCTS

2.01 NOT APPLICABLE

PART 3 - EXECUTION

3.01 GENERAL INSTRUCTIONS

- A. All work shall be done in a safe and cautious manner in order to avoid accidents and property damage.
- B. Protect the work scheduled to remain and, if damaged, repair to match existing work.
- C. All salvaged material, unless otherwise noted in Drawings or in the Description of Work, shall become the property of the Contractor and shall be evaluated in the Contractor's bid price. Remove promptly salvaged material from the Project site as the work proceeds.
- D. Carefully dismantle and store on site all material scheduled to remain the property of the Owner. Protect until removed by the Owner or until end of Contract.
- E. Protect from damage, and clean and overhaul materials scheduled to be reused.
- F. Protect parts of the existing work scheduled to remain. Cut away carefully the parts to be demolished to reduce the amount of necessary repairs.
- G. Support existing structure as needed during cutting of new openings or replacement of structural members.
- H. Prevent accumulation of debris and overloading of any part of the structure.
- I. Prevent access of unauthorized persons to partly demolished areas.
- J. Remove all demolition materials, debris, and rubbish from the Project site as soon as practicable. Do not permit any accumulation on the Project site. Transport all demolition materials without spillage onto the streets.

END OF SECTION

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**SECTION 03 10 00
CONCRETE FORMS AND ACCESSORIES**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Work under this Section includes all labor, materials, equipment, and services necessary to complete the concrete forms and accessories work as shown on the Drawings and herein specified.
- B. Products Installed But Not Supplied Under This Section:
 - 1. Built-in anchors, inserts, and bolts for connection of other materials.
 - 2. Built-in sleeves, thimbles, anchor slots, and water stops.
 - 3. Masonry accessories attached to formwork.
 - 4. Metal fabrications attached to formwork.
 - 5. Flashing, reglets, and sheet metal attached to formwork.
- C. Related Sections:
 - 1. Section 03 20 00: Concrete Reinforcement
 - 2. Section 03 30 00: Cast-In-Place Concrete

1.02 DEFINITIONS

- A. Non-Architectural Concrete Surfaces: Formed surfaces where appearance is not a design consideration.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Submit no later than ten days after notice to proceed or five days prior to pour, whichever is earlier.
- C. Product data for proprietary materials and items, including forming accessories, joint systems, and others if requested by Architect.
- D. Shop drawings, if requested by the Architect/Engineer:
 - 1. Conform to ACI 301.
 - 2. Indicate fabrication and erection of forms for finished concrete surfaces. Show form construction including jointing, special form joints or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually.
 - 3. Architect/Engineer's review is for general architectural applications and features only. The design, engineering, safety, and construction of formwork, re-shoring, and back-shoring (including for structural stability and efficiency) shall remain the sole responsibility of the Contractor.
 - 4. Calculations for formwork, re-shoring, and back-shoring as applicable, sealed by a Professional Engineer licensed in the state applicable to work and Project location.
 - 5. Obtain acceptance of shop drawings prior to fabrication.
- E. Samples of materials, if requested by Architect/Engineer, including names, sources, and descriptions, as follows:
 - 1. Form ties.
 - 2. Form liners.
 - 3. Reglets.
 - 4. Waterstops.

5. Expansion joint materials.
6. Others, if requested by the Architect/Engineer.

1.04 QUALITY ASSURANCE

- A. General: Conform to ACI 347: "Recommended Practice for Concrete Formwork".
- B. Design Criteria:
 1. All formwork is subject to the Architect/Engineer's approval.
 2. The design, engineering, safety, and construction shall remain the responsibility of the Contractor.
 3. Conform to ACI 347, "Recommended Practice for Concrete Formwork"
 4. Formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
 5. Side forms of footings may be omitted and concrete placed directly against excavation only when requested by Contractor and accepted by Architect/Engineer. When omission of forms is accepted, provide additional concrete two (2) inches beyond the minimum design profiles and dimensions of the footings as detailed.
- C. Regulatory Requirements:
 1. Conform to requirements of local, state, and federal rules and regulations applicable to work and Project location.
 2. Conform to the applicable requirements and recommendations of the following codes, specifications, and standards except as modified by the Contract Documents and herein:
 - a. American Concrete Institute, ACI 117 - 90 "Standard Specifications for Tolerances for Concrete Construction and Materials."
 - b. American Concrete Institute, ACI 301 - 99 "Specifications for Structural Concrete."
 - c. American Concrete Institute, ACI 302.1R "Guide for Concrete Floor and Slab Construction".
 - d. American Concrete Institute, ACI 318 - 02 "Building Code Requirements for Structural Concrete."
 - e. American Concrete Institute, ACI 304.2R - 96 "Placing Concrete by Pumping Methods."
 - f. American Welding Society, AWS D1.4-81 "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction."
- D. Where provisions of the above codes and standards are in conflict with each other or the building code in force for this Project, the most stringent shall govern.
- E. Allowable Tolerances:
 1. Non-Architectural Concrete: Conform to ACI 347, Article 3.3.
- F. Where a conflict occurs between the standard specified, the more stringent shall govern.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. On delivery to job site, place materials in area protected from weather.
- B. Store materials above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
- C. Handle materials to prevent damage.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Conform to ACI 347-78 "Recommended Practice for Concrete Formwork", Chapter 4 - Materials for Formwork.
- B. Forms for Exposed Finish Concrete Surfaces:
 - 1. Construct formwork with plywood, metal, metal-framed plywood-faced or other panel type materials acceptable to Architect/Engineer, to provide continuous, straight, smooth exposed surfaces.
 - 2. Formwork shall be mortar-tight and constructed of a material with sufficient thickness to withstand pressure of newly placed concrete without bow or deflection.
 - 3. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings.
 - 4. Temporary openings may be provided on all walls and forms to limit the free fall of the concrete to less than four feet and should be so located as to facilitate the placing and consolidation of the concrete. The ports shall be spaced no more than 6 feet apart to limit the horizontal flow of concrete.
- C. Forms for Unexposed Finish Concrete Surfaces:
 - 1. Construct formwork with plywood, board, metal, or other acceptable material.
 - 2. Provide lumber dressed on at least two edges and one side for tight fit.
- D. Forms for Textured Finish Concrete Surfaces:
 - 1. Units of face design, size, arrangement, and configuration to match Architect/Engineer's control sample. Provide solid backing and form supports to ensure stability of textured form liners.
- E. Forms for Cylindrical Columns and Supports:
 - 1. Metal, glass-fiber-reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.
- F. Pan-Type Forms:
 - 1. Glass-fiber-reinforced plastic or formed steel, stiffened to support weight of placed concrete without deformation.
- G. Carton Forms:
 - 1. Biodegradable paper surface, treated for moisture-resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.
- H. Form Ties and Accessories:
 - 1. Provide factory-fabricated, adjustable-length, removable or snap-off form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
 - 2. Provide ties so that portion remaining within concrete after removal of exterior parts is at least 1-1/2" inside the outer concrete surface. Cutting ties back from face of wall or use of wire ties will not be permitted.
 - 3. Provide ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in the concrete surface.
 - 4. Ties shall be fitted with tapered rubber plugs and plug holes shall be filled with non-shrink grout after forms are removed where concrete is exposed to view. Where the walls have earth on both sides, tapered rubber plugs on the ties will not be required. In these areas snap ties will be sufficient.
- I. Form Coatings:
 - 1. Provide commercial formulation compounds that will not bond with, stain, nor

adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water of curing compounds.

PART 3 - EXECUTION

3.01 GENERAL

- A. Conform to ACI 347 "Recommended Practice for Concrete Formwork", Chapter 3, Construction.
- B. Allowable Tolerances: Construct formwork to provide completed cast-in-place concrete surfaces complying with the tolerances specified in ACI 347 "Recommended Practice for Concrete Formwork", and as follows:
 - 1. Variation from plumb in lines and surfaces: 1/4" per 10 feet, but not more than 1".
 - 2. Variation from level or from grades indicated on the Drawings: for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, 1/4" in any bay or 20 feet max. and 1/2" in 40 feet or more.
 - 3. Variation in cross-sectional dimensions of thickness of slabs and walls: - 1/4" and + 1/2".
 - 4. Variations in footings plan dimensions: - 1/2" and + 2"; misplacement or eccentricity: 2% of the footing width in direction of misplacement but not more than 2"; thickness reduction: 5%.
- C. Provide for openings, offsets, key-ways, screeds, bulkhead, and other features required.
- D. Before concrete placement check the lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems.
- E. Limit the free fall of the concrete to less than four feet. Temporary openings may be provided on walls and forms to accomplish this, and should be so located as to facilitate the placing and consolidation of the concrete. The ports shall be spaced no more than 6 feet apart to limit the horizontal flow of concrete.
- F. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.
- G. Embedded Items:
 - 1. Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.
 - 2. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.
 - 3. Provide metal inserts for anchorage of materials or equipment to concrete construction, not supplied by other trades and as required for the work.
- H. Coat form contact surfaces with form-coating compound before reinforcement is placed.

3.02 FORMWORK

- A. Forms for exposed concrete:
 - 1. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back joints with extra studs or girts to maintain true, square intersections.
 - 2. Use extra studs, walers and bracing as required to prevent bowing of forms between studs and to avoid bowed appearance in concrete. Do not use narrow strips of form materials which will produce bow.
 - 3. Form molding shapes, recesses and projections with smooth-finish materials, and install in forms with sealed joints to prevent displacement.

- B. Corner treatment for all concrete:
 - 1. Form chamfers with 3/4" x 3/4" strips, accurately formed and surfaced to produce uniformly straight lines and tight edge joints.
 - 2. Extend terminal edges to limit and miter chamfer strips at changes in direction.

3.03 REMOVAL OF FORMWORK

- A. Formwork not supporting concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided that curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs and other structural elements may not be removed in less than 14 days, and not until concrete has attained design minimum 28 day compressive strength.

END OF SECTION

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**SECTION 03 20 00
CONCRETE REINFORCEMENT**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Work under this Section includes all labor, materials, equipment, and services necessary to complete the concrete reinforcement work as shown on the Drawings and herein specified.
- B. Products Supplied But Not Installed Under This Section:
 - 1. Concrete reinforcement.
- C. Related Sections:
 - 1. Section 03 10 00: Concrete Forms and Accessories
 - 2. Section 03 30 00: Cast-In-Place Concrete

1.02 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Submit no later than ten days after notice to proceed or five days prior to pour, whichever is earlier.
- C. Product data for proprietary materials and items, including reinforcement, reinforcing bar couplers, reinforcing bar chairs, dowels and dowel baskets, and others if requested by Architect.
- D. Shop drawings as follows:
 - 1. Conform to ACI 301.
 - 2. Placing Drawings:
 - a. Detail fabricating, bending, and placing of reinforcement.
 - b. Show sizes and dimensions for fabrication of reinforcing steel and bar supports.
 - c. Show sizes and dimensions for placing of reinforcing steel and bar supports.
 - d. Show sizes and dimensions for fabrication of reinforcing wire fabric and supports.
 - e. Show sizes and dimensions for placing of reinforcing wire fabric and supports.
 - f. Indicate reinforcement sizes, spacing dimensions, locations, and quantities. Show bar schedules and diagrams of bent bars, stirrup spacing dimensions, splicing, and supporting and spacing devices. Include any special reinforcing required.
 - g. Conform to American Concrete Institute, ACI SP-66 - 94 "ACI Detailing Manual" providing full wall elevations.
 - h. Use 24" x 36" paper size and format per "Fig. 20-Recommended Layout for Placing Drawings" in the American Concrete Institute "Details and Detailing of Concrete Reinforcement (ACI 315-80)*(Revised 1986)."
 - 3. Certificates:
 - a. Provide mill test certificates identifying chemical and physical analysis of each load of reinforcing steel delivered to the supplier.
 - 4. Initial submittal of reinforcement shop drawings shall be complete. No partial submittals will be accepted.
 - 5. Obtain acceptance of shop drawings prior to fabrication.
- E. Samples of materials if requested by Architect, including names, sources, and descriptions,

as follows:

1. Fiber reinforcement.
2. Welded wire reinforcement.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
1. Conform to requirements of local, state, and federal rules and regulations applicable to work and project location.
 2. Conform to the applicable requirements and recommendations of the following codes, specifications, and standards except as modified by the Contract Documents and herein:
 - a. American Concrete Institute, ACI 117 - 90 "Standard Specifications for Tolerances for Concrete Construction and Materials."
 - b. American Concrete Institute, ACI 301 - 99 "Specifications for Structural Concrete."
 - c. American Concrete Institute, ACI 302.1R "Guide for Concrete Floor and Slab Construction".
 - d. American Concrete Institute, ACI 315 - 99 "Details and Detailing of Concrete Reinforcement."
 - e. American Concrete Institute, ACI 318 - 02 "Building Code Requirements for Structural Concrete."
 - f. American Concrete Institute, ACI SP-66 - 94 "ACI Detailing Manual"
 - g. American Welding Society, AWS D1.4-81 "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction."
 - h. American Welding Society, AWS D4 Structural Welding Code – Reinforcing Steel.
 - i. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
- B. Where provisions of the above codes and standards are in conflict with each other or the building code in force for this Project, the most stringent shall govern.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver reinforcement to project site in bundles marked with metal tags indicating bar size and length.
- B. Handle and store materials to prevent damage and accumulation of dirt or excessive rust.
- C. Deliver and store welding electrodes in accord with AWS D 1.4.

1.05 REFERENCE STANDARDS

- A. ACI 301 - Specification for Structural Concrete for Buildings.
- B. AWS D.4 - Structural Welding Code - Reinforcing Steel.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Reinforcing Bars:
1. "Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement", ASTM A 615 (ASTM A 615M), Grade 60 (Grade 420), deformed.
 2. "Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement", ASTM A 996 (ASTM A 996M), Grade 60 (Grade 420), Type A.
- B. Coated Reinforcing Bars:

1. "Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement", ASTM A 767 (ASTM A 767M), Class 2, 2.0 oz/psf zinc, galvanized after fabrication and bending.
 2. "Standard Specification for Epoxy-Coated Steel Reinforcing Bars", ASTM A 775 (ASTM A 775M), patching material supplied, surface prepared to meet SSPC-Vis 1.
- C. Bar Mats:
1. "Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement", ASTM A 184 (ASTM A 184M), clipped.
- D. Wire:
1. "Standard Specification for Steel Wire, Plain, for Concrete Reinforcement", ASTM A 82, plain, cold-drawn steel.
 2. "Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement", ASTM A 496.
- E. Welded Wire Fabric:
1. "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete", ASTM A 185, flat sheets.
 2. "Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete", ASTM A 497, flat sheets.
 3. Provide sheet welded wire fabric for concrete reinforcement. Rolled welded wire fabric is not permitted.
- F. Coated Wire and Welded Wire Fabric:
1. "Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement", ASTM A 884 (ASTM A 884M), Class A, patching material supplied, surface prepared to meet SSPC-Vis 1.
- G. Reinforcement Supports:
1. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place. Do not float bars into place or use bricks.
 2. Use wire bar-type supports complying with CRSI specifications. Do not use wood, brick, and other unacceptable materials.
 3. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
 4. For footings, use chairs for reinforcing. Do not float bars into place or use bricks.
 5. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).
 6. Uncoated or coated to match reinforcement.
- H. Tie Wire: Annealed steel, black, 16 gauge minimum. Uncoated or coated to match reinforcement.

2.02 ACCESSORIES

- A. Welding Electrodes:
1. AWS A5.1, low hydrogen, E70 series.

2.03 FABRICATION

- A. Fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI "Manual of Standard Practice". In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken the material.
- B. Reinforcement with any of the following defects will not be permitted in the Work.

1. Bar lengths, depths and bends exceeding specified fabrication tolerance.
2. Bend or kinks not indicated on Drawings or final shop drawings.
3. Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Placement:
 1. Comply with the requirements in Chapters 5-6 of ACI 301.
- B. Steel Adjustment:
 1. Move within allowable tolerances to avoid interference with other reinforcing steel, conduits, or embedded items.
 2. Do not move bars beyond allowable tolerances without concurrence of Architect/Engineer.
 3. Do not heat, bend, or cut bars without concurrence of Architect/Engineer.
- C. Splices:
 1. Lap splices: Tie securely with wire to prevent displacement of splices during placement of concrete.
 2. Welding: Perform in accordance with AWS D 1.4.
 3. Do not splice bars except at locations shown on drawings without concurrence of Architect/Engineer.
- D. Wire Fabric:
 1. Install in longest practicable length.
 2. Lap adjoining pieces one full mesh minimum and lay splices with 16 gauge wire.
 3. Do not make end laps midway between supporting beams, or directly over beams of continuous structures.
 4. Offset end laps in adjacent widths to prevent continuous laps.
 5. Provide chairs and bolsters to properly locate fabric.
- E. Bar and Fabric Supports:
 1. Provide sufficient numbers of supports and of strength to carry bar and fabric reinforcement.
 2. Do not place reinforcing bars more than 2" beyond the last leg of any continuous bar support.
 3. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- F. Protect reinforcing with minimum thickness of concrete cover for cast-in-place concrete as follows; unless otherwise noted on the Drawings.
 1. Cast against and permanently exposed to earth 3"
 2. Exposed to earth or weather:
 - a. #6 through #18 bars 2"
 - b. #5 bars, 5/8" wire and smaller 1-1/2"
 3. Not exposed to weather or in contact with the ground.
 - a. Slabs, walls:
 - i. #14 and #18 bars 1-1/2"
 - ii. #11 and smaller 3/4"
 - b. Beams, girders, columns:
 - c. Principle reinforcement, ties, stirrups, spirals 1-1/2"

- G. Cleaning: Remove dirt, grease, oil, loose mill scale, excessive rust, and foreign matter that will reduce bond with concrete.
- H. Installation:
 - 1. Position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
 - 2. Arrange, space and securely tie bars and bar supports together with 16 gauge wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so that ends are directed away from exposed concrete surfaces.

END OF SECTION

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**SECTION 03 30 00
CAST-IN-PLACE CONCRETE**

PART 1 - GENERAL

1.01 SUMMARY

- A. Work under this Section includes all labor, materials, equipment, and services necessary to complete the cast-in-place concrete work as shown on the Drawings and herein specified.
- B. Products Installed but Not Supplied Under This Section
 - 1. Concrete Accessories
 - 2. Concrete Reinforcement
 - 3. Joint Sealers
- C. Related Sections:
 - 1. Division 32 Section 32 16 00 – “Sidewalks, Curbs, and Gutters” for concrete sidewalks, exterior slabs on grade and curb and gutter.
- D. Related Sections
 - 1. Division 1 Section 01 45 00 – Quality Control
 - 2. Division 3 Section 03 10 00 – Concrete Forms and Accessories
 - 3. Division 3 Section 03 20 00 – Concrete Reinforcement
 - 4. Division 7 Section 07 92 00 – Joint Sealers

1.02 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Submit no later than ten days after notice to proceed or five days prior to pour, whichever is earlier.
- C. Product data for proprietary materials and items, including admixtures, patching compounds, curing compounds, hardeners, and dry-shake finish materials, and others if requested by Architect.
- D. Samples of materials, if requested by the Architect, including names, sources, and descriptions, as follows:
 - 1. Color finishes.
 - 2. Aggregate.
 - 3. Others, if requested by the Architect.
- E. Concrete mix designs indicating material content per cubic yard for each class of concrete to be furnished. Concrete mix properties shall be indicated. Each mix design shall include the following as a minimum.
 - a. Dry weights of cementitious materials.
 - b. Saturated surface-dried weights of fine and coarse aggregate with ASTM grading size number.
 - c. Quantities, type and name of admixtures with manufacturer's recommendations for proportioning.
 - d. Weight of water.
 - e. Specified Average Compressive Strength (f'_c) and Required Average Compressive Strength (f'_{cr}).
 - f. Water/Cementitious Materials (W/C) Ratio.
 - g. Slump.

- F. Mix design tests.
- G. Laboratory test reports for each material in concrete mix. In lieu of submitting laboratory test reports for each material in concrete mix, submit material certificates signed by the manufacturer and the Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.
- H. Certificates:
 - 1. Manufacturer and Contractor certifications that materials meet specification requirements.
 - 2. Ready-mix delivery tickets, ASTM C 94.
- I. Minutes of pre-installation conference.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements:
 - 1. Conform to requirements of local, state, and federal rules and regulations applicable to work and project location.
 - 2. Conform to the applicable requirements and recommendations of the following codes, specifications, and standards except as modified by the Contract Documents and herein:
 - a. American Concrete Institute, ACI 117 - 90 "Standard Specifications for Tolerances for Concrete Construction and Materials."
 - b. American Concrete Institute, ACI 301 - 99 "Specifications for Structural Concrete."
 - c. American Concrete Institute, ACI 302.1R - 96 "Guide for Concrete Floor and Slab Construction".
 - d. American Concrete Institute, ACI 318 - 02 "Building Code Requirements for Structural Concrete."
 - e. American Concrete Institute, ACI 304R-00 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete."
 - f. American Concrete Institute, ACI 304.2R - 96 "Placing Concrete by Pumping Methods."
 - g. American Concrete Institute, ACI 305R - 99 "Hot Weather Concreting."
 - h. American Concrete Institute, ACI 306R - 97 "Cold Weather Concreting."
 - i. American Concrete Institute, ACI 308R - 01 "Guide to Curing Concrete."
 - j. ASTM International, ASTM C309 – 11 "Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete."
 - k. American Welding Society, AWS D1.4-81 "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction."
 - l. American Welding Society, AWS D4 Structural Welding Code – Reinforcing Steel.
 - m. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
 - 3. Where provisions of the above codes and standards are in conflict with each other or the building code in force for this project, the most stringent shall govern.
- B. Allowable Tolerances:
 - 1. Flatwork true to plane 1/8" in 10'- 0" in areas to receive vinyl composition tile or rubber flooring, and flatwork true to plane 1/4" in 10'- 0" elsewhere. 1/4" accumulated maximum.
- C. Maintain copy of ACI 301 on site.

- D. Testing:
1. Engage a testing agency acceptable to Architect to perform testing responsibilities of the Contractor as specified in ACI 301.
 2. Contractor shall pay all costs of tests and transportation of test material.
 3. Submit 7 day and 28 day compressive strength test results to the Architect for his review.
 4. Test in accordance with Section 01 45 00 and "Methods of Sampling and Testing", ASTM C 94/C 94M.
 5. Sample every 100 yards or fraction thereof for concrete poured in one day and submit 7-day and 28-day compressive strength test results to the Architect for his review.
- E. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.
- F. Mockup: Cast mockup of size indicated or as required to demonstrate typical joints, form tie spacing, and proposed surface finish, texture, and color as requested by the Architect. Maintain sample panel exposed to view for duration of Project, after Architect's acceptance of visual qualities.
1. Demolish mockup and remove from Project site when directed by Architect.
- G. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section 01 31 19 "Project Meetings" and the following:
1. At least 3 to 5 days prior to submitting design mixes, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Require representatives of each entity directly concerned with cast-in-place concrete to attend conference, including, but not limited to, the following:
 - a. Contractor's superintendent.
 - b. Agency responsible for concrete design mixes.
 - c. Agency responsible for field quality control.
 - d. Ready-mix concrete producer.
 - e. Concrete subcontractor.
 - f. Primary admixture manufacturers.
- H. Structural Design Data
1. Concrete:
 - a. Floor slab, walks, aprons, utility encasements and yard slabs: $f'c=4000$ PSI
 - b. Footings: $f'c=3000$ PSI
 - c. Piers, foundation walls: $f'c=4000$ PSI
 - d. Precast topping: $f'c=4000$ PSI
 - e. Parking lots: $f'c=4500$ PSI
 - f. All miscellaneous: $f'c=4000$ PSI

I. Concrete Mixes:

Min. Comp. Strength (PSI/28 days)	Max. Aggr. Size (in.)	Min. Cement (lbs/cu.yd.)
3000	1-1/2	493.5
4000	3/4	587.5
4000	3/4	540.5

Max. Wtr./ Cement Ratio	Max. Slump ¹ (in.)	Air Content (percentage)
0.50	3	2-4
0.45	3	6 ²
0.45	3	2-4

¹Indicates slump prior to addition of super plasticizers..

²Exterior concrete exposed to frost. Minimum air content 6% plus or minus 1 percent.

1. Minimum 28 day concrete cylinder strength shall be:
 - a. Footings 3000 PSI
 - b. Foundation Walls 4000 PSI
 - c. Slab Systems 4000 PSI
2. Use ACI recommendations for slag cement substitute.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Cement: Store in weather-tight enclosures and protect against dampness, contamination, and warehouse set.
- B. Aggregates:
 1. Stockpile to prevent excessive segregation, or contamination with other materials or other sizes of aggregates.
 2. Use only one supply source for each aggregate stockpile.
- C. Admixtures:
 1. Store to prevent contamination, evaporation or damage.
 2. Protect liquid admixtures from freezing or harmful temperature ranges.
 3. Agitate emulsions prior to use.

1.05 PROJECT CONDITIONS

- A. Environmental Requirements:
 1. Allowable Concrete Temperatures:
 - a. Cold weather: Maximum and minimum, ASTM C 94/C 94M.
 - b. Hot weather: Maximum 90 degrees F. Do not place concrete during rain, sleet or snow unless protection is provided.
 2. Concrete work shall conform to American Concrete Institute, ACI 306R when the following conditions exist for more than three consecutive days:
 - a. The average daily temperature is less than 40 degrees F (5 degrees C). The average daily temperature is the average of the highest and the lowest temperatures occurring during the period from midnight to midnight.
 - b. The air temperature is not greater than 50 degrees F (10 degrees C) for more than one-half of any 24 hour period.
 3. Concrete work shall conform to American Concrete Institute, ACI 305R when any combination of the following conditions that tends to impair the quality of freshly mixed or hardened concrete by accelerating the rate of moisture loss and rate of cement hydration or otherwise cause detrimental results exists:

- a. High ambient temperature (generally greater than 75 degrees F).
 - b. High concrete temperature
 - c. Low relative humidity
 - d. Wind speed
 - e. Solar radiation
4. Do not place concrete during rain, sleet or snow unless protection is provided.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Forms and Accessories:
 1. See Section 03 10 00.
- B. Reinforcement:
 1. See Section 03 20 00.
- C. Concrete:
 1. Cement:
 - a. "Standard Specification for Portland Cement", ASTM C 150.
 2. Admixtures:
 - a. Air entraining:
 - i. "Standard Specification for Air-Entraining Admixtures for Concrete", ASTM C 260.
 - b. Chemical Admixtures:
 - i. "Standard Specification for Chemical Admixtures for Concrete", ASTM C 494/C 494M, **Type A**.
 - ii. Concrete may contain a Type A water-reducing admixture.
 - iii. Admixtures are to be used in accordance with manufacturer's recommendations.
 - iv. Chemical admixtures containing chlorides, sulfides, or nitrides are not permitted.
 - v. Admixtures shall be supplied by a single manufacturer.
 - vi. Admixture manufacturers are to be approved in writing by Architect/Engineer prior to use.
 - c. Do not use calcium chloride in concrete.
 3. Aggregates:
 - a. "Standard Specification for Concrete Aggregates", ASTM C 33.
 4. Water: Clean and not detrimental to concrete.
 5. Slump: Plus tolerance 0, minus tolerance 1-1/2".
 6. Mix proportioning: To produce 7-day and 28-day compressive strength of moist cured laboratory samples, as specified under Structural Design Data.
 7. Ready-Mixed Concrete:
 - a. "Standard Specification for Ready-Mixed Concrete", ASTM C 94/C 94M.
 8. Fly Ash:
 - a. "Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete", ASTM C 618, **Class C with a low sulfur content [Class F]**.
 - b. Quality shall be consistent and from the same source. Fly ash shall be Type C.
 - c. Fly ash shall be supplied by a single manufacturer.
 - d. Proportioning by weight of cement shall not exceed 15%.

- i. For every 100 lbs. of cement, the mix shall be adjusted as follows:
 - (a.) 10 lbs. fly ash
 - (b.) 90 lbs. cement
 - e. Use of fly ash in exterior or entrained concrete on or after October 1 is not permitted.
- D. Fiber Mesh:
 - 1. Nylon fiber made of 100% virgin nylon 6 fiber for secondary reinforcement of concrete, ASTM C 39, ASTM C 78, and ASTM C 496. Acceptable products: Nycon nylon fiber as manufactured by Nycon, Inc., Nurlon Fiber Reinforcement as manufactured by Smith Chemical Corporation, and Forta Nylon as manufactured by FORTA Corporation.
 - 2. Fiber Reinforcement: Polypropylene fibers engineered and designed for secondary reinforcement of concrete slabs, complying with ASTM C 1116, Type III, not less than 3/4 inch long.
 - 3. Steel fibers per ASTM A 820.
- E. Evaporation Reducer
 - 1. MasterKure ER 50 as manufactured by BASF Chemical Company. Install per manufacturer's recommendations.
- F. Concrete Curing, Sealing and Hardening Compound
 - 1. "Standard Specification for Specification for Liquid Membrane-Forming Compounds for Curing Concrete", ASTM C 309-11.
 - 2. Curing and sealing materials shall be as follows:
 - a. All cast-in-place concrete to shall be moisture cured in accordance with ACI 301-99.
 - b. All interior cast-in-place concrete flatwork to remain exposed to view shall receive MasterKure HD 200WB as manufactured by BASF Chemical Company. MasterKure HD 200WB shall be applied at the manufacturers recommended rate.
 - c. All exterior cast-in-place concrete shall receive "type 2" white pigment curing compound in accordance with ASTM C309-11.
 - 3. No compound used shall inhibit or otherwise affect the application of the finish.
- G. Concrete Joint Sealant
 - 1. Joints to be sealed include control joints, construction joints, expansion joints, building isolation joints, bollard isolation joints, and isolation joints around floor cleanouts.
 - a. Joint compounds shall be as follows:
 - i. THC-901 as manufactured by Tremco, Inc., or Sonolastic SL 2 as manufactured by Sonneborn / ChemRex.
 - (a.) All joints in concrete flatwork shall receive, unless otherwise stated, Tremco THC-901 or Sonolastic SL 2.
 - (b.) Exterior concrete expansion joints in concrete walks and at bollards shall receive, unless otherwise stated, Tremflex 834 as manufactured by Tremco, Inc.
 - b. All joints in concrete flatwork to receive floor finish in accordance with Division 9 will receive joint filler under Division 9.
- H. Backer Systems
 - 1. Horizontal joint backers
 - a. Concrete Expansion and Isolation Joints where sealant is and is not specified:
 - i. 1/4 inch thick: 1.7 PCF Polyethylene cross-linked closed cell foam with 1/2" deep tear-off strip used with either hot or cold sealants, Dyna

Strip/Foamtastic Expansion Joint Material as manufactured by Symons Corporation.

- I. Waterstops
 - 1. Adhesive: Volclay WB-Adhesive
 - a. Application Rate: 400 – 600 linear feet per gallon.
 - 2. Waterstop: Expanding Bentonite/Butyl Waterstop-RX 101 as manufactured by Colloid Environment Company (CETCO).
 - 3. Rapid Hydration: Waterstop-RXRH.
 - 4. Polyvinyl Chloride Waterstops:
 - a. Polyvinyl Chloride Waterstops shall be 6 inches wide, 3/8 inches thick minimum, ribbed center bulb type and shall comply with U.S. Corps of Engineers Specification CRD-C572. Waterstops shall be continuous. Concrete shall be thoroughly vibrated around the waterstop to avoid honeycombs and to insure complete embedment of the ribbed flanges.
- J. Concrete Retaining Wall Weepholes
 - 1. Dimensions: 2" x 2" x length shown on the Drawings
 - 2. Material: Rigid PVC tubing.
 - 3. Manufacturer: VisiPak Extrusion or equivalent.
 - 4. Spacing: 4'- 0" on center. Coordinate locations with masonry coursing and nominal dimensions.
 - 5. Color: Light gray.
- K. Dovetail Anchor Inserts
 - 1. Galvanized steel inserts with flexible dovetail furnished under Technical Specification Section 04 05 23.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Assure that excavations and formwork are completed, and that ice and excess water are removed.
- B. Check that reinforcement is secured in place.
- C. Verify that expansion and isolation joint material, anchors and other embedded items are secured in position.

3.02 INSTALLATION

- A. Preparation:
 - 1. Notify other crafts involved in ample time to permit the installation of their work; cooperate with other trades in setting such work, as required.
 - 2. Thoroughly wet form immediately before placing concrete, where form coatings are not used.
 - 3. Coordinate the installation of joint materials, inserts, weepholes, embeds and bond breakers with placement of forms and reinforcing steel.
 - 4. Provide mechanical equipment for conveying concrete, and runways for wheeled concrete conveying equipment as required.
- B. Placing Concrete:
 - 1. Place concrete in compliance with the practices and recommendations of ACI 304.
 - 2. Convey concrete from mixer to final position by method which will prevent separation or loss of material.
 - 3. Maximum amount of concrete free fall shall be four feet so that placement of concrete

remains plastic and flows into position.

4. Deposit concrete in continuous operation until panel or section is completed.
5. Place concrete in horizontal layers of 18" maximum thickness.
6. Use air-entrained admixture 6% plus or minus 1% in exterior concrete exposed to weather.
7. Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is complete. Checkerboard placement is not permitted. Concrete shall be placed in strips.
8. Delays in continuous concrete placements longer than 60 minutes create discontinuous concrete and will require replacement of the concrete. Alternately, written approval by the Architect/Engineer can waive the replacement requirement.

C. Joints

1. General: Construct joints true to line with faces perpendicular to surface plane.
2. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Architect/Engineer.
3. Contraction Joints in Slabs-on-Grade: Form weakened plane contraction joints, sectioning concrete into locations or areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 - a. Sawcut joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch wide joints into concrete when cutting action will no longer tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
 - b. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams and other locations, as indicated.

D. Waterstops

1. General: Components and installation shall be in accordance with manufacturer's printed specifications and recommendations. CETCO: (847) 392-5800.
2. Concrete Walls:
 - a. Locate at junction of:
 - i. Footings and foundation walls
 - ii. Horizontal and vertical construction joints;
 - iii. Vertical control joints;
3. Slabs-on-grade:
 - a. Locate at the junction of:
 - i. Floor slabs and walls;
 - ii. Construction joints

E. Finishing

1. Formed Surfaces:
 - a. General:
 - i. Repairs and patches shall be done with compatible concrete grout.
 - ii. Repairs and patches are subject to approval of the Architect/Engineer. Repairs and patches deemed unacceptable by the Architect/Engineer shall be remedied at no cost to the Owner.
 - b. Rough-Formed Finish: As-cast concrete texture imparted by form facing material. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - i. Apply to concrete surfaces not exposed to view.
 - c. Smooth-Formed Finish: As-cast concrete texture imparted by form facing

- material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- i. Apply to concrete surfaces exposed to view.
- d. Architectural Rubbed Finish: Apply the following finish to smooth-formed finish concrete scheduled to remain exposed to view:
 - i. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
2. Unformed Surfaces:
 - a. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.
3. Floor Slabs:
 - a. General:
 - i. Comply with ACI 302.1R recommendations for spreading, vibrating, screeding, floating, re-straightening, troweling, and other finishing operations for concrete surfaces.
 - ii. Do not wet concrete surfaces during finishing operations.
 - b. Floating:
 - i. First Floating:
 - (a.) Apply first floating immediately after screeding and before any excess moisture or bleed water is present on the surface.
 - ii. Second Floating:
 - (a.) Do not work surface until surface is ready for the second floating. (typically after evaporation of most of the bleed water and the water sheen has disappeared.)
 - (b.) Compact and consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straighten until surface is left with a uniform, smooth, granular texture. Multiple passes shall be made perpendicular to previous passes.
 - iii. Apply float finish to surfaces to receive trowel finish.
 - c. Scratch Finish: After the first floating, and while still plastic, texture concrete surface. Use stiff brushes, brooms, or rakes to produce a profile amplitude of ¼ inch in one direction.
 - i. Apply scratch finish to surfaces to receive concrete floor topping and to receive mortar setting beds for bonded cementitious floor finishes.
 - d. Trowel Finish: After both first and second floatings, apply first troweling and consolidate concrete surface with power-driven trowel or by hand troweling if area is small or inaccessible to power driven trowels. Power-driven trowels shall not be used on elevated slabs unless specifically allowed in writing by the Architect/Engineer. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any defects that would telegraph through applied coatings or floor coverings.
 - i. Apply trowel finish to surfaces to be covered with resilient flooring, carpet, ceramic tile or quarry tile set over a cleavage membrane, paint of another thin-film-finish coating system, and elsewhere as indicated.
 - ii. Apply trowel finish to all surfaces that have not been indicated

elsewhere.

- iii. Flatness and levelness tolerances shall be as follows:
 - (a.) Finish and measure surface so gap at any point between concrete surface and an unlevelled, free-standing, 10-foot long straight edge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
 - (b.) FF 35 Flatness – 10' Grid.
FL 25 Levelness – 2' Grid
 - iv. Do not work surface until surface is ready for troweling.
 - e. Fine Broom Finish: After floating and first troweling, and while still plastic, texture concrete surface. Slightly scarify surface with a fine soft-bristled broom in one direction.
 - i. Apply fine broom finish to surfaces where ceramic or quarry tile is to be installed by either thick-set or thin-set method and elsewhere as indicated.
 - ii. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
 - f. Broom Finish: After floating and first troweling, and while still plastic, texture concrete surface. Scarify surface with a stiff-bristled broom in one direction.
 - i. Apply broom finish to exterior concrete platforms, stoops, steps, ramps, yard slabs, equipment pads, site concrete, garage floors, and elsewhere as indicated.
- F. Hardening:
- 1. Harden concrete in accordance with manufacturer's recommendations.
- G. Curing and Sealing:
- a. Keep concrete moist by using curing compounds in accordance with manufacturer's recommendations and moisture cure in accordance with ACI 301.
 - b. Place concrete joint fillers, backer systems, and waterstops as specified herein and in accordance with manufacturer's recommendations.
- H. Testing:
- 1. All concrete shall be tested in standard 6 x 12 inch cylinders.
 - 2. Frequency of Testing:
 - a. Make at least one strength test for each 100 cubic yards, or fraction thereof, of each mixture design of concrete placed in any one day. When the total quantity of concrete with a given mixture design is less than 50 cubic yards, the strength tests may be waived by the Architect/Engineer if, in his judgment, adequate evidence of satisfactory strength is provided, such as strength test results for the same kind of concrete supplied on the same day and under comparable conditions to other work.

3.03 PROTECTION OF COMPLETED WORK

- A. During curing period, protect concrete from damaging mechanical disturbances, water flow, loading, shock and vibration.

3.04 CLEANING

- A. All cleaning shall comply with Technical Specification Section 01 74 00 of this Project Manual.

END OF SECTION

**SECTION 05 12 00
STRUCTURAL STEEL**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Work under this section includes all labor, materials, equipment, and services necessary to complete the structural steel work as shown on the drawings and herein specified.

1.02 DESCRIPTION

- A. Related Work Specified Elsewhere:
 - 1. Division 6 Section 06 10 00 – Rough Carpentry

1.03 WORK FURNISHED BUT NOT INSTALLED

- A. Anchor bolts, angles and plates.
- B. Loose lintels, shelf angles, and plate steel.

1.04 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. Conform to requirements of local, state, and federal rules and regulations applicable to work and project location.
 - 2. All work shall conform to the requirements of the following codes and standards:
 - a. American Institute of Steel Construction (AISC)
 - i. AISC 360-10, "Specification for Structural Steel Buildings", June 22, 2010.
 - ii. AISC 303-10, "Code of Standard Practice for Steel Buildings and Bridges", April 14, 2010.
 - iii. "Specifications for Structural Joints using High-Strength Bolts", December 31, 2009.
 - b. American Society for Testing and Materials (ASTM), Specifications as referenced in this Section.
 - c. American Welding Society (AWS) D1.1 "Structural Welding Code".
 - 3. Where provisions of pertinent codes and standards conflict with this Specification, the more stringent provisions shall govern.
- B. Design Requirements:
 - 1. Connections shall be designed in accordance with these Specifications by the fabricator to support all applied loads, with the design approved or certified by a Structural Engineer.
 - 2. Connections not shown on the Drawings shall be selected or completed by the fabricator to withstand design loadings indicated. The fabricator shall utilize a qualified Structural Engineer to prepare calculations, shop drawings, and other structural data for steel connections.
- C. Professional Engineer Qualifications: A Professional Engineer who is legally authorized to practice in the jurisdiction where the Project is located and who is experienced in providing engineering services to the kind indicated that have resulted in installing steel connections similar to those indicated for this Project and with a record of successful in-service performance.

1.05 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Shop Drawings:
 - 1. Within 15 days after Award of Contract, and before any of the materials of this Section are delivered to the Project site, submit complete shop drawings to the Architect/Engineer in accordance with the provisions of Section 01 33 00 of these Specifications; show erection plans, connection details including location, type and size of all bolts and welds. Weld symbols shall conform to AWS A2.4-86 "Symbols for Welding and Nondestructive Testing."
- C. Product data or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with these 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.
 - a. Indicate Direct Tension Indicators if used.
 - 3. Structural steel primer paint.
- D. Welder's Certificates: Submit manufacturer's certificates, certifying welders employed on the Work, verifying AWS qualification within the previous 12 months.
- E. Submit final connection design calculations and drawings as required by local, state, and federal rules and regulations applicable to Work and Project location. Minimum of five (5) copies shall be submitted.

1.06 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the installed work and materials of all other trades.
- B. Replacement:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.
- C. Delivery:
 - 1. Anchor bolts and other anchorage devices which are embedded in cast-in-place concrete, or masonry construction shall be delivered to the Project site in time to be installed before the start of cast-in-place concrete operations or masonry work.
- D. Storage:
 - 1. Structural steel shall be stored off the ground and kept free of dirt and other foreign matter.
 - 2. Other materials shall be stored in a weather-tight and dry place until ready for use in the Work.
- E. Submittals
 - 1. Submit in accordance with Section 01 33 00.
 - a. Steel shop drawings.
 - b. Grout data and instruction sheet.
 - c. Product data.
 - d. Welder's Certificates.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Steel:
 - 1. ASTM A 36/A 36M: Standard Specification for Carbon Structural Steel; minimum $F_y = 36$ or $F_y = 50$ as specified on Drawings.
 - a. ASTM A 992/A 992M: Standard Specification for Structural Steel Shapes; Grade 50 Structural Steel
 - 2. ASTM A 53/A 53M: Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; Grade B.
 - 3. ASTM A 500: Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 4. ASTM A 501: Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 5. ASTM A 506: Standard Specification for Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled; Grade D or E,
 - 6. Shear Stud Connectors: ASTM A 354, or Threaded Rods: ASTM A 307.
- B. Fasteners:
 - 1. Bolts:
 - a. ASTM A 325: Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 KSI Minimum Tensile Strength
 - b. ASTM A 307: Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
- C. Grout:
 - 1. Grout shall comply with Technical Specification Section 03 60 00.

2.02 FINISHES

- A. General:
 - 1. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.
 - 2. Finish metal fabrications after shop assembly.
- B. Shop Finish
 - 1. Surface Preparation:
 - a. Pool Area (Exposed Steel to be Finished):
 - i. SSPC-SP6: The Society for Protective Coatings "Surface Preparation Specification No. 6 – Commercial Blast Cleaning", current Edition.
 - b. Mechanical & Electrical Rooms (Exposed Steel to be Finished):
 - i. SSPC-SP3: The Society for Protective Coatings "Surface Preparation Specification No. 3 – Power Tool Cleaning", current Edition.
 - c. Areas not exposed (Shop Prime Only):
 - i. SSPC-SP2: The Society for Protective Coatings "Surface Preparation Specification No. 2 – Hand Tool Cleaning", current Edition.
 - 2. Primer:
 - a. Fast curing, universal modified alkyd, rust-inhibiting shop coat with good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Primer shall comply with all federal standards for VOC, lead, and chromate levels. Color shall be gray.
 - b. Shop prime immediately after surface preparation, applying according to manufacturer's instructions to provide a dry film thickness of not less than 2.0 mils. Use priming methods that result in full coverage of joints, corners, edges,

and exposed surface.

3. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
 - a. ASTM A 153/A 153M for galvanizing hardware.
 - b. ASTM A 123/A 123M for galvanizing both fabricated and un-fabricated products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
- C. Touch-Up Painting
 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint and paint all exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
 2. Galvanizing Repair Paint: High-zinc-dust-content paint for galvanizing welds and repair-painting galvanized steel, with dry film containing not less than 90 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- D. Finish Painting
 1. Finish painting shall be performed under Section 09 90 00 – Paints and Coatings.

2.03 OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be new, first quality of their respective kinds, and subject to approval of the Architect.

PART 3 - EXECUTION

3.01 TOLERANCES

- A. Rolling, fabricating and erection tolerances shall conform to the requirements of AISC "Code of Standard Practice for Steel Buildings and Bridges", except for architecturally exposed steel which shall conform to the AISC "Specification for Architecturally Exposed Structural Steel."

3.02 FABRICATION

- A. General:
 1. Fabricate all structural steel in accordance with the State of Wisconsin Building Code and the AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings and Code of Standard Practice for Steel Buildings and Bridges.
- B. Shop Painting:
 1. Shop paint all steelwork, except contact surfaces which are to be welded, high strength bolted with friction type connections or in contact with concrete.

3.03 ERECTION

- A. General:
 1. Erect all structural steel in accordance with the State of Wisconsin Building Code and the AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings and Code of Standard Practice.
- B. Surface Conditions:
 1. Inspection:
 - a. Prior to work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 - b. Verify that all structural steel may be installed in accordance with all pertinent codes and regulations, the original design, and the referenced standards.

2. Discrepancies:
 - a. In the event of discrepancy, immediately notify the Architect/Engineer.
 - b. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
- C. Column Bases, And Bearing Plates:
 1. Column bases and bearing plates for beams and similar structural members shall be aligned with anchor bolts and grouted with non-shrink grout in accordance with Technical Specification Section 03 60 00.
- D. Gas Cutting:
 1. Field correcting of fabrication by gas cutting shall not be permitted on any major member in the structural framing without prior approval of the Architect/Engineer.
- E. Field Touch-Up Painting:
 1. After the erection of structural steel, touch-up paint field bolt heads, nuts, field welds and abrasions in the shop paint coating with the same paint used for the shop painting.
- F. Install and maintain temporary support and shoring.

END OF SECTION

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**SECTION 05 45 00
METAL SUPPORT ASSEMBLIES**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The scope of work includes, but is not necessarily limited to, the furnishing of necessary materials, labor, tools, equipment, accessories and testing to complete the following:
 - 1. Cold rolled channel studs, stud joists, tracks, runners, bracing, bridging, and furring.
 - 2. All required accessories as indicated herein, as shown on the Drawings, and as per manufacturer's recommendations.

1.02 QUALITY ASSURANCE

- A. Comply with the recommended specifications of the following:
 - 1. American Iron and Steel Institute (AISI) Specification for the Design of Cold-Formed Steel Structural Members, Cold-Formed Steel Design Manual, latest edition.
 - 2. American Society for Testing and Materials, ASTM A 653/A 653M: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, and ASTM C 645: Standard Specification for Nonstructural Steel Framing Members.
 - 3. AWS (American Welding Society) Structural Welding Code (D1.1); Specification for Welding Sheet Steel in Structures (D1.3)

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Furnish the following items for approval prior to delivery of materials to the site:
 - 1. Shop drawings: Show materials, shop coatings, steel thicknesses, details of fabrication, and details of attachment to adjoining work, size, location, and spacing of fasteners for attaching framing to itself, details of attachment to the structure, accessories and their installation, and critical installation procedures.
 - 2. Calculations: Engineering calculations or data shall be submitted verifying the framing assembly's ability to meet or exceed design requirements as required by local codes for Architect's and Owner's review.
 - 3. Descriptive literature: Manufacturer's literature containing product and installation specifications and details.
 - 4. Contractor shall submit calculations or data to verify that framing members are in accordance with ASTM C 645.

1.04 DELIVERY AND STORAGE

- A. Handle material in a manner which prevents permanent distortion or loss of structural properties. Store material off ground. Keep dry and protected from weather.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Material shall be manufactured by Dale/Incor, Dietrich Metal Framing, National Gypsum Co., or USG Corp.

2.02 MATERIALS

- A. All non-structural framing members and accessories shall be of the type, size and spacing

as engineered by the manufacturer and shall be manufactured per ASTM C 645.

- B. All light gauge steel (unless noted otherwise) shall be formed from steel that corresponds to the requirements of ASTM A 653/A 653M, Grade A, (Minimum yield strength of 33 KSI).
- C. All non-load-bearing walls and ceiling joists shall be spaced at 16" center to center unless noted otherwise.
- D. All non-load-bearing walls to receive ceramic tile shall be minimum 18 gauge studs, track, bridging, and accessories.
- E. All toilet room stud walls receiving water closets shall be 18 gauge studs, track, bridging, and accessories.
- F. Knee wall construction shall be minimum 14 gauge studs, track, bridging, and accessories.
- G. All ceiling joists shall be minimum 18 gauge joists, track, bridging, and accessories.
- H. All exterior non-load-bearing walls, unless noted otherwise, shall be minimum 18 gauge studs, track, bridging, and accessories.
- I. All interior non-load-bearing walls, unless noted otherwise, shall be minimum 22 gauge studs, track, bridging, and accessories. Doors and windows in interior non-load-bearing walls shall have two full height studs on each side of opening.
- J. Facing material shall not be substituted for bridging.
- K. All studs shall have manufacturer's standard punching.
- L. All anchors shall be provided in accordance with the Drawings, specified herein, and in accordance with manufacturer's recommendations.
- M. Metal furring channels shall be roll-formed, hat shaped sections made of 24 gauge galvanized steel.
- N. Two-inch deep deflection track required at top of non-bearing walls.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Significant temporary concentrated floor or roof loads, such as construction loads due to stacking of heavy building materials, should be avoided during construction unless adequate additional means for carrying these loads has been provided by the Contractor and accepted by the Architect.
- B. Tracks shall be securely anchored to the supporting structure as shown on the Drawings. Butt weld or splice track at all butt joints.
- C. Studs shall be plumbed, aligned and securely attached to the flanges or webs of both upper and lower tracks. Torch cutting of load bearing members is not permitted.
- D. Studs shall not be spliced. Coordinate with other trades to provide necessary backing, blocking or clearance in walls for anchorage or positioning of their work.
- E. Provide insulation equal to that specified elsewhere in all doubled jamb studs and doubled header members which will not be accessible to the insulation contractor.
- F. Joists shall be located directly over bearing studs, or a load distribution member (continuous header) shall be provided at top track.
- G. Provide single row of bridging in joist spaces.
- H. Provide additional joists and blocking in canopy at mechanical penetrations.
- I. End blocking shall be provided where joist ends are not otherwise restrained from rotation.

3.02 FASTENINGS AND ATTACHMENTS

- A. Anchorage of the tracks to the structure shall be with methods designed for the specific application. Size, penetration, type, and spacing shall be as shown on the Drawings.
- B. Welds shall conform to the requirements of AWS D1.1, AWS D1.3, and AISI Manual Section 4 - Connections. All welds shall be touched-up using zinc rich paint.
- C. Screws shall have a protective coating equivalent to cadmium or zinc plating Type NS for use in exterior assemblies.
- D. Wire tying of members is not permitted.

3.03 RESTORATION OF GALVANIZING

- A. After fabrication and erection, restore surfaces damaged or destroyed by application of Z.R.C. Cold Galvanizing Compound or Welco Cold-Galv. Also restore weld surfaces. Products shall be used in strict compliance with recommendations of manufacturer.

END OF SECTION

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**SECTION 05 50 00
METAL FABRICATIONS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following metal fabrications:
 - 1. Rough hardware.
 - 2. Loose bearing and leveling plates.
 - 3. Loose steel lintels.
 - 4. Shelf and relieving angles.
 - 5. Miscellaneous framing and supports for the following:
 - a. Applications where framing and supports are not specified in other Sections.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 5 Section 05 12 00 – "Structural Steel" for structural steel framing system components.
 - 2. Division 5 Section 05 51 00– "Metal Stairs" for metal framed stairs with metal pan treads.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Samples representative of materials and finished products as may be requested by Architect/Engineer.

1.04 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.05 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.01 FERROUS METALS

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/ A 36M.
- C. Rolled Steel Floor Plates: ASTM A 786/A 786M.
- D. Steel Tubing: Product type (manufacturing method) and as follows:
 - 1. Cold-Formed Steel Tubing: ASTM A 500.
 - 2. Hot-Formed Steel Tubing: ASTM A 501.
- E. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/ A 47M malleable iron or ASTM A 27/ A 27M cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153/A 153M.
- F. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.02 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563/ A 563M, and, where indicated, flat washers.
- C. Machine Screws: ANSI B18.6.3 (ANSI B18.6.7M).
- D. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).
- E. Wood Screws: Flat head, carbon steel, ANSI B18.6.1.
- F. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).
- G. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- H. Anchor Bolts: ASTM F1554-99, Grade 36
 - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- I. 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 and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
 - 1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
- J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.
- K. Adhesive Anchors: Hilti HVA adhesive anchor with anchor meeting ASTM A193-01b, Grade B7.
 - 1. Threads on anchors shall conform to Unified Standard Series of ASME B18.2.6 with Class 2A tolerances.

2.03 GROUT

- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
 - 1. Non-shrink, Nonmetallic Grouts:
 - a. B-6 Construction Grout; Bonsal American, Inc.
 - b. Diamond-Crete Grout; Concrete Service Materials Co.
 - c. Sure-Grip High Performance Grout; Dayton Superior Specialty Chemical Corp.
 - d. Euco N-S Grout; Euclid Chemical Co.
 - e. Five Star Grout; Five Star Products, Inc.
 - f. Vibropruf #11; Lambert Corp.
 - g. Crystex; L & M Construction Chemicals, Inc.
 - h. Masterflow 928 and 713; ChemRex-Degussa Building Systems.
 - i. Sealtight 588 Grout; W. R. Meadows, Inc.
 - j. SonogROUT 14; Sonneborn Building Products, ChemRex-Degussa Building Systems
 - k. Kemset; ChemMasters.

2.04 CONCRETE FILL

- A. Concrete Materials and Properties: Comply with requirements of Division 3 Section 03 30 00 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 PSI (20 MPa), unless higher strengths are indicated.

2.05 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Remove sharp or rough areas on exposed traffic surfaces.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- G. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- H. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- I. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- J. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.06 ROUGH HARDWARE

- A. Furnish bent, or otherwise custom-fabricated, bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.07 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.08 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.

2.09 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports for applications indicated that are not a part of structural steel framework as required to complete the Work.
- B. Fabricate units to sizes, shapes, and profiles indicated and required to receive other adjacent construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
 - 1. Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
 - a. Except as otherwise indicated, space anchors 24 inches (600 mm) on-center and provide minimum anchor units in the form of steel straps 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long.
- C. Fabricate support for suspended toilet partitions as follows:
 - 1. Beams: Continuous steel shapes of size required to limit deflection to L/360 between hangers.

2. Hangers: Steel rods spaced not more than 36 inches (900 mm) on-center. Thread rods to receive anchor and stop nuts. Fit hangers with wedge-shaped washers for full bearing on sloping flanges of support beam.
3. Braces and Angles: Steel angles of size required for rigid support of beam and for secure anchorage.

2.10 STEEL BOLLARDS

- A. Fabricate pipe bollards from Schedule 40 steel pipe.
- B. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- (6.4-mm-) thick steel plate welded to bottom of sleeve.

2.11 FINISHES

- A. General:
 1. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.
 2. Finish metal fabrications after shop assembly.
- B. Shop Finish
 1. Surface Preparation:
 - a. SSPC-SP1: The Society for Protective Coatings "Surface Preparation Specification No. 1 – Solvent Cleaning" current Edition
 - b. SSPC-SP2: The Society for Protective Coatings "Surface Preparation Specification No. 2 – Hand Tool Cleaning", current Edition.
 - c. SSPC-SP6: The Society for Protective Coatings "Surface Preparation Specification No. 6 – Commercial Blast Cleaning", current Edition.
 2. Primer:
 - a. Fast curing, universal modified alkyd, rust inhibiting shop coat with good resistance to normal atmospheric corrosion compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Primer shall comply with all federal standards for VOC, lead, and chromate levels. Color shall be gray.
 - b. Shop prime immediately after surface preparation, applying according to manufacturer's instructions to provide a dry film thickness of not less than 2.0 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surface.
 3. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
 - a. ASTM A 153/A 153M for galvanizing hardware.
 - b. ASTM A 123/A 123M for galvanizing both fabricated and un-fabricated products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
- C. Touch-Up Painting
 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint and paint all exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
 2. Galvanizing Repair Paint: High-zinc-dust-content paint for galvanizing welds and repair-painting galvanized steel, with dry film containing not less than 90 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.
- D. Finish Painting

1. Finish Painting shall be performed under Section 09 90 00 – Paints and Coatings.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.
- B. Center nosings on tread widths with noses flush with riser faces and tread surfaces.
- C. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.02 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 installing 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. 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 that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

3.03 SETTING LOOSE PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
 1. Use non-shrink, metallic grout in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations, unless otherwise indicated.

3.04 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a 2.0-mil (0.05-mm) minimum dry film thickness.

END OF SECTION

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**SECTION 06 10 00
ROUGH CARPENTRY**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. This Section describes all the rough carpentry as indicated on the Drawings and specified herein. Furnish and install blocks, nails, bolts, screws, framing anchors, and other rough hardware. Furnish to roofing system installer wood nailers, plywood, nails, bolts, and other wood blocking anchors not specifically specified under another section and blocking required for a complete and proper roofing system.

1.02 QUALITY ASSURANCE

- A. Lumber Grading Rules and Wood Species to be in conformance with Voluntary Product Standard PS 20-70.
- B. Plywood Grading Rules:
 - 1. Softwood Plywood - Construction and Industrial: Product Standard PS 1-74.
- C. Grade Marks: Identify all lumber and plywood by official grade mark.
 - 1. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded, where applicable and condition of seasoning at time of manufacture.
 - a. S-GRN: Unseasoned.
 - b. S-Dry: Maximum 19% moisture content.
 - c. MC-15 or KD: Maximum of 15% moisture content.
 - d. Dense.
 - 2. Softwood Plywood: Appropriate grade trademark of the American Plywood Association.
 - a. Type, grade, class, and identification Index.
 - b. Inspection and testing agency mark.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.

1.04 PRODUCT DELIVERY: STORAGE AND HANDLING

- A. Immediately upon delivery to the job site, place materials in area protected from weather.
- B. Store materials a minimum of 6" above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
- C. Do not store seasoned materials in wet or damp portions of building.
- D. Protect sheet materials from corners breaking and damaging surfaces, while unloading.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Lumber:
 - 1. Dimensions:
 - a. Specified lumber dimensions are nominal.
 - b. Actual dimensions conform to industry standards established by the American Lumber Standards Committee and the rules writing agencies.

2. Moisture content: 19% maximum at time of permanent closing in of building or structure, for lumber 2" or less nominal thickness.
3. Surfacing: Surface four sides (S4S), unless specified otherwise.
4. Framing lumber, any commercial softwood species:
 - a. Light framing:
 - i. General framing: Construction Grade No. 2 and better, S.P.F.
 - ii. Plates, blocking, bracing, furring, and nailers: Construction Grade No. 2 and better, S.P.F.

B. Plywood:

1. Structural II, C-C, exterior, exterior graded plywood, 5 ply, 5/8" thick APA rated roof sheathing with roofing clips as manufactured by TECO or equal spaced no greater than 2'0" on center.
2. Structural II, C-C, exterior, exterior graded plywood, 4 ply, 1/2" thick APA rated wall sheathing.
3. Electrical and Telephone Backboards: 3/4" thick, A-D, group 1, 5 ply, finish provided under Technical Specification Section 09 90 00.

2.02 PRESERVATIVE TREATED WOOD PRODUCTS:

1. Waterborne salt preservatives for painted, stained, or exposed natural wood product:
 - a. AWPB LP-2 aboveground application.
 - b. Lumber re-dried to maximum moisture content of 19% stamped "DRY".
 - c. Wood Preservative: Ammoniacal copper arsenate, or 5% solution of pentachlorophenol.

2.03 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Research or Evaluation Reports: Provide fire-retardant-treated wood acceptable to authorities having jurisdiction and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.
 2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions when tested by a qualified independent testing agency.
 2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
 3. Contact with treated wood does not promote corrosion of metal fasteners.
- C. Exterior Type: Use for exterior locations and where indicated.
- D. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

2.04 ROUGH HARDWARE (Use galvanized at exterior locations):

1. Lag Bolts: Comply with Fed Spec FF-B-561.

2. Machine Bolts: Comply with ASTM A307.
3. Nails: Comply with ASTM F1667-02a, Common nails.

PART 3 - EXECUTION

3.01 CONDITIONS OF SURFACE

- A. Verify that surfaces to receive rough carpentry materials are prepared to exact grades and dimensions. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 DELIVERIES

- A. Stockpile materials sufficiently in advance of need to assure their availability in a timely manner for this Work. Make as many trips to the site as are needed to deliver materials of this Section in a timely manner to ensure orderly progress of the Work.

3.03 INSTALLATION

- A. Provide wood bucks, sleepers, nailers, plugs, shims and furring for finish work.
- B. Provide backup for heating, plumbing, fire protection and electrical fixtures and accessories.
- C. Provide grounds where necessary for the plumb, level or true attachment of other work where the ground is later concealed.
- D. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.
- E. Pressure-Treated Wood Products:
 1. Provide pressure-treated wood for all framing, blocking, furring, nailing strips in contact with concrete and in conjunction with exterior surfaces.
 2. Apply two brush coats of same preservative used in original treatment to all sawed or cut surfaces of treated lumber.
- F. Fit carpentry work to other work; scribe and cope as required for accurate fit.
- G. Produce joints which are tight, true, and well nailed, with members assembled in accordance with the Drawings.
- H. Selection of Lumber Pieces:
 1. Carefully select members.
 2. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing, and will allow making of proper connections.
 3. Cut out and discard defects which render a piece unable to serve its intended function.
 4. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist bow, crook, mildew, fungus, or mold, as well as improper cutting and fitting.
 5. Do not shim any framing component.

3.04 INSTALLATION OF PLYWOOD

- A. Placement:
 1. Place with face grain perpendicular to supports and continuously over at least two supports.
 2. Center joints accurately over supports.

3.05 FASTENING

- A. Nailing (see plan set for diaphragm nailing):

1. Use only common wire nails or spikes, except otherwise specifically noted on the Drawings.
2. Provide penetration into the piece receiving the point of not less than 1/2 the length of the nail or spike.
3. Nail without splitting wood.
4. Pre-bore as required.
5. Remove split members and replace with members complying with the specified requirements.
6. Minimum number and size of fasteners connection wood members shall as set forth in Table 2304.9.1 (reproduced here from the International Building Code).

**TABLE 2304.9.1
FASTENING SCHEDULE**

CONNECTION	FASTENING ^{a,m}	LOCATION
1. Joist to sill or girder	3-8d common 3-3" X 0.131" nail 3-3" 14 gage staple	toenail
2. Bridging to joint	2-8d common 2-3" X 0.131" nail 2-3"14 gage staple	toenail each end
3. 1"x 6" subfloor or less to each joist	2-8d common	face nail
4. Wider than 1" X 6" subfloor to each joist	3-8d common	face nail
5. 2" subfloor to joist or girder	2-16d common	blind and face nail
6. Sole plate to joist or blocking	16d at 16" o.c. 3" X 0.131" nail at 8" o.c. 3"14 gage staple at 12"o.c.	typical face nail
Sole plate to joist or blocking at braced wall panel	3-16d at 16" 4 - 3" X 0.031" nail at 16" 4 - 3" 14 gage staple per 16"	braced wall panels
7. Top plate to stud	2-16d common 3-3" X 0.131" nail 3-3"14 gage staple	End nail
8. Stud to sole plate	4-8d common 4-3" X 0.131" nail 3-3"14 gage staple 2-16d common 3-3" X 0.131" nail 3-3"14 gage staple	Toe nail End nail
9. Double Studs	16d at 24" o.c. 3" X 0.131" nail at 8" o.c. 3"14 gage staple at 8"o.c.	Face nail
10. Double top plates	16d at 16" o.c.	

Double top plates	3" X 0.131" nail at 12" o.c. 3"14 gage staple at 12"o.c. 8-16d common 12-3" X 0.131" nail 12-3" 14 staple typical face nail	Typical face nail Lap splice
11. Blocking between Joists or Rafters to top plate	3-8d common 3-3" X 0.131" nail 3-3" 14 gage staple	Toenail
12. Rim joist to top plate	8d at 6" (152mm) o.c. 3" X 0.131" nail at 6" o.c. 3"14 gage staple at 6"o.c.	Toenail
13. Top plates, laps and intersection	2-16d common 3-3" X 0.131" nail 3-3"14 gage staple	Face nail
14. Continuous header, two pieces	16d common	16" o.c. along edge
15. Ceiling joists to plate	3-8d common 5-3" X 0.131" nail 5-3" 14 gage staple	Toenail
16. Continuous header to stud	4-8d common	Toenail
17. Ceiling joists laps over partitions (see section 2308.10.4.1, Table 2308.10.4.1)	3-16d common minimum, Table 2308.10.4.1 4-3" X 0.131" nail 4-3"14 gage staple	Face nail
18. Ceiling joist to parallel rafters (See section 2308.10.4.1, table 2308.10.4.1_	3-16d common minimum. Table 2:2308.10.4.1 4-3" X 0.131" nail 4-3"14 gage staple	Face nail
19. Rafter to plate (See section 2308.10.1 Table 2308.10.1)	3-8d common 3-3" X 0.131" nail 3-3"14 gage staple	Face nail
20. 1" diagonal brace to each stud and plate	2-8d common 2-3" X 0.131" nail 2-3"14 gage staple face nail	Face nail
21. 1" X 8" sheathing to each bearing wall	2-8d common	Face nail
22. Wider than 1" X 8" sheathing to each bearing	3-8d common	Face nail
23. Build-up corner studs	16d common 3" X 0.131" nail 3"14 gage staple	24" o.c. 16" o.c. 16" o.c.
24. Built-up girder and beams	20d common 32" o.c. 3" X 0.131" nail at 24"o.c.	Face nail at top and bottom staggered on opposite sides

	3"14 gage staple at 24" o.c. 2-20d common 3-3" X 0.131" nail 3-3" gage staple	Face nail at ends and at each splice
25. 2" planks	16d common	At each bearing
26. Collar tie to rafter	3-10d common 4-3" X 0.131" nail 4-3"14 gage staple face nail	Face nail
27. Jack rafter to hip	3-10d common 4-3" X 0.131" nail 4-3"14 gage staple 2-16d common 3-3"X 0.131" nail 3-3"14 gage staple	Toenail Face nail
28. Roof rafter to 2-by ridge beam	2-16d common 3-3" X 0.131" nail 3-3"14 gage staple 2-16d common 3-3" X 0.131" nail 3-3"14 gage staple	Toenail Face nail
29. Joist to band joist	3-16d common 5-3" X 0.131" nail 5-3" 14 gage staple	Face nail
30. Ledger strip	3-16d common 4-3: X 0.131" nail 4-3"14 gage staple	Face nail
31. Wood Structural Panel and particleboard. Subfloor, roof and wall sheathing (to framing)	½ and less 6d ^{c,1} 2 ¾ X 0.113" nail ⁿ 1 ¾: 16 gage ^o 19/32" and ¾ " 8d ^d pr 6d ^e 2 3/8" X 0.113" nail ^p 2"16 gage ^p 7/8" to 1" 8d ^c 1 1/8" to 1 ¾" 10d ^d or 8d ^e ¾" and less 6d ^e 7/8" to 1" 8d ^e 1 1/8" to 1 1/4" 10d ^d or 8d ^e	
32. Panel siding (to framing)	½" or less 6d ^f 5/8" 8d ^f	
33. Fiberboard sheathing.	½" No. 11 gage roofing nail" 6d common nail No. 16 gage staple ⁱ 25/32" No. 11 gage roofing 8d common nail ^h	

	No. 16 gage staple ^j	
34. Interior paneling	1/4" 3/8"	4d ^j 6d ^k

- a. Common or box nails are permitted to be used except where otherwise stated.
- b. Nails spaced at 6" on center at edges, 12" at intermediate supports except 6 inches at supports where spans are 48 inches or more. For nailing of wood structural panel and particleboard diaphragms and shear walls, refer to Section 2305. Nails for wall sheathing are permitted to be common, box, or casing.
- c. Common or deformed shank.
- d. Common.
- e. Deformed shank
- f. Corrosion-resistant siding or casing nail.
- g. Fasteners spaced 3 inches on center at exterior edges and 6 inches on center at intermediate supports.
- h. Corrosion-resistant roofing nails with 7/16-inch diameter head and 1 1/2 inch length for 1/2 inch sheathing and 1 3/4 inch for 25/32 inch sheathing.
- i. Corrosion-resistant staples with nominal 7/16 inch crown and 1 1/8 inch length for 1/2 inch sheathing and 1 1/2 inch length for 25/32 inch sheathing. Panel supports at 16 inches (20 inches if strength axis in the long direction of the panel, unless otherwise marked.)
- j. Casing or finish nails spaced 6 inches on panel edges, 12 inches at intermediate supports.
- K. Panel supports at 24 inches. Casing or finish nails spaced 6 inches on panel edges. 12 inches at intermediate supports.
- l. For roof sheathing applications, 8d nails are the minimum required for wood structural panels.
- m. Staples shall have a minimum crown with of 7/16 inch.
- n. For roof sheathing applications, fasteners spaced 4 inches on center at edges. 8 inches at intermediate supports.
- o. Fasteners spaced 4 inches on center at edge. 8 inch at intermediate supports for subfloor and wall sheathing and 3 inches on center at edges 6 inches at intermediate supports for roof sheathing.
- p. Fasteners spaced 4 inches on center at edges, 8 inches at intermediate

B. Bolting:

- 1. Drill holes 1/16" larger in diameter than the bolts being used.
- 2. Drill straight and true from one side only.
- 3. Do not bear bolt heads on wood, but use washers under head and nut where both bear on wood, and use washers under all nuts.

C. Screw plywood sheathing to studs or furring.

- 1. For lag screws and wood screws, pre-bore holes same diameter as root of threads, enlarging holes to shank diameter for length of shank.

END OF SECTION

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**SECTION 06 60 00
SOLID POLYMER FABRICATIONS**

PART 1 - GENERAL

1.01 GENERAL

- A. Work described in this Section:
 - 1. Integral vanity tops and bowls.
 - 2. Windowsills (stools).
- B. Related work specified elsewhere:
 - 1. Division 5 Section 05 50 00 – Metal Fabrications
 - 2. Division 6 Section 06 10 00 – Rough Carpentry
 - 3. Division 6 Section 06 41 16 – Plastic Laminate Casework

1.02 DEFINITION

- A. Solid surface is defined as nonporous, homogenous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Shop drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
 - 1. Show full size details, edge details, thermoforming requirements, attachments, etc.
 - 2. Show locations and sizes of furring, blocking, including concealed blocking and reinforcement specified in other sections.
 - 3. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, waste receptacle and other items installed in solid surface.
- C. Samples: Submit minimum 6" x 6" (156 mm x 156 mm) samples showing color and pattern variation. Approved samples will be retained as a standard for work.
- D. Product data: Indicate product description, fabrication information and compliance with specified performance requirements.
- E. Maintenance data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project closeout documents.
 - 1. Maintenance kit shall for finishes shall be submitted.
- F. NSF/ANSI standards:
 - 1. Refer to www.nsf.org for the latest compliance to NSF/ANSI Standard 51 for food zone – all food types.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver no components to Project site until areas are ready for installation. Store indoors.
- B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

1.05 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Shop that employs skilled workers who custom fabricate products similar to those required for this project and whose products have a record of successful in-service

performance.

- B. Fabricator/installer qualifications:
 - 1. Work of the section shall be by a certified fabricator/installer, certified in writing by the same manufacturer.
- C. Applicable standards: Standards of the following, as referenced herein.
 - 1. American National Standards Institute (ANSI).
 - 2. American Society for Testing and Materials (ASTM).
 - 3. National Electrical Manufacturers Association (NEMA).
 - 4. NSF International.
- D. Allowable tolerances:
 - 1. Variation in component size: + 1/8" (3mm).
 - 2. Location of openings: + 1/8" (3mm) from dictated location.
- E. Fire test response characteristics:
 - 1. Provide with the following Class A (Class 1) surface burning characteristics as determined by testing identical products per UL 723 (ASTME84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - a. 1) Flame Spread Index: 25 or less.
 - b. 2) Smoke Developed Index: 450 or less.

1.06 WARRANTY

- A. Provide manufacturer's warranty. The manufacturer shall warrant to the original purchaser of any solid surface product for commercial use that the manufacturer will repair or replace, without charge, such product if it fails due to a manufacturing defect during the first 10 years after initial installation. This shall include reasonable labor charges needed to repair or replace the product covered hereunder.
- B. Damage caused by physical or chemical abuse or damage from excessive heat will not be warranted.

PART 2 - PRODUCTS

2.01 SOLID POLYMER FABRICATIONS

- A. Design is based on "Corian" by E.I. DuPont De Nemours & Co., Inc.
 - 1. Pricing based on Grade "C"
- B. Acceptable products:
 - 1. E.I. Du Pont De Nemours & Co., Inc.: "Corian."
 - 2. Avonite, Inc.: "Avonite."
 - 3. LG-Chem / Solid Source, HI-MACS.
- C. Material: Cast, filled polymer; not coated, nonporous, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
 - 1. Superficial damage to a depth of 0.010" (.25 mm) shall be repairable by sanding or polishing.
- D. Integral vanity tops and bowls: Vanity top of solid polymer, complete with integral, cast bowls of solid polymer, having edge details as indicated on the Drawings. Provide complete with backsplash of size shown on the Drawings; Sizes as shown on the Drawings and color to be chosen by Architect from the manufacturer's standard palette.

E. Window sills: [1/2" (13 mm)] thick solid polymer, adhesively, joined with no exposed seams, having edge details as indicated on the Drawings; color to be chosen by Architect from the manufacturer's standard palette.

F. Performance characteristics:

<u>PROPERTY</u>	<u>REQUIREMENT</u>	<u>TEST PROCEDURE</u>
Tensile Strength	6000 psi	ASTM D 638
Tensile Modulus	1.5 x 10 ⁻⁶ psi	ASTM D 638
Elongation	0.4% min.	ASTM D 638
Flexural Strength	10,000psi	ASTM D 790
Flexural Modulus	1.2 x 10 ⁻⁶ psi	ASTM D 790
Hardness	>85	Rockwell "M" scale ASTM D 785
	56	Barcol Impressor ASTM D 2583
Gloss (60 degree	5-75 (matte – highly polished)	ANSI Z124-1980
Light Resistance Gardner)	(Xenon Arc) No effect	NEMA LD 3-2000 Method 3.3 HUD Bulletin UM-73-84
Color Stability	No change, 200 hours	NEMA LD3
Wear and Clean	Passes	ANSI Z124.3 and ANSI Z124.6
Stain Resistance: Sheets	Passes	ANSI Z124.3 and ANSI Z124.6
Fungus and Bacteria Resistance	Does not support micro-bacterial growth	ASTM G21 and G22
Flammability	ASTM E 84	
	All Colors (Class 1 and Class A)	
Flame Spread	1/4"	1/2" 3/4"
	Masonry Gypsum	Sheet Sheet
Smoke Developed	15 25	5 5
Class	20 25	10 15
	1 1	1 1

<u>PROPERTY</u>	<u>REQUIREMENT</u>	<u>TEST PROCEDURE</u>
Water Absorption	Long-term	ASTM D 570
Weight (% Max.)	0.4% (3/4")	
	0.6% (1/2")	
Izod Impact	0.28 ft.lbs/in. of notch	ASTM D 256 (Method A)

Impact Resistance	No fracture	NEMA LD3
Sheets	1/4" slab-36" drop	1/2 lb.ball
	1/2" slab-36" drop	1 lb. ball
	3/4" slab-36" drop	2 lb. ball
Impact Resistance	No cracks or chips	ANSI Z124-1980
Bowls		HUD Bulletin
		UM-73-84
Thermal Expansion	3.02 x 10 ⁻⁵ in./in./°C (1.80 X 10 ⁻⁵ in./in./°F)	ASTM D 696
Boiling Water Surface		
Resistance	No visible change	NEMA LD3-2000
High Temperature		
Resistance (500°F)	No change	NEMA LD3-2000
Weatherability	ΔE* _{94<5} in 1,000 hrs.	ASTM G 155
Specific Gravity**	1.7 standard colors	ASTM D 570
	1.69 Sierra colors	

**Approximate weight per square foot for standard colors: 1/4" (6mm), 2.2 lbs; 1/2" (12.3 mm), 4.4 lbs; 3/4" (19 mm), 7.0 lbs.

2.02 ACCESSORY PRODUCTS

- A. Joint adhesive: Manufacturer's standard one or two-part adhesive kit to create inconspicuous, non-porous joints.
- B. Panel adhesive: Manufacturer's standard neoprene-based panel adhesive meeting ANSI A136.1-1967 and UL listed.
- C. Sealant: Manufacturer's standard mildew-resistant, FDA-complaint, NSF 51-compliant (food zone – any type), UL listed silicone sealant in colors matching components.

2.03 FABRICATION

- A. Factory fabricate components to greatest extent practicable to sizes and shapes indicated, in accordance with approved shop drawings.
- B. Form joints between components using manufacturer's standard joint adhesive; without conspicuous joints.
 1. Reinforce with strip of solid polymer material, 2" wide.
- C. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
- D. Cut and finish component edges with clean, sharp returns. Route radii and contours to template. Smooth edges. Repair or reject defective and inaccurate work.
- E. Cove backsplashes: Field fabricate 1/2" (13 mm) radius cove at intersection of counters and backsplashes. Form backsplashes using 1/2" (13 mm) solid polymer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions, with fabricator present for compliance with requirements for installation tolerances and other conditions affecting performance of the work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install components plumb and level, scribe to adjacent finishes, in accordance with approved shop drawings and product installation data.
- B. Exposed joints and seams shall not be allowed.
- C. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.
- D. Reinforce field joints with solid surface strips extending a minimum of 1 inch on either side of the seam with the strip being the same thickness as the top.
- E. Cut and finish component edges with clean, sharp returns.
- F. Rout radii and contour to template.
- G. Anchor securely to base cabinets or other supports.
- H. Align adjacent countertops and form seams to comply with manufacturers written recommendations using adhesive in color to match countertop.
- I. Carefully dress joints smooth, remove surface scratches and clean entire surface.
- J. Install countertops with no more than 1/8" (3mm) sag, bow or other variation from a straight line.
- K. Adhere window sills to substrate using manufacturer's recommended adhesive.
- L. Provide backsplashes and sidesplashes as indicated on the Drawings. Adhere to countertops using manufacturer's standard color-matched silicone sealant.
- M. Keep components and hands clean during installation. Remove adhesives, sealants and other stains. Replace stained components.
- N. Coordinate countertop installation with plumbing installation by Plumbing Contractor.
- O. Protect surfaces from damage. Repair work or replace damaged work that cannot be repaired to Architect's satisfaction.

END OF SECTION

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**SECTION 07 21 00
VAPOR RETARDERS AND BUILDING INSULATION**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. All thermal and moisture protection required for this Work including, but not necessarily limited to:
 - a. General building insulation
 - b. Perimeter insulation
 - c. Sound batt insulation
 - d. Wall polyethylene vapor retarder
 - e. Vapor Retarder
 - i. All interior slabs on grade at office portion of building shall have vapor barrier installed prior to placing slab.
 - ii. All exterior insulated stud walls shall have vapor barrier installed.
 - 2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 SUBMITTALS

- A. Submit technical data indicating thermal conductance factors of furnished insulation.
- B. Submit samples: two 6" x 6" pieces of each type and thickness of rigid insulation.
- C. Submit manufacturer's recommended installation instructions.
- D. Submit manufacturer's certification that materials meet Specification requirements.
- E. Manufacturer's Product Data:
 - 1. Most recent copy of manufacturer's literature applicable to products and specifications to be used, including material characteristics, test data, installation recommendations, material safety data sheets (MSDS).

1.03 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the Work and materials of all other trades.
- B. Delivery and Storage:
 - 1. Deliver materials to the Project Site, and store in a safe dry place with all labels intact and legible at time of installation.
- C. Replacements:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 INSULATION MATERIALS

- A. General:
 - 1. All reference to R-Values shall mean aged R-Values.
- B. Hollow metal door frame stop insulation
 - 1. At all hollow metal door frames to receive weatherstripping and to be grouted solid furnish to door frame installers:

- a. Equivalent of Polytech Expanded Polystyrene as manufactured by Plymouth Insulation.
 - b. R-value: 4 per 1 inch of thickness
 - c. Compressive Strength: 10 PSI
- C. Other Materials
- 1. Where so indicated on the Drawings, furnish and install.
 - a. Rigid Perimeter Insulation:
 - i. Inhabited Spaces Foundation Walls and Piers:
 - (a.) 2" thick extruded polystyrene
 - (b.) R-Value: R5 per inch
 - (c.) Compressive Strength: 25 PSI
 - ii. Uninhabited or Storage Foundation Walls and Piers:
 - (a.) 2" thick extruded polystyrene
 - (b.) R-Value:R5 per inch
 - (c.) Compressive Strength: 40 PSI
- D. Sound Batt Insulation: 2" thick fiberglass sound insulation kerfed and buckled shall be used in all stud walls as shown on Drawings.
- E. General Insulation:
- 1. At areas requiring general building insulation, use glass fiber batts having a thermal resistance "R" value of R-25 per eight inches for insulation only.
- F. Attic Insulation:
- 1. Cellulose blow-in insulation to a level achieving an "R" value of 50 is required.
- G. Walls at existing exterior building construction.
- 1. Provide R-24 8" blanket insulation with vinyl reinforced vinyl scrim on interior face.

2.02 ADHESIVE

- A. As recommended by insulation manufacturer.

2.03 MECHANICAL FASTENERS

- A. As recommended by insulation manufacturer.
- B. Minimum length 1/2" longer than insulation thickness

2.04 BUILDING WRAP

- A. Tyvek® building wrap as manufactured by DuPont as indicated on drawings.

2.05 VAPOR RETARDER MATERIALS

- A. Sheet membrane material for under slab vapor barrier shall be a polyolefin based membranes. ASTM E 1745 "Class A"
 - 1. Vapor Barriers:
 - a. Viper 6.5 mil Vapor Retarder by InsulationSolutions®, East Peoria Illinois (866)698.6562 www.insulationsolutions.com
 - b. Stego Wrap 10 mil Vapor Retarder by STEGO INDUSTRIES LLC, San Juan Capistrano, CA (877) 464-7834 www.stegoindustries.com
- B. Sheet membrane for exterior stud walls and ceilings shall be 6 mil and clear polyethylene.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Base for Slabs on Grade
 - 1. Base shall be compacted and graded and all under slab work complete prior to placing vapor barrier membrane.
- B. Exterior Stud Walls:
 - 1. Insulation installation shall be complete prior to placing vapor barrier membrane.

3.02 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.
- B. Verify masonry joints where insulation is installed are struck flush.
- C. Verify that openings in masonry walls are sealed. Cut insulation around vents, louvers, pipes, conduit, and other wall penetrations.
- D. Verify that resilient rods or seals are in place around fixtures, pipes, receptacle outlets, and other items in or through the wall to seal openings.
- E. Examine areas to receive rigid insulation to insure work of preceding trades is completed.
- F. Check surfaces to receive rigid insulation to assure they are in uniform plane; and free of concrete fins, debris, grease, oil or other items detrimental to installation.
- G. Proceed with application of insulation only when conditions are satisfactory.

3.03 INSULATION INSTALLATION

- A. Except as otherwise specifically directed by the Architect/ Engineer, install all insulation in accordance with the current edition of "The Manufacturer's Application Instructions."
- B. General:
 - 1. Fit insulation snugly between framing.
 - 2. Maintain integrity of insulation over entire area to be insulated.
 - 3. Insulate small areas between closely spaced framing members.
 - 4. Carefully cut and fit insulation around pipes, conduits, and other obstructions.
 - 5. Where pipe or conduit are located in stud spaces, place insulation between exterior wall and pipe, compressing insulation where necessary.
 - 6. Do not install insulation requiring compression in excess of 10%.
 - 7. Install insulation to attain minimum R-value as indicated for finished assembly.
- C. Mechanical Fasteners:
 - 1. Install adhesively applied mechanical fasteners minimum of 48 hours prior to applying insulation.
- D. Cavity Wall Insulation:
 - 1. Install insulation against masonry wall within cavity.
 - 2. Place insulation with long dimension horizontal and mechanically fasten.

3.04 VAPOR RETARDER INSTALLATION

- A. Under Slab Vapor Barrier
 - 1. Lay barrier with a minimum number of laps allowing enough salvage at edges of pour to lap membrane of adjacent pour.
 - 2. Lap all joints a minimum 8".

3. Flash around all columns and pipes which extend below the floor line using mastic such as Hydrocide Mastic by Sonneborn Building Products installed in accordance with the manufacturer's recommendations and specifications.
 4. Use precaution to protect vapor barrier from punctures and tears during placement of reinforcing and concrete.
 5. Utilize manufacturer's tape to seal seams and penetrations.
- B. Stud Wall Vapor Barrier
1. Lap all vertical joints across a minimum of two furring channels or studs.
 2. Install large enough sheets to avoid horizontal joints. Where horizontal joints cannot be avoided, lap a minimum 24".

END OF SECTION

**SECTION 07 42 13
INSULATED ALUMINUM WALL PANELS**

PART 1 - GENERAL

1.01 SUMMARY

- A. Foamed-insulation-core concealed fastener vertical metal wall panels, with related metal trim and accessories.

1.02 RELATED ITEMS

- A. Parapet caps and/or gravel stops.
- B. Wall support systems.
- C. Sealants not specified in this section.
- D. Fenestration-window frames, glass and glazing.
- E. Entrance work.

1.03 QUALITY ASSURANCE

- A. Standards: Comply with standards specified in this Section.
- B. Qualification of Manufacturers: Use products in the Work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.
- C. Qualifications of Installers: Use skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.04 BUILDING CODE REQUIREMENTS

- A. Wall panel units shall fully comply with Chapter 26 of BOCA, Uniform Building Code, Standard Building Code, or other governing building code as applicable regarding the use of foam plastic. Laboratory and/or full scale fire tests as appropriate to demonstrate compliance shall be available for submission to the building official.
- B. Wall panel units and foam core shall comply with standard code requirements of maximum Flame Spread (25) and Smoke Developed less than 450 per ASTM E 84.

1.05 PERFORMANCE TESTING REQUIREMENTS

- A. Structural Tests: Structural load-span tables and design shall have been derived from and verified by witnessed structural tests for wind loads by the "chamber method" as outlined in ASTM E72. Standard design criteria unless otherwise noted shall be ± 20 psf with a deflection limitation of L/180 under positive loading.
- B. Thermal Value: Standard 1 1/8" thick panel with expanded polystyrene (EPS) core shall have a total R-value of no less than 3.6 hrs-sf-F/BUT when tested according to ASTM C236 and corrected to ASHRAE winter design criteria of 15 mph wind outside, still air inside.
- C. Bond Strength: There shall be no metal primer interface corrosion or delamination from the foam core after 1000 hrs at 135°F and 100% R.H. No delamination or interface corrosion after 2 ½ hrs in a 2 psig, 217°F autoclave.
- D. Air & Water Infiltration: There shall be no water penetration and minimal air infiltration through the panel system when tested according to ASTM E 331 and ASTM E 283 under a static air pressure differential of 6.24 psf (equivalent wind velocity of 49.4 mph).

1.06 SUBMITTALS

- A. General:

1. Comply with provisions of Section 01 33 00.
- B. Manufacturer's Data: Within 30 calendar days after Award of Contract, submit:
 1. Complete materials list of all items proposed to be furnished and installed under this Section;
 2. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;
 3. Shop Drawings for metal wall panel installation showing components, arrangements, dimensions, orientation on walls, sections of trim members, dimensioned elevations, grounds, reinforcements, and accessories.
 4. Samples for initial selections: Manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
 5. Samples for verification: Provide color samples of selected color. Samples shall involve normal color and texture variations, include sample sets showing the full range of variations expected.
- C. Panel Analysis: Provide panel calculations to verify panels will withstand the design wind loads indicated without detrimental effects or deflection exceeding L/180. Include effects of thermal differential between the exterior and interior panel facings and resistance to fastener pullout.

1.07 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

1.08 WARRANTY

- A. Limited warranty: Benchmark Architectural Systems, Inc. warrants its wall panel systems to be free from defects in materials and workmanship for a period of two (2) years from date of shipment to the original purchaser. Benchmark's liability is limited to replacement or purchase price refund of the original materials only. This warranty is void if panels are not installed in accordance with Benchmark's currently published instructions or are used in applications other than those referred to in manufacturer's current literature.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. Basis of Design Manufacturer: Metal Span Insulated Metal Panels. 1720 Lakepointe Drive, Suite 101, Lewisville, Texas.
 1. Basis of Design: CF Santa Fe

2.02 INSULATED METAL WALL PANELS

- A. Concealed Fastener, Insulated Metal Wall Panels with foam core: Structural metal panels consisting of flat exterior metal sheet with heavy, stucco-embossed pattern, and interior metal sheet with a light mesa profile, with factory foamed-in-place polyurethane core in thermally-separated profile, with tongue-and-groove panel edges, attached to supports using concealed fasteners.
 1. [Basis of Design: Metl-Span, CF 7.2 Insul-Rib Wall Panel](#)
 2. G-90 galvanized coated steel conforming to ASTM A 653 or AZ-50 aluminum-zinc alloy coated steel, conforming to ASTM A 792/A 792M, minimum grade 33, pre-painted by the coil-coating process per ASTM A 755/A 755M.
 - a. Exterior Face Sheet: **24-gauge** thickness, with heavy stucco embossed surface
 - 1) Finish: Fluoropolymer two-coat system.
 - 2) Color: As selected by Architect from manufacturer's standard colors.

- b. Interior Face Sheet: G-90 galvanized 26-gauge thickness, with embossed surface Light Mesa profile.
 - 1) Finish: Fluoropolymer two-coat system.
 - 2) Color: As selected by Architect from manufacturer's Premium 1 Exterior Colors.
- 3. Panel Width: 36 inches nominal.
- 4. Panel Thickness: 3" minimum thickness and as shown on drawings.
- 5. Insulating Core: Polyurethane with zero ozone depletion potential blowing agent
 - a. Closed Cell Content: 90% or more as determined by ASTM D 6226.
 - b. Compressive Strength: As required to meet structural performance requirements and with a minimum of 22 psi as determined by ASTM D 1621.
 - c. Shear Strength: As required to meet structural performance requirements and with a minimum of 36 psi as determined by ASTM C 273.
 - d. Tensile Strength: As required to meet structural performance requirements and with a minimum of 41 psi ASTM D 1623.
 - e. Minimum Density: 2.0 pcf (32 kg/m3) as determined by ASTM D 1622.
 - f. Thermal Resistance R-Value: 25 per ASTM C 518 at 75 degrees Fahrenheit mean temperature.

2.03 METAL WALL PANEL ACCESSORIES

- A. General: Provide complete metal panel assemblies incorporating trim, copings, fasciae, gutters and downspouts, and miscellaneous flashings. Provide required fasteners, closure strips, and sealants as indicated in manufacturer's written instructions.
- B. Flashing and Trim: Match material, thickness, and finish of metal panels.
- C. Panel Clips: ASTM A 653/A 653M, G90 (Z180) hot-dip galvanized zinc coating, one-piece, configured for concealment in panel joints, and identical to clips utilized in tests demonstrating compliance with performance requirements.
- D. Panel Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
- E. Joint Sealers:
 - 1. Sealants: Provide Tape Mastic Sealants, Non-skinning sealants, and Urethane Sealants per Section 07 92 00, "Joint Sealants"
 - 2. Vertical Joint Gasket: Manufacturer's standard EPDM gasket. Color: As selected from manufacturer's standard colors.

PART 3 - EXECUTION

3.01 PREPERATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation. Panel substructure shall be level and plumb. Panel substructure shall be structurally sound as determined by that subcontractor's engineer. Panel substructure shall be free of defects detrimental to work and erected in accordance with established building tolerances. Coordinate delivery of such items to project site.

3.02 FABRICATION

- A. General: Provide factory fabricated and finished metal panels, trim, and accessories meeting performance requirements, indicated profiles, and structural requirements.
- B. Fabricate metal panel joints configured to accept sealant tape providing weathertight seal and preventing metal-to-metal contact and minimizing noise resulting from thermal movement.

- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions, approved shop drawings, and project drawings.

3.03 EXAMINATION

- A. Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.
 - 1. Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.
 - 2. Panel Support Tolerances: Confirm that metal panel supports are within tolerances acceptable to metal panel manufacturer but not greater than the following:
 - a. 1/4 inch (6 mm) in 20 foot (6100 mm) in any direction.
 - b. 3/8 inch (9 mm) over any single wall plane.
 - c. At Girt Spacing 10 feet (3048 mm) or more: 1/4 inch (6 mm) out only.
 - d. At Girt Spacing Less Than 10 feet (3048 mm): 1/8 inch (3 mm) out only.
- B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

3.04 METAL PANEL INSTALLATION

- A. Concealed-Fastener Foamed-Insulation-Core Metal Panels: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, and project drawings. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- B. Attach panels to metal framing using screws, fasteners, sealants, and adhesives recommended for application by metal panel manufacturer.
 - 1. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer.
 - 2. Cut panels in field where required using manufacturer's recommended methods.
 - 3. Provide weatherproof jacks for pipe and conduit penetrating metal panels.
 - 4. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer
- C. Attach panel flashing trim pieces to supports using recommended fasteners and joint sealers
- D. Joint Sealers: Install tape sealers and liquid sealants where indicated and where required for weatherproof performance of metal panel assemblies
 - 1. Seal panel base assembly, openings, panel head joints, and perimeter joints using joint sealers indicated in manufacturer's instructions
 - 2. Sealer [and vapor seal bead of non-curing butyl]; apply continuously without gaps in accordance with manufacturer's written instructions, approved shop drawings, and project drawings
 - 3. Prepare joints and apply sealants per requirements of Division 07 Section "Joint Sealants".

3.05 ACCESSORY INSTALLATION

- A. General: Install metal panel accessories with positive anchorage to building and weather tight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.
 - 1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.

2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

3.06 FIELD QUALITY CONTROL

- A. Testing Agency: [Owner will engage] [Engage] an independent testing and inspecting agency acceptable to Architect to perform field tests and inspections and to prepare test reports.
- B. Water-Spray Test: After completing portion of metal panel assembly including accessories and trim, test 2-bay area selected by Architect for water penetration, according to AAMA 501.2.

3.07 CLEANING AND PROTECTION

- A. Remove temporary protective films immediately in accordance with metal panel manufacturer's instructions. Clean finished surfaces as recommended by metal panel manufacturer.
- B. Replace damaged panels and accessories that cannot be repaired to the satisfaction of the Architect.

END OF SECTION

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**SECTION 07 42 14
METAL WALL PANELS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included: furnish and install preformed metal wall panels complete to provide a weather-tight installation. Include all necessary accessories including related flashings, fasteners, insulation, and closures.

1.02 QUALITY ASSURANCE

- A. Standards: Comply with standards specified in this Section.
- B. Qualification of Manufacturers: Use products in the Work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.
- C. Qualifications of Installers: Use skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

- A. General: Comply with provisions of Section 01 33 00 Submittal Procedures.
- B. Manufacturer's Data: Within 30 calendar days after Award of Contract, submit:
 - 1. Complete materials list of all items proposed to be furnished and installed under this Section;
 - 2. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;
 - 3. Shop Drawings for metal wall panel installation showing components, arrangements, dimensions, orientation on walls, sections of trim members, dimensioned elevations, grounds, reinforcements, and accessories.
 - 4. Samples for each type metal wall panel and interior liner.
- C. Panel Analysis: Provide panel calculations to verify panels will withstand the design wind loads indicated without detrimental effects or deflection exceeding L/180. Include effects of thermal differential between the exterior and interior panel facings and resistance to fastener pullout.

1.04 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 DESIGN

- A. All wall panels must be designed in compliance with the standards established by the AISI Gauge Cold-Formed Steel Design Manual and must withstand the design components and cladding wind load with a maximum deflection of 1/180 of the span. The system shall be designed such that when fully erected, the outside face sheet of the insulated wall panel shall have an air leakage rate, at full design wind load, not to exceed 0.0094 CFM per square foot in accordance with NAAMM Test TM-1-68T; and shall show no uncontrollable water infiltration when tested in accordance with NAAMM Test TM-1-68T.
- B. Gauges in no case shall be less than 22 gauge steel.

2.02 MATERIALS

- A. TRC Building:
 - 1. Exterior panels shall be 26-gauge 7.2 Panel as manufactured by MBCI (Verify existing Condition). Exposed fasteners shall be cadmium plated with a vinyl head color matched to exterior wall panel color. Color to be selected from Signature 300 standard color palette.
 - a. Refer to Section 07 42 13 Insulated Metal Wal Panels for building Addition wall panel selection.
- B. Storage Building:
 - 1. Exterior panels shall be 26-gauge Perma-Clad Panel and 26 gauge Corrugated Panel as manufactured by MBCI (Verify existing Condition). Exposed fasteners shall be cadmium plated with a vinyl head color matched to exterior wall panel color. Color to be selected from Signature 300 standard color palette.
 - 2. Interior wall and ceiling panels shall be 26 gauge PBR panel as manufactured by MBCI. Exposed fasteners shall be cadmium plated with a vinyl head color matched to exterior wall panel color. Color to be selected from Signature 300 standard color palette.

2.03 FINISHES

- A. Certify that no blistering, rusting, or other effects shall occur when tested according to ASTM B 117. Flat and formed areas shall have a No. 10 rating according to ASTM D 1654, Table 2, after 250 hours exposure.

2.04 OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of the work of this Section, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Panels, sub-girts, flashings, etc., shall be erected in the direction as shown on the Drawings in a manner so that in the future panels can be removed and relocated with a minimum loss of panel. No welding of panels to structure will be acceptable. The panel manufacturer will be held responsible for the quality of the panels and the completed installation. Should the erection of the panels be sloppy or marred, etc., the Owner will hold the Contractor responsible for replacement or correction.

3.02 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work to the approval of the Architect/Engineer. Do not proceed until unsatisfactory conditions have been corrected.

3.03 FINAL INSPECTION

- A. The manufacturer's recommended installation procedures, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

END OF SECTION

**SECTION 07 60 00
FLASHING AND SHEET METAL**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. This Section describes all prefinished metal coping, prefinished sheet metal soffit brackets, reglets, trellis sheet metal, and sheet metal flashing not specifically described in other Sections of these Specifications but required to prevent penetration of water through exterior shell of the building. Roof flashing details shall be compatible with roofing membrane manufacturer's specifications.
- B. Related Work Described Elsewhere:
 - 1. Division 7 Section 07 71 23: Gutters and Downspouts
 - 2. Division 7 Section 07 42 13: Insulated Aluminum Wall Panels
 - 3. Division 7 Section 07 92 00: Sealant

1.02 QUALITY ASSURANCE

- A. Standards:
 - 1. Comply with standards specified in this Section.
 - 2. Comply with pertinent recommendations contained in current edition of "Architectural Sheet Metal Manual" published by the Sheet Metal and Air Conditioning Contractor's National Association.
- B. Qualifications of Manufacturer:
 - 1. Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/Engineer.
- C. Qualifications of Installers:
 - 1. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Manufacturer's Data:
 - 1. Within 15 calendar days after award of the Contract, submit:
 - a. Complete materials list of all items proposed to be furnished and installed under this Section.
 - b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.
 - c. Shop Drawings showing all proposed work of this Section.
 - d. Manufacturer's recommended installation procedure.
 - e. The manufacturer's recommended installation procedures, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on this work.

1.04 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. Replacements:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 PREFINISHED METAL COPING & EXPOSED SHEET METAL & FLASHINGS

- A. ASTM A 5653/A 653M, lock-forming quality.
- B. Aluminum with 1 mil Kynar 500 finish with ten (10) year guarantee.
- C. Minimum 24 gauge.
- D. Manufactured units are subject to Architect's approval.
- E. Typical drive cleat connection every 10 feet for water tightness and expansions.
- F. Color to be selected by Architect.
- G. Clips:
 - 1. Minimum width 2".
 - 2. Same material and thickness as sheet metal.

2.02 PREFINISHED METAL SOFFIT BRACKETS

- A. ASTM A 653/A 653M, lock-forming quality.
- B. Aluminum with 1 mil Kynar 500 finish with ten (10) year guarantee.
- C. Minimum 18 gauge.
- D. Manufactured units are subject to Architect's approval.
- E. Color to be selected by Architect.
- F. Concealed Clips shall be cold epoxy welded to the inside of the sheet metal bracket and provided with screw holes for mounting to wood blocking. Screw holes shall be oversized to allow for movement from thermal expansion and contraction once the screws are set.
 - 1. Minimum width 2".
 - 2. 16 gauge.
- G. As shown the Drawings, furnish and install gutter guard on the brackets. The gutter guard shall be aluminum rain gutter guard model no. 6933T14 as manufactured by McMaster-Carr or equal.

2.03 FASTENERS

- A. Nails: Galvanized steel material, flathead, wire, barbed, slated type, FS FF-N-105 B(2).
- B. Screws: Cadmium Plated material, self-tapping sheet metal type, FS-S-107 C(1).
- C. Rivets: Cadmium plated material, type and size recommended sheet metal manufacturer.
- D. Bolts: Cadmium plated material, hex head, FS FF-B-575 C.
- E. Nuts: Cadmium plated material, hex head, FS FF-N-836 D.
- F. Washers: Neoprene, type and size recommended to fit anchor.

2.04 EXPANSION ANCHORS

- A. FS FF-B-588 C.

2.05 SOLDER

- A. ASTM B 32; Alloy grade 58, 50% tin, 50% lead.

2.06 SEALANT

- A. FS TT-S-00227 E (3), Type II, Class A.

2.07 BITUMINOUS PLASTIC CEMENT

- A. FS SS-C-153 B, Type I.

2.08 PRIMER COATING

- A. FS TT-P-641 G, Type II.

2.09 ASPHALTIC COATING COMPOUND

- A. FS TT-C-494, Type II.

2.10 REGLETS

- A. Same material and thickness as sheet metal.
- B. Shop formed corners and joint connectors.
- C. Provide Fry Springlok Flashing System: Type SM (Expan-O-Seal).

PART 3 - EXECUTION

3.01 INSPECTION

- A. Verify that substrates are smooth and clean to extent needed for sheet metal work.
- B. Verify that reglets, nails, cants and blocking to receive sheet metal are installed and free of concrete, mortar, grout and soil.
- C. Do not start sheet metal work until conditions are satisfactory.

3.02 PREPARATION

- A. Before installing sheet metal, verify shapes and dimensions of surface to be covered.

3.03 INSTALLATION

- A. General:
 - 1. Install work water-tight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.
 - 2. Hem exposed edges.
 - 3. Angle bottom edges of exposed vertical surfaces to form drips.
 - 4. Install flashing and sheet metal to comply with Sheet Metal and Air Conditioning Contractors' National Association, Inc.

3.04 CLIPS

- A. Spaced Clips:
 - 1. 2' on-center.
 - 2. Secure to substrate with fasteners and cover heads with clip tabs.
- B. Concealed mechanical fasteners to be 0.063" thick aluminum.

3.05 SOLDERING

- A. Clean and flux metals prior to soldering.
- B. Sweat solder completely through seam width.

3.06 SEALANT INSTALLATION

- A. Apply 1/4" diameter bead, centered on full length of butt joints under drive cleat connections.
- B. Apply continuous 1/4" bead under hem edges of sheet metal.
- C. Apply continuous 1/4" bead along top of reglets.

3.07 BITUMINOUS PLASTIC CEMENT

- A. Trowel 1/8" thick.

3.08 ROOF COUNTERFLASHING

- A. Overlap base flashing 4" minimum.
- B. Install bottom edge tight against base flashing.
- C. Lap seam vertical joints 3" minimum, and apply sealant.
- D. Miter, lap seam, and close corner joints with solder or sealant.

3.09 ROOF PENETRATION FLASHING

- A. Base Flashing:
 - 1. Extend flange onto roof 6" minimum away from penetration.
 - 2. Extend flange upward around penetration to at least 12" above roofing.
 - 3. Fold back upper and side roof flange edges 1/2" minimum.
 - 4. Solder-lap joints.
- B. Counter-flashing:
 - 1. Overlap base flashing 1" minimum with storm collar sloped away from penetration.
 - 2. Secure to penetration with solder.

3.10 SHEET METAL COPING

- A. Form metal coping to dimensions shown on the Drawings.
- B. Fabricate joints with lap seams spaced no greater than 10' apart and install drive cleat connection and lap seams in bed of sealant.
- C. Install non-corrosive #14 screw and neoprene washer assembly on roof side of coping.
- D. Lock drip edge over clips secured to substrate.
- E. Miter corners and locate lap seams 5'- 0" in each direction.

3.11 MASONRY FLASHING

- A. Furnish to masonry contractor for installation.

3.12 REPAIRING

- A. Repair or replace damaged work.

3.13 CLEANING

- A. As work progresses, neutralize excess flux with 5 to 10% washing soda solution, and thoroughly rinse.
- B. Leave work clean and free of stains, scrap and debris.

END OF SECTION

**SECTION 07 61 20
METAL ROOFING**

PART 1 - GENERAL

1.01 RELATED WORK ELSEWHERE

- A. Section 07 90 00: Sealants
- B. Section 13 34 19: Metal Building Systems

1.02 DESCRIPTION

- A. Applicable portions and requirements of Division 1, reference drawings apply to work in this Section.
- B. Work under this section includes furnishing and installing all materials and labor required for the new roof system. This includes but is not limited to the following: roof panels, clips, closures, flashing, sealants, and other items required for a complete metal roof system.

1.03 GENERAL

- A. Perform work and fabricate steel in accordance with specifications for the design, fabrication and erection of structural steel for buildings of AISC, State Code and specified herein. Steel to remain exposed shall also comply with specification for architecturally exposed structural steel of AISC.

1.04 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. All work shall conform to the requirements of the State of Wisconsin Code.
 - 2. All work shall conform to the requirements of the following codes and standards:
 - a. American Institute of Steel Construction (AISC).
 - b. American Society for Testing and Materials (ASTM).
 - 3. Where provisions of pertinent codes and standards conflict with this specification, the more stringent provisions shall govern.
 - 4. Design criteria shall be for a live load of thirty (30) pounds per square foot of horizontal projection of roof area and a twenty (20) pound per square foot wind load.
- B. Performance Criteria:
 - 1. Provide wind uplift resistance in accordance with the 1994 Uniform Building Code and pertinent local and state codes.
 - 2. Provide a design analysis signed by a registered Professional Engineer, confirming that the structural capacity of the metal roofing system as determined in accordance with ASTM E 1592 is adequate to resist the above design loads in accordance with the 1994 UBC. Analysis should include calculations verifying the design loads, the uplift pressures and how those loads affect the various areas of the roof. Provide a roof plan with the perimeter areas of discontinuity clearly shown and distinguished from the typical field roof elements.
 - 3. Provide pull out test for implementation of existing building systems and components in determining fastener type and frequency to be used with existing construction.

1.05 WARRANTY

- A. Manufacturer's Product Warranty:
 - 1. Warrant for 20 years, following project delivery date, that panels will be free from defects, and that panels if properly installed will not rupture, fail structurally or perforate.

- B. Installers Warranty:
 - 1. Warrant panels, flashing, sealants, fasteners, and accessories against defective workmanship, and to remain watertight and weatherproof with normal usage for two (2) years.

1.06 SUBMITTALS

- A. Shop Drawings:
 - 1. Within 30 days after award of Contract, and before any of the materials of this Section are delivered to the job site, submit complete shop drawings to the Architect in accordance with the provisions of Section 01.300 of these specifications; show erection plans, connection details including location, type and size of all rivets, bolts and welds. Weld symbols shall conform to AWS A2.4-79 "Symbols for Welding and Nondestructive Testing".

1.07 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the installed work and materials of all other trades.
- B. Replacement:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.
- C. Storage:
 - 1. Materials shall be stored in a weathertight and dry place until ready for use in the work.

PART 2 - PRODUCTS

2.01 MATERIALS, FABRICATION & ASSEMBLY

- A. Roofing System
 - 1. Metal Roof: Fabricate roof face sheets to the profile or configuration indicated from 24 ga. (0.55 mm), Grade C, zinc-coated steel sheets.
 - a. Flat Metal Roof: Manufacturer's standard factory-formed roof panel system designed for concealed clip attachment of panels to metal deck using a concealed clip and clip bearing plates. Acceptable Product and Manufacturer: 24-gauge MBCI Double Lok 2" high seams at 24" nominal centers, continuously from eave or valley to hip or ridge (having no end laps or transverse seams). MBCI galvanized steel coated with full strength finish in manufacturer's standard color Siliconized Polyester Signature 200. Color to be selected by the Architect.
 - i. Clips: Provide 16 gage panel clips.
 - ii. Cleats: Factory caulked, mechanically seamed cleats formed from 24 gauge, Grade C.
 - iii. Fasteners: Screws, bolts, nuts, self-locking rivets, self-locking bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. System shall have a UL 90 uplift rating
 - b. Provide metal-backed neoprene washers under heads of fasteners bearing on weather side of panels.
 - c. Use aluminum or stainless steel fasteners for exterior application and galvanized or cadmium-plated fasteners for interior applications.
 - d. Where used, locate and space fastenings in true vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of neoprene washer.

- e. Provide fasteners with heads matching color of roofing by means of plastic caps or factory-applied coating.
 - 2. Accessories: Provide the following sheet metal accessories factory-formed of the same material in the same finish as roof panels:
 - a. Flashings
 - b. Closers
 - c. Fillers
 - d. Fascias
 - e. Soffits
 - 3. Flexible Closure Strips: Closed-cell, expanded cellular rubber, and self-extinguishing flexible closure strips. Cut or pre-mold to match configuration of roofing and siding sheets. Provide closure strips where indicated or necessary to ensure weathertight construction.
 - 4. Sealing Tape: Pressure-sensitive 100 percent solids grey polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - 5. Joint Sealant: One-part elastomeric polyurethane, polysulfide, or silicone rubber sealant as recommended by the building manufacturer.
- B. Performance Requirements:
- 1. The standing seam roof panels shall be installed to limit air infiltration and water penetration to the values given below. Panels shall have been tested for air infiltration and water penetration by a qualified independent testing laboratory and copies of successful test results shall be submitted to the Architect-Engineer.
 - a. Air Infiltration: When tested in accordance with NAAM Test Procedure TM-1-68T, there shall be gross air leakage no greater than .021 cfm per square foot of overall face area at a static pressure differential of 20 psf.
 - b. Water Penetration: When tested in accordance with NAAM Test Procedure TM-1-68T with water sprayed at the rate of 5 gallons per hour per square foot of overall face area at a static pressure of 3.9 psf for 15 minutes, there shall be no uncontrollable water penetration.
 - 2. Panel Finish
 - a. The Panel Finish:
 - i. Aluminum coated steel - hot dipped aluminum.
 - 3. Panel Application
 - a. All side laps will be field sealed by a lock-seaming device.
 - b. All sidelap sealant shall be factory applied.
 - c. Panel laps shall be at least 6" sealed with sealants and fastened together by clamping plates.
 - 4. Fasteners
 - a. All connections of panels to structural members shall be made with clips with movable tabs that are seamed into the standing lock seam sidelap.
 - b. Connections shall be made with positive field formed standing double lock seam.
 - c. Standing seams shall be formed by a special lock seaming device.
 - d. Fastener locations shall be as shown on erection drawings as furnished by manufacturer.
 - 5. U. L. Uplift Ratings
 - a. Roof system on wide-span structural, with 24-gauge minimum thickness steel panels (all coatings) carries a U.L. wind-uplift class 90 rating U.L. Construction No. 62A.

6. Accessories and trim shall be as standard with manufacturer unless otherwise noted and furnished as specified. Location of standard accessories shall be as shown on erection drawings as furnished by manufacturer.
- C. Guarantee
1. The contractor shall furnish a guarantee for the roofing system and its components against defective materials and workmanship for a period of five (5) years.

2.02 ROOF UNDERLAYMENT

- A. Roof in underlayment material for installation on roof sheathing at standing seam metal roofing shall be as follows:
1. Underlayment:
 - a. DuPont™ RoofLiner: Class 'A' fire rated ASTM E108 high UV-resistant per ASTM G154.

2.03 ICE AND WATER SHIELD

- A. W.R. Grace Co. Ice and Water Shield laid as indicated on drawings.

2.04 SNOW GUARDS

- A. Install Icejax II snow guards as manufactured by Snoblox™ as indicated on drawings.

2.05 NAILS

- A. Hot galvanized, 11 ga.-barbed shank, 3/8" head, and 1" minimum length, Staples are not permitted.

2.06 BITUMINOUS PLASTIC CEMENT

- A. FS SS-C-153C, Type I.

PART 3 - EXECUTION

3.01 TOLERANCES

- A. Rolling, fabricating and erection tolerances shall conform to the requirements of AISC "Code of Standard Practice for Steel Building and Bridges".

3.02 INSPECTION

- A. Assure that surfaces to which the standing seam metal roof panels and accessories are to be applied are uniform, smooth, sound, clean, dry and free of irregularities.
- B. Verify that installation of ice and water shield, metal flashings, and metal trim has been completed.
- C. Verify that work of other trades which penetrates roof deck has been completed.
- D. Do not start work until unsatisfactory conditions are corrected.

3.03 APPLICATION

- A. Felt Underlayment:
- a. Lay one layer of underlayment horizontally over entire roof, lapping each course over lower course one half course and 4" side lap.
 - b. Lap underlayment 6" from both sides over hips and ridges.
 - c. Secure underlayment to deck with sufficient fasteners to hold in place until roofing is applied.
- B. Flashings:
1. Eaves Flashing:
 - a. Install to metal drip edge and where indicated a gutter apron to overhang underlayment.

- b. Apply one row of 3'-0" wide ice and water shield at the eave.
- c. Nail 1" in from each edge to hold ice and water shield in place.
- d. Splice by overlapping ends of upper segments of ice and water shield 12" over lower segments, and secure with bituminous plastic cement.

3.04 INSTALLATION

- A. Responsibility for Installation: The metal panel roofing manufacturer shall be fully responsible for the installation of all work specified in this section. Installation shall be performed by trained mechanics of the manufacturer or by a duly authorized agent of the manufacturer approved by the Architect-Engineer. No installation of the metal roof panel shall commence until written approval of the installation sub-contractor has been received from the Architect-Engineer.
- B. General: All sheets, shall be formed to provide interlocking, weatherproof joints, adequately reinforced, and provided with metal bulkheads at ends of the insulated panel units to protect the insulation.
 1. Panel lengths shall be as shown on drawings, or as long as practical. Horizontal joints shall be made only at structural members or at similar points. All panels cut to a slope, or otherwise, shall have the ends or edges protected by suitable metal fittings securely fastened to panel sheets.
 2. Panels shall be rigidly attached to the structure with bolts, clips, self-tapping screws, or other methods approved by the Architect-Engineer. Welding of metal fittings securely fastened to panel sheets.
 3. All fasteners for exterior panels shall be concealed type. No exposed fasteners will be permitted.
 4. Provide and install all angles and other steel members not designated as structural steel or miscellaneous metal work, but which are required for a complete and rigid panel installation.
 5. Furnish and install all stainless steel or cadmium plated screws or studs and concealed clips required to fasten panels to structure and various parts of the panels together.
- C. Joint Sealing and Locking: Seal all interlocking joints of interior sheets and of exterior sheets with sealed compound applied, whenever possible, in the shop to a sufficient depth to insure sealed joints. Apply sealer carefully and remove excess sealer from exposed surfaces after erection. Clinch-lock the inter-locking ribs of sheet with a button punch or similar device at intervals not to exceed 4'-0".
- D. Sheet Metal Flashing and Fittings:
 1. Metal panel work shall include certain sheet metal flashing as specified, also other sheet metal fittings as required for a complete job.
 2. Install all sheet metal flashing related to or in conjunction with metal panel siding according to flashing details shown on the drawings.
 3. Install flashings at all wall/roof intersections. Where flashing is related to metal panel siding and is adjacent to or is part of the expansion joints, the top sheet of expansion joint shall be of the same material as the exterior face sheet of the metal panel roofing and shall be provided and installed by the Metal Panel Roofing Contractor.
 4. The lower edges of exposed fascia and flashings, caps, etc., shall be held down with compatible metal cleats or clips. Exposed edges of all sheet metal shall be folded back at least 1/4" to form a hemmed edge.
 5. Furnish and install neoprene or EPDM gaskets to close open ends of panels. Gaskets shall be the same shape as the panel sheets and make a weathertight closure. Provide weathertight closures around all items such as pipes, ducts, brackets, etc., which pass through the metal panel siding.
 6. All field caulking required for a weathertight wall panel installation shall be done with

an approved, non-hardening elastic sealant.

3.05 PAINTING

- A. All plain steel accessory items and fittings shall be prime painted on all surfaces and edges with one shop coat of light colored metal primer.

3.06 ADJUST AND CLEAN

- A. Replace damaged panels and accessories.
- B. Remove excess panels and accessories not part of extra stock and debris from project site.
- C. Seal flashings to roof penetrations.

3.07 CLEANING AND CLEAN-UP

- A. After erection, all exposed surfaces of metal panel roofing installations, including interior and exterior shall be cleaned and left free of all grime and dirt.
- B. Cleaning and Repairing: At completion of each day's work and at work completion, sweep panels and flashing clean. Do not allow fasteners, cuttings, filings or scraps to accumulate on finish surfaces.
- C. The Metal Panel Roofing Contractor shall be responsible for the cleanup and removal of all excess metal panels and shipping cartons wrapping, etc.

END OF SECTION

**SECTION 07 71 23
GUTTERS AND DOWNSPOUTS**

PART 1 - GENERAL

1.01 RELATED WORK ELSEWHERE

- A. Division 7 Section 07 60 00 – Flashing and Sheet Metal
- B. Division 7 Section 07 92 00 – Sealants

1.02 DESCRIPTION

- A. Work includes furnishing and installing of closures, gutters, downspouts, flashing, trim, fasteners, and all other accessories as needed for a complete installation.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Samples:
 - 1. Two pieces, minimum one lineal foot of prefinished aluminum gutter and downspout showing representative pattern and textures; color samples showing manufacturer's full range.
- C. Manufacturer's Literature: Material descriptions and recommended installation procedures.

1.04 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials with manufacturer's labels intact and legible.
- B. Deliver materials in sealed packages with Underwriter's Laboratories Inc. labels.
- C. Store materials on raised platforms and protect with coverings at outdoor locations.

1.05 GUARANTEE

- A. Materials: Guarantee against defects for 20 years.
- B. Workmanship: Guarantee against defects for 2 years.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fasteners: Prefinished aluminum nails and pop rivets.
- B. Gutters and Downspouts
 - 1. Gutter system with accessories equivalent to products as manufactured by Perimeter Systems, division of Southern Aluminum Finishing Company, Inc. Profile to be No. G-2 / R 6", 20 gage, Kynar 500 finish, manufactured of aluminum with expansion joints at 40'- 0" intervals.
 - 2. Downspout system shall be the size shown on the Drawings and constructed of 18 gauge material. Surfaces to remain exposed to view shall have color and finish to match gutter. Downspouts concealed from view shall be finished with siliconized polyester enamel. The downspouts concealed from view shall be continuously welded and seamless.
- C. Provide all necessary flashing and trim, corner and edge trim of matching color and gauge for a complete and weather-tight installation.

- D. Sealant
 - 1. Provide all necessary sealant of matching color of gutters for a complete and weather-tight installation.
- E. Other Materials
 - 1. All other materials not specifically described but required for complete and proper gutter and downspout installation, shall be first quality of their respective kinds, new, and as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Assure that surfaces to which material are to be applied are uniform, smooth, sound, clean, dry and free of irregularities.
- B. Verify that installation of substrate has been completed.
- C. Verify that work of other trades which penetrates the overhang and walls is completed.
- D. Do not start work until unsatisfactory conditions are corrected.
- E. Install gutters, downspouts, guards and accessories true and plumb. Slope gutters to the appropriate downspout shown on the Drawings.

3.02 ADJUST AND CLEAN

- A. Replace damaged gutters, downspouts, and accessories.

END OF SECTION

**SECTION 07 72 53
SNOW GUARDS**

PART 1 - GENERAL

1.01 SUMMARY

- A. Work Includes
 - 1. Snojax II polycarbonate snow guard that attached directly to the roof deck.
 - 2. Determine proper snow guard spacing and method of attachment.
- B. RELATED SECTIONS
 - 1. Division 13 – Metal Building Systems

1.02 SYSTEM DESCRIPTION

- A. Components
 - 1. Snojax II snow retention system that consists of individual polycarbonate snow guards.
 - 2. Fasteners
 - a. Non-Floating Mechanically Fastened Metal Roofs: Attach with (2) #14 noncorrosive screws and all-weather sealant.
 - b. Standing Seam Floating Metal Roofs: Attach with Surebond SB-190 Everseal adhesive.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.

1.04 QUALITY ASSURANCE

- A. Provide Architectural Testing product load data rest results for Snow Guards.
- B. Installer shall have at least 5 years' experience installing the specified roofing material and snow guards.

1.05 WARRANTY

- A. Lifetime Warranty
 - 1. Provide warrant information from manufacturer cover against material and/or workmanship defect(s).

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. IceBlox, Inc., d.b.a. Snoblox-Snojax 1405 Brandton Road, Mechanicsburg, PA 17055.
www.snojax.com

2.02 MATERIALS

- A. Injection molded pure virgin grade polycarbonate polymer material construction containing a UV stabilizer.

2.03 FINISH

- A. Colored to match the roof panel.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Substrate
 - 1. Validate that the roofing material has been installed correctly and structure is adequate prior to installing snow guards.

3.02 INSTALLATION

- A. Comply with architectural guidelines and snow guard manufacturer's spacing recommendations. Follow manufacturer's written installation instructions for installation and spacing recommendations.

END OF SECTION

**SECTION 07 92 00
JOINT SEALANTS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. This Section describes sealing of all joints where shown on the Drawings and elsewhere as required to provide a positive barrier against passage of air and passage of moisture.

1.02 QUALITY ASSURANCE

- A. Standards:
 - 1. Comply with standards specified in this Section.
- B. Qualifications of Manufacturers:
 - 1. Products used in the work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/Engineer.
- C. Qualifications of Installers:
 - 1. Proper caulking and proper installation of sealants require that installers be thoroughly trained and experienced in the necessary skills and thoroughly familiar with the specified requirements.
- D. For caulking and installation of sealants throughout the Work, use only personnel who have been specifically trained in such procedures and who are completely familiar with the joint details shown on the Drawings and the installation requirements called for in this Section.

1.03 SUBMITTALS:

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Manufacturer's Data: Within 15 calendar days after Award of the Contract, submit:
 - 1. A complete materials list showing all items proposed to be furnished and installed under this Section.
 - 2. Sufficient data to demonstrate that all such materials meet or exceed the specified requirements.
 - 3. Specifications, installation instructions, and general recommendations from the materials manufacturers showing procedures under which it is proposed that the materials will be installed.
 - a. Upon approval by the Architect, the proposed installation procedures will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.
- C. Prior to acceptance of Work, furnish written guarantee for five (5) years covering repairs required to maintain caulking in a weather-tight condition. Make repairs at no expense to Owner.

1.04 PRODUCT HANDLING

- A. Delivery and Storage:
 - 1. Deliver all materials of this Section to the Project site in the original unopened containers with all labels intact and legible at time of use. Store only under conditions recommended by the manufacturers. Do not retain on the Project site any material which has exceeded the shelf life recommended by its manufacturer.

- B. Protection:
 - 1. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all other trades.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 SEALANTS

- A. Sealant material shall be a one-part polyurethane sealant exceeding the requirements of Federal Specification TT-S-00230.
- B. Sealant Manufacturers and Products:
 - 1. Sonneborn Building Products "Sonolastic NP1"
 - 2. Sika Corp." Sikaflex 180"
 - 3. Tremco, Inc. "Dymeric 511"
- C. Sealant shall be applied on the exterior of the building between exterior door, sidelight, window and louver frames and masonry and concrete; at exterior expansion and control joints in masonry; under thresholds; and other areas where nature of work required it for appearance or to ensure tight construction.
- D. Prime surfaces in accordance with manufacturer's recommendations prior to applying sealant.
- E. Follow manufacturer's recommendation on maximum width and depth of beads, generally maximum width of bead not-to-exceed two times the depth, minimum depth 1/4".
- F. Fill joints deeper than 1/2" with polyurethane foam spacers.
- G. Sealant shall be applied on the interior of the building between all doors, sidelight, window and louver frames and masonry, drywall, and concrete; at interior expansion and control joints in masonry; under thresholds, between cabinetry and walls; and other areas where nature of work requires it for appearance or to ensure tight construction.
- H. Sealant shall be at least 1/2" deep; fill joints deeper than 1" with non-impregnated filler before caulking. Prime block and other porous surfaces prior to caulking as per manufacturer's specifications.
- I. Sealant behind removable flanges, beads or drops when possible, removing items or doing work in advance for this purpose.

2.02 COLORS

- A. Colors for each sealant will be selected by the Architect/Engineer from standard colors normally available from the specified manufacturers. Should such standard color not be available from the approved manufacturer except at additional charge, provide all such colors at no additional cost to the Owner.
- B. In concealed installations and in partially or fully exposed installations where so approved by the Architect/Engineer, standard gray or black sealant may be used.

2.03 PRIMERS

- A. Use only those primers which are non-staining, have been tested for durability on the surfaces to be sealed, and are specifically recommended for this installation by the manufacturer of the sealant used.

2.04 BACKUP MATERIALS

- A. General: Use only those backup materials which are specifically recommended for this installation by the manufacturer of the sealant used, and which are non-absorbent and non-staining.

2.05 BOND-PREVENTIVE MATERIALS

- A. Use only bond-preventive materials best suited for the application and as recommended by the manufacturer of the sealant used.

2.06 MASKING TAPE

- A. For masking around joints, provide masking tape conforming to Federal Specification -UU-T-106c.

2.07 OTHER MATERIALS

- A. All other materials, not specifically described but required for complete and proper caulking and installation of sealants, shall be first quality of their respective kinds, new, and as selected the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Follow the manufacturer's recommended method of preparation for each type of material to which sealant to be applied.

3.03 INSTALLATION OF BACKUP MATERIAL

- A. Use only the backup material recommended by the manufacturer of the sealant and approved by the Architect/Engineer for the particular installation, compressing the backup material 25% to 50% to secure a positive and secure fit. When using backup of tube or rod stock, avoid lengthwise stretching of the material. Do not twist or braid hose or rod backup stock. Open cell backer rod is not permitted.

3.04 PRIMING

- A. Use only the primer recommended by the manufacturer of the sealant and approved by the Architect/Engineer for the particular installation. Apply the primer in strict accordance with the manufacturer's recommendations as approved by the Architect/Engineer.

3.05 BOND-BREAKER INSTALLATION

- A. Install an approved bond-breaker where recommended by the manufacturer of the sealant and where directed by the Architect/Engineer, adhering strictly to the installation recommendations as approved by the Architect/Engineer.

3.06 INSTALLATION OF SEALANTS

- A. General:
 - 1. Prior to start of installation in each joint, verify the joint type according to the details in the Drawings, and verify that the required proportion of width of joint to depth of joint has been secured.
- B. Equipment:
 - 1. Apply sealant under pressure with hand or power-actuated gun or other appropriate means. Guns shall have nozzle of proper size and shall provide sufficient pressure to completely fill joints as designed.
- C. Masking:
 - 1. Thoroughly and completely mask all joints where the appearance of sealant on adjacent surfaces would be objectionable.

- D. Installation of Sealant:
 - 1. Install the sealant in strict accordance with the manufacturer's recommendations as approved by the Architect/Engineer, thoroughly filling all joints to the recommended depth.
- E. Tooling:
 - 1. Tool all joints.
- F. Cleaning Up:
 - 1. Remove masking tape immediately after joints have been tooled.
 - 2. Clean adjacent surfaces free from sealant as the installation progresses. Use solvent or cleaning agent as recommended by the sealant manufacturer.

END OF SECTION

**SECTION 08 11 00
STEEL DOORS AND FRAMES**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. This Section describes all standard and non-standard steel doors and steel door frames delivered to the Project.
- B. Related Work Described Elsewhere:
 - 1. Division 4 Section 04 22 00 – Concrete Masonry Units
 - 2. Division 8 Section 08 70 00 – Finish Hardware
 - 3. Division 8 Section 08 80 00 – Glazing
 - 4. Division 9 Section 09 29 00 – Gypsum Board

1.02 QUALITY ASSURANCE

- A. Standards:
 - 1. Comply with applicable standards specified:
 - a. Underwriters Laboratories, Inc. (UL)
 - b. Factory Mutual Research Approvals (FM)
 - c. American National Standards Institute (ANSI)
 - d. American Society for Testing and Materials (ASTM)
 - e. Federal Specifications (FS)
- B. Qualifications of Manufacturer:
 - 1. Products used in this work of this Section shall be produced by manufacturer regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.
- C. Qualifications of Installers:
 - 1. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- D. Single Source:
 - 1. All work of this Section shall be produced by a single manufacturer unless otherwise approved by the Architect.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Manufacturer's Data:
 - 1. Within 15 calendar days after Award of Contract, submit:
 - a. Complete materials list of all items proposed to be furnished and installed under this Section.
 - b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.
 - c. Shop drawings showing details of each frame type, elevations of each door design type, details of all openings, and all details of construction, installation, and anchorage.

- C. The manufacturer's recommended installation procedures, when approved by the Architect, will become the basis for inspecting or rejecting actual installation procedures used on the Work.

1.04 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. Replacements:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Pioneer Industries, Hackensack, NJ.
- B. Superior Metal Products Co., Inc, Birmingham, AL.
- C. Trussbilt, New Brighton, MN.
- D. Ceco Door Products, Milan, TN.
- E. Steelcraft Manufacturing Co., Cincinnati, OH.
- F. Amweld Building Products, LLC, Garrettsville, OH
- G. Precision Metals, Inc. Milwaukee, WI
- H. Curries Company, Mason City, IA

2.02 STEEL FABRICATION

- A. Carbon Steel: Cold rolled, ASTM A 1008/A 1008M.

2.03 COATING MATERIALS:

- A. Primer: Manufacturer's standard rust inhibitive primer. Similar to Zeibart Car Coating.

2.04 CORE FILLER MATERIAL:

- A. Manufacturer's standard fibrous honeycomb for interior doors and insulation for exterior doors.

2.05 ANCHORS, FASTENERS HARDWARE AND ACCESSORIES

- A. Manufacturer's standard.

2.06 OTHER MATERIALS

- A. All other materials not specifically described but required for the complete and proper installation of the work of this Section shall be new, first quality for their respective kinds and subject to approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 EXISTING CONDITIONS

- A. Inspection:
 - 1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point when this installation will properly commence.
 - 2. Verify that all hollow metal work may be installed in accordance with all product codes

and regulations, the original design and their referenced standards.

3.02 FABRICATION

- A. General:
 - 1. Fabricate hollow metal work to be rigid, neat in appearance, and free from defects, warp or buckle.
 - 2. Completed fabrications to meet ANSI A151.1.
 - 3. Accurately form metal to required sizes and profiles, including astragals if utilized.
 - 4. Clearly identify work that cannot be permanently factory assembled before shipment to assure proper assembly at Project site.
 - 5. Grind and dress exposed welds to form smooth, flush surfaces.
 - 6. Do not use metallic filler to conceal manufacturing defects.
- B. Doors:
 - 1. Form interior face sheets and exterior face sheets of 18-gauge metal.
 - 2. Stiffener:
 - a. Stiffen face sheet with continuous vertical formed steel sections over full thickness of interior space between door faces.
 - b. Stiffeners of 22 gauge minimum, spaced not more than 6" apart, spot welded to both face sheets not more than 4" on-center.
 - c. Fill spaces between stiffeners with core material.
 - 3. Join door faces at vertical edges by mechanical interlock.
 - 4. Doors shall have sealed flush top caps.

3.03 FRAMES

- A. Interior Frames:
 - 1. 16 gauge
 - 2. Diecut mitered corners with interlocking tabs and slots for alignment.
 - 3. **Frames shall be grouted solid with light-weight plaster before installation by installer.**
 - 4. Fabricated with mitered joints for installation after wall is erected.
 - 5. Coating Materials:
 - a. Primer: Manufacturer's galvanized rust inhibitive primer.
- B. Exterior Frames:
 - 1. Exterior frames to be 14-gauge galvanized steel.
 - 2. Diecut mitered corners with interlocking tabs and slots for alignment.
 - 3. **Frames shall be filled with spray foam insulation before installation by installer.**
 - 4. Fabricated with mitered joints for installation after wall is erected.
 - 5. Coating Materials:
 - a. Primer: Manufacturer's galvanized rust inhibitive primer.

3.04 EDGE CLEARANCES

- A. Between doors and frame at head and jamb: 1/8"
- B. At sills without thresholds: 3/4" maximum
- C. At sills with thresholds: 1/4" maximum between threshold and door.
- D. Between meeting edges of pairs of doors: 1/8".

3.05 PREPARATION FOR HARDWARE

- A. ANSI A 115.

3.06 FINISH

- A. Dress tool marks and surface imperfections to smooth surfaces, and remove irregularities.
- B. Chemically treat and clean doors and frames.
- C. Apply manufacturer's standard primer.

3.07 INSPECTION

- A. Assure that frame openings correspond to dimensions of frame furnished.
- B. Check that surfaces to contact frame are free of debris.
- C. Do not proceed with installation until unsatisfactory conditions are corrected.

3.08 INSTALLATION

- A. Anchorage:
 - 1. Attach anchor to opening.
 - 2. Minimum number of anchors:
 - a. Masonry Walls, Concrete Walls & Structural Steel:
 - i. Frames up to 7'- 6": 3 anchors per jamb.
 - ii. Frames 7'- 6" to 8'- 0": 4 anchors per jamb.
 - iii. Frames more than 8'- 0": 1 anchor for each 2'- 0" of jamb or fraction thereof.
 - b. Stud Partitions:
 - i. Frames up to 7'- 6": 3 anchors per jamb
 - ii. Frames 7'- 6" to 8'- 0" 4 anchors per jamb
 - iii. Frame more than 8'- 0": 4 anchors plus one additional anchor for each 2'- 0" or fraction thereof over 8'- 0".
 - 3. Frames: SDI 105
 - 4. Hardware: SDI 107
 - 5. Doors: SDI 100.
- B. Exterior Door Frames:
 - 1. These frames shall be back-coated with rust-inhibitive asphalt coating, shop filled with rigid insulation, and frame filled solid with grout by installer before installation.

3.09 ADJUSTMENT AND CLEANING

- A. Remove dirt and excess sealants or glazing compound from exposed surfaces.
- B. Touch-up marred or abraded surfaces to match original finish.
- C. Adjust moving parts for smooth operation.
- D. Remove debris from Project site.

3.10 GUARANTEES

- A. Guarantee doors and frames against failure of materials or workmanship to include excessive leakage of air infiltration, excessive deflections, faulty operation of sash, deterioration of finish or metal in excess of normal weathering, and defects in hardware and weather-stripping.
- B. Guarantee to extend for two years.

END OF SECTION

SECTION 08 11 16
ALUMINUM DOORS, FRAMES, AND WINDOWS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Furnish and install aluminum doors and frames as shown on the Drawings and specified herein for a complete and proper installation.

1.02 QUALITY ASSURANCE

- A. For purposes of designating type and quality for work in this Section, Drawings and Specifications are based on Kawneer. Whenever substitute products are to be considered, supporting technical literature, samples and drawings must be submitted five (5) days prior to bid date in order to make a valid comparison of the products involved.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Shop Drawings:
 - 1. Within 15 days after Award of Contract, and before any of the materials of this Section are delivered to the Project site, show construction of all parts, metal thickness, installation and erection details including connections, anchorage, fastening and sealing methods. Also show sections of typical members, dimensions and elevation, frame sizes, spacing of anchors and fasteners, and details of accessories.
- C. Manufacturer's Recommendations:
 - 1. Submit two copies of the manufacturer's recommended methods of installation for aluminum doors and frames.
- D. Samples:
 - 1. Accompany the shop drawings; submit samples of the proposed aluminum finishes to the Architect/Engineer.

1.04 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect the materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. Replacement:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architects/Engineer and at no additional cost to the Owner.

1.05 GUARANTEES

- A. Guarantee doors and frames against failure of materials or workmanship to include excessive leakage of air infiltration, excessive deflections, faulty operation of sash, deterioration of finish or metal in excess of normal weathering, and defects in hardware and weather-stripping.
- B. Guarantee to extend for 2 years.

PART 2 - PRODUCTS

2.01 FRAMES

- A. All frames shall be the product of Kawneer Co., Inc. Equivalent products of Tubelite, Inc., YKK AP America, Inc., EFCO Corporation, and PPG Aluminum Entrances shall be

acceptable subject to approval by Architect/Engineer.

- B. Entrance Framing and exterior windows shall be equal to Kawneer EnCore 4½" Depth (Front Application) thermal break and sized to accept 1" insulating glass.

2.02 ALUMINUM (ENTRANCES AND COMPONENTS):

- A. Material Standard: ASTM B 221; 6063-T5 alloy and temper.
- B. The door stile and rail face dimensions of the 350 entrance door will be as follows:
 - 1. Door Vertical Stile Top Rail Bottom Rail
 - a. 350 Series 3½" vertical stile, 3 ½" top stile, 10" bottom rail.
 - 2. Major portions of the door members to be .125" nominal in thickness and glazing molding to be .050" thick.
 - 3. Tolerances: Reference to tolerances for wall thickness and other cross-sectional dimensions of entrance members are nominal and in compliance with Aluminum Standards and Data, published by The Aluminum Association.
 - 4. Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.
 - 5. Provide adjustable glass jacks to help center the glass in the door opening. A. Fasteners: Where exposed, shall be aluminum, stainless steel or plated steel.
 - 6. Perimeter Anchors: Aluminum. When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.

2.03 STANDARD ENTRANCE HARDWARE

- A. Hinges: All aluminum doors shall have aluminum continuous gear hinges.
- B. Weatherstripping: Meeting stiles on pairs of doors shall be equipped with an adjustable astragal utilizing wool pile with polymeric fin.
- C. The door weatherstripping butt hung door and frame (single or pairs) shall be Kawneer Sealair® weathering. This is comprised of a thermoplastic elastomer weathering on a tubular shape with a semi-rigid polymeric backing.
- D. Sill Sweep Strips: EPDM blade gasket sweep strip in an aluminum extrusion applied to the interior exposed surface of the bottom rail with concealed fasteners. Threshold: Extruded aluminum, one piece per door opening, with ribbed surface.
- E. Vonduprin entrance / exit hardware base specified, equivalent manufacturer to be Precision or Dor-O-Matic.

2.04 DOOR SCHEDULE

Hardware Set No. 1 Exterior Door(s) (Aluminum)

- 1 Vonduprin Series 9947L rim device, panic with Schlage Cylinder Lock. Cylinder Lock keying should be coordinated with Finish Hardware Supplier (Section 08 70 00). Coordinate with Electric Strike (Fail Secure) as provided in 08 70 00 Finish Hardware.
- 1 Closers
- 1 Exterior Weather Stripping.

Hardware Set No. 2 Interior Door(s) (Aluminum)

- 1 C0-12/CP Push Pull Sets
- 1 Closers: Provide LCN 4020 Series Surface Mounted (Push-Side), finish to match aluminum door frame color.
- 1 Closers: finish to match aluminum door frame color.

2.05 ALUMINUM WINDOWS

- A. Material Standard: ASTM B221; 6063-T5 alloy and temper
- B. Kawneer EnCore Series 4½" Depth (Front Application) thermal break and sized to accept 1" insulating glass.

2.06 ALUMINUM EXTRUSIONS

- A. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
- B. Alloy 6063
- C. Temper T5

2.07 ALUMINUM FINISH

- A. All exposed surfaces of aluminum door and framing members shall be free of scratches and other serious surface blemishes.
- B. Aluminum moldings shall be given a caustic etch followed by an anodic oxide treatment to obtain:
 - 1. Kawneer Permacoat™ Powder Coating, color to be selected by Architect from manufacturer's standard color palette.

2.08 CARBON STEEL

- A. Shapes, plates and bars: ASTM A 36/A 36M.
- B. Sheets:
 - 1. ASTM A 653/A 653M
 - 2. Zinc coating: ASTM A 653/A 653M

2.09 OTHER MATERIALS

- A. All other materials, not specifically described, but required for a complete and proper installation of the work of this Section, shall be new, first quality for their respective kinds and subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 PRIOR CONDITIONS

- A. Inspection:
 - 1. Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 - 2. Verify that all aluminum doors and frames may be installed in accordance with all pertinent codes and regulations, the original design and the referenced standards.
- B. Discrepancies:
 - 1. In the event of discrepancy, immediately notify the Architect/Engineer.
 - 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 INSTALLATION

- A. General:
 - 1. Install all aluminum doors, frames, and hardware in strict accordance with the manufacturer's recommendations as approved by the Architect/Engineer. Conform to revised shop drawings.

3.03 MECHANICAL ASSEMBLIES

- A. Fit corner joints rigid and weather-tight.
- B. Fasteners concealed when door is installed and closed.

3.04 PROTECTIVE COATINGS

- A. Factory applied.
- B. Solvent-clean metal surface.
- C. Apply bituminous paint to aluminum in contact with galvanically incompatible metal.
- D. Apply zinc chromate primer to aluminum surfaces to be installed in contact with concrete or mortar.

3.05 WEATHERSTRIP

- A. Weather-strip on all sides installed on door.
- B. Weather-stripping to be continuous at corners.

3.06 INSPECTION

- A. Assure that door openings conform to dimensions and tolerances shown on Drawings.
- B. Check that surfaces to contact doors are free of debris.
- C. Do not proceed with installation until unsatisfactory conditions are corrected.

3.07 INSTALLATION

- A. Comply with manufacturer's instructions for installation of units, hardware, operators, and other components.
- B. Set units plumb, level and true to line, without warp or rack of frames.
- C. Anchor frames solidly to surrounding construction to prevent distortion or misalignment.
- D. Apply protective coating to separate aluminum from galvanically incompatible materials.
- E. Use Lok-Tite on all screws.

3.08 ADJUST AND CLEAN

- A. Adjust movable units to operate smoothly and to be weather-tight when closed.
- B. Lubricate hardware and moving parts.
- C. Clean aluminum surfaces and remove excess sealants.
- D. Remove debris from Project site.

END OF SECTION

**SECTION 08 31 16
ATTIC ACCESS PANELS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. Provide security access panels complete, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.
 - 2. Division 01 Section "Construction Waste Management" for recycling and waste disposal requirements.

1.02 QUALITY ASSURANCE

- A. Standards:
 - 1. Comply with standards specified in this Section.
- B. Qualifications of Manufacturer:
 - 1. Use products in the work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.
- C. Qualifications of Installers:
 - 1. Use skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Manufacturer's Data:
 - 1. Within 20 calendar days after Award of Contract, submit:
 - a. Complete materials list of all items proposed to be furnished and installed under this Section;
 - b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;
 - c. Shop drawings showing components, arrangements, dimensions, orientation on walls, sections of trim members, dimensioned elevations, grounds, reinforcements, and accessories.

1.04 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. Replacements:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 ATTIC ACCESS PANEL

- A. Provide 24" x 36" Larsen's Access Panel, model L-MPG, with lock complete, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.
- B. Frame: 16 gauge galvanized steel with one inch flange. All exposed joints welded and ground smooth.
- C. Panel: 20 gauge galvanized steel.
- D. Hinge: Offset concealed continuous type.
- E. Fasteners: Security screws, 6" on center.
- F. Finish: Rust inhibitive primer

2.02 OTHER MATERIALS

- A. All other materials, not specifically described, but required for a complete and proper installation of the work of this Section, shall be new, first-quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work to approval of the Architect/Engineer. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Furnish the specified security access panel with lock to the Mason Contractor. General Contractor shall coordinate the installation of the access panel with masonry installation.

3.03 FINAL INSPECTION

- A. The manufacturer's recommended installation procedures, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on this work.

END OF SECTION

**SECTION 08 36 13
OVERHEAD SECTIONAL DOORS**

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The work required in this Section includes all labor, materials and equipment for the fabrication and installation of electrically operated overhead sectional steel doors in designated locations indicated on the Drawings. It shall include making such tests of installation as required by the Owner and Architect/Engineer.
- B. The Contractor will be held to have examined the Drawings and read over this Specification for work required to be done by other trades in connection with work of this Section and shall furnish and install such supplementary material as needed to properly and completely support the work furnished in this Section or as otherwise required for the complete installation.
- C. The Contractor will cooperate with the Mechanical trades to avoid interference with such equipment as structure, unit heaters, ductwork, piping, etc. and provide adequate track bracing and supports.

1.02 WORK UNDER OTHER HEADINGS

- A. Guard-posts at door openings will be furnished and installed under metal fabrications.
- B. Interior finish painting, including touch up, shall be performed under "Painting".

1.03 QUALITY ASSURANCE

- A. Provide the overhead sectional doors, as complete units produced by one manufacturer, including hardware, controls, accessories, stations, mounting and installation components. The operator, track, door, hardware, mounting hardware, and safety edge to reverse shall be installed by the Door Contractor. Door Contractor shall provide to the Electrical Contractor for installation, push button controls, photo detector control, and radio transmitter receivers.
- B. Manufacturer:
 - 1. Provide overhead sectional doors as manufactured by one of the following, or as approved equal by Architect/Engineer:
 - a. Raynor.
 - b. Overhead Door Corporation
 - c. Wayne-Dalton Corp.
 - d. Haas Door

1.04 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Manufacturer's Data:
 - 1. Within 25 calendar days after Award of Contract submit.
 - 2. Complete materials list of all items proposed to be furnished and installed under this Section.
 - 3. Shop drawings for each type of overhead door units showing components, arrangements, dimensions, orientation on walls, sections of trim members, insulation resistant values, dimension elevations, grounds, motors, reinforcements, operators, controls, and accessories.

PART 2 - PRODUCTS

2.01 MOTOR OPERATED OVERHEAD SECTIONAL DOORS AND FRAMES

- A. Door Sections:
1. Sections shall be 3" thick, roll formed from commercial quality hot dip galvanized steel per ASTM A-525 and A-526. Door sections constructed of 26 gauge interior and exterior skins mechanically interlocked and pressure bonded to a 2-7/8" thick expanded polystyrene core. Interior and exterior skins to be separated by a continuous dual durometer vinyl extrusion to form an effective thermal break and a complete weather-tight seal along section joint. Thermal break extrusion to be held in place by means of a mechanical interlock. End stiles to be minimum 14 gauge, separated from exterior skin with vinyl thermal break.
- B. Finish:
1. Exterior and interior of door skins pre-coated prior to roll forming with epoxy primer. Two coats of finish paint by door manufacturer. Color selection from standard color palette.
- C. Weatherstripping:
1. Door shall be furnished with complete weatherstripping system to reduce air infiltration. Top of door provided with EPDM rubber sealing strip. Bottom of door to have flexible U-shaped vinyl seal encased in extruded aluminum retainer to conform to irregularities in floor. Jamb seal to be EPDM rubber blade type attached to track angle mounting with rigid vinyl snap-on extrusion. Weatherstripping to be replaceable without removal of track, angle mounting, or door hardware. Maximum air leakage per foot of door perimeter (floor, jamb, and header) shall not exceed .81 CFM @ 25 M.P.H. No air leakage shall be detected between section joints when tested in accordance with ASTM E-283.
- D. Tracks:
1. Galvanized track shall be 3". Tracks to have Graduated Seal™ for weather-tight closing. Tracks to be bracket mounted or continuous angle mounted and fully adjustable for sealing door to jamb. Continuous angle size to be not less than 3-1/2"x 6"x1/8" on 3" track. Horizontal track to be adequately reinforced with continuous angle. Provide normal headroom at elevations indicated on the Drawings. Tracks to be fastened to new steel by using 5/16" – 12 Tek Screws. Welding of tracks to steel is not permitted.
- E. Hardware:
1. All hinges and brackets made from galvanized steel. Track rollers shall have ten 1/4" diameter hardened steel balls per roller (2") and ten 5/16" diameter hardened steel balls per roller (3").
- F. Spring Counterbalance:
1. Heavy duty oil tempered wire torsion springs on continuous ball bearing cross header shaft. Galvanized aircraft type lifting cables with minimum safety factor of 5 to 1.
- G. Lock:
1. Interior Locking-Interior dead bolt shall be provided with hole to receive padlock.
- H. Wind Load:
1. Design to withstand 20 lbs. per sq. ft. Deflection of door in horizontal position to be maximum 1/120th of door with.
- I. Glazing:
1. Lite inserts to be 24" x 8" thermal type, 5/8" insulated glass. Glass unit to be encased in one piece vulcanized EPDM rubber frame. Provide quantity as seen on the Drawings.

- J. Insulating Value:
 - 1. Section set shall have overall U-value of .12 as tested in accordance with ASTM C-236.
- K. Override Operation:
 - 1. Manual override operation designed to meet specified applications shall be internal. In direct drive or 3:1 drive ratio. When override operation is functioning, the door shall be operated by lifting the door by one man.
- L. Panel Height:
 - 1. Panel height not to exceed two feet.
- M. Springs:
 - 1. 50,000 cycles

2.02 CONTROLS AND ELECTRICAL

- A. Furnish to Electrical Contractor for all overhead doors' standard three button momentary contact on OPEN/CLOSE/STOP, quantity and type of transmitters listed below, and Photosensor.
 - 1. Transmitters Schedule: Transmitters shall be Model 61 LM singles and 62LM for two-channel operation (enter exit).
 - a. Doors:
 - i. Dual Control/Two Button Transmitter, provide six transmitters per overhead door.
 - ii. Doors to be Vertical Lift and Overhead doors as indicated on drawings.
- B. Receivers
 - 1. Universal Coaxial Receiver as manufactured by Lift Master Model No. 412LM for single channel and Model No. 422LM for two channel receivers.
 - 2. Coordinate Doors with owner 112B, 112C, 112D, 112H 112J, 116B to also have long distance proximity reader.
- C. Photosensor
 - 1. Detection: AT10D Receiver with through beam detection.
 - 2. Range: 10 meters
 - 3. Light Source: Infrared LED
 - 4. Power Supply: 24v
 - 5. Response Time: 25msec
- D. Provide manufacturers emergency disconnect switches.

2.03 OPERATOR DESIGN

- A. General
 - 1. Overhead Doors:
 - a. Operator shall be jackshaft type RHX as manufactured by Overhead Door, or equal as approved by the Architect/Engineer. Provide H.P., voltage, phase as indicated in the Electrical Drawings.
 - b. General Contractor shall provide all mounting pads, struts, and girts necessary for mounting overhead doors to the designed wall construction.
 - c. **Sheriff Department Storage Building:**
 - i. Existing motors and tracks to be used on Project 77082 Storage Building. Existing doors to be removed and replaced with new 3" insulated metal panels. Contractor to verify if existing spring's will be adequate.
- B. Reduction

1. Furnish heavy duty worm gear drive running in oil with additional reduction by chain and sprockets.
- C. Motors-
1. Provide 120-volt single phase motors. Motors shall be separate from reduction mechanism for ease of maintenance.
 2. Roller Chain Drive
 - a. Door shall be driven by roller chain at 6" to 12" per second.
- D. Adjustable Friction Clutch
1. Shall be provided to protect door and operator if door movement is obstructed.
- E. Starter - Reversing Contactor Type
1. Furnish heavy duty across the line reversing type with mechanical interlock.
- F. Limit Switches
1. Provide positive chain drive screw type limit switch, enclosed in electrical control box, easily accessible for precision setting.
 2. Provide limit switch for interlock of ventilation system.
 3. Provide limit switch for interlock of signal system.
- G. Control Voltage
1. Control voltage shall be 24 volts for safety.
- H. Overload Protection
1. Provide manual reset for overload protection.
- I. Emergency Operation
1. A disconnect shall be provided so door can be manually operated.
- J. Magnetic Brake
1. Furnish a magnetic solenoid brake for positive stop.

PART 3 - EXECUTION

3.01 COORDINATION

- A. All electrical work shall comply with the latest editions of the Underwriter's Laboratory, Inc., and the National Electrical Code (NEC).
- B. The electrical work specifications cover the installation of conduit, conduit fittings, supports, power wiring, and including connection.
- C. Control wiring shall be concealed in conduit and the control wiring and control conduit shall be performed by the electrical contractor.
- D. Receiver:
 1. Make sure all connections are correct before turning on power. Mount receiver at location recommended by the manufacturer.
 2. Remove protective cover on receiver for access to sensitivity adjustment, time selection, and light/dark switch. Always keep gasket in place to insure water tightness.
 3. Use screws PF 1/2 when wiring with conduit.
 4. After wiring, mount cover onto the terminal base by tightening screws until spring washers are flat.
 5. Use dry, soft cloth for cleaning the lens and case.
 6. Do not cycle on/off frequently.
 7. Connect auxiliary relay for longer life.

8. Sensitivity Adjustment:
 - a. Set an object to the desired position and then increase the Sensitivity Adjustment gradually from the minimum position until the indicator LED is on. Remove the object and gradually decrease the Sensitivity Adjustment from the maximum position until the LED is off. If the LED is still off even through potentiometer is at maximum position (Point B).
 - b. Set potentiometer at the center between Points A and B.

3.02 MAINTENANCE

- A. Maintenance and call back service for all equipment shall be provided for a period of one year after date of final acceptance of the building.
- B. This service shall include regular examinations by competent and trained personnel, all necessary adjustments, greasing, oiling, cleaning, and parts to keep equipment in perfect condition, except such part made necessary by misuse, accidents or negligence not caused by the Contractor.

3.03 GUARANTEE

- A. The door, motor, and controls shall be guaranteed for a period of two years. During this period the Contractor shall affect any repairs required, without cost to the Owner, due to failures caused by material, workmanship, normal usage, design or construction.

3.04 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be installed. Correct conditions detrimental to proper and timely completion of the work. Verify spacing of door frame, motor, controls, and structure that offset installation of accessories. Do not proceed until unsatisfactory conditions have been corrected.

3.05 TESTING

- A. For actual testing and reporting of tests, use only those personnel and methods approved in advance by the Architect/Engineer. All test reports shall be signed by the individual as authorized in the testing plan approved by the Architect/Engineer and submitted prior to final payment.

END OF SECTION

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**SECTION 08 70 00
FINISH HARDWARE**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. This Section describes all finish hardware required to complete the work as indicated on the Drawings and specified herein. Provide all trim attachments and fastening specified or required for proper and complete installation.
 - 2. Related Work Specified Elsewhere:
 - a. Section 08 11 00: Steel Doors and Frames

1.02 QUALITY ASSURANCE

- A. Standards: Comply with standards specified in this section as listed in Section 01 42 00.
- B. Qualifications of Manufacturers: Products used in the work of this section shall be produced by manufacturers regularly engaged in manufacturing of similar items and with a history of successful production acceptable to the Architect/Engineer.
- C. Qualification of suppliers: the supplier shall have a qualified representative readily available to the architect/engineer, and/or Owner on short notice for consultation and service during the execution of this work and the warranty period.
- D. Fire Rated Openings: Comply with the requirements of Underwriter's Laboratories, Inc.

1.03 SUBMITTALS

- A. General: Comply with the provisions of Section 01 33 00.
- B. Product Data: Within 15 calendar days after award of the contract, submit:
 - 1. Complete materials list of all items proposed to be furnished and deliver under this Section.
 - 2. Identify each hardware item by manufacture, the manufacture's catalog number, and the location of the item in the work.
 - 3. Make the list in a form suitable for ready checking by the architect.
 - 4. Manufacture's specifications, catalog cuts, and other data required to demonstrate compliance with the specified requirements.
 - 5. Approval of the hardware list by the Architect/Engineer shall not relieve the Contractor from the responsibility for furnishing all required finish hardware.
 - 6. Samples: Within 15 calendar days after being so requested by the architect/engineer, deliver to the architect/engineer samples of each finish hardware item.
 - 7. Templates: in a timely manner to ensure orderly progress of the work, deliver templates or physical samples of the approved finish hardware items to pertinent manufactures of interfacing items such as doors and frames.

1.04 PRODUCT HANDLING

- 1. Packing and Marking: Individually package each unit of finish hardware, complete with proper fastening and appurtenances, clearly marked on the outside to indicate the contents and specific locations in the work.
- 2. Protection: use all means necessary to protect materials of this section before, during, and after delivery to the job site and to protect the work and materials of all other trades.
- 3. Replacements: In the event of damage, immediately make all repairs and replacement necessary to the approval of the architect/engineer and at no additional cost the owner.

PART 2 - PRODUCTS

2.01 LOCKS, LATCHES AND DEAD LOCKS

- A. Shall be Schlage:
 - 1. Schlage ND RHO 626 Locksets.
- B. Backset shall be 2-3/4" for all locks, latches, and dead locks. Strikes shall be box type with wide enough lip projection to protect door frame but not to exceed 3/16" beyond face of frame.
- C. All locks and cylinders shall be of one manufacturer and shall be based on **C234 Keyway**.
- D. Lock function legend:
 - 1. Passage Lockset.....ND10S (Schlage)
 - 2. Entrance / Office Lockset.....ND50PD (Schlage)
 - 3. Storeroom Lockset.....ND80PD (Schlage)
 - 4. Exit Only LocksetND25D (Schlage)
 - 5. Note: Functions are noted with hardware groups. Verify all lock functions with owner at key meeting.
 - 6. Note in schedule where anti-ligature hardware is needed.

2.02 EXIT DEVICES

- A. Devices shall be as manufactured by Von Duprin.
- B. Function shall be as noted in schedule.

2.03 KEYING

- A. Keying to be based on Schlage Everest 6 pin cylinder 234 Keyway. Consult with Owner for detailed keying information.
- B. Master keying: Factory key, master key, grand-master key, and great-grand-master key all locks and cylinders. Coordination will be as directed by the Owner's representative.
- C. Number of keys: Furnish three keys for each lock, twelve master keys for each set, and three grand-master keys.
- D. Construction Keying: Furnish a construction master-key system with 15 keys for locks and cylinders. Use only the construction keys during construction.
- E. Identification and Deliver: Factory stamp permanent keys "DO NOT DUPLICATE." Identify permanent keys with tags and send direct to the Owner by registered mail.

2.04 BUTT HINGES

- A. Shall be Hager, McKinney or Stanley ball bearing, non-rising loose pin, flat button tip, unless otherwise specified.
- B. Provide 1-12/ pair butts [per door for doors up to 7'-6" in height. Doors over 7'-6" in height shall have two (2) pairs of butts.
- C. Butt size requirements:
 - 1. Interior doors up to 37" wide 4-1/2 x 4-1/2.
 - 2. Interior doors over 37" wide 5 x 4-1/2.
 - 3. Exterior doors 5 x 4-1/2.
- D. Door butt legend: (unless otherwise noted in Schedule)
 - 1. Exterior doors B1199 – NRP.
 - 2. Interior doors B1179 – TBB.
- E. Furnish U.L. approved butts on labeled doors.
- F. Spring Hinges: A manufactured by Hager, U.L. approved butts on labeled doors. Coordinate hinge requirements with door size and weight.
- G. Continuous gear hinges to be Select Hinge, McKinney, or Stanley.

H. Pivots shall be Glynn-Johnson as specified.

2.05 DOOR CLOSERS

- A. Shall be LCN of proper size as described in manufacturer's schedule of sizes.
- B. Where parallel arm or weather strip is specified, closers shall be one size larger than manufacturer's recommendations.
- C. Closers shall have key adjusting device. Furnish six adjusting keys.
- D. Mount to provide maximum opening permitted by building construction or equipment and note on this schedule the maximum swing per location for other trades involved in reinforcement or installation.
- E. Closers shall be of cast iron, of full rack and pinion construction, including two speed closing adjustment, adjustable hydraulic back-check and fully adjustable spring power plus reversible shoe feature, of type listed in schedule. Close fluid shall be "all weather" type not subject to normal temperature changes.
- F. All door closers shall be similar in design and appearance to those listed in the schedule, so far as possible, and shall be of one manufacturer. Furnish special arms and applications as indicated in hardware schedule or as dictated by structural conditions or local code requirements.
- G. Door closers at labeled fire doors shall bear U.L. approval. Provide thru-bolts for mineral core doors.
- H. Door closers finish to match finish hardware.
- I. Where more than one door occurs in an opening, equip each door with closer, unless otherwise noted.

2.06 PUSH AND PULL HARDWARE, KICKPLATES

- A. Shall be as manufactured by Hager Companies
- B. All plates shall be 16-gauge (.050) with beveled sides and countersunk screw holes at intervals of not over 6" on all four sides. Screws shall be stainless steel oval head, finish to match plates. Size of kick, armor, and mop plates as noted.
- C. Legend:
 - 1. Push plate 30S 3x12
 - 2. Pull Bar 9G 8" (with push plate 30S 3x12)
 - 3. Kickplate on push side of door 16ga.

2.07 STOPS AND BUMPERS

- A. Shall be Ives 409 ½ wall bumper, FS444 floor stop or Glynn-Johnson 90 series overhead type. Provide wall bumper wherever possible. If construction prohibits the use of a wall bumper furnish floor stop, unless specified otherwise in hardware schedule. Equal products as manufactured by Glynn-Johnson, Hager, or Ives are also approved.
- B. Install bumper behind each door.
- C. Where two doors interfere with each other in swinging, provide roller bumper RB471 by Ives as required.
- D. Apply with expansion shield and machine screws only.
- E. Provide overhead door holders where specified.
- F. Anti-Ligature Door Stops by Kingsway Group KG184

2.08 MISCELLANEOUS HARDWARE

- A. Thresholds: Nat. Guard, Reese or Zero as listed. Cope around mullions.

- | | | | |
|----|---|-------|-------|
| 1. | Thresholds | S205A | Reese |
| 2. | Nylon brush weather-stripping | 967C | Reese |
| B. | Weather-strip: Nat. Guard, Reese or Zero as listed. | | |
| 1. | Door head & Jamb | 958A | Reese |
| C. | Electric Strikes: 24 Volt, 6211 as manufactured by Von Duprin, transformers to be provided by Finish Hardware Supplier. | | |
| D. | Magnetic Hold Open: LCN Sentronic SEM 7800 Series Magnets. | | |
| E. | Coat Hooks: Bobrick B-76727 finish to match door hardware. | | |
| F. | Latch Protectors: Don-Jo LP-111-630 | | |
| G. | Flush Bolts: Ives FB358 Top and Bottom of doors. | | |

2.09 FINISHES

- A. Materials shall be the following: Provide with the finish designated in parenthesis ().
1. Knobs, locks, and latches: Satin chrome (US26D).
 2. Dead locks: To Match Locksets
 3. Exit devices: As indicated in hardware Groups
 4. Push, pulls: As indicated in Hardware Groups
 5. Kickplates: As indicated in Hardware Groups
 6. Door closers: To Match Locksets
 7. Door butts: nonferrous for exterior and wet areas. Ferrous for other doors.
 8. Door stops and holders - Satin chrome (US26D).
 9. Miscellaneous items: As indicated
 10. Note: Verify all finishes with architect prior to ordering hardware.

2.10 TOOLS AND MANUALS

- A. With the delivery of permanent keys, deliver to the Owner one complete set of adjustment tools and one set of maintenance manuals for locksets, latch-sets, closers, and panic devices.

2.11 HARDWARE GROUPS

Hardware Set(s) No. 1 thru. 2 (Aluminum Doors)

Hardware to be provided in Section 08 11 16 Aluminum Doors and Frames and 08 42 Automatic Entrance Doors.

Hardware Set No. 3

- | | |
|----|---|
| 1 | Storeroom Lockset |
| 1½ | Pr. Hinges |
| 1 | Closer |
| 3 | Silencers |
| 1 | Electric Strike (Coordinating with the existing system) |
| 1 | Set Weather-stripping – Reese 958A and 967C |
| 1 | Threshold – Reese S205A |

Hardware Set No. 4

- | | |
|----|---|
| 1 | Storeroom Lockset |
| 1½ | Pr. Hinges |
| 1 | Closer |
| 3 | Silencers |
| 1 | Set Weather-stripping – Reese 958A and 967C |
| 1 | Threshold – Reese S205A |

PART 3 - EXECUTION

3.01 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect materials of this Section before, during, and after installation, as well as the materials of other trades.
- B. Replacements:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer, at no additional cost to the owner.

3.02 MATERIALS

- A. Loc-Tite shall be furnished for installation on all screw threads of hardware installation.

3.03 OTHER MATERIALS

- A. All other materials not specifically described but required for a complete and proper installation of the work of this Section, shall be as selected by the Contractor, subject to the approval of the Architect.

3.04 INSTALLATION

- A. Qualification of Installers:
 - 1. Use adequate numbers of skilled workmen who are trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and methods needed for proper performance of this section.
- B. Install the materials in strict accordance with the manufacturer's recommendations and schedules.
- C. Anchor all screws with Loc-Tite to assure permanence of attachment.
- D. All doors and hardware to be left in proper working order and cleaned.

3.05 DELIVERIES

- A. Stockpile all items sufficiently in advance to ensure their availability and make all necessary deliveries in a timely manner to ensure orderly progress of the total work.
- B. All hardware shall be delivered to a destination as directed by the general contractor with sufficient time in advance for proper inspection in order not to delay the scheduled completion date.
- C. The Owner/General Contractor shall provide a lockable room with ample shelving for the storage of hardware. Upon receipt of the hardware, the Finish Hardware supplier shall unpack and place on the shelves all hardware in order of the item and/or door numbers.

3.06 FINAL INSPECTION

- A. The Finish Hardware supplier shall inspect the installation of all hardware furnished and shall report any installation adjustments as are necessary to have all hardware in perfect working order.
- B. The Finish Hardware supplier shall verify the keying with the Owner to ensure proper location of the lock-sets and cylinders and shall assist the owner in correcting faulty operation of any lock or other items called to attention. He shall have all closers checked and adjusted for closing, latching and back check by the manufacturer's representative.
- C. Prior to final acceptance of the building, the Finish Hardware supplier shall make a final inspection of all hardware furnished to verify that all adjustments and corrections have been made and that all hardware are in good working order.

3.07 WARRANTY

- A. Provide a written warranty in approved form in compliance with the related requirements of the General Conditions, covering all Finish Hardware furnished under this section against defects in manufacturing and workmanship for a period of one (1) year from the final

- acceptance of the building.
- B. Any material failing to comply with the above guarantee shall be removed and replaced with satisfactory material at the Finish Hardware supplier's expense, including the necessary labor for removing and replacing.
 - C. During the Warranty Period, the Finish hardware supplier shall, upon request, make prompt adjustments, repairs or replacement as requested to any hardware installed under this contract, other than normal maintenance service.

END OF SECTION

**SECTION 08 80 00
GLAZING**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. This Section describes all glass and glazing accessories as shown on the Drawings, specified herein, and needed for a complete and proper installation.

1.02 QUALITY ASSURANCE

- A. Standards:
 - 1. General Glass Standard: FS DD-G-451; type, class, quality, style, kind and form are specified in reference to this standard.
- B. Qualification of Manufacturer:
 - 1. Use products in the work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.
- C. Qualification of Installers:
 - 1. Use skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Manufacturer's Data:
 - 1. Within 15 calendar days after Award of Contract, submit:
 - a. Complete materials list of all items proposed to be furnished and installed under this Section;
 - b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;
 - c. Shop drawings for each type of glass unit;
 - d. Samples for each type and color of glass unit.

1.04 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. Replacements:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

1.05 SAFETY GLAZING REQUIREMENT

- A. All glass and glazing must comply fully with safety glazing requirements of U.S. Consumers Product Safety Commission Safety Standard for Architectural Glazing Materials. Should there be conflict(s) between this specification and government standards, the latter shall govern.

PART 2 - PRODUCTS

2.01 GLASS MATERIALS

- A. Exterior Insulating Glass: 1" Insulating: ¼" tempered outside and ¼" tempered inside Low E Insulating Glass with 10-year warranty against bleeding, stress fracture, or other failure excluding vandalism or accidental breakage.
 - 1. Acceptable Manufacturer: Pilkington **Grey** Tinted, Energy Advantage, Low-E Argon Filled.
 - 2. Shading Coefficient: 0.33
 - 3. Summer U-Value: 0.30
 - 4. Winter U-Value: .30
 - 5. Solar Heat Gain Coefficient: .29
- B. Interior Tempered Glass: Clear Type I, Class I, tempered to 4 x normal strength, 1/4" thick. (Interior glass shall be tempered where required by 2009 IBC or governing code, otherwise interior glass does not have to be tempered.)
- C. Laminated Glass: ASTM C1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
 - 1. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
 - 2. Interlayer Color: Clear unless otherwise indicated.
- D. Provide Level 1 Bullet Resistant glass at Credit Union Transaction windows as indicated on the drawings. Glazing to be comparable in tint as indicated above.

2.02 OTHER MATERIALS

- A. All other material not specifically described but required for a complete and proper installation of the work of this Section shall be as selected by the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work to the approval of the Architect/Engineer. Do not proceed until unsatisfactory conditions have been corrected.
- B. Check that glazing channels are free of burrs, irregularities and debris.
- C. Check that glass is free of edge damage or face imperfections.

3.02 PREPARATION

- A. Field Measurements:
 - 1. Measure size of frame to receive glass.
 - 2. Compute actual glass size, allowing for edge clearances.
- B. Preparation of Surfaces:
 - 1. Remove protective coatings from surfaces to be glazed.
 - 2. Clean glass and glazing surfaces, to remove dust, oil and contaminants, and wipe dry.

3.03 INSTALLATION

- A. Install glass in locations as shown on the Drawings, and in accordance with the manufacturer's instructions.

- B. Perform glazing when ambient temperature is above 40` F.
- C. Perform glazing on dry surfaces only.

3.04 CLEANING

- A. Remove excess glazing compound from installed glass.
- B. Labels shall remain intact until final cleaning and acceptance, unless otherwise recommended by manufacturer.
- C. Wash and polish both faces of glass.
- D. Remove debris from work site.

3.05 PROTECTION OF COMPLETED WORK

- A. Attach crossed streamers away from glass face.
- B. Do not apply markers to glass surface.
- C. Replace damaged glass.

3.06 FINAL INSPECTION

- A. The manufacturer's recommended installation procedures, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the Work.

END OF SECTION

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**SECTION 08 90 00
LOUVERS AND VENTS**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Fixed metal wall louvers.
 - 2. Blank-off panels for wall louvers.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 7 Section 07 92 00 - "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
 - 2. Division 23 - "Heating, Ventilating & Air-Conditioning" for ductwork connected to metal wall louvers.
 - 3. Division 23 Section 23 09 00 - "Electric Control Systems" for electric and electronic control of motor-operated adjustable metal wall louvers.

1.03 DEFINITIONS

- A. Louver Terminology: Refer to Air Movement and Control Association (AMCA) 501 for definitions of terms for metal louvers not otherwise defined in this Section or in referenced standards.

1.04 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Engineer, fabricate, and install exterior metal wall louvers to withstand the effects of loads and stresses from wind and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter; or permanent damage to fasteners and anchors.
 - 1. Wind Load: Uniform pressure (velocity pressure) of 20 lbf per sq. ft. (960 Pa), acting inwards or outwards.
 - 2. Normal thermal movement is defined as that resulting from the following maximum change (range) in ambient temperature. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.
 - a. Temperature Change (Range): 100 degrees F.
- B. Air-Performance, Water-Penetration, and Air-Leakage Ratings: Provide louvers complying with performance requirements indicated as demonstrated by testing manufacturer's stock units of height and width indicated. Test units according to AMCA 500.
 - 1. Perform testing on unpainted, cleaned, degreased units.
 - 2. Perform water-penetration testing on louvers without screens.

1.05 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 01.
- B. General: Submit each item in this Section according to the Conditions of the Contract and Division 1 Specification Sections.
- C. Product data for each type of product specified.

- D. Shop drawings of louver units and accessories. Include plans, elevations, sections, and details showing profiles, angles, and spacing of louver blades; unit dimensions related to wall openings and construction; free areas for each size indicated; profiles of frames at jambs, heads, and sills; and anchorage details and locations.
- E. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- F. Product test reports evidencing compliance of units with performance requirements indicated.
- G. Product certificates signed by louver manufacturers certifying that their products comply with the specified requirements and are licensed to bear the AMCA seal based on tests made according to AMCA 500 and complying with the AMCA Certified Ratings Program.
- H. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.

1.06 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain louvers and vents from one source and by a single manufacturer where alike in one or more respects regarding type, design, and factory-applied color finish.
- B. Welding Standards: Comply with applicable provisions of D1.2 "Structural Welding Code--Aluminum," and D1.3 "Structural Welding Code--Sheet Steel."
 - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. SMACNA Standard: Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.

1.07 PROJECT CONDITIONS

- A. Field Measurements: Check actual louver openings by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Louvers:
 - a. Airolite Co.
 - b. American Warming and Ventilating.
 - c. Arrow United Industries.
 - d. Greenheck Fan Corp.
 - e. Ruskin Manufacturing.

2.02 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T-52.
- B. Fasteners: Of same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are corrosive or incompatible with joined materials.
 - 1. Use types and sizes to suit unit installation conditions.

2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.
- C. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.
- D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

2.03 FABRICATION, GENERAL

- A. General: Fabricate louvers and vents to comply with requirements indicated for design, dimensions, materials, joinery, and performance.
- B. Assemble louvers in shop to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.
- D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances of louvers, adjoining construction, and perimeter sealant joints.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Join frame members to one another and to fixed louver blades as follows, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary:
 1. With fillet welds, concealed from view.
 2. With fillet welds, concealed from view; or mechanical fasteners; or a combination of these methods; as standard with louver manufacturer.

2.04 FIXED, EXTRUDED-ALUMINUM WALL LOUVERS

- A. Continuous, Horizontal, Drainable, and Fixed-Blade Louvers: Extruded-aluminum frames and louver blades with close-fitting, field-made splice joints in blades designed to permit expansion and contraction without deforming blades or framework. Blades designed to collect and drain water to exterior at sill by means of gutters recessed from front edges of blades and by channels in jambs and mullions, with mullions recessed from front edges of blades so that blades have continuous appearance. Comply with the following requirements:
 1. Louver Depth: 6 inches, unless otherwise indicated.
 2. Frame Type: Channel type.
 3. Frame Thickness: 0.081 inch, unless otherwise indicated.
 4. Blade Thickness: 0.081 inch, unless otherwise indicated.
 5. Blade Profile: Drainable blade.
 6. Blade Angle: 37-1/2 degrees, unless otherwise indicated.
 7. Blade Spacing: 5-1/2 inches on-center for 6-inch- deep, 37-1/2-degree-angle louver blades.
 8. Free Area: Not less than 8 sq. ft. for a 48-inch- wide by 48-inch- high section.
 9. Exterior Corners: Prefabricated corner units with mitered and welded blades aligned with straight sections, with concealed bracing.

2.05 LOUVER SCREENS

- A. General: Provide each exterior louver with louver screens complying with the following requirements:

1. Screen Location for Fixed Louvers: Interior face, unless otherwise indicated.
 2. Screening Type: Bird screening, unless otherwise indicated.
- B. Secure screens to louver frames with stainless-steel machine screws, spaced 6 inches maximum from each corner and at 12 inches on-center between.
- C. Louver Screen Frames: Fabricate screen frames with mitered corners to louver sizes indicated and to comply with the following requirements:
1. Metal: Same kind and form of metal as indicated for louver frames to which screens are attached.
 - a. Reinforce extruded-aluminum screen frames at corners with clips.
 2. Finish: Same finish as louver frames to which louver screens are attached.
 3. Type: Re-wireable frames with a driven spline or insert for securing screen mesh.
- D. Louver Screening for Aluminum Louvers: Fit aluminum louver screen frames with screening covering louver openings and complying with the following requirements:
1. Bird Screening: 1/2-inch- square mesh formed with 0.063-inch- diameter aluminum wire.

2.06 BLANK-OFF PANELS

- A. General: Fabricate blank-off panels from materials and to sizes indicated and to comply with the following requirements:
1. Finish: Match finish applied to louvers with respect to coating type, color, and gloss.
 2. Attach blank-off panels to back of louver frames with stainless-steel sheet-metal screws.
- B. Insulated, Blank-Off Panels: Laminated metal-faced panels consisting of insulating core surfaced on back and front with metal sheets, complying with the following requirements:
1. Thickness: 2 inches.
 2. Metal Facing Sheets: Aluminum sheet, 0.032 inch (0.81 mm) thick.
 3. Insulating Core: Extruded-polystyrene insulation board complying with ASTM C 578, Type VII (2.2 lb/cu. ft. density).
 4. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard extruded-aluminum-channel frames 0.081 inch (2.06 mm) thick, with corners mitered and with same finish as panels.
 5. Seal perimeter joints between panel faces and louver frames with 1/8-inch-by-1-inch polyvinyl chloride compression gaskets.

2.07 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Finish louvers after assembly.

2.08 ALUMINUM FINISHES

- A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- B. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pre-treat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's instructions.
1. Fluoropolymer 3-Coat Coating System: Manufacturer's standard 3-coat, thermocured system composed of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat & clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.

- a. Color and Gloss: As selected by Architect from manufacturer's full range of choices.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.02 INSTALLATION

- A. Locate and place louver units plumb, level, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weather-tight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Repair finishes damaged by cutting, welding, soldering, and grinding operations required for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items that cannot be refinished in the field to the shop, make required alterations, and refinish entire unit, or provide new units.
- F. Protect galvanized- and non-ferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- G. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses, where required to make louver joints weather-tight. Comply with Division 7 Section 07 92 00 "Joint Sealants" for sealants applied during installation of louver.

3.03 ADJUSTING AND PROTECTION

- A. Protect louvers and vents from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of Substantial Completion.
- B. Restore louvers and vents damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by Architect, remove damaged units and replace with new units.
 - 1. Clean and touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.
- C. Test operation of adjustable wall louvers and adjust as needed to produce fully functioning units that comply with requirements.

3.04 CLEANING

- A. Periodically clean exposed surfaces of louvers and vents that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Rinse surfaces thoroughly and dry.

END OF SECTION

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**SECTION 09 90 00
PAINTS AND COATINGS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. All exterior and interior exposed surfaces listed on the Painting Schedule in Part 3 - Execution of this Section, in accordance with the types of finish specified herein and as shown on the Drawings.
- B. Related Work Described Elsewhere:
 - 1. Priming or priming and finishing of certain surfaces are specified to be factory performed or installer performed under pertinent other Sections.
- C. Work Not Included in This Section:
 - 1. Do not include painting which is specified under other Sections.
 - 2. Unless otherwise indicated, painting is not required on surfaces in concealed areas and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces, and duct shafts.
 - 3. Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze, and similar finished materials will not require painting under this Section except as may be specified herein.
 - 4. Do not paint any moving parts of operating units; mechanical or electrical parts such as valve operators, linkages, sinkages, sensing devices, and motor shafts, unless otherwise indicated.
 - 5. Do not paint over any required labels or equipment identification, performance rating, name, or nomenclature plates.
- D. Definitions:
 - 1. The term "paint", as used herein, means all coating systems materials including primers, emulsions, epoxy, enamels, sealers, fillers and other applied materials whether used as prime, intermediate or finish coats.

1.02 QUALITY ASSURANCE

- A. Standards:
 - 1. Comply with standards specified in this Section and as listed in Section 01 42 00.
- B. Qualification of Manufacturer:
 - 1. Product used in the work of this Section shall be produced by manufacturers regularly engaged in the manufacture of similar items and with a history of successful production acceptable to the Architect/Engineer.
- C. Qualification of Workmen:
 - 1. Provide at least one person who shall be present at all times during execution of the work of this Section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this Section.
- D. Paint Coordination:
 - 1. Provide finish coats which are compatible with the prime coats used.
 - 2. Review other Sections of these Specifications as required, verifying the prime coats to be used and ensuring compatibility of the total coating system for the various substrata.
 - 3. Provide barrier coats over incompatible primers or remove the primer and re-prime as required.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provision of Section 01 33 00.
- B. Manufacturer's Data:
 - 1. Within 15 calendar days after Award of Contract, submit:
 - a. Complete materials list of all items proposed to be furnished and installed under this Section.
 - b. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements.
- C. Samples:
 - 1. Following the selection of colors and glosses by the Architect/Engineer as described in Article 2.01.B. below, submit samples as requested for the Architect/Engineer review:
 - a. Provide two samples of each color and each gloss for each material on which the finish is specified to be applied.

1.04 PRODUCT HANDLING

- A. Delivery of Materials:
 - 1. Deliver all materials to the Project site in original, new, and unopened containers bearing the manufacturer's name and label showing the following information:
 - a. Manufacturer name; type of material
 - b. Thinning and mixing instructions.
 - c. Manufacturer's stock number and batch number
 - d. Application instructions.
 - e. Color: name and number.
 - f. Federal Spec. No., if applicable
 - g. Contents by volume of major pigment and vehicle constituents

1.05 JOB CONDITIONS

- A. Surface Temperatures:
 - 1. Do not apply solvent-thinned paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 45 degrees F, unless otherwise permitted by the manufacturer's printed instructions as approved by the Architect/Engineer.
- B. Weather Conditions:
 - 1. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by the manufacturer's printed instructions as approved by the Architect/Engineer. Applications may be continued during inclement weather within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.01 PAINT MATERIALS

- A. Design is based on the use of paint products manufactured by Devoe (ICI Dulux), Glidden (ICI Dulux), Hallman Lindsay, Pittsburgh Paints, Sherwin-Williams, Tnemec, and Diamond Vogel Paint Products and the materials of the manufacturer named in the Painting Schedule.
- B. Colors and Glosses:

1. The Architect/Engineer will select colors to be used in the various types of paint specified and will be the sole judge of acceptability of the various glosses obtained from materials proposed to be used by the Contractor.
- C. Undercoats and Thinners:
 1. Provide undercoat paint produced by the same manufacturer as the finish coat. Use only the thinners recommended by the paint manufacturer and use only to the recommended limits. Insofar as practicable, use undercoat, finish coat, and thinner material as parts of a unified system of paint finish.
- D. Standards:
 1. Provide paint materials which meet or exceed the standards listed for each application in the Painting Schedule in Part 3 of this Section.

2.02 APPLICATION EQUIPMENT

- A. General:
 1. For application of the approved paint, use only such equipment as is recommended for application of the particular paint by the manufacturer of the particular paint, and as approved by the Architect/Engineer.
- B. Other Materials:
 1. All other materials, not specifically described, but required for a complete and proper installation of the work of this Section, shall be new, first-quality of their respective kinds, and as selected by the General Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection:
 1. Prior to installation of the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Discrepancies:
 1. Do not proceed in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 MATERIALS PREPARATION

- A. General:
 1. Mix and prepare painting materials in strict accordance with the manufacturer's recommendations as approved by the Architect/ Engineer.

3.03 SURFACE PREPARATION

- A. General:
 1. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's recommendations as approved by the Architect/Engineer.
 2. Remove all removable items which are in place and are not scheduled to receive paint finish or provide surface applied protection prior to surface preparation and painting operations.
 3. Following completion of painting in each space or area, reinstall the removed items by using workmen skilled in the necessary trades.
- B. Preparation of Wood Surfaces:
 1. Clean all wood surfaces until they are free from dirt, oil, and all other foreign substances.

2. Smooth all finished wood surfaces exposed to view, using the proper sandpaper and spackling compound. Where so required, use varying degrees of coarseness in sandpaper to produce a uniformly smooth and unmarred wood surface.
 3. Unless specifically approved by the Architect/Engineer, do not proceed with painting of wood surfaces until the moisture content of the wood is 12% or less as measured by a moisture-meter approved by the Architect/Engineer.
- C. Preparation of Metal Surfaces:
1. Thoroughly clean all surfaces until they are completely free from dirt, oil, and grease.
 2. On galvanized surfaces, use solvent for the initial cleaning and then treat the surface thoroughly with phosphoric acid etch. Remove all etching solution before proceeding.
 3. Allow to dry thoroughly before application of paint.
 4. Aluminum Conduit:
 - a. Interior, Non-Immersion
 - b. Surface Preparation: SSPC-SP1 "Solvent Cleaning", and dry.
 5. Exterior Metal, Ferrous:
 - a. Surface Preparation: SSPC-SP6 "Commercial Blast Cleaning" – Field.
 6. Interior Metal, Ferrous:
 - a. Surface Preparation: SSPC-SP3 "Power Tooled Cleaning" and Solvent Wiped Field.
 7. Steel Joists - Interior Exposure:
 - a. Surface Preparation: Clean and dry, and SSPC-SP2 "Hand Tool Cleaning" – Field.
- D. Preparation of Gypsum Wallboard Surfaces:
1. Preparation of Gypsum wallboard surfaces shall be as per the requirements in Section 09 29 00 - Gypsum Wallboard.
- E. Preparation of Concrete and Masonry Block Surfaces to be Painted:
1. Fill cracks and irregularities with portland cement grout to provide uniform surface texture.
 2. Fill concrete masonry unit surfaces with block filler.
 3. Surface shall be cured, clean, and dry.

3.04 PAINT APPLICATION

- A. General Requirements:
1. Do not apply initial coating until moisture content of surface is within limitations recommended by paint manufacturer. Test with moisture meter.
 2. Apply paint, enamel, stain, and varnish with suitable brushes, rollers, or spraying equipment.
 - a. Rate of application shall not exceed that as recommended by paint manufacturer for the surface involved less than 10% allowance for losses.
 - b. Keep brushes, rollers, and spraying equipment clean, dry, free from contaminates and suitable for the finish required.
 3. Apply stain by brush.
 4. Comply with recommendation of product manufacturer for drying time between succeeding coats.
 5. Vary slightly the color of successive coats.
 6. Sand and dust between each coat to remove defects visible from a distance of five feet.

7. Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paints, and skipped or missed areas. Finished metal surfaces shall be free of skips, voids or pinholes in any coat when tested with a low voltage detector.
- B. Inspection:
1. Do not apply additional coats until completed coat has been inspected by the Architect/Engineer.
 2. Only inspected coats of paint will be considered in determining number of coats applied.
 3. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in corners and depressions.
 4. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
 5. Apply primer on all work before glazing.
 6. Change colors at doors where colors differ between adjoining spaces or rooms and where door frames match wall colors.
 7. Refinish entire wall where portion of finish has been damaged or is not acceptable.
- C. Painted Work:
1. Back prime all interior trim.
 2. Runs on face shall not be permitted.
- D. Stained (and Natural) Finish:
1. Adjust natural finishes as necessary to obtain identical appearance on veneers and solid stock.
- E. Cleaning:
1. Touch-up and restore finish where damaged.
 2. Remove spilled, splashed or splattered paint from all surfaces.
 3. Do not mar surface finish or item being cleaned.
 4. Leave storage space clean and in condition required for equivalent spaces in Project.
- F. Completed work shall match the approved samples for color, texture, and coverage. Remove, refinish, or repaint all work not in compliance with specified requirements.

3.05 PAINTING SCHEDULE

- A. General:
1. Painting required under this Section is specified herein and shown on the Drawings.
- B. Interior / Exterior Metal, Ferrous:
1. First Coat Primer: PPG Paints: 4020 PF Series Pitt-Tech Plus Interior/Exterior DTM Industrial Primer, Applied at a dry film thickness of not less than 2.0 mils.
 2. Coat: Interior semi-gloss pre-catalyzed acrylic epoxy finish: PPG Paints; 16-510 Series Pitt-Glaze WB1 Interior Semi-Gloss Pre-Catalyzed Water-Borne Acrylic Epoxy, applied at a dry film thickness of not less than 1.5 mils.
- C. Interior Wood (Trim, Door Casings, Wood Doors, Wood Windows, Finish Carpentry) to be Stained or Painted Wood as selected by Architect.
1. First Coat:
 - a. Stained: Sherwin-Williams Wood Classics Oil Stain or Clear Sealer.
 - b. Painted: Latex based; interior primer applied at a spread rate recommended by the manufacturer to achieve a dry film thickness of not less than 1.2 mils.
 - i. Acceptable products include 50801 Wonder-Tones Interior Vinyl Latex Primer by Devoe, 5111 Spred Ultra Primer-Sealer by Glidden, or equal.
 2. Second Coat:

- a. Stained: Sherwin-Williams Oil Base Gloss Varnish.
 - b. Painted: Semigloss acrylic latex enamel with a dry film thickness of not less than 2.6 mils. Acceptable products include Devoe 39XX Wonder Tones Semi-Gloss Interior Latex Enamel, Glidden 8200 Series Spred Ultra Latex Semi-Gloss Enamel, or equal.
3. Finish Coat:
- a. Stained: Sherwin-Williams Oil Base Gloss Varnish.
 - b. Painted: Semigloss acrylic latex enamel with a dry film thickness of not less than 2.6 mils. Acceptable products include Devoe 39XX wonder Tones Semi-Gloss Interior Latex Enamel, Glidden 8200 Series Spred Ultra Latex Semi-Gloss Enamel, or equal.
- D. Interior Masonry and Concrete (new and existing walls and ceiling) Exposed to View hollow core planks:
- 1. Roof / Ceiling System down to finish floor:
 - a. First Coat: Sherwin-Williams PrepRite Masonry Primer.
 - b. Second and Third Coat: Sherwin-Williams ProMar 200 Alkyd Gloss Enamel.
- E. Door Louvers
- 1. First Coat: Sherwin-Williams Kem Kromik Universal Metal Primer.
 - 2. Second Coat: Two coats of Sherwin-Williams Industrial Enamel (B54Z Series).
- F. Exposed Mechanical and Electrical System
- 1. Two coats of Sherwin-Williams Super Save-Lite Hi-Tec Dryfall Eg-Shel.
- G. Interior Drywall, Moisture-Resistant Drywall and Plaster:
- 1. Eggshell Finish
 - a. Primer: PPG Paints: 4-4900XI Series SpeedHide zero Interior Latex Sealer Applied at a dry film thickness of not less than 1.4 mils.
 - b. Interior eggshell acrylic finish: PPG Paints; 6-4310XI Series SpeedHide zero Interior Latex Eggshell Applied at a dry film thickness of not less than 1.5 mils.
- H. Gypsum Board Ceilings
- 1. Flat Finish
 - a. Primer: PPG Paints: 4-4900XI Series SpeedHide zero Interior Latex Sealer Applied at a dry film thickness of not less than 1.4 mils.
 - b. Interior flat acrylic finish: PPG Paints; 6-4110XI Series SpeedHide zero Interior Latex Flat Applied at a dry film thickness of not less than 1.4 mils.

END OF SECTION

SECTION 13 34 19
METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes pre-engineered metal building components of the nominal length and width indicated.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Engineer, design, fabricate and erect the pre-engineered metal building system to withstand loads from winds, gravity, structural movement including movement thermally induced, and to resist in-service use conditions that the building will experience, including exposure to the weather, without failure.
 - 1. Design each member to withstand stresses resulting from combinations of loads that produce the maximum allowable stresses in that member as prescribed in MBMA's "Design Practices Manual.
- B. Design Loads: Basic design loads, as well as auxiliary and collateral loads, are indicated on the Drawings.
 - 1. Basic design loads include live load, wind load, and seismic load, in addition to the dead load.
 - 2. Auxiliary loads include dynamic live loads such as those generated by cranes and material handling equipment.
 - 3. Collateral loads include additional dead loads over and above the weight of the metal building system such as sprinkler systems and roof-mounted mechanical systems.
- C. Structural Framing and Siding Panels: Design secondary structural members and exterior covering materials for applicable loads and combinations of loads in accordance with the Metal Building Manufacturers Association's (MBMA) "Design Practices Manual."
 - 1. Structural Steel: Comply with the American Institute of Steel Construction's (AISC) "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" for design requirements and allowable stresses.
 - 2. Light Gage Steel: Comply with the American Iron and Steel Institute's (AISI) "Specification for the Design of Cold Formed Steel Structural Members" and "Design of Light Gage Steel Diaphragms" for design requirements and allowable stresses.
 - 3. Welded Connections: Comply with the American Welding Society's (AWS) "Standard Code for Arc and Gas Welding in Building Construction" for welding procedures.
- D. Metal Building System Changes/Deviations:
 - 1. Metal building systems shown in the contract documents are the result of multi-discipline coordination, quality level required, knowledge of the owner's requirements, knowledge of the intended use of the building, dimensional requirements, etc. All changes/deviations to the contract documents requested by the metal building system contractor/supplier will require the design professional to re-determine feasibility.
 - 2. The design professional will determine if the change/deviation is required or if it is being requested to save cost. All changes/deviations must be approved by the design professional.
 - 3. If the reason for the change/deviation is determined to be cost savings, the costs incurred by the design professional as a result of the time required to analyze the changes will be charged to the owner and deducted from the contractor's contract

amount, even if the requested changes/deviations are not approved.

1.04 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- C. Product data consisting of metal building system manufacturer's product information for building components and accessories.
- D. Shop drawings for metal building structural framing system, siding panels, and other metal building system components and accessories that are not fully detailed or dimensioned in manufacturer's product data.
 - 1. Structural Framing: Furnish complete erection drawings prepared by or under the supervision of a Professional Engineer legally authorized to practice in the jurisdiction where the Project is located. Include details showing fabrication and assembly of the metal building system. Show anchor bolts settings and sidewall, endwall, and roof framing. Include transverse cross-sections.
 - 2. Siding Panels: Provide layouts of panels on walls and roofs, details of edge conditions, joints, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Include transverse cross-sections.
 - 3. Building Accessory Components: Provide details of metal building accessory components to clearly indicate methods of installation.
- E. Samples for initial selection purposes in form of manufacturer's color charts or chips showing full range of colors, textures, and patterns available for metal siding panels with factory-applied finishes.
- F. Samples for verification purposes of roofing and siding panels. Provide sample panels 12 inch (300 mm) long by actual panel width, in the profile, style, color, and texture indicated. Include clips, battens, fasteners, closures, and other panel accessories.
- G. Installer certificates signed by metal building manufacturer written certification certifying that the installer complies with requirements included under the "Quality Assurance" Article.
- H. Professional Engineer's certificate prepared and signed by a Professional Engineer, legally authorized to practice in the jurisdiction where Project is located, verifying that the structural framing and covering panels meet indicated loading requirements and codes of authorities having jurisdiction.
- I. Submit final component design calculations and drawings as required by local, state, and federal rules and regulations applicable to work and project location. Minimum of five (5) copies shall be submitted.
- J. Submit fees for local and state review. Local and state acceptance of component design is mandatory prior to fabricating components. Submittal shall include required forms, fees, calculations, registered stamps, and signatures.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer to erect the pre-engineered metal building components who has specialized in the erection and installation of types of metal buildings systems similar to that required for this Project and who is certified in writing by the metal building system manufacturer as qualified for erection of the manufacturer's products.
- B. Manufacturer's Qualifications: Provide pre-engineered metal building components manufactured by a firm experienced in manufacturing metal buildings systems that are similar to those indicated for this project and have a record of successful in-service performance.

- C. Single-Source Responsibility: Obtain the metal building system components, including secondary structural framing, wall covering, and accessory components, from one source from a single manufacturer.
- D. Design Criteria: The Drawings indicate sizes, profiles, and dimensional requirements of the pre-engineered metal building system. Metal building systems having equal performance characteristics with deviations from indicated dimensions and profiles may be considered, provided deviations do not change the design concept or intended performance. The burden of proof for equality is on the proposer.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver prefabricated components, sheets, panels, and other manufactured items so they will not be damaged or deformed. Package wall panels for protection against transportation damage.
- B. Handling: Exercise care in unloading, storing, and erecting wall and roof covering panels to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weather-tight ventilated covering. Store metal wall and roof panels so that water accumulations will drain freely. Do not store panels in contact with other materials that might cause staining, denting or other surface damage.

1.07 WARRANTY

- A. Siding Panel Finish Warranty: Furnish the siding panel manufacturer's written warranty, covering failure of the factory-applied exterior finish on metal wall panels within the warranty period. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.
 - 1. Warranty period for factory-applied exterior finishes on wall panels is 20 years after the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Subject to compliance with specified requirements, provide metal building systems provided by one of the following:
 - 1. A & S Building Systems, Inc., Caryville, TN, (800) 274-2100
 - 2. American Buildings Co., Eufaula, AL, (334) 687-2032
 - 3. American Steel Building Co., Inc., Houston, TX, (800) 877-8335
 - 4. Behlen Manufacturing Co., Columbus, NE, (800) 228-0340
 - 5. Butler Manufacturing Co., Kansas City, MO, (816) 968-3000
 - 6. Ceco Building Systems, Columbus, MS, (662) 328-6722
 - 7. Metallic Building Company, Houston, TX (866) 800-6353
 - 8. Nucor Building Systems, Waterloo, IN (260) 837-7891
 - 9. Southern Structures, Inc., Lafayette, LA, (800) 264-5981
 - 10. Star Building Systems, Oklahoma, OK, (800) 654-3921
 - 11. VP Buildings, Memphis, TN, (800) 238-3246

2.02 MATERIALS

- A. Steel Members Fabricated by Cold Forming: Comply with ASTM A 1008/ A 1008M, Grade 50.
- B. Cold-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A 1008/A 1008M or ASTM A 568/A 568M.
- C. Hot-Rolled Carbon Steel Sheet: Comply with requirements of ASTM A 568/A 568M.

- D. Structural Quality Zinc-Coated (Galvanized) Steel Sheet: Comply with ASTM A 653 with G90 (ASTM A 653M with Z275) coating. Grade to suit manufacturer's standards.
- E. Commercial Quality Zinc-Coated (Galvanized) Steel Sheet: Comply with ASTM A 653 with G60 (ASTM A 653M with Z180) coating.
- F. Bolts for Structural Framing: Comply with ASTM A 307 or ASTM A 325/ A 325M as necessary for design loads and connection details.
- G. Thermal Insulation: Glass fiber blanket insulation, complying with ASTM C 991, of 0.5 lb per cu. ft. (8 kg/cu. m) density, thickness as indicated, with UL flame spread classification of 25 or less, and 2 inch (50 mm) wide continuous vapor-tight edge tabs.
 - 1. Vapor Barrier: Vinyl-reinforced scrim.
 - 2. Retainer Strips: 26 gauge (0.55 mm) formed galvanized steel retainer clips colored to match the insulation facing.

2.03 FINISHES

- A. General:
 - 1. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.
 - 2. Finish metal fabrications after shop assembly.
- B. Shop Finish
 - 1. Surface Preparation:
 - a. SSPC-SP1: The Society for Protective Coatings "Surface Preparation Specification No. 1 – Solvent Cleaning", September 1, 2000 Edition and SSPC-SP2: "Surface Preparation Specification No. 6 – Commercial Blast Cleaning", September 1, 2000 Edition.
 - 2. Primer:
 - a. Fast curing, universal modified alkyd, rust inhibiting shop coat with good resistance to normal atmospheric corrosion compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure. Primer shall comply with all federal standards for VOC, lead, and chromate levels. Color shall be manufacturer's standard unless noted otherwise.
 - b. Shop prime immediately after surface preparation, applying according to manufacturer's instructions to provide a dry film thickness of not less than 2.0 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surface.
 - 3. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
 - a. ASTM A 153/A 153M for galvanizing hardware.
 - b. ASTM A 123/A 123M for galvanizing both fabricated and unfabricated products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
- C. Touch-Up Painting
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas of the shop paint and paint all exposed areas with the same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
 - 2. Galvanizing Repair Paint: High-zinc-dust-content paint for galvanizing welds and repair-painting galvanized steel, with dry film containing not less than 90 percent zinc dust by weight and complying with DOD-P-21035 or SSPC-Paint 20.
- D. Finish Painting
 - 1. Finish Painting shall be performed under Division 9 Section 09 90 00 – Paints and

Coatings.

2.04 STRUCTURAL FRAMING

- A. Primary Framing: Provide primary framing members of either hot rolled sections or built-up welded members.
- B. Secondary Framing: Provide the following secondary framing members:
 - 1. Roof purlins: "C"-or "Z"-shaped sections fabricated from minimum 14 gage (1.5 mm) shop-painted roll-formed steel.
 - 2. Purlin roll bracing.
 - 3. Sidewall and endwall girts: "C"-or "Z"-shaped sections fabricated from minimum 14 gage (1.5 mm) shop-painted roll-formed steel.
 - 4. Girt sag bracing.
 - 5. Flange bracing. Flange braces for roof rafters shall be connected to purlins by using brace clips, not by connecting to the sides of the "C" or "Z" shaped section; thus eliminating penetrations through the vapor barrier and allowing faster installation when a simple saver insulation system is installed.
- C. Bolts: Provide shop-painted bolts except when structural framing components are in direct contact with roofing and siding panels. Provide zinc-plated or cadmium-plated bolts when structural framing components are in direct contact with roofing and siding panels.
- D. Shop Painting: Clean surfaces to be primed of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power-tool cleaning.
 - 1. Prime structural steel secondary framing members with the manufacturer's standard rust-inhibitive primer. Color shall match structural steel.

2.05 INSULATION

- A. Roof
 - 1. Provide R-26 8" blanket insulation with vinyl reinforced vinyl scrim on interior face.
- B. Vapor-Retarder Facing: ASTM C1136, with permeance not greater than 0.02 perm when tested according to ASTM E 96, Desiccant Method.
 - 1. Composition: White metalized-polypropylene film facing, fiberglass scrim reinforcement, and kraft-paper backing.
- C. Retainer Strips: 0.019 inch thick, formed, galvanized steel or PVC retainer clips colored to match insulation facing.
- D. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- E. Wall Insulation
 - 1. Refer to section 07 21 00 Vapor Retarders and Building Insulation.

2.06 SIDING PANELS

- A. Siding Panels:
 - 1. Refer to section 07 42 13 Insulated Metal Wall Panels.
 - 2. Refer to section 07 42 14 Metal Wall Panels.

2.07 SHEET METAL ACCESSORIES

- A. General: Provide coated steel sheet metal with coated steel siding panels.
- B. Gutters: Form in 96-inch long sections, complete with end pieces, outlet tubes, and other special pieces as required. Size in accordance with SMACNA. Join sections with riveted and soldered or sealed joints. Provide expansion-type slip joint at center of runs. Furnish gutter supports spaced 36 inches on-center, constructed of the same metal as gutters. Finish to

match siding panel finish. Gutter system with accessories as manufactured by Perimeter Systems, Division of Southern Aluminum Finishing Company, Inc. Profile to be no. G-2/R 8", 20 gauge, Kynar 500 Finish, manufactured of aluminum with expansion joints at 40'- 0" intervals.

- C. Downspouts: Form in 10-foot long sections or shorter, complete with elbows and offsets. Join sections with 1-½ inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and approximately 60 inches center to center. Finish to match wall panels. The downspouts shall be constructed of 18-gauge aluminum with Kynar 500 finish.
- D. Sheet Metal Accessories: Install gutters, downspouts, and accessories in accordance with manufacturer's recommendations for positive anchorage to building and weather-tight mounting. Adjust operating mechanism for precise operation.

2.08 FABRICATION

- A. General: Design prefabricated components and necessary field connections required for erection to permit easy assembly and disassembly.
 - 1. Fabricate components in such a manner that once assembled, they may be disassembled, repackaged, and reassembled with a minimum amount of labor.
 - 2. Clearly and legibly mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
- B. Structural Framing: Shop-fabricate framing components to indicated sizes for erection, welded in place. Provide holes for anchoring or connections shop-drilled or punched to template dimensions.
 - 1. Shop Connections: Provide power riveted, bolted, or welded shop connections.
 - 2. Field Connections: Provide bolted field connections.

PART 3 - EXECUTION

3.01 ERECTION

- A. Girts: Locate and space wall girts to suit door and window arrangements and heights. Secure girts to structural framing and hold rigidly to a straight line by sag rods.
- B. Framed Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to building structural frame.

3.02 SIDING

- A. General: Arrange and nest sidelap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weather-tight enclosure. Avoid "panel creep" or application not true to line. Protect factory finishes from damage.
 - 1. Field cutting of exterior panels by torch shall not be permitted.
- B. Wall Sheets: Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete and elsewhere as necessary for weather-proofing. Handle and apply sealant and backup in accordance with the sealant manufacturer's recommendations.
 - 1. Align bottom of wall panels and fasten panels with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws. When building height requires two rows of panels align lap of panels over wall panels.
 - 2. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 - 3. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

- C. Sheet Metal Accessories: Install sheet metal accessories in accordance with manufacturer's recommendations for positive anchorage to building and weather-tight mounting. Adjust operating mechanism for precise operation.
- D. Thermal Insulation: Install insulation concurrently with installation of wall panels in accordance with manufacturer's directions. Install blankets straight and true in one-piece lengths with both sets of tabs sealed to provide a complete vapor barrier. Locate insulation on back side of wall sheets.
- E. Cleaning and Touch-Up: Clean component surfaces of matter that could preclude paint bond. Touch up abrasions, marks, skips, or other defects to shop-primed surfaces with same type material as shop primer.

END OF SECTION

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SECTION 22 00 00
PLUMBING SCOPE OF WORK

PART 1 - GENERAL

1.01 SCOPE OF WORK

Contractor shall provide all labor, materials, equipment, permits, inspection fees, supervision, utility company charges, and other items noted in Contract General Conditions necessary to yield completely operable and tested systems as shown on the Drawings and specified herein. The work includes, but is not limited to, the following areas:

- A. Building Work:
 - 1. Plumbing:
 - a. Sanitary drain, waste, and vent systems from all points of discharge and connections, including backwater valve and garage catch basins to exterior drainage system 5' outside the building. Trench drains are by the General Contractor.
 - b. Domestic hot and cold water distribution systems to all points of use, including water heater. Include meter and capped connection for irrigation water.
 - c. Combined domestic water and fire protection service from five feet outside the building, including providing one 6-inch flanged connection approximately 12" above finished floor for fire protection.
 - d. Domestic hot, cold, and recirculated water distribution systems from new service to all points of use. All cross connection control equipment and piping as required by the State of Wisconsin Plumbing Code, and in accordance with local requirements.
 - e. New plumbing fixtures and trim.
 - f. Main PVC condensate drain piping systems to the sanitary system.
 - g. Testing to verify compliance with lead regulatory requirements in completed domestic systems.
 - 2. System startup, testing, and adjusting.
 - 3. Piping cleaning and pressure testing.
 - 4. All pressure and temperature instrumentation not a part of any control system.
- B. Equipment schedules are provided as a convenience to the Contractor, but do not relieve him of his responsibility to furnish all items shown on the Drawings and indicated in the Specifications.
- C. Coordination with other trades.
- D. Touch-up painting of damaged materials furnished by this Contractor and damaged by this Contractor. Each Contractor shall be responsible for replacement/patching of all finish materials which have been disrupted and/or damaged as a result of their construction procedures. All materials shall match original and all work shall be done by experienced field tradesmen.
- E. One year labor and equipment guarantee on completed installation.
- F. Cleanup associated with work of respective trades.
- G. Flushing, cleaning, and pressure testing of installed systems.
- H. Provide final record (PDF) drawings identifying any changes that occurred throughout the construction process.
- I. Operation and Maintenance Manuals for all equipment provided, to be submitted within an appropriate time frame to aid in system startup, but in no case longer than 90 days after the

date of system acceptance.

- J. No asbestos or mercury containing materials, materials capable of discharging lead into potable water or air systems, or materials capable of releasing other hazardous substances to the facility air environment, drainage systems, or water systems shall be used.
- K. Equipment schedules are provided as a convenience to the Contractor, but do not relieve him of his responsibility to furnish all items shown on the plans and indicated in the specifications.
- L. Job Site safety is the responsibility of the contractor. The architect/engineer bears no responsibility for job-site safety.
- M. All equipment furnished and installed shall comply with the relevant agency listing, testing, and labeling requirements of the adopted International Mechanical Code with local Amendments and variances.

END OF SECTION

**SECTION 22 01 00
PLUMBING GENERAL PROVISIONS**

PART 1 - GENERAL

1.01 STANDARDS

- A. All work shall be executed in a professional manner and shall be coordinated with other work being performed at the site. The Architect/Engineer reserves the right to direct the removal and replacement of any item which in his opinion will not present an orderly and reasonably neat or workmanlike appearance. Such removal or replacement shall be at the Contractor's expense.
- B. The Contractor shall pay all taxes, fees, licenses, permits and inspection costs required in connection with the work including any impact fees, sewer connection fees and/or water service/water meter connection fees.

1.02 COMPLIANCE

- A. All work and materials shall comply with all applicable laws and building codes and shall conform to the applicable sections of the following codes and standards. Where standards or codes are mentioned in these specifications, the edition or revision in effect during construction of this project shall be followed; hence, the specified numbers may be superseded by new numbers.
 - 1. Hose Connection Vacuum Breakers (ANSI/ASSE 1011)
 - 2. Backflow Preventers with Intermediate Atmospheric Vent. (ANSI/ASSE 1012)
 - 3. Backflow Preventers, Reduced Pressure Principle (ANSI/ASSE 1013)
 - 4. Floor Drains (ANSI A112.21.1)
 - 5. Roof Drains (ANSI A112.21.2)
 - 6. Water Hammer Arrestors (ANSI A112.26.1 & PDI WH-201)
 - 7. Gauges-Pressure Indicating Dial Type-Elastic Element (ASME B40.1)
 - 8. Performance Requirements for Temperature Actuated Mixing Valves (ASSE B1017)
 - 9. Precast Reinforced Concrete Manhole Sections (ASTM C478)
 - 10. Specification for ASTM Thermometers (ASTM E1)
 - 11. Verification and calibration of Liquid-in-Glass Thermometers (ASTM E77)
 - 12. Indicating Pressure Gauge for Fire and Protection Services (UL 393)
 - 13. Gauges, Indicating Pressure for Compressed Gas Service (U.L. 404)
 - 14. Backflow Prevention Devices - Reduced Pressure Principle & Double Check Valve (AWWA C506)
 - 15. Drinking Water System Components (NSF-61)
 - 16. American Society for Testing Materials (ASTM)
 - 17. American Society of Plumbing Engineers (ASPE)
 - 18. American Water Work Association (AWWA)
 - 19. Applicable Codes of the State of Wisconsin and local agencies having jurisdiction
 - 20. Cast Iron Soil Pipe Institute
 - 21. International Approval Services (IAS) (formerly AGA)
 - 22. NAFM - Sound Test Codes
 - 23. National Board of Fire Underwriters
 - 24. National Electrical Code (NEC)
 - 25. National Electrical Manufacturers Association (NEMA)

26. National Fire Protection Association (NFPA)
27. OSHA Standards, particularly #1910
28. Sheet Metal and Air-Conditioning Contractors National Association (SMACNA)
29. Standards of the Hydraulic Institute
30. Underwriters' Laboratories (UL)

1.03 SUBSTITUTIONS AND CHANGES

- A. Comply with applicable requirements of Division 1 including Section 01 33 00 Submittal Procedures and Section 01 25 13 Product Substitution Procedures.
- B. It shall be the responsibility of the contractor to notify all parties concerned of any changes or substitutions he has been authorized to make, and he must include in his notice a full description, including drawings, if necessary, of any deviation from dimension shown on the plans or applicable to manufacturer's named on schedules and named in specifications.
- C. If equipment is provided other than that upon which the design is based, contractor shall coordinate the installation with the work of all other trades and with the space available for installation. Contractor shall pay for any changes caused to other trades as a result of this substitution, plus the additional cost of any required engineering needed to incorporate the proposed alternates.
- D. Elevation of piping, ductwork and equipment indicated on drawings are to be used as guidelines to assist Contractor with installations. Minor changes to these elevations may be necessary to eliminate unforeseen interferences. The Contractor shall obtain the Architect/Engineer's written approval before proceeding with any changes in elevations.

1.04 EQUIPMENT LISTS AND IDENTIFICATION

- A. Each Contractor supplying equipment items shall furnish three sets of Operation and Maintenance Manuals and spare parts list recommended for the proper operation and maintenance of the equipment. State exact quantity so there is no ambiguity.
- B. All major parts of built-up equipment or devices shall bear the manufacturer's nameplate; giving name of manufacturer, description, size, type, serial number, electrical characteristics, and related data.

1.05 DRAWINGS

- A. Due to the scale of the drawings, it is not always possible to indicate all offsets, fittings, valves, and similar items which may be required. This Contractor shall carefully investigate the structural and finish conditions affecting his work and shall plan accordingly, furnishing such valves, fittings, offsets, vents, drains and specialties as may be required to meet such conditions. All piping shall be installed as closely as possible to walls, ceiling, columns, and other structures (consistent with the proper space for covering, removal of pipes, valve access, and other maintenance relationships) so as to occupy a minimum of space and all offsets, fittings, valves, and similar items required to accomplish this must be furnished by the Contractor without additional expense to the Owner. In case interferences develop, the Architect/Engineer shall decide which work is to be relocated regardless of which was first installed.
- B. Before submitting his proposal, the Contractor shall examine the architectural, electrical and mechanical drawings and, if any discrepancies occur between them and this specification, he shall report same to the Architect/Engineer in writing prior to bidding and obtain written instructions for changes in the work.
- C. In case of a difference between the plans and specifications, or between specifications, the decision of the Architect/Engineer shall prevail.
- D. The Contractor shall keep a set of prints on which each he will mark line and grade and other changes made during installation. All changes shall be made through the Construction Manager with Architect/Engineer approval. At the end of the job, or when requested, he will

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GENERAL PROVISIONS

make this information available to the Architect/Engineer for revision of the design drawings for records. Comply with the requirements of Section 01 78 39 Project Record Documents.

1.06 SITE AND JOB CONDITIONS - DIMENSIONS AND MEASUREMENTS

- A. Before submitting proposals, bidders shall visit premises, verify site conditions and conditions under which work under this contract must be conducted. Submission of proposal signifies that bidder has visited premises, has made said examinations and verifications and is fully aware and knowledgeable of all site conditions. No claims for additional compensation will be considered or paid, due to failure to be so informed.
- B. Before commencing work, examine all spaces, surfaces and areas indicated on drawings to receive work. Report necessary corrections in writing immediately to the Architect/Engineer. Do not proceed until corrections (if any required) have been made. Commencing work signifies acceptance of said spaces, surfaces, areas and of job conditions.
- C. Verify all dimensions shown on the drawings and obtain all measurements required for proper execution of work.
- D. Information pertaining to preliminary investigations, such as test borings, location of utilities, existing structures and existing grades appear on the drawings. While such data has been collected with reasonable care, there is no expressed or implied guarantee that conditions so indicated are entirely representative of those actually existing or that unforeseen developments may not occur. The interpretation of results of such investigation shall not be the responsibility of the Architect/Engineer. Where underground services, utilities, structures, buried tanks and other concealed items are located on the drawings or information is provided at the site, this data is based on available records, but not guaranteed to be complete or correct. They are merely given for assistance.

1.07 RIGGING; SUPPORTS AND FOUNDATIONS

- A. The respective Contractor shall furnish and be responsible for delivery into the premises and erection of any equipment furnished.
- B. Brackets, hangers, curbs, supports, and miscellaneous steel as required in connection with distributing piping loads and equipment supports shall be provided by the Contractor for equipment and piping which he installs.
- C. Contractor shall furnish and install all foundations and supports as may be necessary for the respective equipment manufacturer's recommended installation procedures, and shall be responsible for their locations and size whether or not shown on the drawings. Grout under floor mounted equipment bases, or block under roof or elevated steel platform mounted equipment bases, so that same are plumb and level.
- D. All fixtures, equipment and materials shall be supported and fastened in a manner satisfactory to the engineers. Ample backing shall be provided where plumbing fixtures, control panels or other items are supported on walls or partitions. Phillips, A & J, or Ramset anchors shall be used for block or tile walls. Toggle bolts shall be used only when other fastening systems are not suitable. Inserts shall be used wherever possible in concrete.

1.08 ELECTRICAL WORK

- A. Equipment furnished shall comply with Electrical Specifications.

1.09 PIPE AND DUCT SLEEVES AND ESCUTCHEONS

- A. Provide sleeves for all piping and duct work passing through walls, floors, ceiling and partitions. Sleeves shall be 18 gauge galvanized sheet metal unless otherwise specified. Sleeves through boiler room or fire-rated areas roofs, walls, floors and foundation shall be standard weight steel pipe or cast iron pipe sleeves for piping or 1/8" plate and angle iron for ductwork unless otherwise specified. Pipes passing through walls below grade shall utilize Clow F1429 or U.S. Pipe mechanical joint wall sleeve where applicable, and be caulked with

lead and Oakum. Link-Seal bolted rubber materials may also be used to seal pipe to sleeve on cold piping where fire rating is not required.

- B. Sleeves shall be flush with walls unless otherwise indicated.
- C. Conceal all pipe sleeves with chrome plated escutcheons in finished areas.
- D. In unfinished areas, sleeves shall project one (1) inch above finished floor line and be sealed watertight to the floor unless higher projection are indicated.
- E. Sleeves passing through walls or floors below grade above a finished floor line shall be made watertight with a plastic material as approved by the Architect/Engineer.
- F. All openings around duct and pipes and all sleeves where floors, fire rated walls and smoke barriers are penetrated shall be caulked smoke tight with 3M Fire Barrier CP-25, 3M Putty, and FS-195 Wrap/strip or approved equal by Hilti meeting U.L. System 91 and ASTM E-814 (UL-1479), installed per manufacturer's recommendations for horizontal and vertical penetrations. Fiberglass is not acceptable. Where vapor barriers must be continued on cold piping, they shall remain intact through the penetration and also sealed with 3M material per U.L. 91.

1.10 ACCESSIBILITY FOR REPLACEMENT; MAINTENANCE AND REPAIR

- A. The respective contractors shall provide access covers or doors for equipment which is concealed and must be serviced, operated or maintained. Equipment shall include, but not be limited to valves, traps, cleanouts, control devices, filter, strainers, and related devices. Minor deviations from drawings may be made to allow for better accessibility, but major changes shall not be made without approval of the Architect/Engineer.
- B. Furnish and install Milcor, Babcock-Davis, Bilco, Cessco or American Hatch Corporation access panels of proper style to match adjacent finish and approved sizes. Locations shall be approved by the Architect/Engineer or as shown on the plans. Use stainless steel access panels in ceramic tiled walls. Access panels in fire walls or rated ceiling assemblies shall be UL labeled with a rating equal to that of the wall in which it is installed.
- C. Access panels shall be size large enough to allow proper maintenance of respective equipment for which they are installed.
- D. Access panels shall be provided by responsible trades, who shall then coordinate installation of the access panel with the effected trade.

1.11 CUTTING AND PATCHING

- A. All cutting and patching shall be performed only by workmen skilled in the type of work involved.
- B. No structural members shall be cut without the consent of the Architect/Engineer and all such cutting, when authorized, shall be done in strict accordance with the instructions of the Architect/ Engineer. Where piping must pass through structural members and the Architect/Engineer has approved the burning of holes in such member, the Contractor shall provide approved welded steel reinforcement of suitable dimensions adjacent to the hole to effectively offset the weakening effect of the hole upon the member.

1.12 EXCAVATION AND BACKFILL

- A. General:
 - 1. The respective contractors shall do all trench and pit excavation and backfilling required for his work inside and outside of the building, including all required shoring, bracing, pumping, and all protection for safety of persons and property. Materials to be excavated shall be non-classified and shall include all earth or other materials encountered.

2. Unless otherwise shown or specified, provide separate trenches for each utility. Lay all piping in open trench except when the Architect/Engineer gives written permission for tunneling.
 3. The Contractor, in making or causing to be made any trench or excavation on public property or property to which the public has access, shall enclose, support and barricade his work, display warning devices, including red illumination at night and take all necessary precautions to protect the public at large from accidents while the excavation is open.
- B. Excavation:
1. Trenching shall include all clearing, grubbing, wet, dry and rock excavation, and all incidental work such as sheet piling, shoring, underpinning, dewatering, pumping, bailing, transportation, filling and backfilling.
 2. Excavate subsoil required for utilities.
 3. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with work.
 4. Do not interfere with 45 degree bearing splay of foundations.
 5. Hand trim excavation. Hand trim for bell and spigot pipe joints. Remove loose matter.
 6. Remove lumped subsoil, boulders, and rock.
 7. Correct areas over excavated.
 8. Stockpile excavated material in area designated on site and remove excess material not being used, from site.
- C. Limits of Excavation and Subgrade Preparation:
1. Trenches for pipe shall be excavated so that there will be a minimum clearance of six (6) inches on each side of the barrel of the pipe, and a maximum width of trench at the level of the top of the pipe of not more than sixteen (16) inches greater than the O.D. of the pipe, for pipe thirty (30) inch I.D. or smaller. They shall be at all times of sufficient width to permit the pipe to be laid and to permit proper construction methods to be used.
 2. Sufficient space shall be provided in the trench to permit the joint to be properly made. Joint holes may be provided in the excavation with overhanging sides, provided the material excavated is of such a nature as to make this procedure safe for the workmen. Bottom of trenches shall be evenly graded to insure uniform bearing for the length of the pipe except where joint holes are necessary. Excavate all rock, cemented gravel, old masonry or other hard material to a depth of at least four (4) inches below pipe bearing grade and fill with sand or fine gravel firmly compacted to 95% Modified Proctor.
- D. Amount of Opening: In excavating for sewers the excavation shall at all times be finished to the required grade for an adequate distance in advance of the completed sewer, but unless otherwise permitted by the Architect/Engineer, not more than one hundred (100) feet of trench shall be open at one time in advance of the sewer.
- E. Bracing and Sheeting: The Contractor shall furnish, put in place and maintain such sheeting, bracing and shoring as may be required to properly support the sides of any excavation and to prevent any movement of earth which could in any way injure the work under construction or other adjacent property or workmen. If the Architect/ Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports at the expense of the Contractor, but neither the placing of such additional supports by the order of the Architect/Engineer, nor the failure of the Architect/Engineer, to order such additional supports placed, shall release the contractor from his responsibility for the sufficiency of such supports and the integrity of the work. In the removing of sheeting and bracing after construction, special care shall be taken to prevent any caving of the sides of the excavation and injury to the completed work or to adjacent property. OSHA and applicable state requirements shall be followed.

- F. Timber Left in Trench: no sheeting, bracing or other timber shall be left in the trench upon completion of the structure, without order of the Architect/Engineer. All timber must be removed as the backfilling of the trench goes forward unless otherwise ordered by the Architect/Engineer. The Contractor shall leave such sheeting, bracing or timber, as the Architect/Engineer orders in writing, for the purpose of preventing injury to the completed structure, adjacent structures, property or workmen. In no case shall ends of timber, sheeting, or bracing left in the trench be allowed to come nearer than two feet from the established finished grade.
- G. Disposal of Excavated Material: All suitable excavated material shall be used in backfilling over the sewer and appurtenances or distributed otherwise by the Contractor. All excavated material in excess of the quantity required for backfilling shall be hauled away by the Contractor and disposed of by dumping offsite. The Contractor shall provide all necessary labor and equipment for the spreading of all such excess material at the place of dumping and shall keep the dumping ground in neat condition satisfactory to the Architect/ Engineer.
- H. Extra Earth Excavation: In case soft material is encountered in the bottom of a trench or underneath a special structure, which is not indicated by soil boring data and which in the opinion of the Architect/Engineer is not suitable, the Architect/Engineer may order the removal of this soft material and its replacement with concrete or other material in order to make a suitable foundation for the construction of the sewer or structure. Any extra excavation made at the order of the Architect/Engineer will be paid for on the basis of the actual quantity of material excavated.
- I. Extra Sand Backfill: Any extra sand backfill made at the order of the Architect/Engineer will be paid on the basis of compacted volume in place. The sand furnished by the contractor for payment under this item, shall be natural sand free from organic matter, clay balls and stones having a diameter greater than one inch.
- J. Extra Sand Bedding: Any extra sand bedding made at the order of the Architect/Engineer will be paid for on the basis of the compacted volume, in place. The sand furnished by the contractor for payment under this item, shall be natural sand free from organic matter, clay balls and stones having a diameter of greater than one inch. This item is intended to provide sand as a bleeding material when unsuitable material is encountered below pipe grade.
- K. Concrete Work: All concrete work for monolithic concrete sewer construction, reinforced concrete pipe, manholes, catch basins, and all other concrete structures shall be made in accordance with the Standard Specifications for Highway Construction, latest edition.
- L. Backfill:
1. Backfill trenches only after piping has been inspected, tested and locations of pipe and appurtenances have been recorded. Subsidence shall take place after backfilling. Backfill by hand around pipe with sand or fine gravel from the bottom of the pipe excavation to a level one (1) foot above the top of the pipe unless shown otherwise on the plans or as may be directed by the Architect/Engineer during the course of the work. Tamp firmly in layers not exceeding six (6) inches in thickness, taking care not to disturb the backfill, using equipment suitable for the kind of soil being compacted. Under floors, pavements, walks, and other surfacing, the backfill material shall be sand, back run gravel or limestone screenings compacted with a vibrating compactor for the full depth in layers not thicker than six (6) inches. Backfilling from above the pipe to the top of the trench excluding surface restoration for trenches located in, along, or within ten (10) feet of permanent pavements shall be backfilled with sand or fine gravel. This material shall be placed in thin layers and mechanically compacted with suitable equipment. This sand or gravel material shall be brought up to finish grade unless surface restoration has been shown. All backfilling shall be compacted to 95% Modified Proctor Density as established by the American Association of State Highway Officials. When laying pipe in impervious clay and backfilling with sand, the top two (2) feet of backfill shall be clay to seal the trench and reduce the possibility of water collecting in the trench. This must be done as soon as possible after laying the pipe.

- M. Surface Restoration: No basic surface restoration within the Owner's property will be necessary for the construction of the utilities except as per the backfilling specifications above. In particular, all topsoil shall be replaced and the area shall be left in a natural condition.
- N. Clean-up Limitation:
 1. The Contractor will be expected to maintain cleanup operations within a reasonable distance of the sewer being placed in the trench. Cleanup shall consist of leveling and backfill, removal of excess excavation and construction debris, and gravel repair of roads and driveways.
 2. If the Contractor does not maintain cleanup, as specified, the construction will be stopped until cleanup is carried out to the satisfaction of the Architect/Engineer.
- O. Concrete Floor Removal & Replacement
 1. Unless specifically shown or specified to be by other Contract Divisions, sawcut, breakout, remove, haul out and replace existing concrete floors as required for the new work.
 2. Where floors are to be removed by other Contract Divisions, this Contractor shall mark out areas for removal.
 3. Finished floor covering will be provided by other Contract Divisions.

1.13 EXISTING SERVICES

- A. Where existing services such as sewers, domestic and heating piping, gas, electric or other services are encountered, each affected Contractor shall take adequate steps to protect such services.
- B. If such existing services require relocation, make written request for ruling from the Architect/Engineer. Do not proceed on such portions of the work until written instructions are received. Costs involved shall be negotiated.
- C. Inactive services shall be plugged, capped or removed. Notify utility companies, municipal agencies having jurisdiction or Owner's Representative. Protect or remove as directed.
- D. Interruptions:
 1. Where existing services (e.g., water supply, fire protection, and sanitary sewers) must be interrupted for connections by this Contractor, such interruptions shall be scheduled a minimum of one (1) week in advance with Owner's Representative.
 2. Where line interruptions are required to make connection (e.g., steam and condensate), the Contractor shall make arrangements with the Owner's Representative to complete connection AFTER normal working or occupancy hours.

1.14 BASIC MATERIALS AND METHODS - GENERAL

- A. All materials and equipment required for the work shall be new, of first class quality and shall be furnished, delivered, erected, connected and finished in every detail and shall be so selected and arranged as to fit properly in the building spaces. Where a specific kind or quality of material is not specified, a first class standard article as approved by the Architect/Engineer shall be furnished.
- B. Each Contractor shall furnish the services of one or more experienced superintendents who shall be in charge of the installation of his work together with all skilled workmen, fitters, plumbers, metal workers, electricians, welders, helpers, and laborers required to unload, transfer, erect, connect, adjust, start, operate and test each system.

1.15 LUBRICATION

- A. Upon completion of the work and before turning same over to the Owner, Contractor shall clean and lubricate bearings in pumps, air handling equipment and other rotating machinery, except sealed and permanently lubricated bearings. Use only lubricant recommended by the manufacturer.

Marathon Cty. Sheriff's Dept TRC & Storage Bldg. Renovations

**PLUMBING
22 01 00 - 7**

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GENERAL PROVISIONS

1.16 PAINTING

- A. All manufactured mechanical equipment shall be furnished with the manufacturer's standard shop finish unless specified otherwise in other sections of this specification.
- B. All equipment furnished and installed by this Contractor with a factory applied baked enamel finish shall not be painted, but any damaged spots shall be touched up to match.
- C. All prime and finish painting specified, except as noted above, shall be done by the Painting Contractor.

1.17 EQUIPMENT AND SYSTEM IDENTIFICATION

- A. Nameplates:
 - 1. Description: Laminated three-layer plastic with engraved letters.
 - a. Letter Color: White.
 - b. Letter Height: 1/2 inch.
 - c. Background Color: Black.
 - d. Plastic: Conform to ASTM D 709.
- B. Tags:
 - 1. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
 - 2. Chart: Typewritten letter size list in anodized aluminum frame.
- C. PIPE MARKERS
 - 1. Comply with ASME A13.1, 2007.
 - 2. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
 - 3. Include flow arrow markers.
- D. Preparation:
 - 1. Degrease and clean surfaces to receive adhesive for identification materials.
- E. Installation:
 - 1. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
 - 2. Install tags with corrosion resistant chain.
 - 3. Install plastic pipe markers in accordance with manufacturer's instructions.
 - 4. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
 - 5. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
 - 6. Identify control panels and major control components outside panels with plastic nameplates.
 - 7. Identify valves in main and branch piping with tags.
 - 8. Identify piping, concealed or exposed, with plastic tape pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- F. Pipe Label Schedule:
 - 1. All exposed piping shall be tagged in accordance with the following schedule. Piping located above acoustical ceilings shall be tagged on all main runs and separated no

more than 20'-0" O.C. from the center of the tag. Provide tags on all piping at access panel locations.

System	Wording	Letter Color	Background Color
Clear Wastewater	CLEAR WASTEWATER	Black	Gray
Cold Domestic Water	DOMESTIC COLD WATER	White	Green
Compressed Air	COMPRESSED AIR	Black	Blue
Deionized & RO Water	DEIONIZED WATER	White	Green
Hot Domestic Water	DOMESTIC HOT WATER	Black	Green
Hot Domestic Water Return	DOMESTIC HOT WATER RETURN	Black	Green
Fire Protection	FIRE PROTECTION WATER	White	Red
High Strength Wastewater	HIGH STRENGTH WASTEWATER	Black	Yellow
Low Strength Wastewater	LOW STRENGTH WASTEWATER	Black	Yellow
Process Drain Vent	PROCESS DRAIN VENT	Black	Yellow
Process Water	PROCESS WATER	White	Green
Sanitary Vent	SANITARY VENT	Black	Yellow
Sanitary Drain	SANITARY DRAIN	Black	Yellow
Soft Water	SOFT WATER	White	Green
Tempered Water	TEMPERED WATER	White	Green
Tempered Water Return	TEMPERED WATER RETURN	White	Green
Tepid Water	TEPID WATER	White	Green
Tepid Water Return	TEPID WATER RETURN	White	Green
Storm Drain	STORM DRAIN	Black	Yellow

Other piping systems, which may occur and are not listed above, shall be worded and colored as instructed by the Engineer / Architect.

1.18 GUARANTEE

- A. Each Contractor shall guarantee his installation for a period of one (1) year from the date of final acceptance against all defects in material and/or workmanship and ordinary wear and tear. He shall make any and all adjustments to the system and minor alterations as required to place the system in satisfactory operating condition at no extra cost to the Owner.

1.19 EQUIPMENT FURNISHED BY THIS CONTRACTOR

- A. The intent of these specifications is to allow the manufacturer's standard design and construction where suitable. The equipment should have the basic quality, however, as specified. See specific equipment sections for additional requirements.
- B. All manufacturers offering equipment for this project shall furnish to the Architect/Engineer complete information describing the design performance, equipment experience, and other pertinent information necessary for review. In addition, the location of the manufacturer's Service Engineer who will be responsible for servicing the equipment furnished shall be provided. Additional information may be required by the Architect/Engineer after submittal.
- C. Prices shown in the proposal for alternative equipment shall include all structural, mechanical or electrical changes from that shown on the plans which will be required for the installation of the alternate equipment. The plans and specifications have been prepared on the basis of equipment manufactured by those firms listed in the drawing schedules and specifications. All equipment listed in the proposal will be considered carefully on the basis of advantages, disadvantages, and economics.
- D. The Contractor shall guarantee all equipment installed for one (1) year from the date of acceptance by the Owner's Representative. If prior to the duration of one year, any equipment or parts thereof are found to be defective, the Contractor shall replace the part at no cost.

- E. Manufacturer's Services:
1. All equipment shall be given one (1) coat of shop prime, unless otherwise indicated.
 2. Lubrication facilities shall be located for convenient servicing. Lubrication, maintenance instructions and one (1) year supply of recommended lubricant, properly labeled, shall be furnished with all equipment.
 3. Any special tools, including special grease guns, required for maintenance or adjustment of the equipment shall be furnished with the equipment.
 4. Upon completion of the installation of the equipment or before initial operation, three (3) bound sets of complete operating and lubricating instructions for all equipment shall be furnished to the Owner by the Contractor. Included with the operating instructions shall be a complete set of all equipment drawings including shop drawings, repair instructions, complete parts list, lubrication instructions and recommended lists of lubricants.

1.20 SHOP DRAWINGS

- A. Contractor shall provide shop drawings as required by Section 01 33 00 – Submittal Procedures of these specifications
- B. Shop Drawings shall provide complete details of the material or equipment they describe including dimensions, gauges of materials, weights, finishes, motor horsepower, voltage, current, starting characteristics, operating characteristics, building location room number, capacities, rough-in connections, installation requirements, and complete internal and external wiring diagrams showing all connections, along with fan and pump curves where applicable.
- C. In particular, shop drawings on the following equipment items shall be furnished within 15 working days from work of contract to maintain Proposal Schedule.
1. Roof or Floor Mounted Equipment affecting Building Structure (e.g. air handling units, exhaust fans, ventilators).
 2. Floor, wall, or beam column mounted equipment requiring special foundations or supports (e.g. boilers, drainage equipment, tanks, etc.).

1.21 TEMPORARY HEAT

- A. Use of permanent equipment for temporary heating shall be only as allowed by the General Requirements section of these specifications.

1.22 SAFETY

- A. Contractor shall be responsible for job site safety.
- B. Contractor shall comply with OSHA regulations for confined space entry locations.

END OF SECTION

**SECTION 22 02 00
PIPING PRESSURE TEST REPORT**

Line Number or System: _____

Date of Test: ____ / ____ / ____

Test Medium: WATER AIR NITROGEN OTHER - SPECIFY _____

Test Pressure: _____ PSI _____ FT

Time Held at Test Pressure: _____ HOURS _____ MINUTES

CHECKLIST TO BE COMPLETED AFTER PRESSURE TEST		
	NOT APPLICABLE	COMPLETED
System Drained		
System Air Dried		
Temporary Equipment (e.g. pressure gauges, blind flanges, caps, etc.) Removed		
Permanent Equipment (e.g. safety valves, relief, valves, gauges, etc.) Replaced		
Valving Returned to Proper Configuration		

REMARKS:

I certify this system to be leak free and structurally sound as of the date of the test.

FIELD TECHNICIAN (sign and print): _____

SYSTEM ACCEPTED:

OWNER'S REPRESENTATIVE

DATE

Use this form (or equal) for domestic water, storm, sanitary, compressed and medical gas systems.

END OF SECTION

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**SECTION 22 07 00
INSULATION**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Insulation required for this work includes, but is not necessarily limited to the following:
 - 1. Piping and In-Line Equipment:
 - a. Storm water piping above ground. Insulate all horizontal piping, and all vertical piping within 8' of exterior.
 - b. Above ground condensate drains not in mechanical rooms. This also includes overhead floor drain or open site drain piping draining condensate from air conditioning units and any other concealed cold drain.
 - c. Domestic hot and cold water above ground including hot water recirculation piping.
 - d. Domestic hot and cold water and drain piping under handicapped lavatories. Refer to Section 22 10 00.
 - e. Plenum fire barrier wrap insulation on PVC piping installed in air plenums.
- B. Related Work Described Elsewhere:
 - 1. Section 22 10 00: Plumbing

1.02 QUALITY ASSURANCE

- A. Qualifications of Installers:
 - 1. For the actual installation and testing of work under this section, use only thoroughly trained and experienced workmen completely familiar with the items required and the manufacturer's current recommended methods of installation.
 - 2. In acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of installers.

1.03 SUBMITTALS

- A. Materials List:
 - 1. Within 15 days after award of Contract, and before any of the materials of this section are delivered to the job site, submit complete materials list to the Architect/Engineer in accordance with the provisions of Section 01 33 00- Submittal Procedures of these specifications. The list shall identify all materials and equipment proposed to be furnished and installed under this portion of the work, giving manufacturer's name, catalog number, and catalog cut for each item where applicable. Submittals shall include a description of insulation materials, heat transfer data, thicknesses, jackets, adhesives, and methods of application on pipe, duct, fittings and surfaces.
- B. Manufacturer's Recommendations:
 - 1. Accompanying the materials list, submit the manufacturer's current recommended method of installation for the insulation required in this work.

1.04 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.
- B. Replacement:

1. In the event of damage by this Contractor, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. All insulation, unless otherwise indicated, shall have composite (insulation, jacket and adhesive used to adhere the jacket to the insulation) Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding:

Flame Spread	25
Smoke Developed	50
Fuel Contributed	50

Accessories, such as adhesives, mastics, cements and cloth to fittings shall have the same component ratings as listed above. Paper laminate jackets shall be permanently fire and smoke resistant. Chemicals used for treating paper in jacket laminates shall not be water soluble and shall be unaffected by water and humidity. The insulation contractor shall verify in writing, prior to installation, that all products to be used meet the above criteria.

- B. Contractor shall provide all adhesives, mastics mechanical fasteners, etc., as specified herein and as required. Adhesives, equal to those specified, shall be provided and applied in accordance with manufacturer's published recommendations, and shall be as manufactured by Dow Corning, Foster Products, Johns Manville, Owens Corning, or approved equal.
- C. Preformed insulated fittings and jackets shall be as made by Proto PVC Corporation or Johns Manville. PVC covers such as Proto or Zeston, may be used throughout the piping systems.
- D. NFPA 90-A and NAIMA standards shall be met as applicable.

2.02 PIPING INSULATION

- A. Plumbing Systems
 1. Preformed fiberglass pipe insulation manufactured in accordance with ASTM C-547, with a 'K' factor of 0.23 Btu-in/hr-sf/ F @ 75 F mean temperature, shall have a pre-applied all service jacket. A vapor barrier shall be maintained on cold piping by sealing all staples and raw insulation ends and fittings. Insulation shall be as made by Johns Manville Micro-Lok 850-AP or AP-T, or equal by Owens-Corning, Knauf, or Manson Insulation.
 2. Wrap piping with a PVC protective jacket equal to Johns Manville Zeston 300 Series PVC in all mechanical rooms. Color of PVC jacket shall be white.
 3. Fittings, Valves, Flanges, Strainers, Flexible Connectors, Suction Diffusers, Unions, etc.:
 - a. Hot Piping: Fittings shall be insulated by applying factory pre-cut insulation inserts to the fitting per Manville Hi-Lo Temp insulation insert recommendations and covered with 25/50 PVC covers. Other piping components shall be insulated with approved insulating cement of thickness equal to adjoining pipe insulation, with glass fabric cover adhered and finished with fire resistive lagging adhesive. Contractor may also insulate with mitered segments of fiberglass pipe insulation, secured with No. 20 gauge galvanized steel wire, and finished with smoothing coat of insulating cement and glass fabric, as above. Cover all sizes with applicable pre-molded PVC insulation fittings, as made by Proto PVC Corporation and Johns Manville. Wrap other areas not suitable for pre-molded PVC fittings with fiberglass cloth and insulating mastic.
 - b. Cold Piping: Insulate same as hot piping but maintain continuous vapor barrier with mastic, including sealing all staples and raw insulation ends at fittings.

B. Thickness Schedule:

	<u>Pipe Size</u>	<u>Thickness</u>
1. Domestic hot and cold water above ground, overhead condensate drains	all	1"
2. Roof conductors and roof sumps	all	1"
3. Note: Where pipe chase dimensions or interference problems make use of the specified thickness impossible, local reductions in thickness may be made with Architect/Engineer approval.		

C. Exterior piping:

1. Metal jacketing shall be 0.016" (0.4 mm) minimum aluminum or stainless steel with moisture barrier, secured in accordance with the jacket manufacturer's recommendations. Joints shall be applied so they will shed water and shall be sealed completely.

2.03 FIRE BARRIER INSULATION

- A. Foil encapsulated, inorganic high temperature, flexible fireproofing wraps specifically tested for plastic pipe and cable protection from external flame-propagation and smoke generation in return air plenums or other spaces used for environmental air.
- B. Tested with PVC, PEX and CPVC per ASTM E-84 and UL 910 listed to not exceed the following limits:

FLAME SPREAD 25

SMOKE DEVELOPED 50

FUEL CONTRIBUTED 50

- C. Thermal Ceramics/FireMaster PlenumWrap or PlenumWrap+ or equal approved prior to bid.

2.04 OTHER MATERIALS

- A. All other materials, not specifically described, but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and subject to approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection:
 1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 2. Verify that all the work of this section may be installed in accordance with all pertinent codes and regulation, the original design, and the approved shop drawings.
- B. Discrepancies:
 1. In the event of discrepancy, immediately notify the Architect/Engineer.
 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 INSTALLATION

A. General:

1. Contractor shall be responsible for examination and acceptance of all surfaces and conditions prior to delivery and installation.
2. Install all insulation in strict accordance with the respective manufacturers' recommendations as approved by the Architect/Engineer.
3. Insulation shall be applied on clean, dry surfaces and after inspection and release for insulation application. All insulation shall be continuous through wall and ceiling openings and sleeve. Pipe insulation shall be continuous through pipe hangers. All joints shall be butted firmly together. Longitudinal jacket laps and butt strips shall be smoothly secured according to manufacturer's recommendations.
4. When covering is terminated at equipment, specialties, or access doors; or where jackets are pierced by metal parts such as thermometers or pressure gauges, covering material shall be neatly tapered and jacket securely sealed to pipe or other metal part.

B. Piping Insulation Installation:

1. Piping insulation shall be installed with all joints tightly butted; with overlapping longitudinal joints integral with jacket, and with 3" wide separate butt strips; tightly sealed with adhesive. Exposed insulated piping shall be provided with a finish suitable for a final coat of paint. Concealed insulation will not be painted nor will aluminum jacketed pipe.
2. Insulation covering on heated piping shall be neatly trimmed where penetrated by support shoes where slides are used or support inserts where rollers are used.
3. Insulation on all cold surfaces where vapor barrier jackets are used must be applied with a continuous unbroken vapor seal. Hangers, supports, anchors and guides that are secured directly to cold surfaces must be adequately insulated and vapor sealed to prevent condensation. Stapling of vapor barrier jackets on cold piping will be permitted only if the staples are sealed within approved vapor barrier mastic or vapor barrier tape.
4. Rigid insulation inserts shall be installed at outside hangers and pipe resting on structural steel. Inserts between pipe and pipe supports shall consist of Johns Manville Thermo-12 or Calsilite rigid pipe insulation for services below 35°F or wood blocks equal to "Buckaroos" for services above 35°F. The inserts shall be of thickness equal to the adjoining insulation and shall be provided with vapor barrier where required. Inserts shall be of sufficient density to avoid crushing of insulation and damage to vapor barrier. Insulation inserts shall not be less than the following lengths, unless otherwise specified:

1/2" to 2-1/2" pipe size	10" long
3" to 6" pipe size	12" long
8" to 10" pipe size	16" long
12" and over	22" long

Galvanized metal protection shields equal to Grinnel Fig. 167 or equivalent by "Buckaroos" shall be applied between hangers or supports and the pipe insulation. Shields shall be formed to fit the insulation and the length specified for the hanger inserts less 4 " to allow for vapor sealing butt joints in each side of the shields. On piping 6 inches and above pipe covering protection saddles equal to Grinnel Figures 160 through 165 shall be used

Insulation inserts and shields shall be provided by the respective piping Contractor; such as plumbing, process piping, heating and cooling, etc.

5. Specified adhesives, mastics and coatings shall be applied at the manufacturer's recommended minimum coverage per gallon.

6. Where metal jackets are used, installation on pipe, fittings, valves, flanges, and other piping accessories shall conform to Pabco recommendations.
 7. Install Armaflex or Manville Aerotube per manufacturer's recommendation.
- C. Install cold equipment insulation on clean surfaces using manufacturer's recommended adhesives, joining requirements, and finishing vapor barrier coating.

3.03 FIRE BARRIER INSULATION

- A. Install fire barrier insulation in accordance with manufacturer's written instructions and according to the methods described in the UL 910 listing for the product.
- B. Install blankets with minim overlap at transverse and longitudinal joints of 1".
- C. Seal cut edges with aluminum foil tap.
- D. Secure with banding or tie wire as follows:
 1. Banding:
 - a. 1/2" x 0.015" thick carbon or stainless steel banding around the entire perimeter of the insulated pipe.
 - b. Install banding 1/4" from each blanket edge and on maximum 11.3/4" centers.
 2. Tie Wire:
 - a. 16 gauge carbon or stainless steel wire.
 - b. Install tie wires 1/4" from each blanket edge and on maximum 11.3/4" centers.
 3. Install blankets tightly around the piping to be protected and install bands or tie wire to securely hold the insulation in place.
- E. Insulation shall be continuous through hangars and supports with Grinnell Fig. 167 insulation shields.

3.04 TESTS

- A. Insulation shall not be completely installed until pressure/leak tests of piping and ductwork systems have been completed. Straight lengths of pipe may be installed before pressure testing. Verify with ductwork contractor that ductwork integrity has been verified prior to insulating ductwork.

END OF SECTION

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**SECTION 22 10 00
PLUMBING**

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. The plumbing work includes, but is not necessarily limited to:
 - 1. Work summarized in Section 22 00 00, Mechanical and Plumbing Scope of Work.
- B. Related Work Described Elsewhere:
 - 1. Section 22 02 00: Piping Pressure Test Report
 - 2. Section 22 01 00: General Conditions
 - 3. Section 22 07 00: Insulation
 - 4. Division 33: Utilities

1.02 QUALITY ASSURANCE

- A. Qualifications of Workers:
 - 1. Use a sufficient number of journeyman plumbers and competent supervisors in the execution of this portion of the Work to ensure proper and adequate installation of plumbing throughout and inside building.
- B. Compliance with Specifications:
 - 1. Whenever required during progress of the work, and after completion of construction, immediately furnish proof acceptable to the Architect/Engineer that all items of plumbing installed equal or exceed all requirements specified for this work.
 - 2. In the event that such proof is not available or is not acceptable, the Architect/Engineer may require the Contractor to remove the item or items and replace with material meeting the specified requirements and to repair all damage caused in the removal and replacement, all at no additional cost to the Owner.
- C. Codes and Standards:
 - 1. Comply with all Wisconsin Administrative Code and local requirements.

1.03 SUBMITTALS

- A. Shop Drawings:
 - 1. Within fifteen working days after award of contract, and before any plumbing materials are delivered to the job site, submit shop drawings in accordance with the provisions of Division 1 of the General Requirements showing all the plumbing system and plumbing materials, products proposed to be furnished and installed.
- B. Construction Record "As-Built" Drawings:
 - 1. During progress of the work maintain an accurate record of all changes made in the plumbing installation from the layout and materials shown on the approved shop drawings. The location of shutoff valves for the various services and proper identification of services must be shown.

1.04 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect plumbing materials before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacements:
 - 1. In the event of damage caused by this Contractor, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer all at no additional

cost to the Owner.

PART 2 - PRODUCTS

2.01 PIPE

- A. Storm Drainage:
 - 1. Exterior: Standard weight cast iron soil pipe and fittings meeting ASTM C564 or C76, or Schedule 40 PVC ASTM D2665 solvent welded plastic pipe, or corrugated polyethylene with smooth interior liner meeting AASHTO M294 and having a State of Wisconsin alternate approval as Hancor Sure-Lok or TiteLine or Advance Drainage Systems ADS N-12.
 - 2. Interior: Standard weight cast iron soil pipe or no-hub pipe with fittings meeting ASTM C564 (neoprene push-on or no-hub joints) or Schedule 40 PVC ASTM D2665 solvent welded plastic pipe. Plastic pipe and fittings installed in plenum spaces shall be wrapped with fire barrier insulation as described in Specification 22 07 00.
- B. Sanitary Drainage:
 - 1. Exterior: Sanitary drainage piping shall be Schedule 40 PVC ASTM D2665 solvent welded plastic pipe and fittings through 4-inch size. Above 4-inch contractor may use same or SDR 35 ASTM 3034 PVC with push-on rubber joints equal to J-M Ring-Tile PVC gravity sewer pipe and fittings, suitable for depth of bury and soil and compaction conditions.
 - 2. Interior: Domestic waste, vent drain piping shall be standard weight cast iron hub or no-hub soil pipe and fittings meeting ASTM C564 with neoprene push-on or no-hub joints, or Schedule 40 PVC ASTM D2665 solvent welded plastic pipe and fittings. Plastic pipe and fittings installed in plenum spaces shall be wrapped with fire barrier insulation as described in Specification 22 07 00.
- C. Potable Water Piping (Hot/Cold/Recirculation):
 - 1. Potable water piping underground through 3-inch shall be ASTM B-88 type K soft copper meeting AWWA specifications, with bronze compression fittings, or for exterior use only, NSF rated cross-linked polyethylene 160 psi AWWA approved water service pipe. Piping larger than three-inches shall be ductile cast iron push-on joint equal to Clow F-172D meeting ANSI A21.51, class 52. Fittings shall be 250 lb. push-on joint meeting ANSI A21.20 with ANSI 21.11 gaskets. Mechanical joint anchoring fittings may be used in lieu of thrust blocks and tie-rods per UL-FM requirements. Pipe and fittings shall be cement mortar lined per ANSI A21.4 and shall be coated with a bituminous coating of either coal tar or asphalt one mil thick. Brass wedges shall be used where applicable.
 - 2. Potable water piping aboveground through 3-inch shall be hard drawn copper tube type L copper meeting ASTM B-88 with wrought or forged copper fittings and lead free solder. Wrought copper fittings equal to Nibco Press Fit System fittings are acceptable in lieu of wrought solder fittings. Victaulic fittings suitable for domestic water systems are acceptable for cold water, hot water and hot water circulation systems.
- D. Condensate Drain Piping:
 - 1. Condensate drain piping shall be equal to piping specified for potable water piping above ground or schedule 40 PVC, ASTM D2665.

2.02 VALVES

- A. All gate, globe, check and ball valves shall be Milwaukee, Nibco, or Hammond as listed below, or other approved equal. Shutoff valves for general service purposes shall be ball valves, not gate valves. Valves used in potable water service shall not be capable of placing dissolved lead into the potable water stream.

TYPE	SIZE RANGE	VALVE NUMBER		
		Milwaukee	Nibco	Hammond
Gate (screwed)	2" and below	1151	T134	IB629
Gate (sweat)	2" and below	1169	S134	IB648
Gate (flanged)	Above 2"	F-2885A	F617-O	IR1140
Globe (screwed)	2" and below	590T	T235-Y	IB413T
Globe (sweat)	2" and below	1590T	S235-Y	IB423
Globe (flanged)	Above 2"	F-2981A	S718-B	IR116
Swing Check (screwed)	2" and below	510T	T433Y	IB946
Swing Check (sweat)	2" and below	1510T	S433Y	IB945
Swing Check (flanged)	Above 2"	F-2974A	F918-B	IR1124
Ball Valve (threaded)	2" and below	BA-100	T-585-70	8501
Ball Valve (sweat)	2" and below	BA-150	S-585-70	8511

2.03 PIPE SLEEVES AND ESCUTCHEONS

- A. Provide sleeves for all plumbing passing through walls, floors, ceilings and partitions. Sleeves shall be 18 gage galvanized steel, or where permitted by code, PVC schedule 40 is acceptable. Pipes passing through walls below grade shall utilize Clow F1429 or equal U.S. Pipe mechanical joint wall sleeve. Sleeves shall be caulked watertight with mastic or applicable silicone sealant. Sleeves passing through fire-rated structures shall maintain that fire rating. Conceal pipe sleeves in finished areas with chrome plated escutcheons.

2.04 HANGERS, ANCHORS AND SUPPORTS

- A. Hangers and supports shall be Unistrut, Fee and Mason, Michigan Hanger, or Grinnell Company and suitable for size and type of pipe to be supported.
- B. No piping shall be hung from the piping of other trades or systems. Hangers shall be same material as the piping such that neither the hanger nor suspended piping is subject to electrolytic decay.
- C. Piping two-inch and smaller may be supported with hook plates wherever it runs adjacent to a side wall. Piping larger than two-inch shall be supported by a wall bracket and either a clevis or roller type hanger.
- D. Special pipe materials (e.g., plastics) shall be supported per manufacturer recommendation.
- E. The following is a schedule of maximum spacing for hangers and supports and size of suspension rods for all steel and copper piping unless otherwise indicated or required. Rods shall meet ASTM A 575.

PIPE SIZE	ROD DIAMETER	MAX. SPACING
up to 1-1/4"	3/8"	6'-0"
1-1/2" to 2"	3/8"	9'-0"
2-1/2" to 3"	1/2"	11'-0"
4" to 5"	5/8"	14'-0"
6"	3/4"	17'-0"

- F. Drainage piping support shall meet requirements of respective pipe manufacturer and local codes.
- G. Locate hanger supports and accessories to support pipe lines, valves, joints, and additional concentrated loads. Hangers shall not restrict free thermal expansion unless otherwise shown.

- H. Hangers on insulated piping systems shall be oversized to accommodate insulation thickness indicated in Insulation Specification Section 22 07 00. Provide pipe covering protection saddles for applicable insulated piping as also specified in Section 22 07 00, equal to Grinnell Fig. 167.

2.05 VENT FLASHING, SIZING, AND SLOPE

- A. Vent stack installation shall be coordinated with Architectural Chimneys. Grade horizontal vent lines one-eighth-inch per foot, minimum. Vent flashing shall be adaptable to slope of roof. Vent flashings materials shall comply with materials listed in most current addition of Wisconsin Plumbing Code SPS 384.

2.06 VACUUM BREAKERS, CHECK VALVES, AND BACKFLOW PREVENTERS

- A. Provide approved vacuum breakers, check valves, and backflow preventers as required by applicable plumbing codes at all possible cross-connections. This applies to any location where a hose connection is possible such as wall hydrants, hose bibbs, and service sinks. Comply with local health department requirements.

2.07 ELECTROLYTIC ISOLATION

- A. Isolate all dissimilar piping materials with insulating couplings equal to V-line, Walter Valet, Stockham, or Viking.

2.08 MANHOLES AND CATCH BASINS

- A. Precast concrete manholes and catch basins shall be reinforced circumferentially and shall conform to ASTM C478-61T with Clow No. F-3650 or Neenah steps meeting ASTM A-48 Class No. 30. Manholes are sized as indicated on the Construction Drawings, and as a minimum shall be 3'-0" diameter up to 12'-0" deep and 6'-0" diameter beyond 12'-0". See also Specification Division 2 Sitework. Precast section joints shall be Ram-Nek or "O" ring. Connections to sanitary and storm water piping shall be cored, watertight gasketed joints equal to Kor-N-Seal flexible pipe to manhole connector by NPC, Inc., or equivalent. All transition cones shall meet ASTM C-478-61T.

2.09 ACCESS DOORS

- A. Provide access doors by Milcor, Babcock-Davis, Bilco, Cessco, or American Hatch where valves, traps, and other items needing access are concealed and must be serviced, operated, or maintained. Access doors shall match adjacent finish and shall be equipped with Allen key device for locking purposes.

2.10 PLUMBING FIXTURES

- A. General:
 1. Furnish fixtures of Class "A" vitreous china or acid resisting porcelain enameled cast iron as specified. Fixtures shall be unmarked, clean, smooth, bright, and guaranteed not to crack, discolor, scale, or craze.
 2. Fixtures shall be caulked to floors and walls in compliance with Technical Specification Section 07 92 00 Sealants.
 3. All fixtures shall be white unless otherwise specified.
 4. No materials may be used which will place dissolved lead into the potable water stream.
 5. Provide shutoff valves or stops at all fixtures. Use ball valves, not gate valves, as shutoff valves.

2.11 OTHER MATERIALS

- A. All other materials not specifically described but required for a complete and proper installation shall be new, first quality of their respective kinds, and subject to the approval of the Architect/Engineer.

2.12 FLOOR CLEANOUT SCHEDULE

- A. Floor Cleanout FCO-1 shall be equal to Josam Series 56040-1/56050-1, Jay R. Smith 4100/4111 Series, or Zurn ZN-1400 Level-trol, adjustable floor cleanout, cast iron body with anchor flange, gas and watertight ABS tapered thread plug, and round scoriated nickel bronze top adjustable to finished floor.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. General:
 - 1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 - 2. Verify that plumbing may be installed in strict accordance with all pertinent codes and regulations and the approved shop drawings.
- B. Discrepancies:
 - 1. In the event of discrepancy, immediately notify the Architect/Engineer.
 - 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 PLUMBING SYSTEM LAYOUT

- A. General:
 - 1. Layout the plumbing system in careful coordination with the approved shop drawings, determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactory functioning system.
 - 2. Follow the general layout shown on the approved shop drawings in all cases except where other work may interfere.
- B. Enclosure of Pipes:
 - 1. Except where specifically permitted by the Architect/Engineer, lay out all pipes to fall within partition, ceiling, or roof cavities and to not require furring other than that shown on the approved shop drawings.

3.03 TRENCHING AND BACKFILLING

- A. Perform all trenching and backfilling associated with the plumbing installation in strict accordance with provisions of Division 31 of these specifications.

3.04 EXISTING SERVICES

- A. Where existing sewers, piping, gas, electric or other services are encountered in areas in which their presence was unknown by best available information, including information from local utility companies, each affected Contractor shall take adequate steps to protect such services.
- B. If such existing services require relocation, make written request for ruling from the Architect/Engineer. Do not proceed on such portions of the work until written instructions are received.
- C. Inactive services shall be plugged, capped or removed. Notify utility companies, municipal agencies having jurisdiction and the Architect/Engineer. Protect or remove as directed.

3.05 INSTALLATION OF PIPING AND EQUIPMENT

- A. General:
1. Install all piping, promptly capping or plugging all open ends and making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.
 2. Provide uniform pitch of 1/4" per foot when possible and 1/8" per foot minimum for all horizontal waste and soil piping within the building. Pitch all vents for proper drainage.
 3. Cushion all straps and bearings to minimize transfer of sound. Firmly anchor all pipes in position. Provide complete isolation of dissimilar metals.
 4. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions. Promptly remove all defective material from the job site.
 5. Install pipes to clear all beams and obstructions. Do not cut into or reduce the size of load carrying members without the approval of the Architect/Engineer.
 6. Locate all vent pipe discharges in accordance with plumbing and mechanical codes having jurisdiction relative to distances from air intakes, windows, and other situations where their presence constitutes a hazard. Generally at least ten feet horizontal distance from or three feet vertical distance above air intakes is required.
- B. Joints and Connections:
1. Threaded Joints: Joints in threaded piping shall be made with graphite and oil joint compound, or specified lubricant, applied to the male thread only. Care shall be used to keep the inside of the pipe clean from joint compound, cuttings, scale and other foreign material. Pipe shall be reamed full size. Leaking joints shall be repaired by replacement with new threaded materials.
 2. Welded Joints:
 - a. Where welding is called for, it shall be of the fusion process and shall consist of welding by means of either the oxy-acetylene or electric arc process.
 - b. All welding shall conform to the ASME Code for Power Boilers, or the ANSI code for Pressure Piping (latest edition).
 - c. The connections to a welded pipe 2" and larger shall be made with a welding tee or Weld-0-Let of butt, socket, or threaded type as required.
 - d. Only welding ells may be used for changing pipe directions of welded pipe lines. Mitered joints will not be permitted.
 3. Where PVC pipe is used, joints shall be made by solvent cementing method, performed in strict accordance with manufacturer's written instructions except where other types of joints are shown or specified.
 4. Pack all joints in cast iron soil and waste pipe and fittings, using approved material and method, securing fully and properly caulked and smoothly finished, except where compression-type neoprene or no-hub fittings are permitted and used.
 5. Make all aboveground joints in copper tube with lead-free solder applied in strict accordance with the manufacturer's recommendations.

3.06 INSTALLATION OF VALVES

- A. Gate and globe valves shall not be installed with stem below the horizontal.
- B. Gate or ball valves shall be provided in all main branches of the piping and where necessary to dismantle, drain, and repair the systems.

3.07 INSTALLATION OF PLUMBING FIXTURES

- A. The rims, fronts and all exposed parts of lavatories, service sinks, water closets, drinking fountains and other fixtures shall be covered and protected with suitable guards and building paper until completion of the work. This protection is to be installed immediately at the time of setting plumbing fixtures and to be removed only when the completed project is turned over to the Owner.

- B. All fixtures shall be sealed gas and watertight at walls and floors in accordance with manufacturer's recommendation. Manufacturer's recommended hold down bolts shall be used and shall be equipped with nuts and washers.
- C. Roughing in dimensions shall be determined only from fixture brochures approved by the Architect/Engineer.
- D. Mounting of fixtures shall meet ADA accessibility guideline requirements where applicable.

3.08 INSTALLATION OF UNDERGROUND PIPING

- A. Sewer Pipe:
 1. The trench shall be dry during the pipe laying operation. If dewatering is needed, it shall be this contractor's responsibility. The trench bottom shall be prepared as previously specified. Bell holes shall be excavated to that after placement, the barrel of the pipe will have full bearing on the trench bottom.
 2. Pipe shall be protected during handling against impact shocks and free fall.
 3. The laying of the pipe shall commence at the outlet and proceed upgrade with spigot ends pointing in the direction of flow.
 4. The socket of the pipe last laid shall be wiped clean and the spigot end of the pipe to be laid shall then be centered and pushed home against the base of the socket. The pipe shall be centered so that they will form a sewer with a uniform invert. The joints shall be made as previously described.
 5. All pipe shall be laid to the line and grade called for on the plans or minimum slope necessary to satisfy plumbing code. Each pipe, as laid, shall be checked the contractor with a suitable sighting level beam to insure that this result is obtained.
 6. After the pipe is laid, sharp sand or fine gravel shall be carefully deposited along the sides of the pipe. Backfill shall be carefully tamped under the haunches of the pipe. Care shall be taken during backfilling and tamping so that the line and grade of the pipe are not disturbed. Any pipe found off grade or out of line shall be re-laid properly by the contractor. Additional sand, gravel or stone shall then be placed until the entire width of the trench is filled to not less than one foot above the top of the pipe. If sand is used for back fill around the pipe, it shall be thoroughly compacted with a vibratory compactor; hand compaction will not be acceptable. The remainder of the backfilling may be done in the manner presented elsewhere in these specifications.
 7. Minimum cover for exterior piping shall be six feet unless otherwise specified. Interior piping shall have a minimum distance of six-inches from top-of-pipe to bottom-of-floor slab.

3.09 CLEANING SANITARY SEWERS

- A. Verification: Prior to putting systems into use and before the sewer is tested thoroughly flush the sewers and verify that all new and existing sanitary sewers are free of construction debris. If this simple flushing procedure does not readily verify the piping is intact and clean, the sewer shall be cleaned as follows:
- B. The Contractor shall furnish an inflatable rubber ball of a size that will inflate to fit snugly into the sewer to be tested. The ball shall be placed in the upstream manhole and water shall be introduced behind it. The ball shall pass through the pipe with only the force of the water propelling it. All debris flushed out ahead of the ball shall be removed at the first manhole where its presence is noted.
- C. In the event debris stops the ball, the Contractor shall remove the obstruction by further flushing or cleaning. In the event a damaged pipe stops the ball, the Contractor shall repair the sewer.
- D. Cleaning may also be accomplished by the use of a high-pressure water jet.

3.10 CLOSING IN UNINSPECTED WORK

- A. General:
 - 1. Do not cover up or enclose work until it has been properly and completely tested, inspected, and approved.
- B. Non-Compliance:
 - 1. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and, after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Architect/Engineer all at no additional cost to the Owner.

3.11 TESTING

- A. General Procedures:
 - 1. Furnish all required personnel and equipment and make all tests required to receive the approval of the Architect/ Engineer and all agencies having jurisdiction.
 - 2. Piping shall be tested at a hydrostatic pressure to fifty-percent over the system design pressure or at 125 psig, whichever is greater, except that plumbing fixtures and drainage piping shall be tested according to code requirements. Systems shall have no significant pressure loss for 24 hours. If defects are found, repeat tests after defects have been corrected.
 - 3. Concealed pipe shall be tested in sections in such a manner that will not leave any pipe or joint untested.
 - 4. Control devices, air vents and other parts not designated to stand pressures used in testing piping shall be removed or otherwise protected before testing the piping systems.
 - 5. Use Piping Pressure Test Report form in Section 22 02 00 for record purposes where applicable.
 - 6. Full payment will not be authorized unless all piping pressure test reports or signed certifications of complete leak free systems are submitted to the Architect/Engineer.
- B. Additional Testing Requirements:
 - 1. All fabricated piping shall, as a minimum, meet the examination, inspection and testing requirements of ANSI B31.3.
 - 2. Inspectors representing the Owner shall have access at all times while work on their contract is being performed to all sections of the worksite that concern the fabrication and erection of the piping on their contract. The inspectors shall be afforded all reasonable facilities to satisfy them that the work is being performed in accordance with the requirements of applicable specifications and procedures.
 - 3. All welding performed under this specification shall be subject to visual inspection. This visual inspection shall include an examination of joint details prior to welding, inspection for defects during welding and for defects, undercut, overlay and reinforcement dimensions after welding.
 - 4. As far as is practicable, all pressure tests shall be complete system tests conducted in the presence of Architect/Engineer representative. All pressure vessels, instruments and equipment connected to the piping shall be excluded from the tests.
 - 5. Every precaution shall be taken during testing to insure the safety of the operator. Systems to be pressurized will be provided with appropriate gages and pressure relieving devices.
 - 6. All joints, including welds, are to be left un-insulated, unpainted, and exposed for examination during testing.
 - 7. Equipment which is not to be subjected to the pressure test shall be either disconnected from the piping or isolated by blinds or other means during the test. Valves may be used provided that the valve is suitable for the proposed test pressure.

8. Expansion joints shall be provided with temporary restraint, if required, for the additional pressure load under test, or shall be isolated from the test.
 9. Pressure relief and thermal relief valves shall be excluded from these tests.
 10. Before every test the piping systems shall be visually inspected to assure that there are not visual defects and that all connections are tight.
 11. Control valves, unless being tested, shall be set and maintained in the wide open position.
 12. Lines that are spring or counterweight supported and all vapor or gas lines shall be temporarily supported during test in order to support the test fluid load, if necessary.
 13. Lines containing check valves shall have the pressure applied upstream of the check valve so that pressure is applied under the seat.
 14. All in-line instruments, gage glasses, flow meter pot, liquid level float gages, and all other pressure parts of instruments shall be excluded from these tests.
 15. Pneumatic testing of fiberglass reinforced plastic, glass, or plastic piping is not permitted.
 16. Joints found to be defective shall be repaired and retested.
 17. Retesting of lines after repairs shall be done at pressures originally specified for the test.
 18. When pneumatic or hydrostatic tests are not appropriate, tests shall be as specified by the Architect/Engineer.
- C. Test Reports: The Contractor shall make a record of the test applied to each piping system, which shall consist of the following data: Note: Full payment will not be authorized unless all piping pressure test reports or signed certifications of complete leak free systems are submitted to the Architect/Engineer.
1. Line designation number.
 2. Date of test.
 3. Type of test, pressure applied, and length of time at test pressure.
 4. Tested by:
 5. Comments, if any:
 6. Piping Pressure Test Report form in Section 22 02 00 to be completed.
- D. Hydrostatic Tests:
1. The hydrostatic test pressure shall be calculated in accordance with applicable section of ANSI B31.3, but shall not exceed the maximum test pressure of any component included in the test.
 2. Temperature and head adjustments shall be made in accordance with ANSI B31.3, Paragraphs 337.4.1 and 337.4.2.
 3. Hydrostatic test pressures for fiberglass reinforced plastic, glass or plastic pipe, must not exceed manufacturer's recommended working pressure.
 4. All hydrostatically tested systems shall be tested to one and one-half times the design pressure or to a minimum pressure of fifty psig, whichever is greater. All test pressures shall be maintained a minimum of ten minutes before visual examination of joints begins.
 5. Hydrostatic test pressures shall not be applied until the piping system and the testing medium have reached thermal equilibrium.
 6. During the tests, hydrostatic pressures shall be monitored and corrections shall be made to compensate for thermal expansion or contraction. By this procedure the test pressure shall be kept within five psig or one percent, whichever is greater, of its intended value. All joints shall be visually examined for leakage during the test.
 7. Tested systems shall be vented and drained immediately upon successful completion of the test. All process and solvent lines shall be dried by passing clean dry oil-free

air through them until they are dried to the satisfaction of the Architect/Engineer or the Architect/Engineer representative.

8. No repair welding shall be done on any section of piping that contains water.

E. Pneumatic Tests:

1. Air tests shall be performed with clean, dry, oil-free air, or nitrogen, as required. The source shall be equipped with appropriate pressure relief valves and gages.
2. Air tests shall be performed at a test pressure in accordance with the applicable section of ANSI B31.3. The minimum test pressure shall be fifty psig.
3. Pneumatically tested systems shall include a preliminary check at not more than fifty psig. The system shall then be brought up to test pressure in twenty-five psig increments. Enough time shall be left between steps to allow the system to equalize strains, to inspect for leaks by soap and water method and to allow test media to reach thermal equilibrium.
4. During the test, pressures shall be monitored and corrections shall be made to compensate for thermal expansion or contraction. By this procedure, the test pressure shall be kept within five psig of its intended value.
5. Tested systems shall be vented immediately upon successful completion of the test.
6. No repair welding shall be performed on a pressurized system.
7. Where both hydrostatic and pneumatic tests are run on a section of pipe, the hydrostatic test shall precede the pneumatic.

F. Standing Water Test

1. All portions of the system shall be filled with water.
2. Water shall stand for a period of not less than eight hours.
3. The leak rate shall be as specified by "Sewer Design and Construction" - ACME M&R No. 37. Steel piping systems shall be leak tight.
4. If the system loses water faster than the rate specified, the leaking component shall be repaired and the system retested.

3.12 STERILIZATION OF PIPES

A. General:

1. After preliminary purging of the system, chlorinate the entire potable water system, both site and in building, in accordance with the current recommendations of the American Water Works Association and in accordance with pertinent codes and regulations.
2. Chlorinate when building is unoccupied and before water is used for human consumption. Post signs at all taps stating water is unsafe. Remove signs after chlorination.

B. Flushing:

1. Upon completion of the sterilization, thoroughly flush the entire potable water system.
2. When sterilization and flushing are complete arrange with agencies having jurisdiction for all required tests on mains and systems.
3. Contractor shall repeat chlorination and flushing if tests show water is unsafe until safe levels are verified.

3.13 POTABLE WATER SYSTEM TESTING

- A. After completion of the work and prior to owner occupancy, contractor shall utilize the services of an independent testing laboratory to verify that concentrations of dissolved lead

in the potable water system meet the guidelines of US EPA and State and local Health Departments.

- B. Testing shall include representative sampling from all areas of the building, typically sampling the incoming water, at the end of each major piping supply loop, and at domestic hot water returns to water heater systems. Testing shall sample the first one-half gallon at each location after systems have been idle for at least six hours.
- C. If testing indicates levels higher than standards allow, contractor shall take appropriate steps to resolve the problem, typically a series of flushing with very hot water and then retesting.
- D. Submit to Architect/Engineer three copies of letters from agencies having jurisdiction documenting the safety and acceptance of the potable water system.

3.14 CLEANING UP

- A. Prior to acceptance of the work thoroughly clean all exposed portions of the plumbing installation. Remove all labels and all traces of foreign substance, using only a cleaning solution approved by the manufacturer of the plumbing item, being careful to avoid all damage to finished surfaces.

END OF SECTION

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**SECTION 23 00 00
MECHANICAL SCOPE OF WORK**

PART 1 - GENERAL

1.01 SCOPE OF WORK

Contractor shall provide all labor, materials, equipment, permits, inspection fees, supervision, utility company charges, and other items noted in Contract General Conditions necessary to yield completely operable and tested systems as shown on the Drawings and specified herein. The work includes, but is not limited to, the following areas:

- A. Site Work:
 - 1. Coordination with the utility company and cost of natural gas service to the building.
- B. Building Work:
 - 1. Mechanical Piping Systems:
 - a. Natural gas distribution piping from new natural gas service at 7-inch water column including pressure regulators, strainers and accessories to all points of use.
 - 2. HVAC
 - a. New exhaust fans
 - b. Electric unit heaters.
 - c. Gas fired unit heater.
 - d. Air distribution systems including ductwork, exhaust grilles, registers and diffusers, louvers, balancing and control dampers, and related accessories.
 - 3. Controls
 - a. All controls shall be stand alone. The mechanical contractor shall provide the required contacts and relays to maintain damper positions, and engage exhaust fans.
 - b. Provide new VFD for the exhaust fan (EF-2).
 - 4. Mechanical insulation for piping systems, ductwork, and equipment as specified.
 - 5. Complete controls and instrumentation.
 - 6. System startup, testing, adjusting and balancing.
 - 7. Piping and duct cleaning and pressure testing.
 - 8. All pressure and temperature instrumentation not a part of any control system.
- C. Equipment schedules are provided as a convenience to the Contractor, but do not relieve him of his responsibility to furnish all items shown on the Drawings and indicated in the Specifications.
- D. Coordination with other trades.
- E. Startup and coordination with the TAB Contractor.
- F. Touch-up painting of damaged materials furnished by this Contractor and damaged by this Contractor. Each Contractor shall be responsible for replacement/patching of all finish materials which have been disrupted and/or damaged as a result of their construction procedures. All materials shall match original and all work shall be done by experienced field tradesmen.
- G. One year labor and equipment guarantee on completed installation.
- H. Cleanup associated with work of respective trades.
- I. Flushing, cleaning, and pressure testing of installed systems.

- J. Provide final record (PDF) drawings identifying any changes that occurred throughout the construction process.
- K. Operation and Maintenance Manuals for all equipment provided, to be submitted within an appropriate time frame to aid in system startup, but in no case longer than 90 days after the date of system acceptance.
- L. No asbestos or mercury containing materials, materials capable of discharging lead into potable water or air systems, or materials capable of releasing other hazardous substances to the facility air environment, drainage systems, or water systems shall be used.
- M. Equipment schedules are provided as a convenience to the Contractor, but do not relieve him of his responsibility to furnish all items shown on the plans and indicated in the specifications.
- N. Job Site safety is the responsibility of the contractor. The architect/engineer bears no responsibility for job-site safety.
- O. All equipment furnished and installed shall comply with the relevant agency listing, testing, and labeling requirements of the adopted International Mechanical Code with local Amendments and variances.

END OF SECTION

**SECTION 23 01 00
MECHANICAL GENERAL PROVISIONS**

PART 1 - GENERAL

1.01 STANDARDS

- A. All work shall be executed in a professional manner and shall be coordinated with other work being performed at the site. The Architect/Engineer reserves the right to direct the removal and replacement of any item which in his opinion will not present an orderly and reasonably neat or workmanlike appearance. Such removal or replacement shall be at the Contractor's expense.
- B. The Contractor shall pay all taxes, fees, licenses, permits and inspection costs required in connection with the work including any impact fees, sewer connection fees and/or water service/water meter connection fees.

1.02 COMPLIANCE

- A. All work and materials shall comply with all applicable laws and building codes and shall conform to the applicable sections of the following codes and standards. Where standards or codes are mentioned in these specifications, the edition or revision in effect during construction of this project shall be followed; hence, the specified numbers may be superseded by new numbers.
 - 1. American Disabilities Act
 - 2. Air Moving and Conditioning Associations, Inc. (AMCA)
 - 3. Air-Conditioning and Refrigeration Institute (ARI)
 - 4. American National Standards Institute (ANSI)
 - 5. American Society of Civil Engineers (ASCE)
 - 6. American Society for Testing Materials (ASTM)
 - 7. American Society of Mechanical Engineers (ASME)
 - 8. American Society of Plumbing Engineers (ASPE)
 - 9. American Water Work Association (AWWA)
 - 10. American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE)
 - 11. Applicable Codes of the State of Wisconsin and local agencies having jurisdiction
 - 12. Cast Iron Soil Pipe Institute
 - 13. Institute of Boiler and Radiator Manufacturers (IBR)
 - 14. International Approval Services (IAS) (formerly AGA)
 - 15. NAFM - Sound Test Codes
 - 16. National Board of Fire Underwriters
 - 17. National Electrical Code (NEC)
 - 18. National Electrical Manufacturers Association (NEMA)
 - 19. National Fire Protection Association (NFPA)
 - 20. OSHA Standards, particularly #1910
 - 21. Sheet Metal and Air-Conditioning Contractors National Association (SMACNA)
 - 22. Standards of the Hydraulic Institute
 - 23. Underwriters' Laboratories (UL)
 - 24. The Instrument Society of America

1.03 SUBSTITUTIONS AND CHANGES

- A. Comply with applicable requirements of Division 1 including Section 01 33 00 Submittal Procedures and Section 01 25 13 Product Substitution Procedures.
- B. It shall be the responsibility of the contractor to notify all parties concerned of any changes or substitutions he has been authorized to make, and he must include in his notice a full description, including drawings, if necessary, of any deviation from dimension shown on the plans or applicable to manufacturer's named on schedules and named in specifications.
- C. If equipment is provided other than that upon which the design is based, contractor shall coordinate the installation with the work of all other trades and with the space available for installation. Contractor shall pay for any changes caused to other trades as a result of this substitution, plus the additional cost of any required engineering needed to incorporate the proposed alternates.
- D. Elevation of piping, ductwork and equipment indicated on drawings are to be used as guidelines to assist Contractor with installations. Minor changes to these elevations may be necessary to eliminate unforeseen interferences. The Contractor shall obtain the Architect/Engineer's written approval before proceeding with any changes in elevations.

1.04 EQUIPMENT LISTS AND IDENTIFICATION

- A. Each Contractor supplying equipment items shall furnish three sets of Operation and Maintenance Manuals and spare parts list recommended for the proper operation and maintenance of the equipment. State exact quantity so there is no ambiguity.
- B. All major parts of built-up equipment or devices shall bear the manufacturer's nameplate; giving name of manufacturer, description, size, type, serial number, electrical characteristics, and related data.

1.05 DRAWINGS

- A. Due to the scale of the drawings, it is not always possible to indicate all offsets, fittings, valves, and similar items which may be required. This Contractor shall carefully investigate the structural and finish conditions affecting his work and shall plan accordingly, furnishing such valves, fittings, offsets, vents, drains and specialties as may be required to meet such conditions. All piping shall be installed as closely as possible to walls, ceiling, columns, and other structures (consistent with the proper space for covering, removal of pipes, valve access, and other maintenance relationships) so as to occupy a minimum of space and all offsets, fittings, valves, and similar items required to accomplish this must be furnished by the Contractor without additional expense to the Owner. In case interferences develop, the Architect/Engineer shall decide which work is to be relocated regardless of which was first installed.
- B. Before submitting his proposal, the Contractor shall examine the architectural, electrical and mechanical drawings and, if any discrepancies occur between them and this specification, he shall report same to the Architect/Engineer in writing prior to bidding and obtain written instructions for changes in the work.
- C. In case of a difference between the plans and specifications, or between specifications, the decision of the Architect/Engineer shall prevail.
- D. The Contractor shall keep a set of prints on which each he will mark line and grade and other changes made during installation. All changes shall be made through the Construction Manager with Architect/Engineer approval. At the end of the job, or when requested, he will make this information available to the Architect/Engineer for revision of the design drawings for records. Comply with the requirements of Section 01 78 39 Project Record Documents.

1.06 ELECTRICAL WORK

- A. This Contractor shall furnish all electrical devices requiring mechanical connections such as pressure switches, float switches, thermostatic switches, limit switches, solenoid valves,

motor operated valves, other in-line items, and also including motors, unless otherwise indicated. Motors for all mechanical equipment shall be mounted by Mechanical Contractor. Provide magnetic motor starters where specified on packaged equipment.

- B. All electric motors shall be high efficiency.
- C. Equipment furnished shall comply with Electrical Specifications.

1.07 DUCT SLEEVES

- A. Provide sleeves for all duct work passing through walls. Sleeves shall be 18 gauge galvanized sheet metal unless otherwise specified.
- B. All openings around duct and all sleeves where fire rated walls are penetrated shall be caulked smoke tight with 3M Fire Barrier CP-25, 3M Putty, and FS-195 Wrap/strip or approved equal by Hilti meeting U.L. System 91 and ASTM E-814 (UL-1479), installed per manufacturer's recommendations for horizontal and vertical penetrations. Fiberglass is not acceptable. Where vapor barriers must be continued on cold piping, they shall remain intact through the penetration and also sealed with 3M material per U.L. 91.

1.08 ACCESSIBILITY FOR REPLACEMENT; MAINTENANCE AND REPAIR

- A. The respective contractors shall provide access covers or doors for equipment which is concealed and must be serviced, operated or maintained. Equipment shall include, but not be limited to valves, traps, cleanouts, critical dampers, control devices, filter, strainers, and related devices. Minor deviations from drawings may be made to allow for better accessibility, but major changes shall not be made without approval of the Architect/Engineer.
- B. Furnish and install Milcor, Babcock-Davis, Bilco, Cessco or American Hatch Corporation access panels of proper style to match adjacent finish and approved sizes. Locations shall be approved by the Architect/Engineer or as shown on the plans. Use stainless steel access panels in ceramic tiled walls. Access panels in fire walls or rated ceiling assemblies shall be UL labeled with a rating equal to that of the wall in which it is installed.
- C. Access panels shall be size large enough to allow proper maintenance of respective equipment for which they are installed.
- D. Access panels shall be provided by responsible trades, who shall then coordinate installation of the access panel with the effected trade.

1.09 CUTTING AND PATCHING

- A. All cutting and patching shall be performed only by workmen skilled in the type of work involved.
- B. No structural members shall be cut without the consent of the Architect/Engineer and all such cutting, when authorized, shall be done in strict accordance with the instructions of the Architect/ Engineer. Where piping must pass through structural members and the Architect/Engineer has approved the burning of holes in such member, the Contractor shall provide approved welded steel reinforcement of suitable dimensions adjacent to the hole to effectively offset the weakening effect of the hole upon the member.
- C. The size and location of roof and wall openings shall be the responsibility of the particular mechanical trade coordinated with other trades. Cracks and rough edges left following installation of equipment shall be caulked or covered with suitable escutcheons or framing by the Contractor.

1.10 EXISTING SERVICES

- A. Where existing services such as sewers, domestic and heating piping, gas, electric or other services are encountered, each affected Contractor shall take adequate steps to protect such services.

- B. If such existing services require relocation, make written request for ruling from the Architect/Engineer. Do not proceed on such portions of the work until written instructions are received. Costs involved shall be negotiated.
- C. Inactive services shall be plugged, capped or removed. Notify utility companies, municipal agencies having jurisdiction or Owner's Representative. Protect or remove as directed.
- D. Interruptions:
 - 1. Where existing services (e.g., natural gas) must be interrupted for connections by this Contractor, such interruptions shall be scheduled a minimum of one (1) week in advance with Owner's Representative.
 - 2. Where line interruptions are required to make connection (e.g., steam and condensate), the Contractor shall make arrangements with the Owner's Representative to complete connection AFTER normal working or occupancy hours.

1.11 BASIC MATERIALS AND METHODS - GENERAL

- A. All materials and equipment required for the work shall be new, of first class quality and shall be furnished, delivered, erected, connected and finished in every detail and shall be so selected and arranged as to fit properly in the building spaces. Where a specific kind or quality of material is not specified, a first class standard article as approved by the Architect/Engineer shall be furnished.
- B. Each Contractor shall furnish the services of one or more experienced superintendents who shall be in charge of the installation of his work together with all skilled workmen, fitters, plumbers, metal workers, electricians, welders, helpers, and laborers required to unload, transfer, erect, connect, adjust, start, operate and test each system.

1.12 LUBRICATION

- A. Upon completion of the work and before turning same over to the Owner, Contractor shall clean and lubricate bearings in pumps, air handling equipment and other rotating machinery, except sealed and permanently lubricated bearings. Use only lubricant recommended by the manufacturer.

1.13 PAINTING

- A. All manufactured mechanical equipment shall be furnished with the manufacturer's standard shop finish unless specified otherwise in other sections of this specification.
- B. All equipment furnished and installed by this Contractor with a factory applied baked enamel finish shall not be painted, but any damaged spots shall be touched up to match.
- C. All prime and finish painting specified, except as noted above, shall be done by the Painting Contractor.

1.14 EQUIPMENT AND SYSTEM IDENTIFICATION

- A. Nameplates:
 - 1. Description: Laminated three-layer plastic with engraved letters.
 - a. Letter Color: White.
 - b. Letter Height: 1/2 inch.
 - c. Background Color: Black.
 - d. Plastic: Conform to ASTM D 709.
- B. Tags:
 - 1. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
 - 2. Chart: Typewritten letter size list in anodized aluminum frame.
- C. Preparation:

1. Degrease and clean surfaces to receive adhesive for identification materials.

1.15 GUARANTEE

- A. Each Contractor shall guarantee his installation for a period of one (1) year from the date of final acceptance against all defects in material and/or workmanship and ordinary wear and tear. He shall make any and all adjustments to the system and minor alterations as required to place the system in satisfactory operating condition at no extra cost to the Owner.

1.16 EQUIPMENT FURNISHED BY THIS CONTRACTOR

- A. The intent of these specifications is to allow the manufacturer's standard design and construction where suitable. The equipment should have the basic quality, however, as specified. See specific equipment sections for additional requirements.
- B. All manufacturers offering equipment for this project shall furnish to the Architect/Engineer complete information describing the design performance, equipment experience, and other pertinent information necessary for review. In addition, the location of the manufacturer's Service Engineer who will be responsible for servicing the equipment furnished shall be provided. Additional information may be required by the Architect/Engineer after submittal.
- C. Prices shown in the proposal for alternative equipment shall include all structural, mechanical or electrical changes from that shown on the plans which will be required for the installation of the alternate equipment. The plans and specifications have been prepared on the basis of equipment manufactured by those firms listed in the drawing schedules and specifications. All equipment listed in the proposal will be considered carefully on the basis of advantages, disadvantages, and economics.
- D. The Contractor shall guarantee all equipment installed for one (1) year from the date of acceptance by the Owner's Representative. If prior to the duration of one year, any equipment or parts thereof are found to be defective, the Contractor shall replace the part at no cost.
- E. Manufacturer's Services:
 1. All equipment shall be given one (1) coat of shop prime, unless otherwise indicated.
 2. Lubrication facilities shall be located for convenient servicing. Lubrication, maintenance instructions and one (1) year supply of recommended lubricant, properly labeled, shall be furnished with all equipment.
 3. Any special tools, including special grease guns, required for maintenance or adjustment of the equipment shall be furnished with the equipment.
 4. Upon completion of the installation of the equipment or before initial operation, three (3) bound sets of complete operating and lubricating instructions for all equipment shall be furnished to the Owner by the Contractor. Included with the operating instructions shall be a complete set of all equipment drawings including shop drawings, repair instructions, complete parts list, lubrication instructions and recommended lists of lubricants.

1.17 SHOP DRAWINGS

- A. Contractor shall provide shop drawings as required by Section 01 33 00 – Submittal Procedures of these specifications
- B. Shop Drawings shall provide complete details of the material or equipment they describe including dimensions, gauges of materials, weights, finishes, motor horsepower, voltage, current, starting characteristics, operating characteristics, building location room number, capacities, rough-in connections, installation requirements, and complete internal and external wiring diagrams showing all connections, along with fan and pump curves where applicable.
- C. In particular, shop drawings on the following equipment items shall be furnished within 15 working days from work of contract to maintain Proposal Schedule.

1. Roof or Floor Mounted Equipment affecting Building Structure (e.g. air handling units, exhaust fans, ventilators).
2. Floor, wall, or beam column mounted equipment requiring special foundations or supports (e.g. boilers, drainage equipment, tanks, etc.).

1.18 TEMPORARY HEAT

- A. Use of permanent equipment for temporary heating is restricted unless approval is granted by the Engineer.

1.19 SAFETY

- A. Contractor shall be responsible for job site safety.
- B. Contractor shall comply with OSHA regulations for confined space entry locations.

END OF SECTION

SECTION 23 05 93
TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The Testing, Adjusting and Balancing (TAB) shall include all work specified within this section including coordination with Mechanical and Controls Contractors.
- B. Furnish all required personnel and equipment and perform all tests required to secure approval of the installation from all agencies having jurisdiction.
- C. Balancing:
 - 1. The contractor shall balance and adjust air moving equipment and air distribution and exhaust systems. All instruments used by the contractor shall be accurately calibrated and maintained in good working order. Balance and adjust the air system in accordance with the recommendations contained in "Standards for Field Measurements and Instrumentation, Total System Balance" of the Associated Air Balancing Council or the NEEB Manuals.
 - 2. Upon completion of the system balancing, the contractor shall submit to the Architect/Engineer five (5) typewritten air balance reports with all pertinent data, including actual operating conditions report. Utilize standard NEEB or AABC forms or equal forms.

1.02 DRAWINGS AND SPECIFICATIONS

- A. All portions of the project specifications are a part of these specifications as stated above. It shall be the balancing contractor's responsibility to properly coordinate the requirements of these provisions with the Mechanical Contractor.

1.03 GENERAL

- A. The Mechanical Contractor shall select and employ an impartial, independent balancing agency will provide testing and balancing services for the heating, ventilating, and air conditioning (HVAC) systems of this project. These services shall be paid for by the Mechanical Contractor. Final approval of the balancing contractor shall be by the Engineer.
- B. The schedule for testing and balancing the HVAC systems shall be established by the Mechanical Contractor in coordination with the balancing agency (on a critical path network). It is the balancing agency's responsibility to initiate this continuing coordination to determine his schedule for final testing and balancing services and the periodic inspections required during construction.
- C. The balancing contractor will have a contractual relationship with the Mechanical Contractor but will be responsible to the Engineer for the satisfactory execution of testing and balancing the HVAC systems. The Mechanical Contractor shall have allowed sufficient funds in his project cost estimate for the testing and balancing phases.

1.04 QUALIFICATIONS OF THE BALANCING AGENCY

- A. The balancing agency should be a member of the Associated Air Balance Council (AABC) or NEBB.
- B. The balancing agency shall submit records of experience in the field of air and hydronic system balancing or any other data as requested by the Engineer. The supervisory personnel for the firm shall have at least five (5) years' experience, and all the employees used in this project shall be qualified technicians in this specific field.
- C. The balancing agency shall furnish all necessary calibrated instrumentation to adequately perform the specified services. An inventory of all instruments and devices in possession of

the balancing agency may be required by the Engineer to determine the balancing agency's performance capability.

1.05 STANDARDS

- A. The balancing agency shall perform the services specified herein in accordance with the Associated Air Balance Council's or NEBB's standards and procedures including revisions, to the date of the contract.
- B. All terms in this specification shall have their meaning defined as stated in the Standards.
- C. If these specifications set forth more stringent requirements than the AABC or NEBB Standards and procedures, these specifications shall prevail.

1.06 DOCUMENTS

- A. The Mechanical Contractor will provide the balancing agency one copy of the following documents:
 - 1. Project drawings and specifications.
 - 2. Approved construction revisions pertaining to the HVAC systems.
 - 3. Approved submittal data on HVAC equipment and systems to be installed by the mechanical subcontractor.
 - 4. Approved HVAC shop drawings.
 - 5. Approved HVAC wiring diagrams, control diagrams, and equipment brochures, as appropriate.

1.07 COORDINATION

- A. It will be necessary for the balancing agency to perform his services in close coordination with the Mechanical Contractor.
- B. The plans and specifications have indicated meters, valves, dampers, and other devices for the purpose of adjusting the system to obtain optimum operating conditions. It will be the responsibility of the Mechanical Contractor to install these devices in a manner that will leave them accessible and readily adjustable. The balancing agency shall provide guidance if there is a questionable arrangement of a control or balancing device.
- C. The General Contractor, Mechanical Contractor, Controls Systems Contractor, and the suppliers of the HVAC equipment shall all cooperate with the balancing agency to provide all necessary data on the design and proper application of the system components. In addition, they shall furnish all labor and materials required to eliminate any system deficiencies.

1.08 RESPONSIBILITIES OF THE MECHANICAL CONTRACTOR

- A. The Mechanical Contractor shall complete the installation and start all HVAC systems to ensure they are working properly, and shall perform all other items as described hereinafter to assist the balancing agency in performing the testing and balancing of the HVAC systems.
- B. Air Distribution systems:
 - 1. Verify installation for conformity to design.
 - 2. Terminate all exhaust ducts, and pressure test them for leakage, as required by specification.
 - 3. Ensure that all volume-dampers are properly located and functional. Dampers serving requirements of minimum and maximum outside-, and exhaust air shall provide tight closure and full opening, with a smooth and free operation.
 - 4. Verify that all exhaust-grilles are installed and operations.
 - 5. Ensure that all fans (exhaust) are operating and free of vibration. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protection shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.

6. Make any necessary changes to the sheaves, belts, and dampers, as required by the balancing agency, at no additional cost.
7. Install clean filters.

1.09 RESPONSIBILITIES OF THE CONTROLS SYSTEMS CONTRACTOR

- A. The Controls Systems Contractor shall complete the installation of the temperature control system, and operate and test all control systems to ensure they are functioning properly as designed. The temperature control contractor shall assist the balancing agency in testing and balancing the HVAC systems, as described hereinafter.
 1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water reset, and fire and freeze stats.
 2. Verify that all controlling instruments are calibrated and set for design operating conditions.
 3. Calibrate room thermostats after installation, and before the thermostat control verification tests are performed. The balancing agency shall prove the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.
 4. The Controls Contractor shall allow sufficient time in the project to provide assistance and instruction to the balancing agency in the proper use and setting of control components such as, but not limited to, computers, static pressure controllers, or any other device that may need set points changed so that the testing and balancing work can be performed.

1.10 NOTIFICATION FOR TESTING AND BALANCING WORK TO BEGIN

- A. The Mechanical Contractor shall notify the balancing agency in writing when all heating, ventilating, and air conditioning systems are complete and ready for testing and balancing. The mechanical contractor shall attest that he has completed all items as described in these specifications.
- B. If, upon commencing the work, the balancing contractor finds that the systems are not ready, or if a dispute occurs as to the readiness of the systems, the balancing agency shall request an inspection to be made by the Engineer. This inspection shall establish to the satisfaction of the represented parties whether or not the systems meet the basic requirements for testing and balancing. Should the inspection reveal the notification to have been premature, all costs for the inspection and work previously accomplished by the balancing agency shall be paid for by the general contractor. Furthermore, such items that are not ready for testing and balancing shall be completed and placed in operational readiness before testing and balancing services shall again be requested.

1.11 QUANTITIES

- A. In all cases where a device, operation, procedure, tool, equipment, or part of the equipment is herein referred to in the singular number, it is intended that such reference shall apply to as many such devices, as are required to complete the testing and balancing specified herein.

1.12 STORAGE

- A. In coordination with the general agency, the balancing contractor shall arrange for an area of ample size and convenient location for storage of tools, equipment, and other items as required.

1.13 PRO-RATE EXPENSE

- A. The balancing contractor shall not be responsible in whole or in part for any pro-rate expense for utilities, or expense of any nature relating to the rest of the building or other contractor's work.

PART 2 - BALANCING SPECIFICATIONS AND RESPONSIBILITIES OF THE BALANCING AGENCY

2.01 SCOPE

- A. In accordance with Project Drawings and Specifications and as specified herein, the balancing agency shall provide all supervision, personnel, instruments, calibration equipment, and all other materials and services necessary to perform all testing and balancing of the heating, ventilating, and air conditioning systems. All test data including all pertinent calculations shall be reported on appropriate forms.

2.02 GENERAL

- A. The testing and balancing of the heating, ventilating, and air conditioning systems shall be performed by an independent balancing agency approved by the Engineer. The balancing agency shall have a minimum of five (5) years specialized experience in air- and hydronic system balancing, and possess calibrated instruments, qualified test-and-balance engineers, and skilled technicians to perform all required tests.
- B. The tests shall demonstrate the specified capacities and operation of all equipment and materials comprising the systems. The balancing agency shall then make available to the Owner's representative such instruments and technicians as are required for spot checks of the system.
- C. The balancing agency shall not instruct or direct the mechanical contractor in any of the work. Any proposed changes or revision in the work shall be submitted to the Engineer in writing. The Engineer shall then process the proposal as appropriate.

2.03 AIR SYSTEM PROCEDURES

- A. The balancing agency shall perform the following testing and balancing functions in accordance with the Associated Air Balance Council National Standards or NEBB Standards:
 - 1. Fan Speeds: test and adjust fan RPM to achieve design CFM requirements.
 - 2. Current and Voltage: measure and record motor current and voltage.
 - 3. Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.
 - 4. Main Ducts: Adjust main ducts to within design CFM requirements and traverse for total CFM quantities.
 - 5. Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
 - 6. Tolerances: Test and balance each diffuser, grille, and register to within 10% of design requirements.
 - 7. Description: record the size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.

2.04 SPECIAL SYSTEMS PROCEDURES

- A. As required, special systems procedures must be specified separately.

2.05 VERIFICATION OF TEMPERATURE CONTROL

- A. The balancing agency shall be assisted by the temperature control contractor in verifying the operation and calibration of all temperature control systems. The following tests shall be conducted.

1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water reset, and fire and freeze stats.
2. Verify that all controlling instruments are calibrated and set for design operating conditions.
3. Calibrate the room thermostats after installation and before thermostat control verification tests are performed. The balancing contractor shall prove the accuracy of the final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.

2.06 TEST-AND-BALANCE REPORT

- A. The test-and-balance report shall be complete with logs, data, and records as required herein. All logs, data, and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the balancing agency's certified test-and-balance engineer.
- B. Five (5) copies of the test-and-balance report are required and shall be submitted to the Engineer.
- C. The report shall contain the following general data in a format selected by the balancing contractor.
 1. Project number
 2. Contract number
 3. Project title
 4. Project location
 5. Project Architect
 6. Project Mechanical Engineer
 7. Test & balance agency
 8. Test & balance engineer
 9. General contractor
 10. Mechanical subcontractor
 11. Dates tests were performed
 12. Certification
- D. The test-and-balance report shall be recorded on report forms conforming to the recommended forms in the AABC National Standards or NEBB Standards. At a minimum, the report shall include:
 1. Preface: A general discussion of the system, any abnormalities and problems encountered.
 2. Instrumentation list: The list of instruments including type, model, manufacturer, serial number, and calibration dates.

2.07 FINAL ACCEPTANCE

- A. At the time of final inspection, the balancing agency shall recheck, in the presence of the Owner's representative, specific and random selections of data recorded in the certified test-and-balance report.
- B. Points and areas for recheck shall be selected by the Owner's representative.
- C. Measurements and test procedures shall be same as the original test and balance.
- D. Selections for recheck, specific plus random, shall not normally exceed 15 percent of the total number tabulated in the report, except where special air systems require a complete recheck for safety reasons.

- E. If random tests demonstrate a measured flow deviation of 10% or more from that recorded in the certified test-and-balance report, the report shall automatically be rejected. In the event the report is rejected, all systems shall be readjusted and tested, new data recorded, a new certified test-and-balance report submitted, and a new inspection test made, all at no additional cost.

2.08 OPPOSITE SEASON TEST

- A. The balancing agency shall perform an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made. The balancing agency shall make any necessary modifications to the initial adjustments to produce optimum system operation.

END OF SECTION

SECTION 23 30 00
HEATING, VENTILATION, & AIR CONDITIONING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included:

1. Heating, ventilating, and air conditioning required for this work is indicated on the drawings and includes, but is not necessarily limited to:
 - a. HVAC work included under HVAC systems in Section 22 00 00 Scope of Work.
 - b. Responsibility for operation, startup and guarantee of installed systems and equipment.
 - c. All necessary permits and approvals associated with installation of this work.
 - d. Provide dampers, if so indicated, under Equipment Specifications. Note that at least one damper motor must be provided for each 48 inch x 48 inch damper, unless other motors are already indicated to meet the required function of the dampers.
 - e. Install all automatic dampers. Dampers shall be set free of binding. Frames of dampers shall not be used to square duct work and shall be caulked for tight seal. Access doors or panels shall be furnished and installed by sheet metal workers to allow access to automatic control dampers.
 - f. Assemble multiple section dampers with required interconnecting linkages, shafts and brackets and extend the required number of shafts through the ducts for externally-mounted damper motors. Jack shafts will be assembled with sealed roller or ball bearings of stainless steel construction.
 - g. Dampers, louvers, grilles, diffusers, intake ventilators, roof curbs, and other specified items.
 - h. Include one set of spare air handling system filters for startup. After operating systems, and balancing airflow, replace with clean filters prior to turning over facility to owner.
 - i. Startup and coordination with Testing and Balancing (TAB) Contractor.

B. Related Work Described Elsewhere:

1. Section 22 10 00: Plumbing
2. Section 23 00 00: Mechanical Scope of Work
3. Section 23 01 00: General Provisions
4. Section 23 05 93: Testing, Adjusting & Balancing
5. Section 26 00 00: Electrical Scope of Work

1.02 QUALITY ASSURANCE

A. Qualifications of Installers:

1. For the actual fabrication, installation, and testing of work under this section, use only thoroughly and experienced workmen completely familiar with the items required and the manufacturer's current recommended methods of installation.
2. In acceptance or rejection of the finished installation, no allowance will be made for lack of skill on the part of installers.

B. Codes and Standards:

1. In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations contained in "Duct Construction Standards" 2005 edition, as published by the Sheet Metal and Air Conditioning Contractors Association (SMACNA), on all systems.

2. Comply with NFPA 90A, UL Standard 181, and SMACNA.
3. ASHRAE Handbook, particularly most recent Systems Volume Chapter on Sound and Vibration Control.

1.03 SUBMITTALS

- A. Shop Drawings:
 1. Within 15 days after award of contract, and before any materials of this section are delivered to the job site, submit complete shop drawings to the Architect/Engineer in accordance with the provisions of Section 01 33 00 of the General Requirements.
- B. Materials List:
 1. Accompanying the shop drawings, submit a complete list of all materials proposed to be furnished and installed under this section, giving manufacturer's name and catalog number for each item; this shall in no way be construed as permitting substitution except as specifically provided in Section 01 33 00 of the General Requirements.
- C. As-Built Drawings:
 1. During progress of the work, maintain an accurate record of all changes made in the system from the layout and materials shown on the approved submittals or plans.

1.04 PRODUCT HANDLING

- A. Protection:
 1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.
- B. Replacements:
 1. In the event of damage caused by this contractor, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. General:
 1. All equipment shall be of the capacity and type shown on the equipment schedule in the drawings and shall be as manufactured by one of the manufacturers designated herein or shall be an equal approved in advance by the Architect/Engineer.
- B. Single Source:
 1. For ease of maintenance and parts replacement, use equipment of a single manufacturer to the maximum extent possible.
 2. Indicate on proposal form the equipment manufacturers to be used on this project.

2.02 NATURAL GAS PIPING

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.
- B. Natural gas pressures shall not exceed five (5) pounds per square inch gauge on customer side of the meter.
- C. Above ground gas piping shall be Schedule 40 black steel ASTM A53 with 150 pound malleable iron screwed or 150 pound welded fittings.
- D. Underground gas piping shall be Polyethylene, SDR-11, ASTM D2513 pipe and fittings with heat fusion socket joints, or Plastic Coated Schedule 40 steel pipe meeting ASTM A-53 with welded hot wrapped joints grounded with magnesium anodes at appropriate intervals (approximately 20 feet). Underground gas piping installed by municipal gas utility, up to meter

may be plastic pipe meeting local codes and requirements of municipal gas utility.

- E. Polyethylene pipe and fitting materials shall be compatible and by same manufacturer to ensure uniform melting and a proper bond. Fabricated fittings shall not be used
- F. Provide connection between buried plastic gas service piping and metallic riser in accordance with the gas code. Provide metallic riser consisting of HDPE fused coating on steel pipe for connection to above ground building distribution piping. Underground horizontal metallic portion of riser shall be at least twenty four inches in length before connecting to the plastic service pipe. An approved transition fitting or adaptor meeting design pressure rating and plastic pipe manufacturers recommendations shall be used where the plastic joins the metallic riser.
- G. AGA (IAS) rated ball valves shall be used on gas service through 2" size, equal to Legend Model T-3000 Blue Top gas ball valve or Hammond 875, rated at 175 psig WOG.
- H. Gas Pressure Regulator: Per ANSI Z21.18, single-stage steel-jacketed, corrosion-resistant pressure regulator. Include atmospheric vent, elevation compensator, with threaded ends conforming to ASME B1.20.1 F for 2" NPS and smaller piping. Regulator shall be capable of reducing owners service pressure to 7" W.C. Contractor shall verify owner's service pressure.
- I. Install piping per installation guidelines set forth in section 22 10 00.
- J. All piping 3" and larger with an operating pressure of 2 PSI or more shall be welded. All piping systems operating at 5 PSI shall be welded.

2.03 PROPELLER FANS

- A. Fans shall be Greenheck, Penn, or Cook as listed in the equipment schedule, or equivalent by Carnes, PennBarry, or Twin City. Features shall include:
 - 1. Each fan shall bear a permanently affixed manufacture's engraved metal nameplate containing the model number and individual serial number
- B. Wheel:
 - 1. Material type: aluminum blades and hubs
 - 2. Securely attached to fan shaft by welding or with standard square key and set screw or tapered bushing
 - 3. Statically and dynamically balanced in accordance with AMCA Standard 204-05
 - 4. The propeller and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency
- B. Motors:
 - 1. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and furnished at the voltage and phase listed on the equipment schedule.
 - 2. Mechanical contractor shall provide accessible for maintenance
- C. Shafts and Bearings:
 - 3. Fan Shaft shall be ground and polished solid steel with an anti-corrosive coating
 - 4. Bearing shall be cast iron pillow block with grease fittings
 - 5. Bearings shall be selected for a minimum L10 life in excess of 100,00 hours at maximum cataloged operating speed
 - 6. Bearing shall be air handling quality and 100% factory tested by bearing manufacturer
 - 7. Fan Shaft first critical speed is at least 25 percent over maximum operating speed
- D. Disconnect Switch
 - 8. NEMA rated: 3R
 - 9. Positive electrical shut-off
 - 10. Wired from fan motor to junction box
 - 11. Location: Disconnect shall be located at the fan location.
- E. Wall Housing:

- 12. Mounting arrangement: Flush Exterior
- 13. Constructed of galvanized steel with heavy gauge mounting flanges and pre-punched mounting holes
- 14. Housing shall include OSHA approved motor guard
- 15. Reduces installation time and provides maximum installation flexibility
- F. Motor Side Guard:
 - 16. Guard type: OSHA Guard
 - 17. Protective guard completely enclose the motor and drive side of the fan
- G. Weatherhood:
 - 18. Shall shield wall opening and dampers from rain and snow
 - 19. Material type: Aluminum
 - 20. Turndown Angle: 45 degrees
 - 21. Screen: Birdscreen
 - 22. Finishes: Weatherhood shall be powder coated to match exterior finishes. Coordinate final color with general contractor

2.04 CENTRIFUGAL FANS

- A. Fans shall be Greenheck, Penn, or Cook as listed in the equipment schedule, or equivalent by Carnes, PennBarry, or Twin City. Features shall include:
- B. Dynamically balanced, all aluminum centrifugal wheels with backwardly inclined blades.
- C. Totally enclosed motors per equipment schedule with weather-proof motor enclosure.
- D. Backdraft damper or motorized shutoff damper as scheduled.
- E. Disconnect switch
- F. Bird Screen
- G. Solid state speed controllers for direct drive fans.
- H. UL 705 stamp for general use.

2.05 DUCTWORK

- A. Duct Schedule
 - 1. Pressure Class:
 - a. The minimum acceptable duct pressure class, for all ductwork is 2 inch W.G. positive or negative, depending on the application. Duct pressure classes shall follow the following:

	<u>Pressure Class</u>
Exhaust Air Ducts	2" W.C.

- 2. Intermediate Reinforcement: match duct material
- 3. Elbow Configuration:
- 4. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - a. Velocity 1000 fpm (5 m/s) or Lower:
 - i. Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
 - ii. Mitered Type RE 4 without vanes.
 - b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):
 - i. Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - ii. Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.

- iii. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - c. Velocity 1500 fpm (7.6 m/s) or Higher:
 - i. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - ii. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - iii. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - d. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
 - i. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - ii. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
 - iii. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
 - e. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."
 - i. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - (a.) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - (b.) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - (c.) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
 - (d.) Radius-to Diameter Ratio: 1.5.
 - ii. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
 - iii. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Standing seam.
- 5. Branch Configuration:
 - a. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - i. Rectangular Main to Rectangular Branch: 45-degree entry.
 - ii. Rectangular Main to Round Branch: Spin in.
 - b. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - i. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
 - ii. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
 - iii. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

2.06 EXHAUST STACKS

- A. On gas-fired unit heaters, breaching shall be type "B" Metalbestos or Hart and Cooley Metlvent with inner aluminum liner and outer galvanized steel (or equivalent by AMPCO or Van Packer), with Breidert X-Hauster or Metlvent top, sized for actual flue gas rate.

2.07 GAS FIRED UNIT HEATERS

Units shall be Modine unit heater or equal by Reznor, Trane or Sterling with power vented, low static axial fan, aluminized steel heat exchanger, aluminized steel burners, draft diverter, factory installed 24 volt controls, wall mounted thermostat, spark ignition, fan time delay, totally enclosed motors with thermal overload protection, and adjustable louver fin diffusers.

2.08 REGISTERS, GRILLES AND DIFFUSERS

- A. The Contractor shall furnish and install grilles and diffusers at the location shown on the plans using the types and sizes specified. Grilles and diffusers shall be factory finished enamel. Supply grilles shall include foamed plastic gaskets where applicable and the contractor shall furnish any supplementary flanges, collars or mounting devices necessary to attach his work to the construction of the building.
- B. A manufacturer is used as a standard for selection and basis for type and quality, however, equivalent units by others listed will be accepted. Acceptable manufacturers are: Titus, Hart & Cooley/Tuttle & Bailey, Price, Krueger, Donco, Carnes, Reliable, Nailor, and Architectural Grille. Where not scheduled, units shall be sized, furnished and installed per manufacturer's recommendations, including proper throw for specific application.

2.09 LOW LEAKAGE DAMPERS

- A. Frame:
 - 1. Damper frame shall be 16 ga. galvanized steel formed into a 5" x 1" structural hat channel. Top and bottom frame members on dampers less than 17" high shall be low profile design to maximize the free area of these smaller dampers. Frame shall be 4-piece construction with 1 1/2" (minimum) integral overlapping gusset reinforcements in each corner to assure square corners and provide maximum resistance to racking. Stainless steel frame is optional.
- B. Blades:
 - 1. Damper blades shall be heavy gauge extruded aluminum airfoil shape with metal blade to blade overlap. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper. Provide symmetrical blades of varying size as required to completely fill the damper opening. Blade orientation is horizontal. Blade operation is parallel or opposed.
 - 2. Blade Edge: Silicone blade seals shall come standard.
- C. Rating:
 - 1. Dampers shall have a maximum leakage of Class 1 @ 4 in. wg or Class 1A @ 1 in. wg as defined by AMCA (Leakage class 1 is defined as 8 cfm/ sq. ft. @ 4 in. wg and class 1A is defined as 3 cfm/ sq. ft. @ 1 in. wg. at -40°F). Tested in accordance with AMCA standard 500-D.
 - 2. Dampers shall have a maximum velocity rating of 4000 fpm.

2.10 MANUAL VOLUME DAMPERS

- A. Standard Stainless Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.

- c. Flexmaster U.S.A., Inc.
 - d. McGill AirFlow LLC.
 - e. Nailor Industries Inc.
 - f. Pottorff.
 - g. Ruskin Company.
2. Standard leakage rating, with linkage outside airstream.
 3. Suitable for horizontal or vertical applications.
 4. Frames:
 - a. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized or stainless sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Stainless -steel, 0.064 inch (1.62 mm) thick.
 6. Blade Axles: Stainless or Galvanized steel.
 7. Bearings:
 - a. Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 8. Tie Bars and Brackets: Stainless or Galvanized steel.
 9. Damper Hardware:
 - a. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4- mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
 - b. Include center hole to suit damper operating-rod size.
 - c. Include elevated platform for insulated duct mounting.

2.11 LOUVERS

- A. Louvers shall be drainable blade, heavy duty of anodized aluminum with custom Kynar finish selected by Architect. Louvers shall be rated according to AMCA Standard 500. Louvers shall be sized at 500 FPM maximum air velocity where not sized on plans. Manufacturer shall be Ruskin or equal by American Warming and Ventilating, Louvers and Dampers, Dowco, Pottorff, or Greenheck. Where aluminum comes in contact with steel, the steel shall be insulated from direct contact with the aluminum by a heavy coat of alkali-resistant paint or synthetic resin zinc chromate primer. Provide sixteen (16) gauge 1/2 x 1/2 mesh bird screen with a removable frame installed at the inner face of the louver.

2.12 ACCESS

- A. Provide hinged access panels in ducts and in walls or ceiling where concealed adjacent to all dampers, fire dampers, splitters and temperature control devices. Fasteners shall be Camlock type for ready access and tight locked shutoff. Units shall be UL approved or contractors shall furnish an affidavit for units through rated walls and ceilings. Location of access panels shall be coordinated with the other trades subject to the approval of the Owner or Architect/ Engineer.

2.13 DUCT SLEEVES

- A. Provide sleeves for all duct work passing through walls, floors, ceilings and partitions. Sleeves shall be 18 gauge galvanized sheet metal. Sleeves through other areas shall be

1/8" plate and angle iron. Sleeves through fire-rated partitions shall be filled with 3M Fire Barrier material as specified in Section 22 01 00.

2.14 OTHER MATERIALS

- A. All other materials not specifically described or listed but required for a complete and proper installation of the work of this section, shall be as selected by the Contractor, subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Inspection:
 - 1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 - 2. Verify that the work of this section may be installed in accordance with all pertinent codes and regulations and the approved shop drawings.
- B. Discrepancies:
 - 1. In the event of discrepancy, immediately notify the Architect/Engineer.
 - 2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
- C. Field Measurement:
 - 1. Measurements of actual field conditions must be made by contractor to verify equipment and ductwork installation requirements.

3.02 INSTALLATION OF EQUIPMENT

- A. General:
 - 1. Install all equipment where indicated on the approved shop drawings.
 - 2. Avoid interference with structure and the work of other trades; do not cut into load carrying members without the specific approval of the Architect/Engineer.
- B. Inspection:
 - 1. Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

3.03 INSTALLATION OF DUCTS

- A. Fabrication of Rectangular Ducts:
 - 1. Fabricate and install all ducts in strict accordance with the approved shop drawings and the referenced standards.
 - 2. On sheet metal ducts, cross-break or roll form all flat surfaces to prevent vibration.
- B. Duct Layout:
 - 1. All duct sizes shown on the drawings are net dimensions inside the insulation; wherever obstructions require a change in duct size, maintain equivalent areas.
 - 2. On rectangular duct, make all duct elbows right angle type with elbow turns or turning blades, or make elbows with a radius of 1-1/2 times the duct width.
 - 3. Fabricate transitions using a 30° angle (max.) when reducing a dimension and 45° angle (max.) when increasing a dimension.
 - 4. One (1") inch diameter test openings shall be furnished in ductwork where required for proper adjustment of all supply and exhaust systems. Provide suitable pressure-tight

coverings for openings when not in use.

- C. Round, Oval, and Flexible Duct: Install all round, oval, and flexible duct in accordance with manufacturer's recommendations. Maximize length of flex duct upstream of supply diffusers or return grilles shall be three (3) feet. Where 90° bends occur, hard ductwork shall be utilized instead of the flex duct.
- D. Dampers and Splitters:
1. The Contractor shall strategically locate dampers, splitters, or volume controllers to accurately regulate the flow of air.
 2. Install opposed blade balancing dampers where shown on the plans and in the fresh air intake and return air ducts at each unit, unless already furnished with the equipment. Dampers shall be constructed of not less than twenty (20) gauge galvanized steel, blades shall not be over twelve inches (12") wide or forty-eight (48") inches long. Damper blades shall be close fitting with blade shaft riding on Oilite or nylon bearings all mounted in heavy gauge channel iron. Use standard mixing boxes where shown.
 3. Furnish and install volume regulators and dampers at all branch take-offs to diffusers and supply registers.
 4. After dampers have been finally adjusted, the open and closed position of each damper shall be marked on the duct adjacent to the damper quadrant. Also, Contractor shall scribe end of damper shaft parallel to open direction of damper to denote damper orientation.
- E. Openings:
1. The Contractor shall advise all parties concerned as to the proper size and shape of all necessary openings for ductwork, grilles, exhaust fans, gravity relief vents, and other system components, and shall direct said contractor in their proper placement. All voids around conduit, ductwork, tubing, and other items penetrating walls and floors of smoke barriers and rated walls shall be filled with Dow Corning Firestop Sealant or approved equal.
- F. Ductwork Support:
1. Hang and support ductwork as defined by SMACNA, Section IV, 1995 Manual, Second Edition, or as defined within. Hanger spacing shall not exceed 8 feet. Contractor must verify adequacy of supporting structures. In all cases, ductwork shall be securely and permanently installed in a rigid manner.
 2. Horizontal, rectangular duct above 60" - use angle iron on each side and one across top and bottom of duct, welded or bolted together and spaced on 10 foot centers.
 3. Horizontal, round duct above 36" dia. - use 1" x 16 gauge continuous U-shaped strap passing under duct and anchored to support in two places.
 4. Vertical ducts shall be supported at each floor with angles. 12" x 12" or equivalent ducts shall have supports riveted to duct. Larger ducts shall be flanged and supports bolted to flange.
 5. Where it is not convenient to support ductwork at the desired location, additional structure shall be provided by this contractor to meet the span and load requirements.
- G. ACCESS DOORS
1. Furnish and install sheet metal doors in ducts where shown on the drawings and at each other point where access to concealed equipment or control devices must be made through the ductwork.
 2. Make all such doors air-tight with neoprene stripping and provide latch on each door that can be opened from inside and outside the duct. No access door shall be smaller than duct width x 12" up to 12" duct. Duct 12" will have access door 12" x 24" and increase with duct width to 24" x 24". Access doors shall be hinged one side, open inside and outside, swing to seal tight from or by air pressure and meet necessary fire ratings as applicable.

3. Ductmate Sandwich Type Access Doors may also be used meeting either above minimum size requirements or of adequate size to allow easy access to equipment which must be maintained.
 4. Also see specifications for access panels in Section 2.
 5. Install access doors adjacent to duct silencers to allow access for inspection or cleaning.
 6. Install access doors at all elbows to proper cleaning.
 7. Access Door Sizes:
 - a. One-Hand or Inspection Access: 12 by 12 inches (300 by 300 mm).
 - b. Two-Hand Access: 12 by 12 inches (300 by 300 mm).
 - c. Head and Hand Access: 18 by 12 inches (460 by 300 mm).
 - d. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
 - e. Body Access: 25 by 14 inches (635 by 355 mm).
 - f. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).
- H. ADDITIONAL INSTALLATION REQUIREMENTS FOR EXHAUST DUCTS SERVING HIGH-HUMIDITY LOCATIONS
1. Install exhaust ducts from wet, high-humidity locations without dips and traps that may hold water. Slope ducts a minimum of 2 percent back toward drain.
 2. Provide a drain pocket at each low point and at the base of each riser with a 1- inch (25-mm) stainless steel drain from each drain pocket to open site floor drain.
 3. Minimize number of transverse seams.
 4. Do not locate longitudinal seams on bottom of duct.

PART 4 - CONTROLS

4.01 DESCRIPTION

- A. Work includes furnishing and installation of complete and operable control systems. The work includes, but is not necessarily limited to, the following:
1. Standalone controls at all gas fired unit heaters, electric unit heaters, and exhaust fans.
 2. Control panel cabinets for temperature control systems as required for proper functionality. All relays, controls components located in the facility shall be in a control cabinet. The mechanical contractor is responsible for any 120v wiring to the control cabinet. Coordinate final location of the control cabinet with the owner / general contractor.
 3. All required wiring including all 120v wiring not shown on Electrical plans, and interposing relays for energizing motors at local starters from the standalone BMS/ATC. The 120v wiring to the control panel shall be run by the mechanical/controls contractor. The mechanical/controls contractor can sub out the work to the electrical contractor but the price of all conduit, wiring, and related accessories shall be included within the mechanical contractors bid.
 4. All required control wiring and conduit. All wiring shall be located within conduit.
 5. Temperature / control devices used on the project shall be rated for unconditioned spaces based.
 6. The systems shall be complete in all respects, tested and ready for operation.
 7. All materials, equipment and apparatus shall be new and of first-class quality.

8. The engineering, installation, calibration, programming and checkout necessary for complete and fully operational controls systems, as specified hereafter, shall be provided by the Controls subcontractor.
9. Comply with UL, NEC and state and local codes.
10. Provide hands-on training to the Owner adequate to allow proper day-to-day operation of the system.

4.02 QUALIFICATIONS

- A. The Controls subcontractor shall be a qualified and experienced contractor with at least five years experience in the installation of such systems and shall maintain a fully staffed service and parts office within 100 miles of the job site. Contractors may be asked to provide qualifying documents to the Engineer if requested.

4.03 SUBMITTALS

- A. Shop Drawings:
 1. Within 20 days after award of contract, and before any of the materials of this section are delivered to the job site, submit complete shop drawings to the Architect/Engineer in accordance with the provisions of these specifications.
 2. Each set shall include diagrammatic layout, wiring diagrams, reset schedules, sequence of operation, equipment schedule, valve schedule with sizing data, damper schedule with motor sizing data, and catalog sheets for each device to be used. Include list of both new and existing materials as applicable.
- B. As-Built Drawings:
 1. Upon completion of the job, this Contractor must furnish "as-built" drawings.

4.04 WARRANTY

- A. All devices and installation shall be warranted to be free from defects in workmanship and material for a period of one year from the date of job acceptance by the owner. Any equipment, software, or labor found to be defective during this period shall be repaired or replaced without expense to the owner. Factory authorized warranty service shall be available within 100 miles of jobsite.

4.05 CODES AND STANDARDS

- A. All electrical work required in this section shall comply with all requirements of pertinent electrical codes, local authorities, and Section 26.

4.06 PRODUCT HANDLING

- A. Protection:
 1. Use all means necessary to protect the materials of this section before, during, and after installation and to protect the installed work and materials of all other trades.
- B. Replacements:
 1. In the event of damage caused by this contractor, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 5 - CONTROLS - PRODUCTS

5.01 MISCELLANEOUS

- A. Duct mounted Control Dampers
 1. Duct mounted Dampers shall be designed to operate in systems having velocities up to 3,000 FPM with a static pressure differential of 4" WG. The frame shall be

minimum 16 gauge galvanized steel roll formed channel. Blades shall be minimum 16 gauge galvanized steel with a maximum width of 8". Shafts shall be minimum 1/2" diameter and shall ride in nylon or oilite bearings. Maximum damper sections size shall be 48" x 72", with larger damper installed in sections with appropriate jack shafting.

2. All multiple blade duct mounted proportional control dampers shall be opposed blade type and all two-position dampers shall be parallel or opposed blade type.
3. Duct mounted Dampers shall be minimum leakage type equipped with blade and edge seals.

B. Actuators

1. Electronic valve and damper operators shall be positive positioning, spring return. Motors shall be of the low voltage synchronous type and shall be non-overloading at a continuous stall.
2. Actuators to be factory selected, mounted and tested for proper operation based on unit size, type and torque requirements to provide smooth positioning without fluttering.

5.02 RELAYS

- A. Pilot Relays: equal to Functional Devices RIB series, UL Listed, 10A contact rating, LED status indicator.

5.03 CURRENT SENSING RELAYS

- A. Motor status indication, where shown on the points list or plans, shall be provided using current sensing relays. Relays shall be self-powered and shall have selectable AC ranges of 1-6 amps, 6-40 amps, and 4-200 amps. The switch output shall be rated for 30 VDC, 0.15 amps, with fully adjustable threshold setting, 0.25 seconds response time or less, able to accept #2 wire or smaller with 0.510 inch dia. window, and grade KJW-4051 housing material and UL listed flame retardant properties. Units shall be equal to Veris Hawkeye.
- B. Where current sensing relays are applied on devices controlled by VFD's, provide devices capable of discerning between normal current reductions and those due to belt or coupling failure.

5.04 CONTROL PANEL CABINETS

- A. Furnish and install control cabinets of standard gauge steel with hinged door. Panels shall be provided as required by the job conditions. There shall be at least one (1) cabinet per mechanical room or control area in which control devices are mounted, unless otherwise indicated. Leave final as-built control print and operating sequence in each panel.

5.05 OTHER MATERIALS

- A. All other materials, not specifically described, but required for a complete and proper installation of the work of this section, shall be new, first quality of their respective kinds, and subject to approval of the Architect/Engineer.

5.06 VARIABLE FREQUENCY DRIVES

A. ACCEPTABLE MANUFACTURERS

1. ABB, Toshiba, Danfoss, Eaton/Cutler Hammer, Allen Bradley
2. All VFD's on this project shall be by one manufacturer.

B. GENERAL REQUIREMENTS

1. The controls contractor is responsible for providing variable frequency drives for all equipment specified with VFDs. If equipment is capable of being provided with factory installed VFDs (RTU-#) the controls contractor shall either provide payment for the VFD

or coordinate with the mechanical contractor to insure variable frequency drives are not in both bids.

C. MANUFACTURED UNITS

1. The unit shall be variable torque, modular design for control of the motors as specified in Division 15 and rated at the motor full load nameplate amps.
2. The unit shall be U.L. listed, solid state, microprocessor-based with a pulse width modulated (PWM) output wave form (none others are acceptable).
3. The VFD shall employ a full wave bridge rectifier and capacitors to minimize the ripple of the rectified voltage to maintain near constant DC voltage. Insulated gate bipolar transistors (IGBT's) shall be employed as the output switching device.
4. The VFD package shall contain the equivalent of 5% impedance to reduce harmonic distortion. The 5% equivalent impedance shall be provided in the form of a DC bus choke, an input AC line reactor in each phase, or a combination of the two methods.
5. Control circuitry shall be plug-in, plug-out modular basis with a corrosion resistant coating on printed circuit boards.
6. Units to be suitable for an operating environment from 0°C to 40°C temperature and humidity up to 90% non-condensing.
7. Electrically and physically isolate control circuitry and conductors from power circuitry and power conductors. Control conductors and power conductors shall not be run in the same pathway.
8. The unit enclosure shall be NEMA 1 as required for the application minimum and all components shall be fully factory assembled and tested prior to leaving the manufacturing facility.
9. Include the following operating and monitoring devices mounted on the front cover:
 - a. A disconnect switch or circuit breaker to de-energize both the drive and bypass circuit with door interlocked handle and lock-open padlocking provisions.
 - b. Operating mode selector switch marked "hand-off-auto".
 - c. Manual speed adjustment via keypad, mounted on the door.
 - d. Manual bypass selector switch to select power through drive or bypass.

D. PERFORMANCE REQUIREMENTS

1. Units shall be suitable for input power of electrical system as scheduled on the drawings $\pm 10\%$, 3 phase, 60 Hertz nominal.
2. Use a current limiting control device to limit output current to 110% continuous for one minute; also refer to Protection Features in this section. Full load output current available from drive shall not be less than motor nameplate amperage. The full load amp rating of the VFD shall not be less than the values indicated in the NEC Table 430-150.
3. Output power shall be suitable for driving standard NEMA B design, three phase alternating current induction motors at full rated speed with capability of 6:1 turndown.
4. Additional performance capabilities to include the following:
 - a. Ride through a momentary power outage of 15 cycles,
 - b. Start into a rotating load without damage to drive components or motor, capable of automatic restart into a rotating load after a preset, adjustable time delay following a power outage,
 - c. Input power factor: Min 0.95 throughout the speed range,
 - d. Minimum efficiency: 95% at 100% speed, 85% at 50% speed.

E. CONTROL REQUIREMENTS

1. Use control circuits compatible with input signal from temperature control system in the automatic mode and from manual speed control in the manual mode. Vary motor speed in response to the input control signal. Include components necessary to accept the

signal from the temperature control system in the form that it is sent. Refer to Division 23 00 00.

2. Include the following additional control features:
 - a. Hand-Off-Automatic (HOA) selector switch to select local or remote start/stop and speed control
 - b. Analog input, selectable 0-10v or 4-20 mA, for automatic control from the temperature control system
 - c. Local speed control at the VFD
 - d. Adjustable acceleration and deceleration rate so that the time period from start to full speed and from full speed to stop can be field adjusted
 - e. Adjustable minimum and maximum speed settings for both automatic and manual modes of operation
 - f. Field adjustment of minimum and maximum output frequency
 - g. Two (2) sets of programmable form "C" contacts for remote indication of variable frequency drive condition. Note: default programming to be set for "Drive Run & Fault".
 - h. Illuminated display keypad
 - i. External Fault indicator
 - j. One (1) input for a N.O. dry contact type input for a 2-wire remote start/stop
 - k. One (1) input for a N.C. dry contact type input for external faults: (freezestats, fire alarm, smokes, etc).
 - l. One (1) N.O. dry contact output for proving motor status. This output shall be programmed to detect belt or coupling break that would remove the load from the motor. The dry contact will open on loss of load or VFD being off.
 - m. PID control loop capable of VFD control from an external device connected to a VFD analog input.
 - n. The VFD controller shall convert VFD information into the LonWorks protocol that will be compatible with the building direct digital energy management system (EMS) supplied on the project. This output shall be through a serial interface port capable of two-way communication with the building EMS provided on this project. Final connection shall not require any additional intermediate gateway devices to provide throughput of data. The following data shall be provided at a minimum:
 - Fault condition
 - Speed
 - Amperage
 - Frequency
 - Voltage
 - Bypass status

F. PROTECTION FEATURES

1. Use electronic protection circuitry in the power circuits to provide an orderly shutdown of the drive without blowing fuses or tripping circuit breakers and prevent component loss under the following abnormal conditions:
 - a. Activation of any safety device;
 - b. Instantaneous overcurrent and/or over voltage of output;
 - c. Power line overvoltage and undervoltage protection;
 - d. Phase loss;
 - e. Single and three phase short circuiting;
 - f. Ground faults;

- g. Control circuit malfunction;
- h. Over-temperature; and
- i. Output current over limit.
- j. Provide the following additional protective features:
 - Input transient overvoltage protection up to 3000 volts per ANSI 37.90A;
 - DC bus fusing or other electronic controls which limit the rate of rise of the DC bus current and de-energizes the drive at a predetermined current level;
 - Fusing for the control circuit transformer;
 - Grounded control chassis; and
 - Devices and/or control circuitry to ensure that the variable frequency drive and bypass starter are not both energized and driving motor simultaneously.

G. DIAGNOSTICS

- 1. Provide an English character display (no error codes) with indicators for the following:
 - a. Phase loss
 - b. Ground fault
 - c. Overcurrent
 - d. Overvoltage
 - e. Undervoltage
 - f. Over temperature
 - g. Overload
 - h. DC bus status

H. AC INPUT LINE REACTORS

- 1. When needed to comply with the requirement for 5% equivalent impedance, furnish and factory install AC input line reactors.
- 2. Line reactors shall be installed in each phase of the AC input side of the VFD and mounted within a common enclosure with the VFD.
- I. Line reactor shall be a three phase inductor, iron core, 600V, Class H insulation, 115 degree C rise, copper windings with screw type terminal blocks.

5.07 LABELS

- A. Every control and device shall be labeled as to its function with either Lamicoid Labels that are screwed to panel and equipment or Laser-printed Mylar Labels that are adhered. Example: T-7, Chilled Water Supply Temp., etc. Label shall be keyed to symbol used in ATC System Control Prints.

PART 6 - CONTROLS - SEQUENCES

6.01 GAS FIRED UNIT HEATER / ELECTRIC UNIT HEATER

- A. The mechanical contractor shall provide a 7-day programmable thermostat to control the gas fired unit heater and electric unit heater. The thermostat shall cycle the fan and heating source on as required to maintain the space setpoint temperature. Thermostats shall cycle heater to maintain a space temperature of 60F (adjustable).

6.02 EXHAUST FANS

- A. Exhaust fans shall be controlled depending on the function of the particular fan. All fans shall operate continuously, be controlled a VFD, or on an occupied/unoccupied schedule.
- B. Where fans are provided with motorized dampers, the damper shall open and prove open prior to starting the fan.
- C. Motorized dampers associated with outside air louvers shall be interlocked with the fan

operation.

END OF SECTION

**SECTION 26 00 00
ELECTRICAL SCOPE OF WORK**

PART 1 - GENERAL

1.01 SCOPE OF WORK

Contractor shall provide all labor, materials, equipment, permits, inspection fees, supervision and other items noted in Contract General Conditions, necessary to yield completely operable, code compliant, and tested systems as shown on the drawings and specified herein. The work includes, but is not limited to, the following areas:

- A. Demolition:
 - 1. Remove light fixtures, wiring devices, communication devices, fire alarm devices, equipment connections raceway etc. as required where walls, ceilings and floors are removed.
 - 2. All abandoned existing wiring, devices, and raceways to be completely removed to source.
- B. Temporary Power and Lighting
 - 1. Temporary power may be derived from the existing services.
 - 2. Temporary lighting system for construction.
 - 3. Temporary electrical equipment including panelboards, circuit breakers, receptacles, etc.
- C. Site Work:
 - 1. Mechanical and plumbing equipment connections.
 - 2. Miscellaneous devices.
- D. Lighting Systems
 - 1. Building mounted exterior lighting.
 - 2. Interior lighting system including fixtures and components for their complete installation.
- E. Electric Power System
 - 1. Electrical power distribution including the following:
 - a. Panelboards.
 - b. Surge protection devices.
 - c. Overcurrent protection devices.
 - d. Disconnect switches.
 - e. Feeders.
 - f. Branch circuit wiring.
 - 2. Electrical devices including the following:
 - a. Special outlets.
 - b. Receptacles.
 - 3. Motor control equipment
 - a. Disconnects.
- F. Electrical connection and/or installation of equipment provided by others including the following:
 - 1. HVAC.
 - 2. Plumbing.
 - 3. Fire protection equipment and associated devices.

4. Door hardware components.
- G. Life Safety Systems
1. Emergency power source.
 2. Interior and exterior egress lighting.
 3. Exit signage.
 4. Fire Alarm System.
- H. Communication Systems
1. Telephone and data system including the following:
 - a. Termination components.
 - b. Raceways.
 - c. Supports.
 - d. Cabling.
 - e. Jacks.

1.02 RELATED SECTIONS

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.03 ALTERNATES

- A. Refer to Section 01 23 00 for a list of alternates.

1.04 UNIT PRICES

- A. Refer to Section 01 22 00 for required unit prices.

PART 2 - PRODUCTS

2.01 Not Used

PART 3 - EXECUTION

3.01 Not Used

END OF SECTION

**SECTION 26 01 00
GENERAL ELECTRICAL PROVISIONS**

PART 1 - GENERAL

1.01 SUMMARY

- A. These specifications set forth conditions, and include the work to be performed, equipment to be installed, and certain methods to be employed to implement a complete and operable electrical installation. This specification shall apply to all electrical work to be performed as listed in Section 26 00 00 Electrical Scope of Work as well as any other electrical work required of other trades or by Sections of this Project Manual.
- B. Related Documents
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 REFERENCES

- A. National Fire Protection Agency:
 - 1. NFPA 70 - National Electrical Code
 - 2. NFPA 72 – National Fire Alarm Code
 - 3. NFPA 101 - Life Safety Code
- B. State of Wisconsin Department of Safety and Professional Services
 - 1. SPS 316 – Electrical Code
 - 2. SPS 363 - Energy Conservation
- C. Local Code and Inspector Requirements
- D. Local Utility Service Rules and Requirements

1.03 CODES AND STANDARDS

- A. Comply with Section 01 42 00 – Reference Standards.
- B. Specific naming of codes or standards occurs on the Drawings, and in other Sections of these Specifications.
- C. These specifications are minimum requirements and shall govern except where made more stringent by other sections of this specification or local, state or federal laws or regulations. Where conflict between drawings, specifications, codes or standards occurs, the more stringent requirements shall govern. No extra compensation for such compliance will be allowed.
- D. Submission of proposal is considered evidence that the Contractor is proficient and experienced, and knowledgeable of all standards, codes, ordinances, permits and regulations affecting his work.

1.04 PERMITS, INSPECTIONS, AND UTILITY CONNECTIONS

- A. The Contractor shall prepare and submit all applications and working drawings, as required by the General Conditions and the Supplemental/Special Conditions, to the authorities having jurisdiction over the project. All licenses and permits shall be secured and paid for by the Contractor in accordance with the General and Supplemental/Special Conditions of the project.
- B. The contractor shall obtain and pay for any underground locates, public or private, prior to starting work for the execution of this work. Scheduling of all underground locates shall be responsibility of the contractor.

1.05 EXAMINATION OF PLANS, SPECIFICATION, AND SITE

- A. Before submitting a bid the contractor shall be familiar with all features of the building and site which may affect the execution of his work. No additional payment will be allowed for work resulting from the failure to obtain this information. The contractor shall clarify any omissions or errors in the plans specifications with architect or engineer before submitting his bid.

1.06 DRAWINGS

- A. The drawings depicting electrical work are diagrammatic and show symbols representing electrical equipment and devices in their approximate location. The exact location of such equipment and devices shall be established in the field in accordance with instructions from the Architect/Engineer and as established by manufacturer's installation drawings and details.
 - 1. Coordinate the location of equipment and devices with the other trades performing work in the area.
 - 2. Refer to shop drawings and submittal drawings for all equipment requiring electrical connections to verify rough-in and connection details.
 - 3. Dimensions noted on the electrical drawings are subject to measurements of adjacent and previously completed work.
 - 4. Dimensions shall not be derived by scaling drawings.
- B. The Contractor shall keep a detailed set of record drawings in accordance with Section 01 78 39. The record drawings shall include all conduit and feeder runs, pull box locations, and any deviations from the Contract Drawings.

1.07 SUBMITTALS AND SUBSTITUTIONS

- A. Comply with Section 01 33 00 – Submittal Procedures in addition to the following requirements.
- B. Comply with the specific submittal requirements of each specification section in addition to the following requirements.
- C. Approval of equipment, fixtures, methods, etc. proposed as alternates to those called for in the plans may be obtained by the following process. Consideration of alternate equipment shall be solely at the discretion of the Engineer. No alternates to the plans and specifications will be accepted except those given prior approval as follows.
 - 1. Any and all proposed alternate equipment, fixtures, methods, etc. must be submitted for approval not less than ten (10) days prior to bid due date. Submittals shall be equivalent to those required for review as noted herein.
 - 2. After review of the submittals the Engineer will determine acceptability of alternate proposals. All acceptable alternates will be made known to prospective contractors through the means of communication deemed best by the Engineer.
- D. Submit all materials and equipment for review. Each sheet of descriptive literature submitted shall be clearly marked to identify the material or equipment as follows:
 - 1. Submit schematics and connection diagrams for all electrical equipment. A manufacturer's standard connection diagram or schematic showing more than one scheme of connection will not be accepted unless it is clearly marked to show the intended connections. Sequence of operation shall be worded to indicate the progression of operation of all pushbuttons, limit switches, relays, solenoids and all other control devices.
 - 2. Equipment and materials descriptive literature not readily cross-referenced with the drawings or specifications shall be identified by a suitable notation.
 - 3. Lamp fixture descriptive sheets shall show the fixture schedule letter, number, or symbol for which the sheet applies.

4. Product sheets showing UL approved systems & materials for fire stopping. Identify the fire wall or floor where the product will be applied.
5. Sheets or drawings showing more than the particular item under consideration shall have crossed out all but the pertinent description of the item for which review is requested.
6. Equipment and materials descriptive literature and drawings shall show the specification paragraph for which the equipment applies.
7. The Contractor shall submit within thirty (30) days of the award of the contract for the Engineer's approval and prior to any purchase of the items, electronic PDF files or six (6) copies of materials, equipment, devices (including outlets and switches), conduit and wire, and fixtures proposed to be incorporated within the work. Where manufacturers are indicated for an item in the specification, only designation by catalog number of the manufacturer of the item to be used shall be required. All other items shall be listed with catalog numbers and descriptive information. The list must be complete to receive consideration. Items judged by the Engineer to be in non-conformance may be rejected.
8. The Electrical Contractor shall review all submittals prior to submission.
 - a. The Contractor shall verify that the materials and equipment depicted will properly fit into construction.
 - b. Where equipment connections and/or locations are dependent on equipment provided by other trades, obtain submittal documentation from said trades to verify accurate coordination.
 - c. Documents submitted without Contractor's review stamp will be returned to Contractor prior to Architect/Engineer review.
9. No materials or equipment subject to prior review by the Architect/Engineer shall be fabricated or installed by the Contractor without approval. The Architect/Engineer's review of the submittals does not relieve the Contractor of the responsibility of deviations from the requirements of the drawings and specifications, unless prior written approval for such deviations has been granted.
10. The Contractor shall assemble and submit to the Architect/Engineer for subsequent submission to the Owner, complete Operation and Maintenance manuals in accordance with Section 01 78 23 for each of the installed systems.

1.08 TEMPORARY FACILITIES

- A. Comply with the requirement of Section 01 50 00 Temporary Facilities/Controls.
- B. The Electrical Contractor shall provide all labor and material for temporary power and lighting required in construction for all trades until the permanent system is in operation. Where a temporary electrical service is required, Contractor shall arrange all necessary requirements with the local utility.
- C. The Electrical Contractor shall include the following facilities in the temporary power and lighting service for the entire project:
 1. The temporary lighting system shall be sufficient to enable all trades to safely complete their work. Illumination shall be 5 footcandles minimum in all areas and, in addition, shall meet or exceed the requirements of 29 CFR 1926.56 Illumination (OSHA regulations).
 2. Temporary lighting system shall be circuited and controlled so that the lighting level in each portion of the building can be reduced to provide security lighting during non-working hours and on weekends and holidays. The level of lighting for security purposes shall be in accordance with all federal, state and local regulations. The Electrical Contractor shall be responsible for the control of the temporary lighting such that the lighting is turned on at the beginning of each workday and the normal working lighting is reduced to the security lighting level at the end of each workday.

3. After installation of the permanent lighting system, it may be used for construction lighting as required.
4. Complete installation shall be in compliance with all applicable codes. Electrical Contractor's bid will allow removal and salvage for any temporary service when it is no longer required.
5. The Owner shall pay for all electricity consumed throughout the duration of construction.

1.09 NEGLIGENCE

- A. Should the electrical contractor fail to provide materials, templates, or other necessary information causing delay or expense to another party, he shall pay the actual amount of the damages to the party who sustained the loss.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Material and equipment shall be furnished new.
- B. All material and equipment shall be listed by Underwriters' Laboratories, Inc. and shall bear UL listing labels where a UL test or standard exists.
- C. Products shall be by established manufacturers regularly engaged in making type of materials to be provided and complete with all parts, accessories, trimmings, connections, etc. reasonably incidental thereto as specified in detail or as described in manufacturer's catalog. All equipment shall be properly cleaned, adjusted, and put in complete working order ready for service.

2.02 SUPPORTING DEVICES

- A. Channel Support Systems
 1. U-Channels: Roll formed from 12-gauge steel. U-Channel width 1.5/8", height shall be sized for the application of the channel and the device it supports.
 - a. Channel for indoor, dry application shall have one of the following finishes.
 - i. Pre-Galvanized Zinc Coating – ASTM A525 G-90
 - ii. Finish equal to B-Line Dura-Green®™ or Unistrut Perma-Green®™
 - b. Channel for outdoor, wet and damp application shall have Hot-Dipped Galvanized After Fabrication – ASTM A123 finish.
 2. Fittings and accessories:
 - a. Fittings and accessories shall be manufactured by the U-Channel manufacturer.
 - b. Indoor, dry application finish: Electro-plated Zinc – ASTM B633.
 - c. Outdoor, wet, and damp application finish: Hot-Dipped Galvanized after Fabrication – ASTM A123.
- B. Plywood backboards shall be 3/4" minimum thickness, fire rated, and painted on all sides.
- C. Fastening Hardware including screw, bolts, nuts, washers, etc. shall be stainless steel in outdoor, wet or damp locations.
- D. Plastic anchors shall not be used.
- E. Concrete or masonry anchoring systems shall be applied per manufacturer's recommendations for base material and load applications.

2.03 FIRESTOPPING

- A. Comply with the requirements of Section 07 84 00.

- B. Firestopping systems shall provide a fire resistance rating equal to the hourly resistance rating of the floor, wall, or partition in which the system is installed.
- C. Application and installation of firestopping products shall be in strict compliance with the manufacturer's instructions.

2.04 ACCESS PANELS

- A. All access panels required by code or otherwise to electrical service equipment shall be supplied and installed by Electrical Contractor.
- B. Access panel sizes and locations shall be coordinated with all other trades. Where possible, locate equipment requiring access with equipment of other trades. Where access panels are shared between trades, costs of access panels and installation shall be split between trades requiring them.

PART 3 - EXECUTION

3.01 EQUIPMENT INSTALLATION REQUIREMENTS

- A. Install all components, level, plumb, and parallel and perpendicular to other building system components, except where specifically noted.
- B. Install all equipment to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnection with minimum interference of installation with other systems.
- C. Coordinate equipment locations with equipment and systems installed by other trades. Where a conflict arises, notify the Architect/Engineer and obtain approval for an alternate location before proceeding with installation.
- D. Verify equipment dimensions to insure dimensional compatibility.

3.02 CUTTING AND PATCHING

- A. Comply with the requirements of Section 01 73 29
- B. Cutting and patching shall not impair the strength or function of work being cut, i.e. structural members shall not be weakened, and holes through exterior walls shall be waterproofed.
- C. No structural members shall be cut without prior approval from the Architect/Engineer.
- D. Repair disturbed surfaces to match adjacent undisturbed surfaces.

3.03 FIRESTOPPING

- A. All penetrations through walls, floors, and partitions shall be sealed.
- B. Sealants and sealing systems shall restore the fire resistive rating of the wall, floor, or partition that is penetrated.

3.04 TRENCHING

- A. Cover Material of trench
 - 1. Cover Material: Unwashed bank-run sand or crushed bank-run gravel consisting of durable particles ranging in size from fine to coarse in a substantially uniform combination. Conform to the following gradation:

Cover Material	
Percent Passing	
Sieve Size	By Weight
1 Inch	100

3/4 Inch	85-100
No. 4	35-65
No. 40	15-35
No. 200	5-15

2. Base Material:
 - a. Excavated Material: Natural soils classified in ASTM D 2487 as Gravels (GW, GP GM and GC), Sands (SW, SP, SM and SC) and Silts and Clays (ML and CL). Silts and Clays classified as OL, MH, CH, OH, and PT are not acceptable unless specifically allowed by Architect/Engineer. Soil material shall be free from vegetable or other organic matter, trash, debris, stones larger than three inches and frozen material.
 3. Backfill Material:
 - a. Raising Site Grades: Silty Clay with moisture content of 2 to 3 percent of optimum moisture content. Lifts not to exceed 6" in loose thickness and compacted to a minimum 95%.
 - b. Final Inches of Fill Material: Not more than 5% passing No. 200 sieve.
- B. Backfilling
1. Backfill trenches to contours and elevations with unfrozen materials.
 2. Do not backfill over wet, frozen or spongy sub-grade surfaces.

3.05 TESTS

- A. The Electrical Contractor shall conduct all tests required to ensure proper installation and operation off all components of the electrical system. The Electrical Contractor shall provide all instrumentation and labor necessary to conduct these tests. The engineer may require that he or his authorized representative be present for any required test.
- B. During the course of construction, conduct the following tests, tabulate data, date, sign and submit to the Engineer. Further tests may be required to ensure proper operation of the electrical system.
 1. Standard megger insulation test on each feeder.
 2. Ground resistance test.
 3. Check motors for proper rotation.
 4. Ensure that all phase conductors are entirely free from grounds and short circuits.
 5. Test the ground fault protection equipment of switchboards before temporary service is removed. Obtain test procedure from manufacturer and review procedure with the Architect/ Engineer before conducting the test.
- C. Upon completion of project, adjust all voltage taps on transformers for an optimum operating level.
- D. Aim all adjustable lighting fixtures.
- E. Adjust all auxiliary systems for optimum performance.

3.06 PLACING OF SYSTEMS IN OPERATION

- A. The Electrical Contractor shall be responsible for all start-up procedures and system checks.
- B. All equipment shall be installed, tested and operated in accordance with the respective manufacturer's recommendations.

3.07 GUARANTEES

- A. All labor, materials and equipment shall be guaranteed in writing by installing contractor for one year after final acceptance date and/or normal continuous complete season's operation applicable to equipment or system.
- B. Acceptance date shall be determined by Architect/Engineer and stated in writing. Contractor shall secure equal guarantees from suppliers.
- C. Contractor shall make all necessary alterations, repairs, adjustments and replacements during guarantee period as directed by Architect/Engineer to comply with Contract Documents, at no cost to the Owner.
- D. Repair or replacements made under the guarantee provision shall bear further one-year guarantee from date of acceptance of repair or replacement.

3.08 INSPECTION

- A. Upon completion of the work described under these specifications and drawings, the Electrical Contractor shall obtain and pay for inspection and approval by the local electrical inspecting authority. One (1) certified copy of the inspection report shall be delivered to the Architect/Engineer.

3.09 HOUSEKEEPING AND CLEANUP

- A. Daily remove from the site all debris and rubbish accumulating as a result of the electrical installation. Upon completion of the project, dispose of all debris and rubbish and leave manholes and electrical equipment rooms broom clean. Clean the interiors of all cabinets, pull-boxes and equipment enclosures.

3.10 PRODUCT HANDLING

- A. Protection: Equipment shall be constructed and packaged to withstand all stress induced in transit and during installation.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

3.11 DISCREPANCIES

- A. In the event of discrepancy, immediately notify the Architect/ Engineer.
- B. Do not proceed with the installation in areas of discrepancies until all such discrepancies have been fully resolved.

3.12 START-UP ASSISTANCE

- A. The Electrical Contractor shall provide electricians to assist with the equipment start-up, including but not limited to, the following:
 - 1. Vacuum and blow out all electrical panels.
 - 2. Change motor rotation as required.
 - 3. Exchange wires incorrectly landed on terminal strips.
 - 4. Increase overload element sizes when insufficient to carry the load served.
 - 5. Measure and record all panelboard voltage and motor-running currents.
 - 6. Correct all wiring errors.

3.13 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor shall assemble and submit to the Architect/Engineer for subsequent submission to the Owner, complete Operation and Maintenance manuals in accordance with Section 01 78 23 for each of the installed systems.
- B. The manuals shall consist of bound volumes instructing the Owner's personnel in the use, operation, and maintenance of the system or piece of equipment to which the manual pertains. The manual shall include the items specified in Section 01 78 23 and in the

specific Specification Section for the equipment or system. The manuals shall cover all phases of operation and maintenance and shall be illustrated with drawings, photographs, wiring diagrams etc. as necessary.

- C. Each manual shall include two sets of final shop drawings depicting the equipment or system as installed.

END OF SECTION

**SECTION 26 05 19
CONDUCTORS AND CABLES**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section encompasses the selection and installation of wire and cable for all types of applications.
- B. Related Documents
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 26 01 00 - General Electrical Provisions.
 - 3. Section 26 05 33 – Raceways and Boxes.
 - 4. Section 26 05 53 - Electrical Identification.

1.02 REFERENCES

- A. Federal Specifications (Fed. Spec.):
 - 1. J-C-30A(1) Cable and Wire Electrical (Power, Fixed Installation).
- B. Underwriters Laboratories, Inc. (UL) Publications:
 - 1. No. 44 Rubber-Insulated Wire and Cables.
 - 2. No. 83 Thermoplastic-Insulated Wires.
 - 3. No. 493 Thermoplastic-Insulated Underground Feeder and Branch Circuit Cables.

1.03 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittal Procedures in addition to the following requirements.
- B. Comply with Section 26 01 00 - General Electrical Provisions.
- C. Provide product data from the cable manufacturer.

1.04 DELIVERY AND STORAGE

- A. Provide cable on original reels or in boxes, new and unused.
- B. Store cables in dry protected area and protect cable ends in accordance with manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Low Voltage, Lighting and Power Cables:
 - 1. Conductors provided on 600 volt power and lighting systems to be stranded per ASTM B 8 soft drawn copper for wires sizes 8 AWG through 14 AWG and stranded soft drawn copper per ASTM B 8 for 6 AWG wire sizes and larger.
 - 2. Insulation system shall be type THHN, THWN or XHHW, 75°C min., rated 600V as defined and listed in Article 310 of NEC.
 - 3. Minimum size conductor utilized shall be #14 AWG for lighting circuits and #12 AWG for power circuits.
 - 4. Acceptable manufacturers are Essex, General Cable, Southwire, Triangle, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Lighting and Power Cables:
 - 1. Install only after completion of work which might cause damage to wires or conduit.
 - 2. Clean out or replace conduit in which dirt, water, concrete, or other foreign matter has been allowed to accumulate, before installing wiring.
 - 3. Identification of Insulated Conductors: Mark on outer cover giving voltage, type, and size. In addition, identify each end of each conductor wire with marking tape or sleeve as described in Section 26 05 53 - Identification.
 - 4. Splices:
 - a. No wire splices allowed in entire length of conduit or raceway.
 - b. Make splices in electrical enclosures.
 - c. Splice Insulation: Equal to original factory insulation.
 - d. Splicing Copper to Aluminum: Use aluminum-copper connections, approved as suitable for the purpose.
 - 5. Termination of Conductors:
 - a. Insulated type compression lugs, "Sta-Kon" type by Thomas & Betts.
 - b. At distribution equipment containing aluminum bus bars use aluminum-copper lugs rated and approved for the application.
 - c. For lighting and receptacle circuits use "Scotchlox Spring" connectors manufactured by 3M.
- B. Lace or clip groups of feeder conductors at distribution centers, pullboxes, and wireways.
- C. Use wire pulling lubricant listed by UL for pulling No. 4 AWG and larger wire. Do not pull cables through conduit with more than allowable bends specified in NEC 345-11.
- D. Limit the number of conductors in boxes so that the maximum number does not exceed the number permitted by Tables 314.16(A) of the National Electrical Code.
- E. Support conductors in vertical raceways in accordance with the National Electrical Code. Cable supports shall be O-Z/Gedney Type "R".
- F. Shared neutral circuits shall not be used when circuits are supplying non-linear loads or have an isolated ground. These circuits shall have dedicated neutrals, except where the circuit is part of a connection to an office furniture modular wiring system.
- G. Wiring for emergency systems shall be installed in separate conduit runs.

END OF SECTION

**SECTION 26 05 26
GROUNDING SYSTEM**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section covers the selection and installation of the equipment for an effective grounding system.
- B. Related Documents
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 REFERENCES

- A. Institute of Electrical and Electronics Engineers:
 - 1. IEEE Standard 142-1972 - Grounding.
- B. National Fire Protection Association (NFPA) Publications:
 - 1. National Electrical Code Article 250.
- C. Underwriters Laboratories Inc. (UL) Publications:
 - 1. UL-No. 467.

1.03 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittal Procedures in addition to the following requirements.
- B. Certified test reports on cable and ground rods.
- C. Ground resistance tests.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Ground rods shall be 3/4" x 10'-0" long, copper-weld, sectional type, steel core with thick copper covering inseparably welded together.
- B. Ground Bus shall be predrilled copper (aluminum not permitted) with standard NEMA bolt hole sizing. Bus bar to be electro-tin plated for reduced contact resistance. Size: 1/4" X 2" minimum.
- C. Ground Connections:
 - 1. Shall be exothermic weld when concealed.
 - 2. Shall be mechanical where exposed to view.
 - 3. Where the grounding conductor penetrates a concrete surface use a 5/8 inch solid copper-weld rod or a thermo-weld anti-siphon water stop.
- D. Grounding electrode shall be soft drawn stranded copper sized in accordance with Section 250 of the NEC. Solid may be used where penetration of a concrete surface is required.
- E. Acceptable manufacturers are Cadweld, 0-Z Gedney, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Ground all metallic conduits, cable trays, supports, cabinets and equipment in accordance with the National Electrical Code. Ground wire shall be of the same kind and quality as other

conductors in the building, shall be placed in steel conduit runs as specified for branch circuits, and shall be sized to meet the requirements of the National Electrical Code.

- B. Test ground resistance with a ground meter of bridge type and report results to Architect/Engineer. Drive additional rods as directed by Architect/Engineer. Additional rods will be paid for as an extra. The system resistance should not exceed 5 OHMS.
- C. Ground Rod Installation: Drive each rod vertically for not less than ten feet. Multiple rods: Where required to obtain the specified ground resistance, install multiple rods. Where rock prevents the driving of vertical ground rods, install grounding electrodes in horizontal trenches to achieve the specified resistance.
- D. Grounding conductors shall be attached to equipment by means of approved copper alloy solder-less grounding lugs or clamps which shall be attached to the equipment and the grounding point by means of hexhead cap screws or machine bolts after the contact surfaces have been cleaned to bright metal.
- E. Ground conductors run in conduit with circuit conductors shall be securely connected inside the junction boxes or enclosures. Ground conductors terminating at the motor control centers and switchgear, shall be terminated at the ground bus. Splices in ground conductors shall be made by the "Cadweld" process by Erico Products, Inc., Continental Industries "Thermoweld", or equal.
- F. Ground straps shall be supported at intervals not exceeding two (2) feet by means of round head bronze machine screws and approved type anchors.
- G. Flexible or nonmetallic conduit will not be approved for continuity in a grounding system. A separate ground wire shall be installed and bonded to conduit system on both sides of flexible conduit. A separate ground wire shall be installed in all non-metallic conduit. Ground motor bases and frames pulling a separate conductor in with the motor feeder.
- H. Install a bonding jumper around expansion fittings to maintain continuous ground continuity.
- I. Service entrance ground conductor shall be connected to the building water service. Where ground connection is made to the water service on the building side on the water meter, a jumper or shunt shall be installed around the water meter, the current carrying capacity and mechanical protection shall not be less than required for the grounding conductor. Ground connection shall be made to building structural steel including UFER within concrete slab.
- J. All power feeds to panels, motors, etc. shall contain a ground conductor sized according to the National Electrical Code. The conduit system shall not be considered an acceptable ground.
- K. All branch feeds to lights, receptacles, equipment, and general distribution shall contain a ground conductor sized according to the National Electrical Code. The conduit system shall not be considered an acceptable ground.
- L. Provide a copper ground bus mounted to wall on insulating stand-offs in each electrical room for telephone/data equipment with a #6 minimum insulated ground wire in conduit from telephone equipment ground bus to service entrance ground bus.

END OF SECTION

**SECTION 26 05 33
RACEWAY AND BOXES**

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Raceways include the following:
 - 1. Rigid metal conduit.
 - 2. Intermediate metal conduit.
 - 3. Electrical metallic tubing (EMT).
 - 4. Flexible metal conduit.
 - 5. Liquidtight flexible conduit.
 - 6. Rigid nonmetallic conduit.
 - 7. Wireway.
- C. Boxes, enclosures, and cabinets include the following:
 - 1. Device boxes.
 - 2. Outlet boxes.
 - 3. Pull and junction boxes.
 - 4. Cabinets and hinged cover enclosures.
- D. Related Documents
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 26 01 00 - General Electrical Provisions.
 - 3. Section 26 27 26 - Wiring Devices.
 - 4. Section 26 05 53 - Electrical Identification.

1.02 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittal Procedures in addition to the following requirements.
- B. Comply with Section 26 01 00 - General Electrical Provisions.
- C. Product data for wireway and fittings, floor boxes, hinged cover enclosures, and cabinets.
- D. Shop drawings for nonstandard boxes, enclosures, and cabinets. Include layout drawings showing components and wiring.

1.03 QUALITY ASSURANCE

- A. Comply with NFPA 70 "National Electrical Code" for components and installation.
- B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
 - 1. The Terms "Listed and Labeled": As defined in the "National Electrical Code," Article 100.
- C. Comply with NECA "Standard of Installation."
- D. Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering Products that may be incorporated in the Work include, but are not limited to, the following:
1. Metal Conduit and Tubing:
 - a. Allied Tube and Conduit, Grinnell Co.
 - b. Anamet, Inc., Anaconda Metal Hose.
 - c. Anixter Brothers, Inc.
 - d. Carol Cable Co., Inc.
 - e. Cole-Flex Corp.
 - f. Flexcon, Inc., Coleman Cable Systems, Inc.
 - g. Spiraduct, Inc.
 - h. Triangle PWC, Inc.
 - i. Wheatland Tube Co.
 2. Nonmetallic Tubing and Conduit:
 - a. Anamet, Inc., Anaconda Metal Hose.
 - b. Breeze-Illinois, Inc.
 - c. Carlon.
 - d. Certainteed Corp, Pipe & Plastics Group.
 - e. Hubbell, Inc., Raco, Inc.
 - f. Spiraduct, Inc.
 - g. Thomas & Betts Corp.
 3. Conduit Bodies and Fittings:
 - a. Scott Fetzer Company, Adalet-PLM.
 - b. American Electric, Construction Materials Group.
 - c. Emerson Electric Co., Appleton Electric Co.
 - d. Carlon.
 - e. Hubbell, Inc., Killark Electric Manufacturing Co.
 - f. General Signal, O-Z/Gedney Unit.
 - g. Thomas and Betts Electrical Components Group.
 4. Wireway:
 - a. Hoffman Engineering Co.
 - b. Keystone/Rees, Inc.
 - c. Square D Co.
 5. Boxes, Enclosures, and Cabinets:
 - a. Scott Fetzer Company, Adalet-PLM.
 - b. Butler Manufacturing Co., Walker Division.
 - c. Cooper Industries, Midwest Electric.
 - d. Erickson Electrical Equipment Co.
 - e. Hoffman Engineering Co., Federal-Hoffman, Inc.
 - f. Saginaw Control & Engineering
 - g. Hubbell Inc., Killark Electric Manufacturing Co.
 - h. General Signal, O-Z/Gedney.
 - i. Raco, Inc., Hubbell Inc.
 - j. Robroy Industries, Inc., Electrical Division.
 - k. Square D Co.
 - l. Thomas & Betts Corp.
 - m. Quazite.
- B. Metal Conduit and Tubing
1. Rigid Steel Conduit (GRC, RSC): ANSI C80.1.
 2. Intermediate Metal Conduit (IMC): ANSI C80.6.
 3. Electrical Metallic Tubing (EMT) and Fittings: ANSI C80.3 with steel set-screw or compression-type fittings.
 4. Flexible Metal Conduit: Zinc-coated steel.
 5. Liquidtight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.

6. Fittings: NEMA FB 1, compatible with conduit/tubing materials.
- C. Non-metallic Conduit and Tubing
1. Electrical Nonmetallic Tubing (ENT): Not an acceptable raceway, shall not be used.
 2. Rigid Nonmetallic Conduit (RNC): NEMA TC 2, Schedule 40 or 80 PVC.
 3. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.
- D. Wireways
1. Material: Sheet metal sized and shaped as indicated.
 2. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireway as required for complete system.
 3. Select features where not otherwise indicated, as required to complete wiring system and to comply with NEC.
 4. Finish: Manufacturer's standard enamel finish.
- E. Outlet and Device Boxes
1. Sheet Metal Boxes: NEMA OS 1.
 2. Cast Metal Boxes: NEMA FB 1, type FD, cast ferrous alloy box with gasketed cover.
 3. Nonmetallic Boxes: NEMA OS 2.
- F. Pull and Junction Boxes
1. Small Sheet Metal Boxes: NEMA OS 1.
 2. Cast Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.
 3. In Ground Pull Box: Rated for the application.
- G. Cabinets and Enclosures
1. Hinged Cover Enclosures: NEMA 250, steel enclosure with continuous hinge cover and flush latch. Finish inside and out with manufacturer's standard enamel.
 2. Cabinets: NEMA 250, type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 WIRING METHODS

- A. Outdoors: Use the following wiring methods:
1. Minimum conduit size to be 1".
 2. Exposed: Rigid or intermediate metal conduit.
 3. Concealed: Rigid or intermediate metal conduit.
 4. Underground, Single Run: Rigid nonmetallic conduit. (PVC).
 5. Underground, Grouped: Rigid nonmetallic conduit. (PVC)
 6. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquidtight flexible metal conduit.
 7. Boxes and Enclosures: NEMA Type 3R minimum.

- B. Indoors: Use the following wiring methods:
1. Minimum conduit size to be 1/2".
 2. Conduits for feeder conductors shall be GRC or IMC regardless of size.
 3. Feeder raceway may be rigid nonmetallic conduit when installed below grade if installed with GRC or IMC elbow and stub-up through slab.
 4. Conduits 1 1/4" diameter and smaller may be EMT where allowed by other paragraphs in this section.
 5. Conduits 1 1/2" and greater shall be IMC or GRC except where flexible conduit is allowed by other paragraphs in this section.
 6. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible metal conduit, except in wet or damp locations use liquidtight flexible metal conduit.
 7. Damp or Wet Locations: PVC coated GRC or PVC.
 8. Underground:
 - a. Conduits routed underground shall be rigid nonmetallic conduit with GRC or IMC elbow and GRC or IMC stub through slab.
 9. Exposed:
 - a. Below 8'-0" above finished floor: Rigid or intermediate metal conduit.
 - b. Above 8'-0" above finished floor: Electrical metallic tubing.
 10. Concealed in walls and above ceilings: Electrical metallic tubing.
 11. Type MC cable and Romex is not permitted.
 12. Conduit fittings:
 - a. RMC and IMC shall have threaded fittings.
 - b. EMT shall have steel compression fittings except steel set screw fittings will be accepted for 1/2" and 3/4" raceways.
 13. Boxes and Enclosures: NEMA Type 1.
- C. For conduits that pass through exterior walls use environmental conduit seal type fittings.

3.03 INSTALLATION

- A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.
- B. Use of plastic anchors must be pre-approved by project engineer.
- C. Conceal conduit and EMT within walls, ceilings, and floors except where specifically noted in the plans and specifications.
- D. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.
- E. Install raceways level and square and at proper elevations. Provide adequate headroom.
- F. Complete raceway installation before starting conductor installation.
- G. Use temporary closures to prevent foreign matter from entering raceway.
- H. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
- I. Make bends and offsets so the inside diameter is not reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
- J. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings.
- K. Install Linkseal on all underground conduits that enter a building space.

- L. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions, except as otherwise indicated.
- M. Do not embed raceways slabs.
- N. Install raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.
 - 1. Run parallel or banked raceways together, on common supports where practical.
 - 2. Make bends in parallel or banked runs from same center line to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.
- O. Join raceways with fittings designed and approved for the purpose and make joints tight.
 - 1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
 - 2. Use insulating bushings to protect conductors.
- P. Tighten set screws of threadless fittings with suitable tool.
- Q. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter square to the box and install two locknuts with dished part against the box.
- R. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
- S. Install pull wires in empty raceways. Use No. 14 AWG (1.6 mm) zinc-coated steel or monofilament plastic line having not less than 200-lb (90 kg) tensile strength. Leave not less than 12 inches (300 mm) of slack at each end of the pull wire.
- T. Telephone and Signal System Raceways 2-Inch Trade Size (Size 53) and Smaller: In addition to the above requirements, install in maximum lengths of 150 feet (45 m) and with a maximum of two 90-deg bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.
- U. Install raceway sealing fittings according to the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:
 - 1. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
 - 2. Where otherwise required by the National Electrical Code.
- V. Stub-Up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs, and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6 inches (150 mm) above the floor. Where equipment connections are not made under this Contract, install screwdriver-operated threaded flush plugs flush with floor.
- W. Flexible Connections: Use maximum of 6 feet (1830 mm) of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.
- X. Install hinged cover enclosures and cabinets plumb. Support at each corner.
- Y. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment

connectors. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.04 PROTECTION

- A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touch-up coating recommended by the manufacturer.

3.05 CLEANING

- A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION

**SECTION 26 05 53
ELECTRICAL IDENTIFICATION**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section provides the minimum requirements for the identification of the components of the electrical system.
- B. Related Documents
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 26 01 00 - General Electrical Provisions.

1.02 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittal Procedures.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Nameplates shall be 1/8" 2-ply laminated with 1" high white letters on a black background.
- B. Wire and cable markers shall be permanently attached cloth, split sleeve, or tubing type.
 - 1. The identification shall be printed on the marker; write-on markers are not acceptable.
 - 2. Include the branch circuit number, control circuit or any other appropriate identification that will expedite future tracing and trouble shooting.
- C. Tape for wire color coding shall be thermo-plastic adhesive tape.
- D. Underground warning tape shall be a detectable polyester with aluminum foil core and polyester under-laminate, 2" wide, warning marker labeled "BURIED ELECTRIC LINE" or similar; Brady 91601, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Identify switchboards, panelboards, enclosed circuit breakers, enclosed switches, motor starters, variable frequency drives, and other electrical enclosures using engraved laminated plastic nameplates, specified above, as follows:
 - 1. Switchboards and panelboards with panel number.
 - 2. Motor starters, individual circuit breakers in switchboards and MCCs, and enclosed switches with equipment served (1" high letters).
 - 3. Other enclosures with equipment and location being served.
- B. Equip each distribution, lighting, and lighting control panel with a clear plastic covered typewritten directory accurately indicating rooms and/or equipment being serviced.
- C. All electrical systems shall be color coded per National Electrical Code.
 - 1.

	480Y/277 Volt Systems:	208Y/120 Volt Systems:
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	Blue
Neutral	Gray	White
Ground	Green with one yellow stripe	Green
Isolated Ground	Green with two yellow stripes	Green with one yellow stripe

2. Wire sizes #6 and smaller shall have color coded insulation the full length of the wire.
 3. Wire size #4 and larger shall have color coded insulation the full length of the wire or be identified with the appropriate color tape at all switchboards, panelboards, junction boxes, motor terminals, and any other enclosure where phase identification is necessary.
- D. Wires in each junction box, panelboard, disconnect, enclosure or outlet shall be labeled with wrap-on numbers according to the circuit number to which they are connected.
 - E. When wire of different systems junction in a common box, each cable shall be grouped with its own system and identified using tags or identification strips.
 - F. When a piece of equipment is fed from more than one electrical source or more than one disconnect switch must be off to completely disconnect the equipment provide signs at each disconnect warning of this hazard.
 - G. Identify all mechanical and electrical items with item, panel and circuit number.
 - H. Install arc flash warning labels at equipment if provided by the Engineer.
 - I. An underground warning marker shall be placed above buried cables and conduits the full length of the trench at a depth of 6" below grade.
 - J. Identify all non standard receptacles and multi-switch lighting controls as follows:
 1. Provide non-standard receptacles with engraved stainless steel plates identifying the equipment being served and the NEMA configuration of the device.
 2. Line voltage multi-switch lighting controls shall be labeled using engraved or stamped plates.
 3. Low voltage multi-switch lighting controls shall be labeled using factory provided label holders, or using stamped or engraved plates.
 - K. Identify all telecommunications cables, jacks, outlets, and components following the recommendations of BICSI and as per Section 27 10 00 of this specification.

END OF SECTION

**SECTION 26 24 16
PANELBOARDS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section encompasses the selection and installation of circuit breaker panelboards, and their circuit breakers.
- B. Related Documents
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 26 01 00 - General Electrical Provisions
 - 3. Section 26 05 53 - Electrical Identification
 - 4. Section 26 43 13 – Surge Protection Devices.

1.02 REFERENCES

- A. National Fire Protection Association (NFPA) Publications:
 - 1. No. 70 - National Electrical Code (NEC).
- B. Underwriters' Laboratories, Inc. (UL) Publications:
 - 1. No. 50 - Cabinet and Boxes, Electrical.
 - 2. No. 67 - Panelboards.
 - 3. No. 489 - Molded Case Circuit Breakers and Circuit Breaker Enclosures.
 - 4. UL 891 - Dead Front Switchboards.
- C. National Electrical Manufacturers Association (NEMA) Publications:
 - 1. No. PB-1 - Panelboards.
 - 2. NEMA PB 2: Deadfront Distribution Switchboards.
 - 3. NEMA PB 2.1: Proper Handling, Installation, Operation, and Maintenance of Deadfront Switchboards rated 600V or Less.
 - 4. No. AB-1 - Molded Case Circuit Breakers.

1.03 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittals and Substitutions in addition to the following requirements.
- B. Shop drawings for panel.
- C. Product data on circuit breakers.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. General
 - 1. Furnish and install distribution and power panelboards as shown on the plans. Panelboards shall be dead-front, safety type equipped with thermal magnetic, molded case bolt-on circuit breakers of frame and trip ratings as shown on the schedule. Provide Type 1, Class I, UL listed.
 - 2. Panelboard bus structure and main lugs or main breaker shall have current ratings as shown on the drawings. Buses shall be rated to withstand a minimum of 110% of the maximum calculated available fault circuit current, but not less than 22,000 amperes symmetrical.

3. Panelboard assembly, including main breaker, shall be 80% rated unless otherwise noted. All sections and branch units shall be bussed directly to bus structure.
 4. Phase, neutral and ground busses shall be copper.
 5. Panelboards to be fully rated AIC.
 6. Bussing for neutrals shall be 100% rated throughout unless indicated otherwise on the panel schedules.
 7. All panelboards shall be completely factory assembled with molded case circuit breakers. Circuit breaker AIC rating shall not be lower than panelboard withstand rating. Series rating of main and branch circuit breakers is permitted as shown on drawings.
 8. Provide mounting brackets, busbar drillings, filler pieces for unused spaces and ground bus.
 9. Arrange buses for 3-phase wire distribution.
 10. Ground Bus: Provide an un-insulated copper equipment ground bus bar.
 11. Panelboards shall bear the UL label and conform to latest NEC requirements
- B. Distribution Panelboards:
1. Distribution Panelboards including, but not limited to, housing, buses, circuit breakers, and main circuit breaker. UL listed for service entrance.
 2. Construction: Provide steel enclosure (NEMA 1), provide lockable door. Provide ventilating louvers where required to limit the temperature rise of current carrying parts. Thoroughly clean and prepare all steel for factory painting by a phosphate or similar treatment, and follow immediately with a primer coat of rust-inhibiting paint. Final finish coat shall be the manufacturers standard gray.
 3. Equipment shall be comparable to Square D (I-Line).
- C. Branch Circuit Panelboards:
1. Panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel is to be specified in UL Standard 50 for cabinets. The size of wiring gutters shall be in accordance with UL Standard 67. Recessed cabinets to be equipped with spring latch and tumbler lock on door of trim. Doors over 48" long shall be equipped with three-point latch and vault lock. All locks shall be keyed alike. End walls shall be removable. Fronts shall be of code gauge, full finished steel with rust-inhibiting primer and baked enamel finish.
 2. Panelboards shall have branch circuits numbered vertically in two rows, (1, 3, 5 and 2, 4, 6, etc.). Branch runs shall be connected by circuit numbers indicated on drawings.
 3. Minimum circuit trip rating shall be 20 amps for power and lighting.
 4. Panelboards shall be comparable to Square D NQ or NF.
- D. Circuit Breakers
1. Molded Case Circuit Breakers:
 - a. Molded case circuit breakers shall have over-center, trip-free, toggle-type operating mechanism with quick-make/quick-break action and positive handle indication. Two- and three-pole breakers shall be common trip.
 - b. Construction shall be of a rugged, integral housing type molded insulating material, with silver alloy contacts, arc quenchers and phase barriers for each pole.
 - c. Each circuit breaker shall have a permanent trip unit containing individual non-adjustable thermal and magnetic trip elements in each pole with a common trip bar for all poles and a single operator. Circuit breaker operating handles shall assume a center position when tripped. All breakers shall be calibrated for operation in an ambient temperature of 40°C. Magnetic trip shall be adjustable from 3X to 10X for breakers with 400 ampere frames and higher. Factory setting shall be HI, unless otherwise noted.

- d. Main and feeder breakers for emergency systems shall have LSI electronic trip units for coordination.
 - e. Breakers shall have removable lugs. Lugs shall be UL Listed for copper conductors. Breakers shall be UL Listed for installation of mechanical screw type lugs or crimp lugs.
 - f. Circuit breakers in panelboards shall be bolt-on type on phase bus bar and shall have minimum interrupting rating exceeding calculated maximum available fault current by 10%. Series rating of main and branch circuit breakers is permitted as shown on drawings.
- E. Acceptable manufacturers are Square-D, Eaton/Cutler Hammer, GE.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation shall be in accordance with National Electrical Code, as shown on the drawings, and as herein specified.
- B. Emergency systems shall be selectively coordinated per NEC 700.27. A copy of the study shall be submitted to the Engineer and AHJ.
- C. Follow manufacturer's installation instructions.
- D. Properly ground switchboard per National Electrical Code and this specification.
- E. All wiring terminations to be marked as to wire number or circuit number.
- F. Flush mounted panel shall have tubs set into walls square with building lines and front panel, trim will match with tub and wall.
- G. Provide a minimum of (4) spare $\frac{3}{4}$ " conduits from panel tub to above accessible ceiling space for each recessed panel.
- H. All panels shall be mounted at a 6'-6" maximum height above finished floor to the top of the enclosure.
- I. Properly mount circuit breakers so that acceptable electrical connection is made to bus work.
- J. Each panel shall be provided with a neatly typewritten directory identifying its circuit connections. Panel identification and directories shall comply with Section 26 05 53 of this specification.

END OF SECTION

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**SECTION 26 27 26
WIRING DEVICES**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This Section encompasses the selection and installation of wiring devices to include:
 - 1. Line Voltage Wall Switches
 - 2. Dimmer Switches
 - 3. Receptacles
 - 4. Cover Plates
- B. Related Documents
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 26 01 00 - General Electrical Provisions.
 - 3. Section 26 05 53 - Electrical Identification.

1.02 REFERENCES

- A. Underwriters Laboratories Inc. (UL) Publications:
 - 1. UL-20 Underwriter's Laboratories General Use Snap Switches.
- B. National Electrical Manufacturers Association (NEMA) Publications:
 - 1. WD 1 General Purpose Wiring Devices: National Electrical Manufacturers Association Standards (NEMA).
- C. American National Standard Institute (ANSI):
 - 1. C 73 Series American National Standard Institute (ANSI) American Standards on Plugs and Receptacles.

1.03 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittal Procedures in addition to the following requirements.
- B. Product data of all types of items supplied.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Wall Switches
 - 1. Lighting and other flush switches shall be specification grade, quiet operating, toggle type in totally enclosed base of the following make and catalog number or approved equal:
 - a. Single Pole 20 amp 120/277V Hubbell No. 1221
 - b. Two Pole 20 amp 120/277V Hubbell No. 1222
 - c. Three Way 20 amp 120/277V Hubbell No. 1223
 - d. Four Way 20 amp 120/277V Hubbell No. 1224
 - 2. Color shall be light almond.
 - 3. Pilot light switches shall be lighted button and a switch. The load and the neon lamp should operate simultaneously.

4. Reference to Hubbell devices has been used as a means of establishing the grades and types of devices for use on the project. Comparable devices of Bryant, Leviton, or Pass & Seymour, Inc. will be acceptable.
- B. Dimmer Switches:
1. Dimmer switches shall be compatible for the fixture type which is being dimmed.
 2. Where permitted, individual dimmer switches shall be Nova T slide to off. Provide capacity as required by load.
- C. Receptacles:
1. Standard Duplex Receptacle: Full gang size, specification grade, polarized, duplex, parallel blade, grounding slot, rated at 20 amperes, 120 volts, to conform to NEMA WD-1. Receptacles shall be similar to those as manufactured by Hubbell (No. 5362) or equivalent devices by Bryant, Leviton, or Pass & Seymour, Inc.
 2. Ground fault receptacle: UL listed Class A with 5 milli-ampere sensitivity 20 ampere 120 VAC rating grounded NEMA 5-20R. Manufactured by Bryant, Leviton, Hubbell, Pass & Seymour, Inc., or equal.
 3. TVSS receptacle UL listed to standards 1449 and 498. Receptacle shall be similar to those as manufactured by Hubbell (No. 5262S) or equivalent devices by Bryant, Leviton, or Pass & Seymour, Inc.
 4. Color of devices shall be light almond.
- D. Cover Plates: Provide for standard switches and receptacles.
1. Material:
 - a. Plastic, non-combustible, mar-proof thermosetting material, minimum 0.100" thick.
 - b. Steel: Hot dip galvanized, 1.25 oz/sq.ft. minimum.
 - c. Cast Metal: Die cast profile, ribbed for strength, flash removed, primed with gray enamel, furnished complete with four mounting screws.
 - d. Gaskets: Resilient rubber or closed cell foam urethane.
 2. Type Application:
 - a. Flush Mounting Plates: Nylon in all living and office areas, stainless steel in all others.
 - b. Surface Box Plates: Beveled, steel, pressure formed for smooth edge to fit box.
 - c. Weatherproof Covers: Cast aluminum, high impact nonmetallic, gasketed for in-use covers.
 3. Acceptable manufacturers are Hubbell, Crouse-Hinds, Bryant, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All wiring devices shall be of one manufacturer and shall be delivered to project in original cartons. Devices shall be in accordance with Electrical Symbol Legend.
- B. Mounting heights shall be as specified on the drawings.
- C. Coordinate switch mounting location with architectural detail.
- D. Standard duplex receptacles shall be oriented with the ground opening on the bottom.
- E. Receptacles indicated with GFCI on the drawings are to be GFCI receptacles. GFCI protection of standard receptacles through GFCI circuit breakers is not permitted unless noted otherwise.
- F. The outdoor units to be enclosed in cast aluminum boxes with weatherproof in-use covers.

- G. Provide engraved nameplate for receptacle other than standard duplex receptacle.
- H. Device plates of the one-piece type shall be provided for all outlets to suit the devices installed; do not use sectional type device plates. Screws shall be of metal with countersunk heads, in color to match the finish of the plates. Screws shall be vertically aligned. Install plates with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices; plaster filling will not be permitted.

END OF SECTION

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**SECTION 26 28 13
FUSES**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section encompasses the selection and installation of fuses and current limiters.
- B. Related Documents
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 26 01 00 - General Electrical Provisions
 - 3. Section 26 28 16 - Motor & Circuit Disconnects

1.02 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittals and Substitutions in addition to the following requirements.
- B. Product data.
- C. Test reports on conditions.
- D. Time current curves and current limitation curves.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Time delay, dual element fuses.
 - 1. Ferrule, blade, type.
 - 2. Fiber, laminated, casing.
 - 3. Ampere rating as shown.
 - 4. 250 and 600 volt rating.
 - 5. 200,000 ampere interrupting rating.
 - 6. Class G, RK1, or RK5 and UL listed.
 - 7. Can withstand 110% of rated load current at 25 degrees C indefinitely.
 - 8. Provide a time delay of at least 10 seconds at 500% of rated load current.
- B. Acceptable manufacturers of fuses are Bussman, Reliance fuse or equal.
- C. Fuseholders:
 - 1. Bakelite, porcelain, phenolic base.
 - 2. Spring clips with side barriers and screw terminals.
 - 3. Screw, waterproof, in-the-line universal mounting.
 - 4. Panel-mounted type.
 - a. Standard.
 - b. Snap-lock.
 - c. RFI shielded.
 - d. Waterproof.
 - e. Bayonet knob.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Fuses to be properly mounted or bolted into their fuseholder so as to maintain proper continuity.
- B. Fuses and fuseholders sized according to the NEC.
- C. Coordination with other protective devices shall be accomplished by using proper time-current curves.
- D. Where ampere rating or protective device is 600 amperes or less, protection shall be Type RK5 dual element fuses having a minimum interrupting rating of 100,000 amperes RMS.
- E. Where the ampere rating of the protective device is 30 amperes or less and where the voltage is not over 150 volts to ground, protection shall be cartidge fuses or Type RK5C fuses, having a minimum interrupting rating of 20,000 amperes.
- F. Single phase motors of 150 volts or less to ground shall be protected with Type RK1 fuses in motor running protection sizes.
- G. Single or three phase motors operated on line voltages over 150 volts shall be installed with individual motor running protection by using Type RK5 fuses, having a minimum interrupting rating of 20,000 amperes.

END OF SECTION

**SECTION 26 28 16
DISCONNECT SWITCHES**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section encompasses all motor and general circuit disconnects including separately mounted disconnects and those mounted in motor control centers, panelboards and switchboards.
- B. Related Documents
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 26 01 00 - General Electrical Provisions
 - 3. Section 26 28 13 - Fuses

1.02 REFERENCES

- A. Underwriters Laboratories Inc. (UL):
No. 98 - Enclosed Switches.
- B. National Fire Protection Association (NFPA):
No. 70 - National Electrical Code (NEC).
- C. National Electrical Manufacturers Association (NEMA):
No. KS 1 - Enclosed Switches.

1.03 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittals and Substitutions in addition to the following requirements.
- B. Provide shop drawings for approval for all disconnects switches that are not included with equipment, including outline and mounting dimensions, wiring schematic diagrams and withstandability ratings.
- C. Provide product data for approval for all disconnects not an integral part of equipment.
- D. Provide typical test report data for all disconnects outlined above.
- E. Provide manuals for operation and maintenance data including renewal parts for all disconnects.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Disconnect Switches:
 - 1. The disconnect switches shall be safety type, NEMA type HD, UL listed, lockable, with quick-make, quick-break operating handle, and mechanism forming an integral part of the box, not in the cover. The switches to have dual cover interlock to prevent unauthorized opening of door in the "ON" position or closing mechanism with door open. Handle position shall indicate if switch is ON or OFF. Switches shall have removable arc suppressors, where necessary to permit easy access to line-side lugs. Lugs shall be UL listed for aluminum and/or copper cables and front removable. All current carrying parts shall be plated.
 - 2. In outdoor locations, the disconnect switch enclosures and operators shall be NEMA 3R.

3. Provide fusible disconnect switches with clips for fuses which have adequate interrupting capacity for the application and have an adequate short circuit current withstand rating to meet or exceed the available short circuit current.
4. Disconnect switches shall be provided with lugs suitable for the conductors used.
5. Acceptable manufacturers are Square-D, Eaton, General Electric, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install motor and circuit disconnects in accordance with manufacturers recommendations and applicable codes.
- B. Disconnect switches for single phase motors rated 1 HP and less may be a snap switch type general use switch if it is provided with a means for locking the switch in the open position.
- C. Disconnect switches for motors 1-1/2 HP and larger shall be heavy duty switches similar to Square "D" Type H heavy duty line.

END OF SECTION

**SECTION 26 28 18
CIRCUIT BREAKERS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. This section encompasses the selection and installation of circuit breakers in their related enclosures.
- B. Related Documents
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 26 01 00: General Electrical Provisions.
 - 3. Section 26 24 19: Motor Starters.
 - 4. Section 25 24 16: Panelboards.

1.02 REFERENCES

- A. National Fire Protection Association (NFPA) Publications:
No. 70 National Electrical Code (NEC).
- B. National Electrical Manufacturers Association (NEMA) Publications:
No. AB-1 Molded Case Circuit Breakers.
- C. Underwriters Laboratories, Inc. (UL) Publications:
No. 489 Molded Case Circuit Breakers and Circuit Breakers Enclosures.

1.03 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittals and Substitutions in addition to the following requirements.
- B. Product data including applicable shop drawings.
- C. Coordination and characteristic curves for circuit breakers.
- D. Test reports.

PART 2 - PRODUCTS

2.01 EQUIPMENT

- A. Molded Case Circuit Breakers:
 - 1. Molded case circuit breakers shall have over-center, trip-free, toggle-type operating mechanism with quick-make/quick-break action and positive handle indication. Two- and three-pole breakers shall be common trip.
 - 2. Construction shall be of a rugged, integral housing type molded insulating material, with silver alloy contacts, arc quenchers and phase barriers for each pole.
 - 3. Each circuit breaker shall have a permanent trip unit containing individual non-adjustable thermal and magnetic trip elements in each pole with a common trip bar for all poles and a single operator. Circuit breaker operating handles shall assume a center position when tripped. All breakers shall be calibrated for operation in an ambient temperature of 40°C. Magnetic trip shall be adjustable from 3X to 10X for breakers with 400 ampere frames and higher. Factory setting shall be HI, unless otherwise noted.
 - 4. Breakers shall have removable lugs. Lugs shall be UL Listed for copper conductors. Breakers shall be UL Listed for installation of mechanical screw type lugs or crimp lugs.

5. Circuit breakers in panelboards shall be bolt-on type on phase bus bar and shall have minimum interrupting rating as follows:
 - a. 120 volt breakers: 10,000 amperes symmetrical.
 - b. 208 and 240 volt breakers: 22,000 amperes symmetrical.
 - c. 480 volt breakers: 22,000 amperes symmetrical.
 6. Provide ground fault interrupters with 4-6 ma sensitivity.
 7. For circuit breakers being added to existing panelboards, coordinate the breaker type with existing panelboards. Modify the panel directory.
- B. Acceptable manufacturers are: Square-D, General Electric, Eaton, Siemens, or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Circuit breakers to be mounted in enclosures, or panels.
- B. Breakers shall have permanently installed lockout devices.
- C. Enclosure for circuit breaker shall be properly grounded.
- D. Attach handles so as not to interfere with cover plate or door.
- E. Properly mount circuit breaker so that acceptable electrical connection is made to bus work.
- F. Termination of breaker terminals shall be to industry standards.
- G. Installation shall be in accordance with National Electrical Code, as shown on the Drawings, and as herein specified.
- H. Balance the load on all phases and rearrange branch circuiting if required, for balancing.

END OF SECTION

**SECTION 26 50 00
LIGHTING**

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes interior, exterior, and site lighting fixtures, lamps, ballasts, LED's, drivers, emergency lighting units, and accessories.
- B. Related Documents
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
 - 2. Section 26 01 00 - General Electrical Provisions

1.02 DEFINITIONS

- A. Emergency Lighting Unit: A fixture with integral emergency battery-powered supply and the means for controlling and charging the battery. It is also known as an emergency light set.
- B. Fixture: A complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts required to distribute light, position and protect lamps, and connect lamps to power supply. Internal battery-powered exit signs and emergency lighting units also include a battery and the means for controlling and recharging the battery. Emergency lighting units include ones with and without integral lamp heads with remote capability to power an exterior emergency fixture.
- C. Average Life: The time after which 50 percent fails and 50 percent survives under normal conditions.

1.03 SUBMITTALS

- A. Comply with Section 01 33 00 - Submittals and Substitutions in addition to the following requirements.
- B. Product Data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange Product Data for fixtures in order of fixture designation. Include data on features and accessories and the following:
 - 1. Outline drawings indicating dimensions and principal features of fixtures.
 - 2. Electrical Ratings and Photometric Data: Certified results of independent laboratory tests for fixtures and lamps.
 - 3. Battery and charger data for emergency lighting units.
- C. Shop Drawings detailing nonstandard fixtures and indicating dimensions, weights, method of field assembly, components, features, and accessories.
- D. Wiring diagrams detailing wiring for control system showing both factory-installed and field-installed wiring for specific system of this Project, and differentiating between factory-installed and field-installed wiring.

1.04 QUALITY ASSURANCE

- A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.
- B. Listing and Labeling: Provide fixtures, emergency lighting units, and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.
 - 1. Special Listing and Labeling: Provide fixtures for use in damp or wet locations, and recessed in combustible construction that are specifically listed and labeled for such use.

2. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
 3. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- C. Coordinate fixtures, mounting hardware, and trim with ceiling system and other items, including work of other trades, required to be mounted on ceiling or in ceiling space.

1.05 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Manufacturer's Warranty: Shall be submitted within closeout documents.
- C. Special Warranty for Batteries: Submit a written warranty executed by the manufacturer agreeing to replace rechargeable system batteries that fail in materials or workmanship within the specified warranty period.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, fixtures that may be incorporated into the Work include, but are not limited to, the products specified in the Light Fixture Schedule.
- B. Electronic ballasts for fluorescent light fixtures shall be manufactured by Motorola except where other manufacturers have been specifically approved by the Architect/Engineer.
- C. Dimmable electronic ballasts for compact fluorescent light fixtures shall be manufactured by Lutron except where other manufacturers have been specifically approved by the Architect/Engineer.

2.02 FIXTURES AND FIXTURE COMPONENTS

- A. Metal Parts: Free from burrs, sharp corners, and edges.
- B. Sheet Metal Components: Steel, except as indicated. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit re-lamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during re-lamping and when secured in operating position.
- D. Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:
 1. White Surfaces: 85 percent.
 2. Specular Surfaces: 83 percent.
 3. Diffusing Specular Surfaces: 75 percent.
 4. Laminated Silver Metallized Film: 90 percent.
- E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or water white, annealed crystal glass, except as otherwise indicated.
 1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 2. Lens Thickness: 0.125 inch (3 mm) minimum; except where greater thickness is indicated.
- F. Drivers for LED Fixtures:

1. Electronic Driver for LED Fixtures: Comply with UL 1310 Class 2 requirements for dry and damp locations. EMI compliance with FCC Part 15 Class A. Include the following features unless otherwise indicated:
2. Rated for 50,000 hours of life, unless otherwise noted.
3. Type: Constant current
4. Sound Rating: Class A.
5. Total Harmonic Distortion Rating: 20 percent or less.
6. Power factor at full load: >0.90
7. Efficiency at full load: >85%
8. Input Voltage: 120V - 277V (+/- 10%)
9. Frequency Range: 50 – 60 Hz (+/- 10%)
10. Transient Protection: NEMA SSL – 2010, Non-Roadway 2.5KV
11. Over voltage and load protection: Yes, non-latching
12. Ambient Operating Temperature: -30C to 50C
13. Dimming Control: 0-10V (isolated)
14. Dimming Range: 10% - 100%
15. Source/Sink Current: 1mA max.

G. LED Fixtures:

1. Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.
2. Include the following features unless otherwise indicated:
3. Each Luminaire shall consist of an assembly that utilizes edge-lit LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
4. Luminaire optics shall consist of precision formed optical assembly with positively retained high grade acrylic lenses using laser precise micro-prism patterns to provide directional distribution
5. Each luminaire shall be rated for a minimum operational life of 100,000 hours utilizing a maximum ambient temperature of (25°C).
6. Light Emitting Diodes tested under LM-80 Standards for a minimum of 10,000 hours.
7. Color Rendering Index (CRI) of 82 at a minimum.
8. Color temperature 4000K, unless otherwise indicated.
9. Rated lumen maintenance at 92% lumen output for 100,000 hours, unless otherwise indicated.
10. Fixture efficacy of 115 Lumens/Watt, minimum
11. Fixture depth shall be no greater than 3.25"
12. 5 year luminaire warranty, minimum.
13. Photometry must comply with IESNA LM-79.
14. The individual LEDs shall be constructed such that a catastrophic loss of the failure of one LED will not result in the loss of the entire luminaire.
15. Luminaire shall be constructed such that driver may be replaced or repaired without the replacement of the whole fixture.

H. Technical Requirements:

1. The luminaire shall not consume power in the off state.
2. Operation Voltage: The luminaire shall operate from a 50 HZ to 60 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
3. Power Factor: The luminaire shall have a power factor of 0.9 or greater.

4. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.
 5. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
- I. Thermal Management:
1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
 2. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
 3. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
 4. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.
- J. Exit Signs: Conform to UL 924 and the following:
1. Sign Colors: Refer to Luminaire Schedule on drawings.
 2. Arrows: Include as indicated.
 3. Lamps for AC Operation: Light-emitting diodes (LED), 70,000 hours minimum rated life.
- K. Self-Powered Exit Signs (Battery Type): Integral automatic high/low trickle charger in a self-contained power pack.
1. Battery: Sealed, maintenance-free, 90 minute minimum running time, nickel-cadmium type with special warranty.
- L. Emergency Lighting Units: Conform to UL 924. Provide self-contained units with the following features:
1. Battery: Sealed, maintenance-free with minimum 10-year nominal life and special warranty.
 2. Charger: Minimum 2-rate, fully automatic, solid-state type, with sealed transfer relay.
 3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. Relay disconnects lamps and battery and automatically recharges and floats on trickle charger when normal voltage is restored.

2.03 LAMPS

- A. Comply with ANSI C78 series that is applicable to each type of lamp.
- B. Fluorescent Color Temperature and Minimum Color-Rendering Index (CRI): 3500 K and 85 CRI, except as otherwise indicated.
- C. Non-compact Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid start circuits.
- D. Metal Halide as specified in Luminaire Schedule on drawings.

2.04 FINISHES

- A. Manufacturer's standard, except as otherwise indicated, applied over corrosion-resistant treatment or primer, free of streaks, runs, holidays, stains, blisters, and similar defects.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's written instructions and approved Shop Drawings.
- B. Support for Recessed and Semi-recessed Grid-Type Fluorescent Fixtures: Units may not be supported from suspended ceiling support system. Install ceiling support system rods or wires at a minimum of 4 rods or wires for each fixture, located not more than 6 inches (150 mm) from fixture corners.
 - 1. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corner.
 - 2. Fixtures Smaller than Ceiling Grid: Install a minimum of 4 rods or wires for each fixture and locate at corner of ceiling grid where fixture is located. Do not support fixtures by ceiling acoustical panels.
 - 3. Fixtures of Sizes Less than Ceiling Grid: Center in acoustical panel except where located along walls that are oriented at a different angle than the ceiling grid. In this case, position light fixtures in a line parallel to the wall. Support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
- C. Provide support for pendant fixtures that is separate from the ceiling grid.
- D. Lamping:
 - 1. Where specific lamp designations are not indicated, lamp units according to manufacturer's instructions.

3.02 CONNECTIONS

- A. Ground lighting units. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.03 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Give advance notice of dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Tests: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include the following information in tests of emergency lighting equipment:
 - 1. Duration of supply.
 - 2. Low battery voltage shutdown.
 - 3. Normal transfer to battery source and retransfer to normal.
 - 4. Low supply voltage transfer.
- E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.
- F. Report results of tests.
- G. Replace fixtures that show evidence of corrosion during Project warranty period.

3.04 ADJUSTING AND CLEANING

- A. Clean fixtures after installation. Use methods and materials recommended by manufacturer.
- B. Allow for three separate sessions with architect, engineer and owner's representative to adjust exterior floodlight fixtures.

END OF SECTION

**SECTION 31 00 00
EARTHWORK**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
1. Clearing and grubbing.
 2. Stripping and stockpiling topsoil.
 3. Rough grading.
 4. Proof-rolling of stripped sub-grades.
 5. Excavating, filling, compacting, and grading sub-grade, sub-base, and base course for building foundation and footing, floor slab, sidewalks, yard slabs, and pavement.
 6. Disposal of excavated materials not required for fills.
 7. Dewatering of excavations for building foundation and footing, floor slab, sidewalks, yard slabs, and pavement.
 8. Drainage of all areas of the Work to prevent standing water and erosion of excavations for building foundation and footing, floor slab, sidewalks, yard slabs, and pavement.
 9. Protection of excavations for building foundation and footing, floor slab, sidewalks, yard slabs, and pavement.
 10. Furnishing and placing select fill and backfill materials.
 11. Topsoil placement and finish grading for landscaping.
 12. Providing temporary haul roads and erosion controls.
 13. Restoration.
- B. Related Sections:
1. Section 02 30 00 - Subsurface Investigations
 2. Section 31 25 00 - Erosion and Sedimentation Control
 3. Section 31 23 16 - Trenching

1.02 DEFINITIONS

- A. Influence Zone Under Footings: Foundations, Pavements, Floor Slabs, Yard Slabs, or Sidewalks: Area below sub-base bounded by a horizontal to two vertical slope extending outward from one foot beyond outer edges.
- B. Influence Zone Around Piping, Electrical, and Ducts: Area below limits bounded by horizontal line 12 inches above pipe, conduit, or duct and by one horizontal to two vertical slope extending downward from that line one foot beyond outer edge of pipe, conduit, or duct.

1.03 REFERENCES

- A. ASTM C136- Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- B. ASTM D1557- Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort.
- C. ASTM D2487- Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
- D. ASTM D2922- Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
- E. ASTM D3017- Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.04 SUBMITTALS

- A. General: Submittals shall be made in accordance with Technical Specification Section 01 33 00.
- B. Quality Control Submittals:
 - 1. Test Reports: Submit three copies of compaction test reports for existing in-place soils and controlled fill, laboratory test reports, and field footing sub-grade evaluation reports.

1.05 PROJECT/SITE CONDITIONS

- A. Environmental Requirements:
 - 1. All erosion control methods shall comply with Wisconsin Construction Site Management Handbook as published by the Department of Natural Resources.
 - 2. Dust Control:
 - a. Use all means necessary to control dust on and near the Work and on and near all site borrow areas if such dust is caused by the Contractor's operations during performance of the Work or if resulting from the condition in which the Contractor leaves the site.
 - b. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of other Work on the site.
- B. Existing Conditions:
 - 1. Where existing sewers, water, electric or other services are encountered, Contractor shall take adequate steps to protect such services.
 - 2. If such existing services require relocation, make written request for ruling from the Architect/Engineer. Do not proceed on such portions of Work until written instructions are received. Costs involved shall be negotiated.
 - 3. Information Based on Preliminary Investigations:
 - a. Information pertaining to preliminary investigations, such as test borings, location of utilities, and existing grades has been collected for the Project and will be available for review by bidders. There is no expressed or implied guarantee that conditions so indicated are entirely representative or those actually existing or that unforeseen developments may not occur. The interpretation of results of such investigation shall not be the responsibility of the Architect/Engineer. The Contractor shall visit the Site and make his own interpretation of conditions, based on his investigation of existing conditions and on soil reports. Where underground services, utilities, etc., are located on the Drawings or given at the Site, they are based on available records, but are not guaranteed to be complete or correct. They are merely available for assistance.
- C. Protection:
 - 1. Use all means necessary to protect all materials of this section before, during, and after installation and to protect all objects designated to remain.
 - 2. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer at no additional cost to the Owner.
 - 3. Use all means necessary to protect all existing utilities, roads, and all other site improvements that are to remain.

1.06 SEQUENCING AND SCHEDULING

- A. Sequence and schedule activities so that work will progress in a timely manner. Contractor shall schedule and sequence work with all Contractors on the Project.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Fill and Usage:
 - 1. Approval is required by geotechnical engineer in writing to the Architect/Engineer.
 - 2. Composition: Bank run gravel conforming to Wisconsin Department of Transportation Specification Section 304 and ASTM C 136.
 - 3. Classification
 - a. Floor Slabs, Footings, and Aprons at Building:
 - i. 100 percent passing screen having nominal square opening size of 3".
 - ii. Not more than 30% retained on 3/4" sieve.
 - iii. Not more than 46% passing No. 100 sieve.
 - iv. Raising Site Grades: Not more than 12% passing No. 200 sieve.
 - v. Final Eight Inches of Fill Material: Not more than 5% passing No. 200 sieve.
 - b. Exterior Concrete Yard Slabs and Walks:
 - i. Raising Site Grades: Silty Clay with moisture content of 2 to 3 percent of optimum moisture content. Lifts not to exceed 6" in loose thickness and compacted with sheepsfoot type roller. Minimum compaction 95%.
 - ii. Final Eight Inches of Fill Material: Not more than 5% passing No. 200 sieve.
 - c. Paved Areas and Concrete Aprons at Roads:
 - i. Raising Site Grades: Silty Clay with moisture content of 2 to 3 percent of optimum moisture content. Lifts not to exceed 6" in loose thickness and compacted with sheepsfoot type roller. Minimum compaction 95%.
 - ii. Final Inches of Fill Material: Not more than 5% passing No. 200 sieve.
- B. Earth Fill:
 - 1. On-site subsoil or borrow free from organic material and other deleterious substance and rocks or lumps over six inches in greatest dimension, and not more than 15% of the rocks or lumps shall be larger than 2 1/2 inches in greatest dimension.
Satisfactory materials are defined as those meeting ASTM D2487 Soil Classification Groups GW, GP, GM, GC, SW, SP, SM, SC, and CL.
 - a. Unsuitable Material: Soil Classification Groups ML, OL, MH, CH, OH and Pt.
- C. Topsoil Fill: On-site topsoil. Use excess topsoil for landscaping and filling in turf areas.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Notify corporations, companies, individuals, or authorities owning above or below ground conduits, wires, pipes, or other utilities running to property or encountered during excavation operations. Cap or remove and relocate services as required.

3.02 PREPARATION

- A. Protection: Protect, support, maintain conduits, wires, pipes, or other utilities that are to remain in accordance with the requirements of owners of said services.
- B. Surface Preparation:
 - 1. Layout of Work:
 - a. Layout site earthwork.
 - b. Establish sitework elevations.

3.03 CLEARING AND GRUBBING

- A. Accept the site as found and remove all trash, rubbish, and other debris.
- B. Remove all trees, saplings, bushes, vines, and undergrowth within the Contract Limits as required for execution of construction except for planning to remain or removed by others as indicated on the Drawings.
- C. Remove all stumps, roots, and matted roots within the limits of grubbing depths below:
 - 1. Walks 12 inches below bottom of base course
 - 2. Drives 18 inches below bottom of base course
 - 3. Parking Areas 12 inches below bottom of base course
 - 4. Lawn Areas 8 inches below bottom of new topsoil
 - 5. Fills 12 inches below bottom of fill zone
 - 6. Where drives, walks, and other construction or fills overlap, the greater depth shall apply.
- D. Remove the material from the site. Burning of materials on-site is not permitted.

3.04 STRIPPING AND STOCKPILING TOPSOIL

- A. Remove topsoil and unsuitable material to its entire depth from areas to be occupied by buildings and paving, and from areas to have change in grade.
- B. Stockpile topsoil in a designated or approved location. Remove excess topsoil from the site.

3.05 PROOF ROLLING OF STRIPPED SUB-GRADES

- A. Proof roll subgrades under building areas, walk areas, and areas to be paved in the presence of the geotechnical engineer. Proof roll after stripping to sub-grade and immediately prior to placing fill material.
- B. Proof roll with at least two passes performed in a criss-cross pattern with a fully loaded tri-axle dump truck with a minimum gross weight of 30 tons, or equivalent acceptable to the Design Professional.
 - 1. Adjust as necessary for proper weather conditions.
- C. Remove soft, loose, weak, and unstable or unsuitable soils and replace with approved compacted fill materials and re-compact.

3.06 EXCAVATING

- A. Excavate to elevations and dimensions necessary to complete construction.
- B. Remove unsuitable material as determined by Geotechnical Engineer.
- C. Remove excess material from the Site.

3.07 PLACING FILL

- A. Notify Owner and Soils Testing Agency before placing fill material.
- B. Do not use wet or frozen material or place fill on wet, unstable or frozen sub-grade.
- C. Fill excavations below bottom of foundation or footing elevations within influence zone with concrete or structural fill.
- D. Do not backfill until new concrete has been properly cured, and required tests have been accepted.
- E. Place fill simultaneously on both sides of free-standing structures.
- F. Fill adjacent to structure, footings, and foundation walls shall be structural fill.
- G. Place fill against foundation walls enclosing interior spaces only after construction is in place to brace the top of the wall.
- H. To minimize lateral forces against structure due to wedging action of soil, begin compaction

of each layer at structure wall.

- I. Provide mechanical compaction for cohesive materials and vibratory compaction for granular materials. Compaction by travel of grading equipment shall not be considered adequate for uniform compaction.
- J. Provide hand guided vibratory or tamping compactors whenever fill is to be placed in confined areas.
- K. Lift Thickness: Place materials uniformly in layers not to exceed 6 inches in depth, measured loose, for cohesive soils; and in layers not to exceed 8 inches in depth, measured loose for granular materials.
- L. Compact to the percent of maximum dry density listed in the following schedule in accordance with ASTM D 1557.

<u>Compaction Schedule Location</u>	<u>Minimum Percent Compaction</u>
Footing or Foundation Slab Influence Zone & Adjacent to Foundations	95
Floor Slab, Pavements, Subgrade Pipe Influence Zones; Walks, aprons, and stoops	95

<u>Compaction Schedule Location</u>	<u>Maximum Percent Compaction</u>
Lawns and Landscape Areas	80

- M. Compact sub-grade to degree required for subsequent fill.
- N. Moisture Content of Fill: Within 3% of optimum when placed and compacted. For silty clay see paragraph 2.01.A.3. b. & c in this Section.
- O. Testing Requirements:
 - 1. Contractor shall provide testing.
 - 2. Geotechnical Engineer shall check all foundation subgrades to verify bearing capacities and settlement characteristics of foundation soils prior to the construction of foundations.
- P. Test Frequency:
 - 1. Test sub-grade and fill to check bearing capacity or densities as follows:
 - a. At each layer of compacted fill, one test for every 5,000 sq. ft., for areas other than backfill at foundation wall.
 - b. At sub-grade of each individual pad footing.
 - c. At sub-grade for continuous footings at 50 ft. center to center.
 - d. At each layer of compacted fill for foundations, floor slabs, pavements, utility trenches, walks, aprons, and step sub-grade.
 - e. At each layer of compacted backfill for foundation walls, and adjacent to foundations, test locations not to exceed 50 ft. center to center.
 - 2. Test performed on successive layers of fill shall be made at alternating and remote locations from each other to provide a representative profile of the section or area being constructed.
- Q. Rough Grading Tolerances:
 - 1. Granular cushion: Plus or minus 0.1 ft.
 - 2. All backfill: Plus or minus 0.1 ft.

3.08 DRAINAGE

- A. All building material waste shall be properly managed and disposed to prevent pollutants and debris from being carried off the site.
- B. Grade around the building so that ground is pitched to prevent water from running into

excavated areas and damaging structures.

- C. Maintain all excavations and trenches where footings are to be placed, free of water at all times.
- D. Provide all pumping required to keep excavated areas clear of water during construction.
 - 1. Use geotextile bag and discharge to appropriate location on site to prevent erosion
 - a. Maximum apparent opening size: ASTM D-4751, 0.212 mm
 - b. Grab Tensile Strength: ASTM D-4632, 300 lbs.
 - c. Mullen Burst: ASTM D-3786, 580 psi
 - d. Permeability: ASTM D-4491, 0.2 cm/sec
 - e. Fabric: Nominal Representative Weight, 12 oz.
 - 2. Geotextile bags shall be securely attached to discharge pipe
 - 3. Discharge shall be directed to either a sediment trap or sediment basin

3.09 RIPRAP

- A. Provide light riprap in accordance with Wisconsin DOT Standard Specifications 606 'Rip Rap' latest edition.
- B. Rip rap at all storm pipe outlets to the bottom of slopes 4:1 or steeper at a minimum 4'-0" wide. Unless specified otherwise, riprap shall be at least 1'-0" thick, measured perpendicular to the slope.
- C. Provide geotextile fabric under rip rap.

3.10 SHEETING AND SHORING

- A. All excavation of every description and of whatever substances encountered shall be performed to the depths indicated or otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner in a sufficient distance from the banks of the trench or pit to avoid overloading and to prevent slides or cave-ins. Sheeting and shoring shall be placed as may be necessary for the protection of the Work and for the safety of personnel.

3.11 PLACEMENT OF TOPSOIL

- A. Prior to spreading topsoil, scarifying the sub-grade to a depth of two inches to promote the bonding of the topsoil to the subsoil.
- B. Spread and compact topsoil to a uniform depth of eight inches in all landscaped areas and other areas stripped, but no paved or otherwise constructed upon.

3.12 RESTORATION

- A. Restore all lawn and surface areas, whether within the Contract limits or not, disturbed as a result of earthwork operations of this job.
- B. Conduct earthwork operations in a manner that prevents spillage on streets and adjacent areas. Clean-up spillage, on-site and off-site, caused by earthwork operations.

3.13 TEMPORARY HAUL ROAD

- A. Temporary haul road shall be constructed to the thicknesses, lengths, and widths necessary to assure trades access to and from the Site, and to and from construction zones to places of equipment storage. The road shall be constructed to prevent sediment from being tracked onto public or private roadways. The temporary haul road shall be constructed adjacent to the job trailer and the road shall be wide enough at the job trailer to permit proper ingress and egress of construction trades and authorized personnel parking during peak hours.

3.14 PROTECTION OF EXCAVATIONS

- A. Protect newly graded areas from traffic and erosion. Repair settlement and washing that occurs prior to acceptance of Work. Reestablish grades to required elevations and slopes.

3.15 DISPOSAL OF EXCAVATED MATERIALS

- A. Dispose of all excess excavation on the Site as directed by the Architect/Engineer.

END OF SECTION

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SECTION 31 23 23
FILL

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This item shall consist of furnishing, placing and compacting materials in accordance with these Specifications, the Contract, as shown on the Drawings in plans and cross sections, or as directed by the Design Professional. The work shall be done at the locations and to the lines and grades as shown on the Drawings or as directed by the Design Professional.

1.02 REFERENCE STANDARDS

- A. ASTM D1556 – Test Method for Density of Soil in Place by Sand-Cone Method.
- B. ASTM D1557 – Test Method for Moisture-Density Relations of Soil and Soil-Aggregate Mixtures using a 10-lb. Rammer and 18-in. Drop.
- C. ASTM D2922 – Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Fill: Fill shall consist of earth that is free from boulders, masonry or other unacceptable materials. Earth containing sod, organic matter or humus shall not be included in this classification. This classification does not include Select Fill and Topsoil.
- B. Select Fill: Select Fill shall refer to processed or selected natural materials. The material shall consist of sand, a mixture of sand with gravel, crushed stone, or crushed concrete, more generally identified as pit run sand, pit run sand and gravel, crushed stone base course, crusher run crushed stone, and crushed concrete. The gradation of the material shall be such that not less than one-hundred percent (100%) passes a six-inch (6") sieve; not less than eighty-five percent (85%) by weight passes a three-inch (3") sieve; and not less than twenty-five percent (25%) passes a No. 4 sieve. The material shall be free from dirt, debris, frozen materials, vegetable matter, and lumps or balls of clay. The source and the material to be used for the various purposes shall be subject to the approval of the Design Professional.

The definitions set forth below shall apply to this material.

1. Sand: Granular material almost entirely passing the No. 4 sieve and predominantly retained on the No. 200 sieve.
2. Gravel: Rounded to sub-angular granular material, predominantly retained on a No. 4 sieve, obtained from deposits created by the reduction or disintegration of rock.
3. Crushed Stone Base Course: Material as defined in 32 11 00, Base Course, of these Specifications.
4. Crusher Run Crushed Stone: Hard, durable particles of crushed stone resulting from the artificial crushing of rock, boulders, or large cobble stones which will not meet the gradation requirements for Crushed Stone Base Course as defined above, but which will meet the gradation requirements for Select Fill as specified herein.
5. Crushed Concrete: Granular material resulting from the artificial crushing of hardened concrete.
6. Unless otherwise specified or directed by the Design Professional, the materials to be used as Select Fill for the various purposes intended, including constructing embankments, backfilling excavations for unsuitable materials, backfilling trenches, and backfilling excavations for structures, shall be any of the above, at the Contractor's option.

- C. Three-inch (3") Crushed Stone: Backfill of the undercut area of the subbase shall consist of three-inch (3") crushed stone or breaker run at the depth specified in the Drawings.
- D. Salvageable Crushed Stone: When directed by the Design Professional, the Contractor shall segregate salvable crushed stone, free of earth, debris and vegetable matter, from the existing pavement, and shall use this crushed stone as Select Fill material under concrete curb and gutter, concrete sidewalk and pavement, at no additional cost to the Owner.
- E. Topsoil: Topsoil shall be of humus-bearing soil, adapted to the sustenance of plant life and commonly known as black dirt, and shall be free of stones, debris, vegetable material and excesses of peat, sand or clay.
- F. Embankment and pavement subgrade materials:
 - 1. Fill material to be used in the construction of embankments under sidewalks, curbs and pavements shall consist of processed or selected natural materials satisfactory to the Design Professional. The material shall be free of boulders, masonry, sod, organic matter, humus, frozen materials or other unacceptable materials. The maximum size of the material in the upper portion of the embankment within twelve inches (12") of the subgrade shall be less than six inches (6") in any dimension. All areas under such embankments shall be stripped of all topsoil and organic materials, and shall be compacted in accordance with the requirements for "Standard Compaction" in paragraph 3.03 of this Section before the fill material for the embankment is placed. Fill material for such embankments shall not be placed on frozen ground. Fill material for such embankments shall be compacted in accordance with the requirements for "Special Compaction" in paragraph 3.04 of this Section.
 - 2. Fill materials to be placed in those portions of embankments under sidewalks, curbs and pavements which lie beyond the limits of assumed two horizontal-to-one vertical (2H:1V) slopes extending outward and downward from the outer limits of the finished construction may consist of materials conforming to the requirements of fill material as defined in paragraph 2.01.A. of this Section, except that such materials may contain sod, organic matter and humus. Such materials shall be compacted in accordance with the requirements for "Standard Compaction" in paragraph 3.03 of this Section. The Design Professional may waive this density requirement for unstable materials permitted to be placed in embankments outside the above designated slopes.

PART 3 - EXECUTION

3.01 GENERAL

- A. Where the terms "Standard Compaction" and "Special Compaction" appear herein, they shall be as defined in paragraphs 3.03 and 3.04, respectively, in this Section.
- B. The material to be used for backfilling the excavations for unsuitable materials and for the backfilling of excavations for bridges, culverts, retaining walls and other structures shall be Select Fill as defined in paragraph 2.01.B. of this Section. Such materials shall be compacted in accordance with the requirements for "Special Compaction", as described in paragraph 3.04 in this Section.

3.02 COMPACTION – GENERAL

- A. Fill materials except Select Fill, Salvageable Crushed Stone and Topsoil shall be compacted in accordance with the requirements for "Standard Compaction" unless otherwise specified herein or in the Contract. Select Fill materials and Salvageable Crushed Stone materials shall be compacted in accordance with the requirements for "Special Compaction" unless otherwise specified in the Contract. Topsoil shall be lightly compacted in order to minimize future settlement.
- B. Fill material shall not be compacted when the moisture content is such as to cause excessive rutting by the hauling equipment or excessive displacement or distortion under the compacting equipment. Where such conditions exist, the fill material shall be allowed to dry prior to compacting. When necessary, drying of such fill material shall be accelerated by

aeration or manipulation by means of blade graders, discs or other appropriate equipment.

- C. When the fill material does not contain sufficient moisture to compact properly, water shall be added in quantities deemed necessary to aid and accelerate and to secure effective compaction.
- D. Compaction testing shall be done by a certified soils tester. The number and timing of tests shall be at the sole discretion of the Design Professional. The cost of all normal soil testing shall be paid by the Owner.

3.03 STANDARD COMPACTION

- A. The fill material shall be deposited, spread and leveled in layers not exceeding twelve inches (12") in thickness before compaction. Each layer of the spread and leveled fill material shall be compacted to the degree that no further appreciable consolidation is evidenced under the action of the compaction equipment. The required compaction shall be attained for each layer before any fill material for a succeeding layer is placed thereon.
- B. Hauling and leveling equipment shall be routed and distributed over each layer of the fill material in such a manner as to make use of the compaction afforded thereby. Should the Design Professional determine that the compaction is not satisfactory or sufficient, special compaction equipment shall be used to accomplish the compaction. Such special compaction equipment shall include tamping rollers, pneumatic-tired rollers, vibratory rollers, or other types of equipment designed for compaction, which will produce the required results in the materials encountered and be subject to the approval of the Design Professional.

3.04 SPECIAL COMPACTION

- A. Upon the properly prepared ground surface, the fill material shall be deposited, spread and leveled in layers generally not exceeding twelve inches (12") in thickness before compaction. Each layer of the spread and leveled fill material shall be compacted by means of suitable compaction equipment to not less than the specified density before the succeeding layer is placed
- B. All fill material placed within the limits of assumed two-to-one (2:1) slopes extending outward and downward from the outer limits of the finished construction shall be compacted to not less than the density specified below.
- C. Fill materials in embankments of six feet (6') or less in height shall be compacted to at least ninety-five percent (95%) of maximum density for their full depth. Fill material in embankments over six feet (6') in height shall have the top six feet (6') compacted to not less than ninety-five percent (95%) of maximum density, and those portions more than six feet (6') below the finished subgrade shall be compacted to at least ninety percent (90%) of maximum density.
- D. The maximum density shall be determined in accordance with the Standard Method of Test for the Moisture-Density Relations of Soils, ASTM Designation D1557, Method D, with replacement of the fraction of material retained on the 200-mesh sieve with No. 4 to 20-mesh material. The density of compacted fill material shall be determined in accordance with the Test for Density of Soil-in-Place by the Sand-Cone Method, ASTM Designation D1556, Test for Density of Soil and Soil Aggregate in Place by Nuclear Methods, ASTM Designation D2922, or by other approved methods.
- E. In the event the material in the density sample differs in percentage of aggregate retained on a No. 4 sieve from that in the sample upon which maximum density was determined, the maximum density shall be adjusted in accordance with approved procedure.
- F. The foregoing density requirements shall not apply to portions of embankments constructed of materials which, because of numerous large stones or high percentages of material retained on the No. 4 sieve, cannot, in the determination of the Design Professional, be accurately tested in accordance with the above procedures for determining maximum of in-place dry density.

3.05 SUBGRADE COMPACTION IN CUTS

- A. The finished earth subgrade in cut sections for a width equal to the width of the proposed construction shall be compacted as provided for "Standard Compaction" unless "Special Compaction" is called for in the Contract.
- B. On grading projects where Special Compaction is required, the finished earth subgrade in cut sections to the width above described and to a depth of at least six inches (6") shall be compacted to at least ninety-five (95%) of maximum density. Determination of maximum density and attained density in the earth subgrade shall be in accordance with the methods prescribed for "Special Compaction" in paragraph 3.04 of this Section.

3.06 TOPSOIL COMPACTION

- A. Topsoil shall be placed at least four inches (4") thick, nominally compacted to minimize future settlement and shall be graded and raked to the satisfaction of the Design Professional. Finished topsoil areas shall be free of stones, road materials or lumps of dirt.

END OF SECTION

**SECTION 32 11 23
AGGREGATE BASE COURSE**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Work under this section includes all labor, materials, equipment, and services necessary to complete the aggregate base course work as shown on the drawings and herein specified.
 - 2. Work includes aggregate base course work for under bituminous paving, concrete paving, curb and gutter and shoulders.
- B. Related Sections
 - 1. Division 32 Section 32 12 16 Bituminous Paving
 - 2. Division 32 Section 32 13 13 Concrete Paving

1.02 REFERENCES

- A. Wisconsin Department of Transportation, *State of Wisconsin Standard Specifications for Highway and Structure Construction*, Latest Edition.
 - 1. Section 301 "Base, Subbase, and Subgrade Aggregate"
 - 2. Section 305 "Dense-Graded Base"
 - 3. Section 312 "Select Crushed Material"

1.03 SUBMITTALS

- A. All submittals are to be in accordance with Division 01 – Section 01 33 00 Submittal Procedures.
- B. Submit material certificate of compliance from material supplier or test results from testing agency for sieve analysis.
- C. Submit inspection reports from Licensed Geotechnical Engineer.
- D. Submit test results from testing agency for maximum density and in-place density.
- E. Copy of testing agency DOT certifications for sampling.

1.04 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Conform to requirements of local, state, and federal rules and regulations applicable to work and project location.
 - 2. Conform to the applicable requirements and recommendations of the following codes, specifications, and standards except as modified by the Contract Documents and herein:
 - a. Wisconsin Department of Transportation, *Standard Specifications for Highway and Structure Construction*, Latest Edition. Referred to as WisDOT Standard Specifications.
 - 3. Where provisions of pertinent regulations, codes, and standards conflict with this specification, the more stringent provisions govern.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Crushed Aggregate
 - 1. Materials are to meet the requirements of Section 301 "Base, Subbase, and Subgrade Aggregate" of the WisDOT Standard Specifications for Dense 1.1/4" (31.5 mm) base and Section 305 "Dense-Graded Base" for 1.1/4" (31.5 mm) or 3" (75 mm) gradation for all base layers.
 - 2. Geotechnical Engineer to approve aggregate gradation for base layers.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Check subgrade for conformity with grade and cross section.

3.02 PREPARATION

- A. Prepare the foundation/subgrade or previously placed base layer as specified in Section 211 of the WisDOT Standard Specifications, before placing aggregate base course.
- B. Proof roll existing subgrade immediately prior to placement of aggregate base course.
 - 1. Proof roll with at least two passes performed in a crisscross pattern with a fully loaded tri-axle dump truck with a minimum gross weight of 30 tons, or equivalent acceptable to the Design Professional.
 - 2. Remove soft, loose, weak, and unstable or unsuitable soils and replace with approved compacted fill materials and re-compact.

3.03 CONSTRUCTION

- A. Placement
 - 1. See Section 301.3.4 of the WisDOT Standard Specifications.
- B. Compaction
 - 1. See Sections 301.3.4.2, 301.3.4.3 and 305.3.2 of the WisDOT Standard Specifications.
 - 2. Compact the aggregate base course to 95 percent (+/- 2%) of maximum density in accordance with of the WisDOT Standard Specifications.
- C. Site Tolerances
 - 1. See Section 301.3.4 of the WisDOT Standard Specifications.
 - 2. Smoothness: Not more than 1/4" above design grade or 1/2" below design grade.

3.04 FIELD QUALITY CONTROL

- A. Site Tests, Inspection
 - 1. Inspections
 - a. Inspections to be performed by a licensed Geotechnical Engineer, or technician under his/her direction.
 - b. Geotechnical Engineer to approve subgrade prior to aggregate base course placement.
 - c. Geotechnical Engineer to approve the aggregate base course installation.
 - d. Inspection to occur during subgrade compaction and after compaction of base course.
 - 2. Testing
 - a. Engage a testing agency with a licensed Geotechnical Engineer on staff acceptable to the Design Professional to perform sampling and testing responsibilities as specified.

- b. If tests indicate Work does not meet specified requirements, remove Work and replace. Retesting to be done, as required, until installation meets the specifications, and no further consideration for additional compensation will be given.
 - c. See Section 301.2.3 of the WisDOT Standard Specifications for sampling and testing standards.
3. All costs of inspections, tests and transportation of test material are considered incidental to the project, and no further consideration for additional compensation will be given.

END OF SECTION

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**SECTION 32 12 16
BITUMINOUS CONCRETE PAVING**

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes
 - 1. Work under this section includes all labor, materials, equipment, and services necessary to complete the bituminous concrete paving work as shown on the drawings and herein specified.
- B. Related Sections
 - 1. Division 32 Section 32 11 23 Aggregate Base Course
 - 2. Division 32 Section 32 12 16 Bituminous Concrete Paving

1.02 REFERENCES

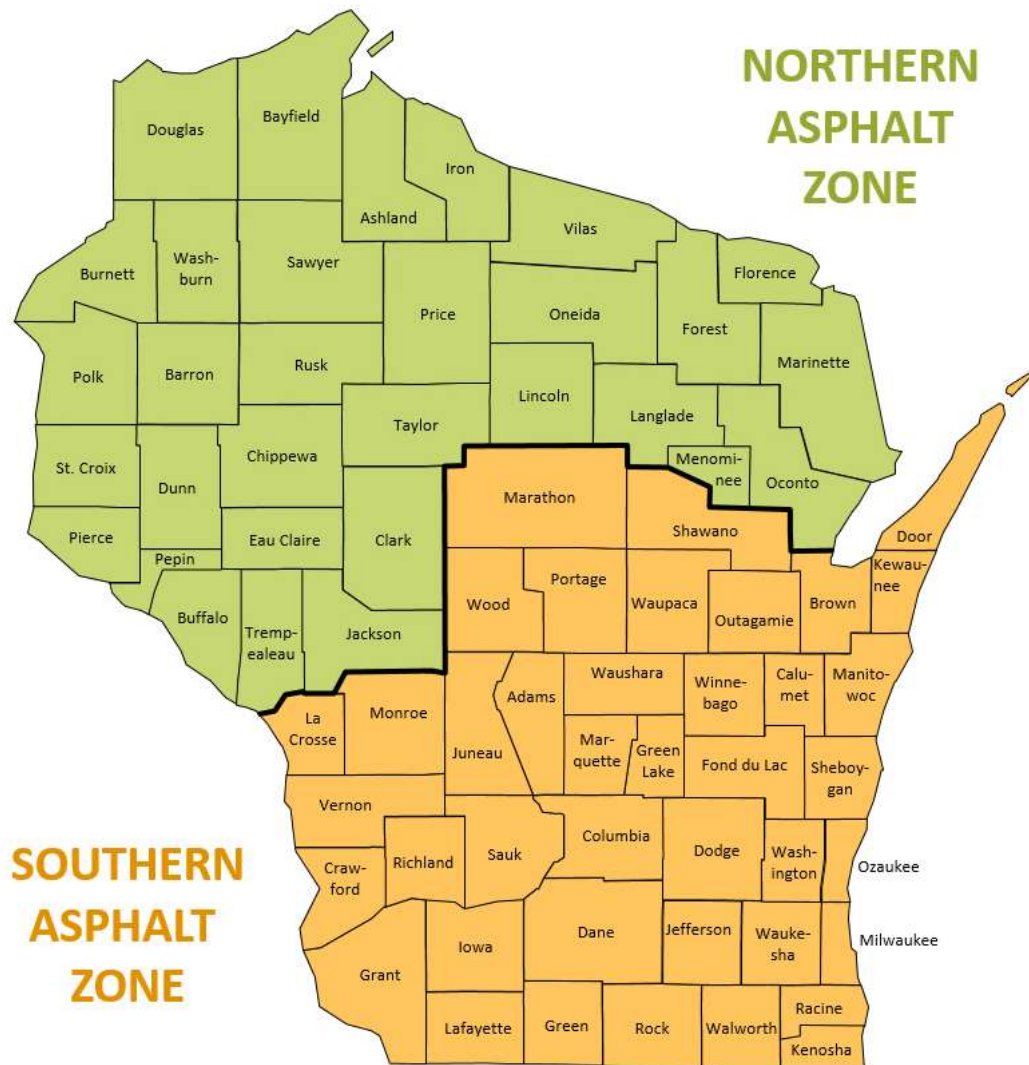
- A. Wisconsin Department of Transportation, *State of Wisconsin Standard Specifications for Highway and Structure Construction*, Latest Edition.
 - 1. Section 450 "General Requirements for Asphaltic Pavements"
 - 2. Section 455 "Asphaltic Materials"
 - 3. Section 460 "Hot Mix Asphalt Pavement"
 - 4. Section 465 "Asphaltic Surfaces"
 - 5. Section 475 "Seal Coat"
- B. Wisconsin Asphalt Pavement Association, "2018 Asphalt Pavement Design Guide."
- C. Wisconsin Asphalt Pavement Association, "2018 Asphalt Parking Lot Design Guide."

1.03 DEFINITIONS

- A. Asphaltic Binder: The principal asphaltic binding agent in HMA, including asphalt cement and material added to modify the original asphalt cement properties.
- B. Design Life: The design life is the period of time during which the pavement is expected by the designers to provide a certain level of service. It is original construction to a time where the pavement needs reconstruction, typically 15 to 20 years.
- C. ESAL: Equivalent single axle load. ESAL is a measurable relationship of pavement damage over the design life compared to the effects of axles carrying different loads.
- D. Filler: A finely divided mineral aggregate added to asphaltic mixtures to improve mixture properties.
- E. HMA: Hot Mix Asphalt
- F. HT: Heavy traffic level classification, > 8 million ESAL
- G. Leveling Layer: Initial layer placed thinner than the minimum required under Wisconsin Department of Transportation, Standard Specifications Section 460.3.2.
- H. Lower Layer: Any asphaltic pavement layer that will not be exposed to traffic when the pavement structure is complete. A pavement structure may have multiple lower layers.
- I. LT: Light traffic level classification, < 2 million ESAL
- J. MT: Medium traffic level classification, 2 – 8 million ESAL
- K. PG: Performance Graded
- L. Upper Layer: The asphaltic pavement layer exposed to traffic when the pavement structure is complete. A pavement structure has only one upper layer.

M. Wisconsin Asphalt Zones: Wisconsin is divided into two geographic zones--northern and southern--which dictate the asphaltic binder grade to be used. See map for county-by-county breakdown of zones.

1. Northern Zone: Ashland, Barron, Bayfield, Buffalo, Burnett, Chippewa, Clark, Douglas, Dunn, Eau Claire, Florence, Forest, Iron, Jackson, Langlade, Lincoln, Marinette, Menominee, Oconto, Oneida, Pepin, Pierce, Polk, Price, Rusk, Saint Croix, Sawyer, Taylor, Trempealeau, Vilas, Washburn
2. Southern Zone: Adams, Brown, Calumet, Columbia, Crawford, Dane, Dodge, Door, Fond du Lac, Grant, Green, Green Lake, Iowa, Jefferson, Juneau, Kenosha, Kewaunee, La Crosse, Lafayette, Manitowoc, Marathon, Marquette, Milwaukee, Monroe, Outagamie, Ozaukee, Portage, Racine, Richland, Rock, Sauk, Shawano, Sheboygan, Vernon, Walworth, Washington, Waukesha, Waupaca, Waushara, Winnebago, Wood



Courtesy of Wisconsin Asphalt Pavement Association, www.wispave.org/wisconsin-asphalt-zones/

1.04 SUBMITTALS

- A. All submittals are to be in accordance with Division 01 – Section 01 33 00 Submittal Procedures.
- B. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties
 - 1. Submit product information for asphalt and aggregate materials.
 - 2. Submit mix design with laboratory test results supporting design.
- C. Material Certificates: For each paving material, from manufacturer.

1.05 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Conform to requirements of local, state, and federal rules and regulations applicable to work and project location.
 - 2. Conform to the applicable requirements and recommendations of the following codes, specifications, and standards except as modified by the Contract Documents and herein:
 - a. Wisconsin Department of Transportation, *State of Wisconsin Standard Specifications for Highway and Structure Construction*. Referred to as WisDOT Standard Specifications.
 - 3. Where provisions of pertinent regulations, codes, and standards conflict with this specification, the more stringent provisions govern.
- B. Certifications
 - 1. Performance Graded Asphalt Binders:
 - a. Sampling and testing are in accordance with the most current version of the Combined State Binder Group Certification Method of Acceptance for Asphalt Binders.
 - 2. Other asphaltic materials:
 - a. Sampling other asphaltic material is in accordance with the Section 455.2.2.2 of the WisDOT Standard Specifications.
 - b. Testing is in accordance with the Section 455.2.3.2 of the WisDOT Standard Specifications.
 - 3. Hot Mix Asphalt Pavement:
 - a. Provide coarse aggregates from a Wisconsin Department of Transportation approved source.

1.06 PROJECT CONDITIONS

- A. Project Environmental Requirements
 - 1. Transporting and Delivering Mixtures
 - a. Deliver the mixture to the paver receiving hopper at a temperature between 260-300° F. Asphalt delivered below 260° F may be rejected by Design Professional. Cover all loads during inclement weather or when the ambient air temperature falls below 65° F.
 - 2. Environmental Limitations:
 - a. Tack Coat: Apply tack coat only when the air temperature is 32° F or more and the surface is dry and reasonably free of loose dirt, dust, or other foreign matter. Do not apply if weather or surface conditions are unfavorable or before impending rains.

- b. HMA Pavement – Lower Layer: Do not place asphaltic mixture when the air temperature approximately 3 feet above grade, in shade, and away from artificial heat sources is less than 36° F. The lower layer and base course may be placed at a lower temperature with the Design Professional's written approval.
 - c. Place asphaltic mixture only on a prepared, firm and compacted base, foundation layer, or existing pavement substantially surface-dry and free of loose and foreign material. Do not place over frozen subgrade or base, or when the roadbed underlying the foundation or base is temporarily unstable from the effects of frost heaving. Unless the contract provides otherwise, incorporate loose roadbed aggregate as a part of preparing the foundation, in shoulder construction, or dispose of as the Design Professional approves.
 - d. Do not place asphaltic mixture between October 15 and May 1, regardless of temperature, without the Design Professional's written approval or direction. Do not construe the Design Professional's non-approval as grounds for extending contract time. The Design Professional will conduct the final inspection and determine acceptance when the placement is complete.
 - e. If the Design Professional directs or allows placing asphaltic mixtures between October 15 and May 1, either by request or to complete the work to the stage the contract requires, the work will be performed at one's own risk. The Design Professional may subsequently revoke acceptance based on the results of a post-acceptance inspection in May. Restore all pavement damage or defects the Engineer attributes to temperature or other weather conditions occurring between October 15 and May 1 by repairing or replacing pavement the Design Professional directs.
3. Pavement Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40° F for oil-based materials, and not exceeding 95° F.

PART 2 - PRODUCTS

2.01 ACCESSORIES

- A. Exterior pavement markings
 - 1. Cold Paint: Type S or Type N traffic paint in accordance with AASHTO Designation M248. Regular set drying time, applied per manufacturer's instructions.
 - 2. Use only lead free paint.

2.02 AGGREGATES

- A. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- B. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
- C. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

2.03 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320, Performance Graded Binder as specified:
 - 1. LT Traffic Classification
 - a. LT 58-28 S
 - i. Northern and Southern Asphalt Zone
 - ii. 20-yr Design ESALs < 2 Million
 - iii. No modifications, for normal traffic situations
 - iv. Residential driveways

- v. School and recreational areas
 - vi. Parking lots
 - vii. Low volume roads
 - b. LT 58-34 S
 - i. Northern Asphalt Zone
 - ii. 20-yr Design ESALs < 2 Million
 - iii. Conditions and applications similar to LT 58-28 S
- 2. MT Traffic Classification
 - a. MT 58-28 S
 - i. Northern and Southern Asphalt Zone
 - ii. 20-yr Design ESALs 2 – 8 Million
 - iii. No modifications, for normal traffic situations
 - iv. Industrial parking lots
 - v. Medium volume rural roadways
 - b. MT 58-34 S
 - i. Northern Asphalt Zone
 - ii. 20-yr Design ESALs 2 – 8 Million
 - iii. Conditions and applications similar to MT 58-28 S
 - c. MT 58-28 H
 - i. Northern and Southern Asphalt Zone
 - ii. 20-yr Design ESALs 2 – 8 Million
 - iii. Applications similar to MT 58-28 S
 - iv. Slow moving traffic situations
 - d. MT 58-34 H
 - i. Northern Asphalt Zone
 - ii. 20-yr Design ESALs 2 – 8 Million
 - iii. Slow moving traffic situations
- 3. HT Traffic
 - a. HT 58-28 H
 - i. Northern and Southern Asphalt Zone
 - ii. 20-yr Design ESALs > 8 Million
 - iii. Truck terminals
 - iv. Industrial roadways
 - v. Slow moving traffic situations
 - b. HT 58-34 H
 - i. Northern Asphalt Zone
 - ii. 20-yr Design ESALs > 8 Million
 - iii. Conditions and applications similar to HT 58-28 H
- B. Tack Coat: ASTM D 977 emulsified asphalt or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.
- C. Recycled Asphaltic Materials: Recycled asphaltic materials content is according to Section 460.2.5 of the WisDOT Standard Specifications, except the maximum allowable percentage for the Upper Layer is 22%.

2.04 MIXES

- A. WisDOT standard paving mixes will usually be required for public roads. Same paving mixes may also be used for private work.
- B. Asphalt Paving Mixtures: Areas designated as Light Duty are designed as HMA Pavement LT in accordance with Section 460 of the WisDOT Standard Specifications. Areas designated as Heavy Duty are designed as HMA Pavement MT.
- C. Asphaltic mixture, which, in the judgment of the Design Professional, is not sufficiently mixed or is defective in another manner, will be rejected.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Site Verification of Conditions
 - 1. Verify that elevations and gradients of base are correct.
- B. Proof roll existing subgrade immediately prior to placement of aggregate base course.
 - 1. Proof roll with at least two passes performed in a crisscross pattern with a fully loaded tri-axle dump truck with a minimum gross weight of 30 tons, or equivalent acceptable to the Design Professional.
 - 2. Remove soft, loose, weak, and unstable or unsuitable soils and replace with approved compacted fill materials and re-compact.

3.02 PREPARATION

- A. Protection
 - 1. All exposed surfaces not to be covered with asphaltic concrete are to be protected during priming so that asphalt cement will not adhere to or discolor the surface. No pockets are to remain in the finished surface to prevent lateral drainage of water. All low spots are to be replaced at no additional cost to the Owner.
 - 2. Contact surfaces of curbs, gutters, underground appurtenances, and other structures are to be painted with a thin, uniform coating of hot asphalt cement, or asphalt cement dissolved in naphtha before the surface mixture is placed against them. The surface material is to be placed uniformly high so that after compaction, it will be approximately ¼" higher than adjacent gutter flanges and all other structures.
- B. Surface Preparation
 - 1. Apply tack coat to contact surfaces of curbs and concrete paving.
 - 2. Coat surfaces of manhole frames with oil to prevent bond with asphalt paving. Do not tack coat these surfaces.
 - 3. Cut edge of existing bituminous surfaces against which new pavement abuts in a straight and perpendicular cut.

3.03 INSTALLATION

- A. Water valve boxes and manhole frames are to be set to ¼" below the finished pavement grade.
- B. Loose material to be removed during the construction of all middle and upper lifts.
- C. Sweep or clean dust, dirt, debris and other foreign matter from the road prior to application of the tack coat.
- D. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted. Place asphalt pavement in accordance with Section 460 of the WisDOT Standard Specifications.

- E. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.04 APPLICATION

- A. Tack coat is to be applied at a rate of 0.050 to 0.070 gallons per square yard after dilution in conformance with Section 455.3.2 of the WisDOT Standard Specifications.
 - 1. Apply to surfaces on the longitudinal joints between successive paver passes and on contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement.
 - a. Tack coat may be eliminated if previous course is freshly placed and thoroughly clean.
 - b. Allow tack coat to dry until at proper condition to receive paving.

3.05 CONSTRUCTION

- A. Site Tolerances
 - 1. Density: Minimum required density is to conform to WisDOT Standard Specifications, Table 460-3 for traffic lanes.
 - 2. Thickness: In-place compacted thickness tested in accordance with ASTM D 3549 will not be acceptable if exceeding the following tolerances:
 - a. Lower Layer: Plus or minus 1/4 inch (6 mm).
 - b. Upper Layer: Plus 1/4 inch (6 mm), no minus.
 - 3. Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10 foot straightedge applied parallel to and at right angles to centerline of paved areas:
 - a. Lower (Base) Course: Plus or minus 1/2 inch.
 - b. Upper (Surface) Course: Plus 1/4 inch, no minus.
 - c. Crowned Surface: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.
- B. Joints
 - 1. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - a. Clean contact surfaces and apply tack coat to joints.
 - b. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
 - c. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
 - d. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
- C. Compaction
 - 1. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

2. Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted in accordance with Section 460 of the WisDOT Standard Specifications.
 3. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
 4. Compact all layers of HMA mixture to 91.0 – 93.0% of target maximum density. Refer to WisDOT Standard Specifications, Table 460-3, particularly Note 3 related to lower layers constructed on crushed aggregate or recycled base courses.
 5. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
 6. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
 7. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.
- D. Pavement Marking:
1. Allow paving to age for 30 days prior to starting pavement marking.
 2. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

3.06 REPAIR/RESTORATION

- A. Existing surfaces to be seal coated
1. Adhere to Section 475 "Seal Coat" of the WisDOT Standard Specifications.
 2. Immediately prior to application of asphalt material, existing surfaces are to be thoroughly cleaned with a power broom or other suitable equipment to remove dirt and other objectionable matter.
 3. The asphalt material is to be applied in a single application at a rate of approximately 1/3-gallon per square yard. When the desired stage of tackiness of the asphalt coat is attained, aggregate for seal coat cover is to be spread uniformly over the treated surface by mechanical spreaders. The amount of aggregate is to be sufficient to completely cover the treated surface, but limited to the approximate amount that can be embedded in and bonded by the asphalt material.
 4. Roll surface immediately after spreading the aggregate to ensure aggregate is thoroughly embedded in the asphalt material and the surface is smooth and uniform in texture.

3.07 FIELD QUALITY CONTROL

- A. Furnish a nuclear density machine with a qualified operator to verify field compaction. Testing to be performed the day of placement with a minimum of five density tests for every 200 ton placed. The five tests are taken across the width of the mat at a location determined by the Design Professional. The average of those five tests must meet minimum required density conforming to WisDOT Standard Specifications, Table 460-3.
- B. Paving density disincentives in conformance with Section 460.5.2.2 of the WisDOT Standard Specifications will be administered.
- C. All costs of testing and transportation of test material are considered incidental to the project, and no further consideration for additional compensation will be given.

END OF SECTION

**SECTION 32 13 13
CONCRETE PAVING**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work included: Provide portland cement concrete paving where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.
- B. Related work: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section
- B. Do not commence placement of concrete until mix designs have been reviewed and approved by the Architect/Engineer and all governmental agencies having jurisdiction and until copies of the approved mix designs are at the job site and the batch plant.
- C. Provide access for, and cooperate with, the inspector and testing laboratory representative.

1.03 PRODUCT DELIVERY: STORAGE AND HANDLING

- A. Cement: Store in weather-tight enclosures and protect against dampness, contamination, and warehouse set.
- B. Aggregates:
 - 1. Stock pile to prevent excessive segregation, or contamination with other materials or other sizes of aggregates.
 - 2. Use only one supply source for each aggregate stock pile.
- C. Admixtures:
 - 1. Store to prevent contamination, evaporation or damage.
 - 2. Protect liquid admixtures from freezing or harmful temperature ranges.
 - 3. Agitate emulsions prior to use.

1.04 ENVIRONMENTAL REQUIREMENTS

- A. Allowable Concrete Temperatures:
 - 1. Cold weather: Maximum and minimum, ASTM C 94.
 - 2. Hot weather: Maximum 90` F.
 - 3. Do not place concrete during rain, sleet or snow unless protection is provided.

PART 2 - PRODUCTS

2.01 FORMS

- A. Construct forms with tight joints to the exact sizes, shapes, lines and dimensions shown as required to obtain accurate alignment, location, grades, level and plumb work in the finished structure.
- B. Earth forms will not be permitted for paving.

2.02 REINFORCEMENT

- A. Comply with the following as minimums:
 - 1. Bars: ASTM A 615/ A 615M, Grade 60, unless otherwise shown on the Drawings, using

- deformed bars for number 3 and larger.
- 2. Welded wire fabric: ASTM A 185.
- 3. Bending: ACI 318.
- B. Fabricate reinforcement to the required shapes and dimensions, with fabrication tolerances complying with the CRSI "Manual of Standard Practices".
- C. Do not use reinforcement having any of the following defects:
 - 1. Bar lengths, depths or bends exceeding the specified fabricating tolerances;
 - 2. Bends or kinks not indicated on the Drawings or required for the Work;
 - 3. Bars with cross-section reduced due to excessive ruse or other causes.

2.03 CONCRETE

- A. Concrete shall conform to the applicable requirements of Section 03 30 00 except as otherwise specified. Concrete shall have a minimum compressive strength of 3500 PSI at 28 days. Maximum size of aggregate shall be 1 ½ inches.
- B. Air Content
 - 1. Mixtures shall have air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.
- C. Slump
 - 1. The concrete slump shall be 2 inches where determined in accordance with ASTM C 143/ C 143M.
- D. Comply with the following as minimums:
 - 1. Portland cement: ASTM C 150, Type I or II, low alkali.
- E. Aggregate, general:
 - 1. ASTM C 330, uniformly graded and clean
 - 2. Do not use aggregate known to cause excessive shrinkage.
 - 3. Aggregate, coarse: crushed rock or washed gravel with maximum size between ¾" and 1 ½", and with minimum size number 4.
 - 4. Aggregate, fine: natural washed sand of hard and durable particles varying from fine to particles passing a 3/8" screen, of which at least 12% shall pass a 50-mesh screen.
- F. Water: Clean and potable
- G. Use only such additives as are recommended in the mix design and approved by the Architect/Engineer and governmental agencies having jurisdiction.
- H. Provide concrete in the proportions established by the approved mix design.

2.04 OTHER MATERIALS

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FINAL PREPARATION OF SUBGRADES

- A. After preparation of subgrade as specified in another Section of these Specifications, thoroughly scarify and sprinkle the entire area to be paved and then compact to a smooth,

hard, even surface of 95% compaction to receive the aggregates.

3.03 PLACEMENT OF BASE COURSE

- A. Base (where required):
 - 1. Spread the specified coarse aggregate to a thickness providing the compacted thickness shown on the Drawings.
 - 2. Compact to 96%.
- B. Thickness tolerance: Provide the compacted thickness shown on the Drawings within a tolerance of minus 0.0" to plus 0.5".
- C. Smoothness tolerance: Provide the lines and grades shown on the Drawings within a tolerance of 0.05 feet vertically and 1" in alignment at any point.
- D. Correct deviations by removing materials, replacing with new materials and reworking or recompacting as required.
- E. Use only the amount of moisture needed to achieve the specified compaction.

3.04 INSTALLATION

- A. Upon completion of base course and formwork, install reinforcement (if required) as shown on the Drawings.
 - 1. Clean reinforcement to remove loose rust and mill scale, earth and other materials which reduce bond or destroy bond with concrete.
 - 2. Position, support and secure reinforcement against displacement by formwork, construction and concrete placement operations.
 - 3. Place reinforcement to obtain the required coverage for concrete protection.
- B. Transit mix the concrete in accordance with provisions of ASTM C 94.
 - 1. With each load, provide ticket certifying to the materials and quantities and to compliance with the approved mix design.
 - 2. On the transit-mix ticket, state the time water was first added to the mix.
 - 3. At the batch plant, withhold 2 ½ gal of water per cu yd of concrete.
 - 4. Upon arrival at the job site, and as directed by the testing laboratory inspector, add all or part of the withheld water before the concrete is discharged from the mixer.
 - 5. Mix not less than five minutes after the withheld water has been added and not less than one minute of that time immediately prior to discharge of the batch.
 - 6. Unless otherwise directed provide 15 minutes total mixing time per batch after first addition of water.
- C. Do not use concrete that has stood over 30 minutes after leaving the mixer or concrete that is not placed within 60 minutes after water is introduced into the mix.
- D. Conveying:
 - 1. Place concrete in accordance with the following and pertinent recommendations contained in ACI 304.
 - 2. Deposit concrete continuously in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section.
 - 3. If a section cannot be placed continuously, provide construction joints as specified herein.
 - 4. Perform concrete placing at such a rate that concrete which is being integrated with fresh concrete is still plastic.
 - 5. Deposit concrete as nearly as practicable in its final location so as to avoid segregation due to rehandling and flowing.
 - 6. Do not subject concrete to any procedure which will cause segregation.

7. Do not use concrete which becomes non-plastic and unworkable or does not meet required quality control limits or has been contaminated by foreign materials.
 8. Remove rejected concrete from the Site.
- E. Deposit and consolidate concrete in a continuous operation within the limits of construction joints until the placing of a panel or section is completed.
1. Bring surfaces to the correct level with a straightedge and then strike off.
 2. Use bullfloats or darbies to smooth the surface, leaving it free from bumps and hollows.
 3. Do not sprinkle water on the plastic surface. Do not disturb the surfaces prior to start of finishing operations.
- F. Expansion joints:
1. Do not permit reinforcement to extend continuously through any expansion joint.
 2. Locate expansion joints along the edges of all structures and where indicated, filled to full depth with expansion joint material.
- G. Finishing:
1. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
 2. During or after the first floating, check the planeness of surface with a ten foot straightedge applied at not less than two different angles.
 3. Cut down high spots and fill low spots and produce a surface level within $\frac{1}{4}$ " in two feet as determined by a two foot straightedge placed anywhere on the surface in any direction.
 4. Refloat the surface immediately to a uniform sandy texture.
 5. While the surface is still plastic provide a textured finish by drawing a fiber bristle broom uniformly over the surface.
 - a. Unless otherwise directed by the Architect/Engineer provide the texturing in one direction only.
 - b. Provide light, medium or course texturing as directed by the Architect/Engineer.

3.05 CURING AND PROTECTION

- A. Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.

END OF SECTION

**SECTION 33 44 16
PREFABRICATED UTILITY TRENCH DRAIN SYSTEMS**

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Work Included:
 - 1. Provide prefabricated trench drain system, complete, in place, as shown on the Drawings, specified herein, and needed for a complete and proper installation.

1.02 QUALITY ASSURANCE

- A. Standards:
 - 1. Comply with standards specified in this Section.
- B. Qualifications of Manufacturer:
 - 1. Use products in the work of this Section produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect/ Engineer.
- C. Qualifications of Installers:
 - 1. Use skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.03 SUBMITTALS

- A. General:
 - 1. Comply with provisions of Section 01 33 00.
- B. Manufacturer's Data:
 - 1. Within 15 calendar days after award of Contract, submit:
 - 2. Complete materials list of all items proposed to be furnished and installed under this Section;
 - 3. Manufacturer's specifications and other data required to demonstrate compliance with the specified requirements;
 - 4. Shop Drawings showing components, arrangements, dimensions, orientation on ground, sections of members, dimension elevations, grounds, reinforcements, and accessories.

1.04 PRODUCT HANDLING

- A. Protection:
 - 1. Use all means necessary to protect materials of this Section before, during, and after installation and to protect installed work and materials of all other trades.
- B. Replacements:
 - 1. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect/Engineer and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 PREFABRICATED TRENCH DRAINS

- A. Design of Trench drains is based on Perma-Trench model Z-806-HDG, as manufactured by Zurn Industries, Inc... The drain shall incorporate a grate and frame able to withstand a uniform load of 50 PSF and a concentrated load of 2000 lbs. on a 20 square inch area. The grate shall also be heel proof. Design of the grate is based on model number Z-882-RPG, as manufactured by Zurn. Equivalent products of other manufacturers may be considered

subject to the provisions of Section 01 33 00.

- B. Grate system shall show compliance with ADAAG Section 4.5.4. and conform to ASTM specification A536-84, Grade 80-55-06.
- C. Equip trench drain with channel braces and channel chairs to prevent any movement of the frame during installation of concrete.
- D. Furnish to the Owner upon substantial completion of the Project two shovel heads shaped to match the inside diameter of a channels as manufactured by drain supplier. The shovel heads shall be secured to 5'-0" long wood handles furnished by the Contractor.

2.02 OTHER MATERIALS

- A. All other materials, not specifically described, but required for a complete and proper installation of the work of this Section, shall be new, first-quality of their respective kinds, and as selected by the Contractor subject to the approval of the Architect/Engineer.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to the proper and timely completion of the work to approval of the Architect/Engineer. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Install in locations shown on the Drawings, as specified herein, and at elevations per Drawings and in accordance with the manufacturer's instructions. Furnish and install all grounds, brackets, anchors, trim and accessories for a complete installation.

3.03 FINAL INSPECTION

- A. The manufacturer's recommended installation procedures, when approved by the Architect/Engineer, will become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

END OF SECTION