

# PROJECT MANUAL

## PORT OF GULFPORT MISSISSIPPI STATE PORT AUTHORITY

### EAST PIER DEEP WATER WHARF FOR USM/NOAA



MP Design Group Project # 0297.23.001  
REV 0 ISSUED FOR BIDDING 01.18.2024



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# ADVERTISEMENT TO BID

Mississippi State Port Authority

The MISSISSIPPI STATE PORT AUTHORITY AT GULFPORT has authorized the advertisement to bid on the following project:

## **“EAST PIER DEEP WATER WHARF FOR USM/NOAA”**

The work consists of, but is not limited to:

Furnish all materials, equipment, labor, and supervision and performing all operations necessary for the completion of Mississippi State Port Authority **“East Pier Deep Water Wharf for USM/NOAA”** project at Gulfport, Mississippi as described in the contract documents.

Generally, the project includes outfitting the existing east pier with infrastructure to support research vessels for USM and NOAA, modifications to the “Small Boat Pier” located west of the 30th Ave. entrance, and construction of a new severe weather storage area at MSPA's Cotton Compress site. The infrastructure includes domestic water, sanitary sewer, fire water, electrical service, telecommunications, lighting, security fencing, new standoff fenders, modifications to existing fenders, and installation of new mooring bit bollards. There are four bid alternates for this project. Alternate #1 is the scope of work for the Small Boat Pier located at the west bank of the Port of Gulfport. Alternate #2 is the entire electrical scope at the severe weather site. Alternate #3 is to remove and replace 16 fenders. And Alternate #4 is to procure and install a new marine crane at the Small Boat Pier.

Bids shall be received sealed and marked: **“East Pier Deep Water Wharf for USM/NOAA”** on the outside envelope not later than **2:00 p.m. on Wednesday, February 28, 2024**, at 2510 14th Street, Suite 1450, Gulfport, Mississippi, 39501 at which time said Bids will be opened, read out loud, and recorded. On the outside of the bid envelope, contractor’s Certificate of Responsibility number must appear. Any Bids received after said date and time shall be returned to the Bidder unopened.

Each Bid must be accompanied by cash, a cashier's check, certified check or Bid Bond in the amount of ten percent (10%) of the total Bid amount. The power of attorney for the bonding company's agent should be on file with the Mississippi State Port Authority or should accompany the Bid, and the Bid Bond must be furnished by a corporate surety company qualified to do business in Mississippi.

The Bid Bond shall name the Mississippi State Port Authority as the obligee, shall be substantially in the form of the Bidder's Bond on file with the Mississippi State Port Authority, and shall be payable to the Mississippi State Port Authority in the event the Bidder fails to execute, and deliver to the Mississippi State Port Authority the Contract within fourteen (14) days after the award of the Contract to Bidder.

The Plans, Specifications, Bid Forms and form of Contract for the Project are filed in the office of the Mississippi State Port Authority, Engineering Department, phone number 228-865-4300 and are by reference made a part of this Notice.

Official bid documents can be downloaded from Central Bidding at [www.centralbidding.com](http://www.centralbidding.com). Electronic bids can be submitted at [www.centralbidding.com](http://www.centralbidding.com). For any questions relating to the electronic bidding process, please call Central Bidding at 225-810-4814.

OR

Official bid documents can be downloaded from [www.shipmspaprojects.com](http://www.shipmspaprojects.com).

Electronic bids can be submitted in lieu of sealed paper bids at [www.shipmspaprojects.com](http://www.shipmspaprojects.com).

For any questions relating to Plan House's electronic process, please call Plan House at 228-248-0181.

A Pre-Bid Conference is scheduled for 2:00 p.m. Thursday, February 15th, 2024 at MSPA's office located on the 14<sup>th</sup> floor of the Hancock Whitney Building, 2510 14<sup>th</sup> St., Gulfport MS 39501.

With the Bidder's Bid, each Bidder shall provide the Authority with the following information required by the General Conditions:

- (a) Bidder must provide with Bid the name, location and the place of business of each subcontractor who will perform work or labor or render services to the Contractor in or about the construction of the Work of Improvement, or who will specially fabricate and install any portion of the Work according to detailed Drawings contained in the Plans and Specifications, in an amount in excess of \$50,000.00.
- (b) Bidder must provide with Bid the portion of the Work which will be done by each subcontractor. Contractor shall list only one subcontractor for each such portion as is defined by Contractor in the Bid.
- (c) Bidder must provide with Bid a copy of each Subcontractor's Mississippi State certificate of responsibility, if subcontractor will perform work, labor or services in an amount in excess of \$50,000.00.
- (d) Bidder must provide with Bid a copy of Contractor's Mississippi State certificate of responsibility.
- (e) Bidder must provide with Bid a certification letter stating that all new labor hires will be residents of Mississippi.
- (f) Bidder must provide with Bid a certification letter stating that Bidder will agree to use Mississippi products over non-Mississippi products when all things are equal with respect to price, quality, availability and service.
- (g) Bidder must provide a Bid Bond with Bid.
- (h) If Bidder is a non-resident contractor, Bidder must provide with Bid a copy of contractor's current State law pertaining to own State's treatment of non-resident contractors.
- (i) Bidder must provide with Bid the Certification Regarding Debarment, suspension, other responsibility matters and lobbying.

The Authority reserves the right to reject all Bids as well as any Bid that does not comply with this Advertisement to Bid and the Authority's Information for Bidders.

Dated: 1-22-24



Jon T. Nass  
Executive Director  
Mississippi State Port Authority

## INFORMATION FOR BIDDERS

Bids will be received by the Mississippi State Port Authority (herein called the "Port Authority" or "Authority"), at 2510 14<sup>th</sup> Street, Suite 1450, Gulfport, Mississippi 39501 until 2:00 p.m. local time on **Wednesday, February 28, 2024**, and then at said office publicly opened and read aloud.

Each Bid must be submitted in a sealed envelope, addressed to the Executive Director, Mississippi State Port Authority, 2510 14th Street, Suite 1450, Gulfport, Mississippi 39501, Each sealed envelope containing a Bid must be plainly marked on the outside as **"East Pier Deep Water Wharf for USM/NOAA"** project, envelope should also bear on the outside the name of the Bidder, the Bidder's address and the Bidder's certificate of responsibility number. If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed to the Executive Director, Mississippi State Port Authority, at P.O. Box 40, Gulfport, Mississippi 39502 or 2510 14th Street, Suite 1450, Gulfport, Mississippi 39501.

All Bids must be made on the required Bid form. All blank spaces for Bid prices must be filled in, in ink or typewritten, and the Bid form must be fully completed and executed when submitted.

Bidder shall also submit with Bid the required certification regarding "Debarment, Suspension, Other Responsibility Matters and Lobbying".

The Port Authority may waive any informalities or minor defects or reject any and all Bids. Any Bid may be withdrawn prior to the above scheduled time for the opening of Bids or authorized postponement thereof. Any Bid received after the time and date specified shall not be considered. No Bidder may withdraw a Bid within 30 days after the actual date of the opening thereof. Should there be any reasons why the Contract cannot be awarded within 30 days after bid opening, the time may be extended by written mutual agreement between the Port Authority and the low Bidder.

A bidder may be disqualified for any of the following reasons:

- (a) Failure to comply with the bid requirements as set forth herein;
- (b) Bidder is in arrears on existing Contracts with the Port Authority or another governing authority or state agency;
- (c) Bidder is, or anticipates being, in litigation or arbitration with the Port Authority or another governing authority or state agency; or,
- (d) Bidder has defaulted on a previous Contract.

After Bids have been submitted, the Bidder shall not assert that there was a misunderstanding concerning the quantities or type of the Work of Improvement or the nature of the Work to be done.

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

Any prospective Bidder desiring an explanation or interpretation of the Specifications, or other documents, must request it from the Authority, in writing, at least FIVE (5) days before the date of Bid opening. Oral explanations or instructions given before the award

of a Contract will not be binding. Any information given a prospective Bidder concerning a request will be furnished promptly to all other prospective Bidders as an addendum to the Bid solicitation, if the information is necessary in submitting bids or if the lack of it would be prejudicial to other prospective Bidders.

Bid alternates provided on the Bid Form are not listed by any rank of importance and the owner reserves the right to award an alternate or alternates in any order or grouping.

The Contract Documents contain the provisions required for the construction of the Project. Information obtained from an officer, agent, or employee of the Port Authority or any other person shall not affect the risks or obligations of the Contract.

**WARNING: THERE ARE UTILITY LINES (E.G. WATER, GAS, TELEPHONE, OR POWER) ON THE SITE WHERE THE WORK WILL BE PERFORMED. ACCORDINGLY, IT IS THE SOLE RESPONSIBILITY OF CONTRACTOR TO DETERMINE THE EXACT LOCATION OF THE UTILITY LINES BEFORE COMMENCING THE WORK UNDER THIS CONTRACT.**

The party to whom the Contract is awarded will be required to execute the Contract within fourteen (14) calendar days from the date when Notice of Award is delivered to the Bidder. The Notice of Award shall be accompanied by the Contract. In case of failure of the Bidder to execute the Contract, the Port Authority may, at the Port Authority's option, consider the Bidder in default, in which case the Port Authority may award the Contract to the next lowest responsible bidder.

Within fourteen (14) days of receipt of the Contract signed by the party to whom the Contract was awarded, the Port Authority shall sign the Contract and, if necessary, send the Contract to the Mississippi Development Authority ("MDA") in Jackson, Mississippi, for execution. When the Contract is fully executed, an executed duplicate of the Contract shall be returned to the Bidder. Should the Port Authority or MDA not execute the Contract within thirty (30) days from receipt of the Contract, the Bidder may, by Written Notice, withdraw Bidder's signed Contract. Such notice of withdrawal shall be effective upon receipt of the notice by the Port Authority.

Bidder must agree to commence work on a date to be specified in a written "Notice to Proceed" of Owner and to fully complete the project within the time specified in the Project Milestone Schedule as follows:

**Project Milestone Schedule:**

1.Milestone #1- Partial Substantial Completion: Contractor must have all items that are required to allow USM and NOAA vessels to be moored along the East Pier. Items to include the following: all new and modified fenders, all new bollards and bollards to be replaced, domestic water, sanitary sewer, fire water, lights, temporary power, and security fencing. Partial Substantial Completion must be achieved within 180 consecutive calendar days after the Notice to Proceed date.



2. Milestone #2 – Substantial Completion Date of Entire Project: Substantial completion for the entire project scope must be achieved within 280 consecutive calendar days after the Notice to Proceed date.

3. Milestone #3 – Final Completion/Acceptance: Project shall be fully complete and ready for final payment within 30 consecutive calendar days after the Milestone #2, Substantial Completion, date.

In the event that Contractor fails to reach Milestone #1, Partial Substantial Completion, on or before the date established in the Project Milestone Schedule, Contractor shall pay Owner liquidated damages in the amount of \$1,200 per day for each day beyond the Partial Substantial Completion Date that the Work is not partially substantial complete.

In the event that Contractor fails to reach Milestone #2, Substantial Completion, on or before the date of Substantial Completion, Contractor shall pay Owner liquidated damages in the amount of \$1,200 per day for each day beyond the Substantial Completion Date that the Work is not substantially complete.

In the event that Contractor fails to reach Milestone #3, Final Completion/Acceptance (including, without limitation, the completion of all close-out requirements as specified prior to the expiration of the date of Final Completion) Contractor shall pay, in addition to any amounts owed pursuant to Partial Substantial and Substantial Completion, liquidated damages in the amount of \$1,200.00 per day for each day beyond the Final Completion date that the Work is not fully completed and finally accepted (Final Acceptance) by Owner.

The Bidder, and its subcontractors, shall be an experienced contractor in work of the type and character defined in the Specifications. The Port Authority may make such investigations as it deems necessary to determine the ability of the Bidder and its subcontractors to perform the Work, and the Bidder and its subcontractors shall furnish to the Port Authority all such information and data for this purpose as the Port Authority may request. The Port Authority reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder demonstrates that such Bidder and its subcontractors, in the Port Authority's opinion, is not properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein. The Bidder and the subcontractors must have current certificates of responsibility, if subcontractor is performing work in an amount in excess of \$50,000.00, and the classification of contractor's and/or subcontractor's kind of work or projects for which contractor is qualified shall be so stated in the certificates of responsibility. These Certificates of Responsibility should be updated yearly and a current copy sent to MSPA should the construction project extend past the expiration date of Certificate of Responsibility on file with MSPA.

**If Bidder does not have a Certificate of Responsibility number he can only bid on public projects fifty thousand dollars (\$50,000.00) or less and must provide a statement on the outside or exterior of the envelope or container containing his bid to the effect that the bid enclosed therewith does not exceed fifty thousand dollars (\$50,000.00).**

A conditional or qualified Bid will not be accepted.

Award will be made to the lowest and best Bidder.

All applicable laws, ordinances, and the rules and regulations of all governmental authorities having jurisdiction over construction of the Project shall apply to the Contract throughout.

Each Bidder is responsible for inspection of the site and for reading and being thoroughly familiar with the Contract Documents. The failure or omission of any Bidder to do any of the foregoing shall in no way relieve any Bidder from any obligation in respect to his, her, or its Bid.

The low Bidder shall supply the names and addresses of major material suppliers when requested to do so by the Port Authority. Resident labor shall be employed by Bidder.

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**A pre-bid conference will be held at 2:00 p.m. local time on Thursday, February 15, 2024 at 2510 14<sup>th</sup> Street, Suite 1450, Gulfport, Mississippi 39501 to be followed by a site inspection trip. Each Bidder is required to visit and inspect the site of Work to fully obtain exact work scope and work requirements. For further information contact Mr. James Buras, Port Engineer, at (228) 865-4300 or Email [jburas@shipmspa.com](mailto:jburas@shipmspa.com).**

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For purpose of these Contract Documents and for all technical and administrative matters pertaining to Contract Documents, including but not necessarily limited to Construction Contract, Change Orders, and Compliance with rules and regulations, the Port Authority will be represented by the Executive Director of Mississippi State Port Authority, or his designated representative.

ALL CHANGES, ALTERATIONS OR DEVIATIONS TO THE WORK OF IMPROVEMENT MUST BE BY WRITTEN CHANGE ORDER EXECUTED BY THE EXECUTIVE DIRECTOR OF THE PORT AUTHORITY AND THE CONTRACTOR.

### **INTERPRETATION OF CONTRACT DOCUMENTS**

Any interpretation of the Contract Documents will be made only by a written Addendum duly issued, and a copy of such Addendum will be mailed or delivered to each planholder receiving a set of such documents. The Port Authority will not be responsible for any other explanation or interpretation of the Contract Documents.

### **SITE INSPECTION**

Each Bidder shall be held to have compared the site with the Contract Documents and to have satisfied himself/herself as to the condition of the site, existing obstructions, the actual elevations and any other factors affecting the carrying out of the Work before the delivery of the completed Bid Form.

Contractor is advised that their work shall be conducted so as to cause the least interference with work being performed by other Contractors.

### **ADDENDA DURING BIDDING**

During the bidding period, Bidders may be advised by written Addenda of additions, omissions or alterations in the Contract Documents. All such changes shall be included in the Work covered by the Bid Form and shall become a part of these Contract Documents.

### **MODIFICATION TO BID**

A bidder may modify the bid prior to the scheduled closing time indicated in the Advertisement for Bids in the following manner:

- a. Notification on Envelope: A modification may be written on the outside of the sealed envelope containing the bid.
- b. A facsimile (fax) **will not** be acceptable.

End of Section



# BID FORM

Proposal of \_\_\_\_\_ (hereinafter called "Bidder"), doing business as a \_\_\_\_\_, (insert "a corporation," "a partnership," or "an individual" applicable; if a corporation, indicate state of incorporation) to the Mississippi State Port Authority ("hereinafter called "Port Authority" or "Authority"), an agency existing under the laws of the State of Mississippi.

In compliance with your Advertisement for Bids, Bidder hereby proposes to perform all Work for the Work of Improvement known as:

**“EAST PIER DEEP WATER WHARF FOR USM/NOAA”**

and all appurtenant Work and materials required to complete the Work, in strict accordance with the Contract Documents, within the time set forth therein, and at the prices stated below.

By submission of this Bid, each Bidder certifies, and in the case of a joint Bid, each party thereto certifies as to his/her own organizations, that this Bid has been arrived at independently, without consultation, communication or agreement as to any matter relating to this Bid with any other Bidder or with any competitor.

Bidder hereby agrees to commence Work of Improvement under this Contract within five (5) days after the date of service of the Notice to Proceed, and to fully complete the project within **310** consecutive calendar days thereafter as provided in Sections 7 and 34 of the General Conditions.

**Project Milestone Schedule:**

1. Milestone #1- Partial Substantial Completion: Contractor must have all items that are required to allow USM and NOAA vessels to be moored along the East Pier. Items to include the following: all new and modified fenders, all new bollards and bollards to be replaced, domestic water, sanitary sewer, fire water, lights, temporary power, and security fencing. Partial Substantial Completion must be achieved within 180 consecutive calendar days after the Notice to Proceed date.

2. Milestone #2 – Substantial Completion Date of Entire Project: Substantial completion for the entire project scope must be achieved within 280 consecutive calendar days after the Notice to Proceed date.

3. Milestone #3 – Final Completion/Acceptance: Project shall be fully complete and ready for final payment within 30 consecutive calendar days after the Milestone #2, Substantial Completion, date.

Bidder acknowledges receipt of the following Addenda: (if none, so state)

No. \_\_\_\_\_ Date: \_\_\_\_\_  
No. \_\_\_\_\_ Date: \_\_\_\_\_  
No. \_\_\_\_\_ Date: \_\_\_\_\_

Attached to this Bid is a list of subcontractors as required by Section 24 of the General Conditions and Advertisement for Bid.

Bidder agrees to perform all the work described in the Contract Documents for the amounts as set forth in the following Bid Form.

**BID FORM**  
Mississippi State Port Authority  
East Pier Deep Water Wharf For USM/NOAA  
Schedule of Bid Items

ITEM NO.	ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
<b>Base Bid - Deep Water Wharf</b>					
1	MOBILIZATION / DEMOBILIZATION	LS	1		
2	GENERAL CONDITIONS	LS	1		
3	DEMOLITION	LS	1		
4	GROUT REMOVAL	CY	85		
5	ASPHALT PAVING	SY	1000		
6	CONCRETE PAVING (WHARF DECK)	SY	100		
7	STRUCTURAL GROUT FILL	CY	85		
8	SECURITY FENCE	LF	800		
9	AUTOMATIC GATE	EA	2		
10	4' WIDE PEDESTRIAN GATE	EA	2		
11	ABOVE GRADE UTILITY TRENCH (DETAIL #7, C620)	LF	236		
12	ABOVE GRADE UTILITY TRENCH (DETAIL #9, C620)	LF	45		
13	ABOVE GRADE UTILITY TRENCH (DETAIL #2, C621)	LF	120		
14	ABOVE GRADE UTILITY TRENCH (DETAIL #3, C621)	LF	120		
15	ABOVE GRADE UTILITY TRENCH (DETAIL #4, C621)	LF	5		
16	ELECTRICAL PULL BOX	EA	2		
17	6" SEWER FORCE MAIN (DUCTILE IRON)	LF	830		
18	6" SEWER FORCE MAIN (SDR 26 PVC)	LF	375		
19	2" SEWER FORCE MAIN (SCH 10 STAINLESS 316L)	LF	70		
20	VESSEL SEWER CONNECTIONS (2")	EA	1		
21	VESSEL SEWER CONNECTIONS (6")	EA	2		
22	8" WATER MAIN (DUCTILE IRON)	LF	300		
23	FIRE HYDRANT ASSEMBLY	EA	1		
24	2" WATER SERVICE (SCH 10 STAINLESS 316L)	LF	170		
25	VESSEL WATER CONNECTIONS	EA	3		
26	NEW FENDER (TYPE 1 FENDER)	EA	2		
27	NEW FENDER (TYPE 2 FENDER)	EA	2		
28	MODIFIED TYPE 2 FENDER	EA	4		
29	NEW MOORING BOLLARD	EA	29		
30	NEW LADDER	EA	3		
31	ELECTRICAL PLATFORM #1	EA	1		
32	ELECTRICAL PLATFORM #2	EA	2		
33	ELECTRICAL CONDUIT AND CONDUCTOR	LS	1		
34	VESSEL SHORE POWER ENCLOSURES	EA	3		
35	SITE LIGHTING	LS	1		
36	TELECOMMUNICATIONS	LS	1		
37	MS POWER CONNECTION WITH TRANSFORMERS	LS	1	\$ 300,000.00	\$ 300,000.00
38	TEMPORARY POWER FOR VESSELS	LS	1		
39	STEEL PIPE BOLLARDS	EA	10		
40	TIMBER RAIL	LF	870		

41	100% Coal Tar Epoxy	LS	1		
<b>Base Bid - Severe Weather Site</b>					
39	MOBILIZATION / DEMOBILIZATION	LS	1		
40	GENERAL CONDITIONS	LS	1		
41	DEMOLITION (SEVERE WEATHER SITE)	LS	1		
42	STRIPPING (SEVERE WEATHER SITE)	CY	425		
43	610 LIMESTONE (SEVERE WEATHER SITE)	CY	515		
44	SECURITY FENCE (SEVERE WEATHER SITE)	LF	420		
45	20' DOUBLE GATE (SEVERE WEATHER SITE)	EA	1		
<b>TOTAL BASE BID UNIT PRICE SUM -</b>					<b>\$</b>

**TOTAL PROJECT BASE BID UNIT PRICE SUM - (in words):** \$ \_\_\_\_\_

\_\_\_\_\_ **Dollars**  
(Base Bid Unit Price Sum - in words)

<b>ALTERNATE NO. 1 - SMALL BOAT PIER SCOPE</b>					
<b>ITEM NO.</b>	<b>ITEM</b>	<b>UNIT</b>	<b>ESTIMATED QUANTITY</b>	<b>UNIT PRICE</b>	<b>AMOUNT</b>
46	MOBILIZATION / DEMOBILIZATION	LS	1		
47	GENERAL CONDITIONS	LS	1		
48	CONCRETE SLAB	SY	40		
49	CRANE FOUNDATION CONCRETE	LS	1		
50	TIMBER PILES	EA	4		
51	SECURITY FENCE WITH 6' WIDE GATE	LS	1		
52	ELECTRICAL PEDESTALS	EA	2		
53	ELECTRICAL LIGHTING	LS	1		
<b>TOTAL ALTERNATE #1 UNIT PRICE SUM -</b>					<b>\$</b>

**TOTAL ALTERNATE #1 UNIT PRICE SUM - (in words):** \$ \_\_\_\_\_

\_\_\_\_\_ **Dollars**  
(Alternate #1 Unit Price Sum - in words)

ALTERNATE NO. 2 - SEVERE WEATHER ELECTRICAL					
ITEM NO.	ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
54	MOBILIZATION / DEMOBILIZATION	LS	1		
55	GENERAL CONDITIONS	LS	1		
56	LIGHT POLES	EA	4		
57	PEDESTALS	EA	8		
58	GENERATOR	EA	1		
59	PANELS	LS	1		
60	MS POWER CONNECTION AND TRANSFORMERS	LS	1	\$ 150,000.00	\$ 150,000.00
61	CONCRETE PAD FOR GENERATOR	LS	1		
62	CONCRETE PAD FOR TRANSFORMER	LS	1		
<b>TOTAL ALTERNATE #2 UNIT PRICE SUM -</b>				<b>\$</b>	

**TOTAL ALTERNATE #2 UNIT PRICE SUM - (in words):** \$ \_\_\_\_\_

Dollars

(Alternate #2 Unit Price Sum - in words)

ALTERNATE NO. 3 - EAST PIER FENDERS					
ITEM NO.	ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
56	REMOVE AND REPLACE TYPE 1 FENDERS	EA	13		
<b>TOTAL ALTERNATE #3 UNIT PRICE SUM -</b>				<b>\$</b>	

**TOTAL ALTERNATE #3 UNIT PRICE SUM - (in words):** \$ \_\_\_\_\_

Dollars

(Alternate #3 Unit Price Sum - in words)

ALTERNATE NO. 4 - SMALL BOAT PIER CRANE					
ITEM NO.	ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE	AMOUNT
55	MARINE CRANE	EA	1		
<b>TOTAL ALTERNATE #3 UNIT PRICE SUM -</b>				<b>\$</b>	

**TOTAL ALTERNATE #3 UNIT PRICE SUM - (in words):** \$ \_\_\_\_\_

Dollars

(Alternate #4 Unit Price Sum - in words)



## **“East Pier Deep Water Wharf for USM/NOAA”**

Note: Bids shall include all applicable taxes and fees. All blanks shall be filled in. Total amount of Bid shall be the sum of all the Pay Items. Contract Award will be made based upon the pricing of this Bid Schedule and the contractor qualifications as set forth in the bid documents. In case of discrepancy between the sum of the items and Total Amount of Bid, the sum of the items shall be considered to be the Total Amount of Bid. Award will be made to only one Bidder based upon the Base Bid as applicable from this Bid Form and determination of best value. Bid alternates provided on the Bid Form are not listed by any rank of importance and the Owner reserves the right to award an alternate or alternates in any order or grouping.

The undersigned, having read and understood the Bidding Documents and examined the Project site and adjoining areas, and being familiar with the obstacles and conditions that will affect proposed Work, hereby offers and agrees to furnish all labor, equipment and materials and to perform all the Work required for **“East Pier Deep Water Wharf for USM/NOAA”** project at the Mississippi State Port Authority at Gulfport, Port of Gulfport, Gulfport, Mississippi in accordance with the Contract Documents and at the prices stated in the preceding Bid Schedule.

\_\_\_\_\_  
Legal Name of Bidder

\_\_\_\_\_  
Address

\_\_\_\_\_  
Signature of Authorized Person

\_\_\_\_\_  
City, State Zip

\_\_\_\_\_  
Name & Title of Authorized Person

\_\_\_\_\_  
Attest

\_\_\_\_\_  
Name & Title

\_\_\_\_\_  
(SEAL--if Bid is by a corporation)

Notes:

If Bid is by a corporation, corporate seal is affixed in space provided immediately above.

Signature is by an individual legally authorized to bind Bidder to a contract. If signature is by an agent of Bidder, the current power-of-attorney verifying agent's authority to bind Bidder is attached.

**LIST OF SUBCONTRACTORS TO BE SUBMITTED WITH BID**

**“East Pier Deep Water Wharf for USM/NOAA”**

Pursuant to the General Conditions, the Advertisement for Bids and the Information for Bidders, the undersigned Bidder hereby submits the following list of each Subcontractor, and their current certificate of responsibility, who will perform work or labor or render services, or who will specifically fabricate and install any portion of the Work according to detailed Drawings contained in the Plans and Specifications, that is in an amount in excess of \$50,000.00.

<b>Description of work to be performed by subcontractor:</b>	<b>Name, address, contact information of subcontractor</b>	<b>COR No.</b>	<b>Estimated Dollar Amount</b>

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

\_\_\_\_\_  
Bidder

\_\_\_\_\_  
Name (printed or typed)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

End of Bid Form

**MISSISSIPPI STATE PORT AUTHORITY AT GULFPORT**

**CERTIFICATIONS REGARDING DEBARMENT, SUSPENSION, OTHER  
RESPONSIBILITY MATTERS AND LOBBYING**

(Execute in duplicate)

State of Mississippi

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

I, \_\_\_\_\_  
(Name of person signing certification)

individually, and in my capacity as \_\_\_\_\_,  
(Title)

of \_\_\_\_\_ do hereby certify  
(Name of Firm, Partnership, or Corporation)

under penalty of perjury under the laws of the United States and the State of Mississippi that

\_\_\_\_\_, Bidder  
(Name of Firm, Partnership, or Corporation)

on Project No. \_\_\_\_\_,

\_\_\_\_\_ County(ies), Mississippi, that said  
legal entity and its corporate officers, principal owners, managers, auditors and others in a  
position of administering federal funds:

- a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in (b) above; and
- d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

Initial here "\_\_\_\_\_" if exceptions are attached and made a part thereof. Any exceptions shall address to whom it applies, initiating agency and dates of such action.

Note: Exceptions will not necessarily result in denial of award but will be considered in determining bidder responsibility. Providing false information may result in criminal prosecution or administrative sanctions.

The Bidder further certifies, to the best of his or her knowledge and belief, that:

1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this contract, Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions will be completed and submitted.

The certification contained in (1) and (2) above is a material representation of fact upon which reliance is placed and a prerequisite imposed by Section 1352, Title 31, U.S. Code prior to entering into this contract. Failure to comply shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000. The bidder shall include the language of the certification in all subcontracts exceeding \$100,000 and all subcontractors shall certify and disclose accordingly. All of the foregoing and attachments (when indicated) is true and correct.

Executed on \_\_\_\_\_

\_\_\_\_\_  
Signature

# GENERAL CONDITIONS

(Basic Contract Terms)

APPLICABLE TO ALL WORK

## 1. DEFINITIONS

- (a) **AUTHORITY OR OWNER:** The term "Authority" or "Owner" means the Mississippi State Port Authority at Gulfport.
- (b) **ENGINEER:** The term "Design Engineer" or "Engineer" means MP Design Group, telephone number 228-388-1950.
- (c) **WORK OF IMPROVEMENT:** The term "Work of Improvement" or "Work" means all work specified in the Contract Documents for the Project known as:

### **“East Pier Deep Water Wharf for USM/NOAA”**

- (d) and all appurtenant Work and materials required to complete the Work. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
- (e) **PLANS OR DRAWINGS:** The term "Plans" or "Drawings" means the drawings showing plans, sections, details and applicable notes describing the Work of Improvement as identified in paragraph 1 of the Contract prepared by the Engineer.
- (f) **SPECIFICATIONS:** The term "Specifications" means the text of the technical specifications or special provisions as identified in paragraph 1 of the Contract prepared by the Engineer.
- (g) **CONTRACT DOCUMENTS:** The term "Contract Documents" means the documents identified in paragraph 1 of the Contract.
- (h) **CONTRACT:** The term "Contract" means the Contract executed by the Authority and Contractor for the Work of Improvement in the form included in the bid document.
- (i) **SUBSTANTIAL COMPLETION:** The time at which the Work is at least 90% complete, in accordance with the Contract Documents, so that the Work can be utilized for its intended purpose, AND Final Completion can be achieved within 30 days. The terms "Substantially Complete" and "Substantial Completed" as applied to all or part of the Work refer to Substantial Completion of such Work.
- (j) **PARTIAL SUBSTANTIAL COMPLETION:** The time at which a milestone has been reached and a portion of the Work can be utilized for its intended purpose.
- (k) **FINAL COMPLETION:** The time at which the Work is complete and ready for final payment. The terms "Final Acceptance", "Time of Completion", and "Ready for Final Payment" as applied to the Work refer to Final Completion of such Work
- (l) **CONTRACT TIMES:** The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; (c) achieve Final Completion; and (d) complete the Work of Improvement.

## 2. PERFORMANCE OF WORK OF IMPROVEMENT.

Contractor shall perform the Work of Improvement in accordance with the Contract Documents. Contractor shall furnish all labor, materials, equipment, appliances, services, tools and other things necessary for the complete and timely performance of the Work of Improvement.

### **3. CONTRACT PRICE.**

Authority shall pay Contractor for the Work of Improvement the Contract Price payable as set forth below, except as otherwise provided in paragraph 29 "Withholding of Payment."

Upon receipt of this Contract, Contractor shall submit to Authority a cost breakdown ("schedule of values") showing major items of Work. Quantities, units, and unit prices shall be shown. The sum of all individual items shown shall add up to the contract amount and this breakdown shall be used as the basis of monthly progress payments. Contractor's overhead, profit, and other general project costs such as portalets, rentals, etc. shall be included on the schedule of values for each phase or milestone of the project. The breakdown shall not be unbalanced for costs or "front loaded."

On the Friday proceeding the first Wednesday of the month the Contractor shall submit, on a form approved and accepted by the Authority, an estimate in writing showing value of Work performed to that date. Upon approval of such estimate by the Authority, payment will be made for the Work performed to the date of the estimate; provided, however, the Authority will retain five percent (5%) of such estimated value as partial security for fulfillment of the Contract. If Authority disagrees with any estimate of Contractor of the value of Work performed, Authority shall nevertheless pay Contractor for the value of the Work performed (less retentions) as to which no Contract exists. Unless they are further subject to withholding as set forth in paragraph 29, the retentions shall be paid to Contractor thirty (30) days after the Board of Port Commissioners approves and accepts the Work of Improvement as complete.

Each invoice for payment submitted by Contractor shall be accompanied by an appropriate unconditional affidavit from Contractor's subcontractors in a form acceptable to the Authority. Said affidavit shall state subcontractors have been paid in full and that no liens have been filed against owner as a result of nonpayment. Where such releases are conditional, Authority will either withhold payment or pay Contractor by joint checks payable jointly to Contractor and the claimant.

Where Bond Funds are being used to finance the Work of Improvements, the Contractor acknowledges that the Authority does not make payments directly to the Contractor. The Authority shall approve invoices for payment in the manner specified above, but payments shall be made by the State Treasurer's Office in Jackson, Mississippi. The Authority agrees to use its best effort to expedite payments by the State Treasurer's Office, but can not accept responsibility for prompt payment of invoices submitted for payment. Final payment cannot be made until Authority receives written consent from contractor's surety.

Availability of Funds -- It is expressly understood and agreed that the obligation of the MSPA to proceed under this Contract is conditioned upon the appropriation of federal and/or state funds. If the funds anticipated for the continuing fulfillment of the Contract are, at anytime, not forthcoming or insufficient, either through the failure of the federal government

to provide funds or of the State of Mississippi to appropriate funds or the discontinuance or material alteration of the program under which funds were provided or if funds are not otherwise available to the MSPA, the MSPA shall have the right upon ten (10) Working days written notice to the Contractor, to terminate this Contract without damage, penalty, cost or expenses to the MSPA of any kind whatsoever. The effective date of termination shall be as specified in the notice of termination

#### **4. RESPONSIBILITIES.**

For all matters pertaining to the Work of Improvement, unless otherwise provided, Authority will be represented by its Executive Director, or a designated representative, in all administrative matters and by the designated "Design Engineer" in all technical matters.

Before commencement of the Work, Contractor shall notify Authority and Engineer of the name of the person (called Contractor's representative) who shall be on-site and who shall be the duly authorized representative of Contractor empowered to make decisions for, and on behalf of Contractor, and to execute change orders on behalf of Contractor, and to whom orders and directions by Engineer and Authority to Contractor may be given.

It shall be the sole responsibility of Contractor to complete the Work of Improvement within the time and in the manner prescribed by this Contract.

#### **5. EXAMINATION OF SITE, PLANS AND SPECIFICATIONS.**

It is the sole responsibility of Contractor to visit the site of the Work of Improvement and to thoroughly examine the Contract Documents and to fully acquaint Contractor with the conditions to be encountered as to the character, quality and quantity of Work to be performed and materials to be furnished. Contractor shall fully understand the facilities, difficulties and restrictions, including Port Operations, that may be encountered in performing the Work of Improvement.

By execution of this Contract, Contractor represents to Authority that Contractor has made the visitation and examination referred to in the preceding sentence and can perform the Work of Improvement for the contract price.

Contractor is advised that any report or other information (hereafter called "additional information") given to Contractor by Authority or Engineer or obtained by Contractor from the records of Authority (except for the Contract Documents) is not a part of the Contract unless specifically referenced to be used in conjunction with this Contract and is given solely for the convenience of Contractor for whatever use Contractor may wish to make of it. It is expressly understood and agreed that the Authority assumes no responsibility whatsoever in respect to the sufficiency or accuracy of the additional information or of any interpretations made thereof by any person. Availability or use of such additional information shall not be a waiver of Contractor's duty to examine the site of the Work, and Contractor is cautioned to make such independent investigation as Contractor deems necessary to satisfy Contractor as to the conditions to be encountered in the performance of the Work, including but not limited to (1) conditions bearing upon transportation, disposal, handling and storage of materials; (2) the availability of labor, water, electric power and roads; (3) uncertainties of weather, tides or

similar physical conditions at the site; (4) the conformation and conditions of the ground and (5) other site conditions that may affect the Work performance.

## **6. CONTRACT BONDS.**

Within fourteen (14) days after delivery of the "Notice of Award" of this Contract, or prior to commencement of the Work, whichever is earlier, Contractor shall furnish to Authority with sureties qualified to do business in the State of Mississippi the following bonds:

- (a) A payment bond in a sum not less than the Contract price; and
- (b) A performance bond in an amount not less than 100% of the contract price for the Work of Improvement guaranteeing Contractor's full and timely performance of the Work in accordance with this Contract.

All bonds shall be in a form approved as to form by counsel for the Authority prior to acceptance by Authority.

## **7. TIME OF PERFORMANCE.**

Contractor shall commence the Work of Improvement promptly after execution of the Contract and after issuance of the "Notice to Proceed". The Contractor shall complete the Work of Improvement within the time specified in the Contract in accordance with Paragraph 14. The Contract Times may be extended only in accordance with paragraph 26, "Extension of Contract Times."

Upon receipt of this Contract, Contractor shall submit to Authority a schedule for the completion of the Work of Improvement in a form acceptable to the design engineer and Authority ("construction schedule") showing major items of Work, Start Date, and Completion Date including, but not limited to: mobilization, demolition, any phasing or staging completion, major equipment deliveries, inspection dates, milestones if needed, substantial completion, and close-out documentation. The completion date for all individual items shown shall be consistent with the Contract Times required by this Contract.

Port Authority or Port Authority's Representative will issue a Certificate of Substantial Completion when the Work is Substantially Complete in accordance with the Contract Documents. Contractor is to achieve Final Completion of the Work, to include all listed nonconformance items, no later than 30 calendar days after date of Port Authority's acceptance of Substantial Completion provided in Certificate of Substantial Completion unless otherwise noted in certificate.

Along with the monthly request for payment, Contractor shall submit to the Authority an updated construction schedule for all individual items showing percentage work completed to date, percentage of work to be completed, and estimated Completion Date for Work of Improvement.

## **8. AUTHORITY OF ENGINEER.**



The designated design Engineer shall decide any and all questions which may arise as to (1) the quality or acceptability of materials furnished and the Work performed, (2) the manner of performance of the Work of Improvement, (3) interpretation of technical matters within the Contract Documents, and (4) the acceptable fulfillment of the Contract by Contractor.

## **9. CONFORMITY WITH PLANS AND ALLOWABLE DEVIATIONS.**

Finished surfaces in all cases shall conform with the lines, grades, cross-sections, and dimensions shown on the Plans. Deviations from the Plans, as may be required by the exigencies of construction, will be determined in all cases by Engineer and must be authorized in writing by Authority.

Contractor shall provide to Authority shop drawings, submittals, or other submission of samples (hereafter referred to collectively as "submissions") as may be necessary for the prosecution of the work of improvement. The shop drawing and submission shall be submitted to the Engineer who shall promptly review all shop drawings. All shop drawings and submissions submitted shall be in conformance with the contract documents (including plans and specifications). Once submitted for the Engineer's review, shop drawings and submissions shall bear the Contractor's certification that Contractor has reviewed, checked and approved the shop drawings and submissions and that they are in conformance with the requirements of the contract documents (including plans and specifications). Any deviations in the shop drawings or submissions from the contract documents (including plans and specifications) shall be plainly stated in bold print on the shop drawings and the submissions specifying exactly what are the deviations, and, in addition, in submitting such shop drawings and submissions to the Engineer, they shall be accompanied by a cover letter stating that the shop drawings or submissions submitted deviate from the contract documents (including the plans and specifications) and specifying in detail such deviations.

Unless any deviation in the shop drawings or submissions from the contract documents (including the plans and specifications) have been approved by Authority by a written change order pursuant to the provisions of this Contract, approval by the Engineer of any shop drawing or submission shall not relieve Contractor of Contractor's liability to the Authority for any damage or injury that results because the shop drawing or submission deviates from the contract documents (including the plans and specifications) whether or not such shop drawings or submissions are approved by the Engineer. The ultimate responsibility for preparing shop drawings or submissions in conformity with the contract documents (including the plans and specifications) remains with the Contractor.

Portions of the work requiring a shop drawing or submission shall not be commenced by Contractor until the shop drawing or submission has been approved by the Engineer. A copy of each approved shop drawing and submission shall be kept in good condition by Contractor at the site of the work and shall be available to Engineer, or Authority, for inspection.

## **10. INTERPRETATION OF PLANS AND SPECIFICATIONS.**

Should it appear that the Work to be done, or any matter relative thereto, is not sufficiently detailed or explained in the Contract Documents, the Contractor shall apply in writing to the Engineer for such further explanations as may be necessary for Contractor to

accomplish the Work of Improvement, and Contractor shall conform to such explanation or interpretation of the contract by Engineer so far as may be consistent with the intent of the original Plans and Specifications. In the event of doubt or question relative to the true meaning of the Specifications or Plans as explained or interpreted by the Engineer, reference shall be made to the Authority, whose decision thereof shall be final.

In the event of any discrepancy between any Plans or Drawing and the figures written thereon, the figures shall be taken as correct.

## **11. ORDERS OF ENGINEER.**

Whenever it is desirable by the design Engineer and Authority to give Contractor directions concerning the Work, orders will be given in writing to Contractor by delivery to Contractor's representative, or in the representative's absence, to Contractor's on-site superintendent or foreman in charge or the particular Work in reference to which the order is given, and such written orders shall be binding on Contractor and Contractor shall comply therewith.

Any provision of the contract notwithstanding, all orders, directions or interpretations of the Engineer and Authority to Contractor shall be in writing and shall be given to Contractor within two working days after requested by Contractor.

Contractor shall not be bound to follow any orders, directions or interpretations of Engineer that are not in writing. Authority shall not be liable to Contractor for Work performed by Contractor in reliance on verbal orders of design Engineer and neither shall such reliance relieve Contractor from the responsibilities of Contractor set forth in the Contract.

If Contractor believes that the order issued by the design Engineer entitles Contractor to a change in either the contract price or the time of performance, or both, Contractor shall give Engineer and Authority written notice of a request for a change order within two (2) days after receipt of the order by the Engineer. The written request shall state the requested change in contract price, or time of extension, and shall detail the basis for the request. Upon such a request, Contractor shall not be required to carry out the order of the Engineer pending the execution of a change order unless Contractor is otherwise directed in writing. If Contractor has requested a change order and is ordered to proceed with the Work before a change order is executed, such proceeding with the Work shall be without prejudice to the Contractor's right, if any, to request extra compensation or an extension of time.

## **12. INSPECTION.**

The Authority and design Engineer or his designee shall at all times have access to the Work during construction and shall be furnished with every reasonable facility for obtaining full knowledge respecting the progress, workmanship and character of materials used and employed in the Work.

Whenever Contractor varies the period during which Work is carried on each day, Contractor shall give due notice to Authority and Engineer so that proper inspection may be provided. Any Work done in the absence of Engineer, will be subject to rejection.

The inspection of the Work shall not relieve Contractor of any of Contractor's obligations to fulfill the Contract as prescribed. Defective Work shall be made good, and unsuitable materials may be rejected, notwithstanding the fact that such defective Work and unsuitable materials have been previously overlooked by Engineer in inspection and accepted for payment.

**13. REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK.**

All Work which is defective in its construction or deficient in any way of the requirements of the Contract shall be remedied or removed and replaced by Contractor in an acceptable manner, and no compensation will be allowed for such correction.

Any Work done beyond the lines and grades shown on the Plans or established by design Engineer, or any extra Work done without the written authority of Authority, will be considered as unauthorized and will not be paid for.

Upon failure on the part of Contractor to comply forthwith with any order of Engineer made under the provisions of this paragraph or paragraphs 10 or 11, Authority shall have authority to cause the defective Work to be remedied, or removed and replaced, and unauthorized Work to be removed, and to deduct the costs thereof from any moneys due or to become due the Contractor.

**14. SUBSTANTIAL COMPLETION; PARTIAL SUBSTANTIAL COMPLETION; FINAL INSPECTION**

(a) Substantial Completion:

When Contractor considers the entire Work ready for its intended purpose, the Work is at least 90% complete, and the Work will be ready for Final Acceptance within 30 days, Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written

objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

(b) Partial Substantial Completion:

Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents; or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work; or which the Contract Documents have identified as milestones in accordance with the Contract Times, subject to the following conditions:

Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14 (a), (b), & (c) for that part of the Work.

Contractor, at the time established for each milestone in the Contract Documents, will notify Owner and Engineer in writing that Contractor considers the portion of Work can be used by the Owner for its intended purpose and substantially complete and request Engineer to issue a certificate of Partial Substantial Completion for that part of the Work.

Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14 (a) will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of this agreement regarding property insurance.

(c) Final Inspection:

Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

**15. COMPLIANCE WITH LAWS.**

Contractor shall keep informed as to and comply with all Federal, State and Municipal laws pertaining to the Work of Improvement or governing the Mississippi State Port Authority at Gulfport including applicable provisions in the Authority's Tariff No. 4, as amended from time to time, and any successor Tariff. Contractor shall immediately report in writing to the Authority any discrepancy or inconsistency in the Plans, Specifications, Drawings or Contract that appear to violate or be contrary to the then existing applicable Federal, State and Municipal laws.

**16. PROVISIONS APPLICABLE TO LABOR.**

- (a) **WORKER'S COMPENSATION.** Contractor (and all Contractor's subcontractors) are required to secure the payment of worker's compensation to its employees.

Before commencing performance of the Work of Improvement under the Contract, Contractor shall sign and file with Authority the following certification:

"I am aware of the provisions of the Contract which require every employer to be insured against liability for worker's compensation, and I will comply with such provisions before commencing performance of the Work of this contract."

- (b) **NON-DISCRIMINATION.** No discrimination shall be made in the employment of persons in the Work of Improvement under the Contract because of the race, religious creed, color, national origin, ancestry, physical disability, mental disability, medical condition, marital status or sex of such person.

- (c) Contractor shall employ only workers and laborers who have actively resided in Mississippi for two years next preceding such employment.

**17. REFERENCE TO STATUTES.**

Whenever reference is made to the provision of any statute or law in this Contract, such reference applies to any amendment or change in such statute or law now existing but to become operative some time after the signing of the contract.

**18. PERMITS AND LICENSES.**

Contractor shall, at Contractor's own cost, procure all administrative construction and building permits and licenses and any other permits that may be required for construction of the Work of Improvement, pay all charges and fees and give all notices necessary and incidental to the due and lawful prosecution of the Work of Improvement. The Authority shall, at Authority's own cost, procure all discretionary permits, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the Work of Improvement.

**19. PUBLIC CONVENIENCE AND SAFETY.**

Contractor shall so conduct his operations as to cause the least possible obstruction and inconvenience to public traffic and port operations.

Contractor shall furnish, erect, and maintain such fences, barriers, lights, warning and directional signs as deemed necessary by Engineer to give adequate warning to the public and other port users at all times of the construction and of any dangerous conditions to be encountered as a result thereof, and contractor shall also erect and maintain such signs as may be furnished by Authority.

**20. RESPONSIBILITY FOR DAMAGE.**

During the progress of the Work or any time before final acceptance, Authority and Engineer shall not be liable to Contractor for any loss or damage to the Work of Improvement or any part thereof, or to any material or equipment used or to be used in performing the Work, or for injury or damage to any person (including workers) or damage to property from any cause.

Nothing herein shall be deemed to relieve Authority or Engineer from liability they may have to Contractor for damage caused by Authority or Engineer's negligence or intentional acts.

Until Final Acceptance by Authority, protection of the Work of Improvement and materials and equipment used thereon shall be the sole responsibility of Contractor.

**21. INDEMNIFICATION AND LIABILITY INSURANCE.**

Contractor shall indemnify and defend Authority, and the State of Mississippi and its elected and appointed officers, employees and agents from any liability for the death or injury to any person or damage to property arising from Contractor's activities in

performance of the Contract or on the property of Authority. Upon execution of the Contract, Contractor shall, at the cost and expense of Contractor, procure and maintain during the time of the Contract, liability and property damage insurance in not less than the following amounts: \$2,000,000.00 combined single commercial general liability, and automobile liability insurance on all vehicles owned or operated by Contractor on Port property, including those which are hired or non-owned and used in the course of the Contractor's business, with limits for bodily injury or death of \$500,000 per person and \$1,000,000 per occurrence and for property damage of \$500,000 per occurrence, or a combined single limit of \$1,000,000. The Mississippi State Port Authority at Gulfport, its Board of Port Commissioners, its officers, agents and employees, the State of Mississippi and its elected and appointed officers, employees and agents shall be named as additional insureds on such policies. The Contractor shall provide that the insureds thereon waive subrogation against the State of Mississippi and the said political subdivisions thereof. Upon execution of this Contract, Contractor shall promptly furnish Authority with certificates of insurance showing Contractor's compliance with the insurance provisions of this paragraph.

Specific to Use of Marine Vessels: The Contractor shall, to the extent applicable, also be protected against maritime claims and damages of a similar nature, which could fall within the provisions of other State or Federal laws or regulations, including, by way of example and not as a limitation, claims brought under the United States Longshoremen's and Harbor Workers' Compensation Act or any other laws to which the Contractor or the Work may be subject pursuant to the Contractor's compliance obligations above. If Contractor uses an owned or chartered vessel or vessels to perform the Work, Contractor shall procure a Protection and Indemnity Insurance Policy (P&I) in an amount of not less than One Million and 00/100 Dollars (\$1,000,000.00) per occurrence. The P&I policy shall include coverage for the vessel's or vessels' captain and crew. If Contractor will be performing the Work in or around navigable water and working on or from a vessel or vessels that Contractor does not own or has not chartered, Contractor shall procure a Maritime Employers Liability Policy in an amount of not less than One Million and 00/100 Dollars (\$1,000,000.00) per occurrence and One Million and 00/100 Dollars (\$1,000,000.00) aggregate.

**Cancellation area on the certificate must read as follows on all insurance certificates: "Should any of the above described policies be cancelled before the expiration date thereof, the issuing insurer will mail 30 day written notice to the certificate holder named to the left", or a cancellation modification must be attached stating the above clause.**

## **22. CONTRACTOR'S RESPONSIBILITY FOR WORK.**

Until written final acceptance of the Work of Improvement by Authority, Contractor shall have full charge and care thereof and shall bear the risk of injury, loss or damage to all or any part thereof by an Act of God (including fire, flood, or hurricane) or from any other cause, whether arising from the execution of the Work or Improvement or otherwise. Contractor shall rebuild, repair, restore and make good all damage to the Work or any portion thereof occasioned by an Act of God or any other cause before final acceptance of the whole Work of Improvement by Authority and shall bear the entire expense of such

rebuilding, repair or restoration. The preceding sentence notwithstanding, Contractor is liable for the repair of damages by an Act of God.

### **23. ASSIGNMENT.**

Neither the Contract, or any portion thereof, or any rights to proceeds there from (whether due or to become due) shall be assigned by Contractor without the prior written consent of Authority. The execution of any such assignment by Contractor without prior written consent of Authority shall constitute a breach of Contract and Authority may, within thirty (30) days from the date it first receives notice or knowledge of such assignment, terminate the Contract by notifying Contractor of such termination in writing, or exercise all rights and remedies given Authority because of a breach of Contract by Contractor or the termination of the Contract.

### **24. SUBCONTRACTORS.**

Contractor shall provide Authority with the following information:

- (a) The name and location and the place of business of each subcontractor who will perform Work or labor or render services to Contractor in or about the construction of the Work of Improvement, or who will specially fabricate and install any portion of the Work according to detailed drawings contained in the Plans and Specifications, in an amount in excess of fifty thousand dollars (\$50,000.00). This information should be included with the Contractor's Bid.
- (b) The description of the Work which will be done by each subcontractor. Contractor shall list only one subcontractor for each such description as is defined by Contractor in Contractor's bid.
- (c) A copy of each Certificate of Responsibility shall be provided with contractor's bid, if subcontractor is performing work in an amount in excess of \$50,000.00.

Listing of subcontractors by Contractor and Authority's failure to object to any subcontractor so listed shall not relieve Contractor from his responsibility for completion of the Work of Improvement in strict compliance with the terms of this Contract. If, in the opinion of Engineer, any subcontractor fails to complete the portion of the Work sublet to him/her within the time and in the manner prescribed by the Contract, Contractor shall complete or cause to be completed such Work in the time and in the manner specified by Engineer.

### **25. TEMPORARY SUSPENSION OF WORK.**

The Authority shall have the authority to suspend the Work wholly or in part, for such period as it may deem necessary due to (1) unsuitable weather, (2) such other conditions as are considered unfavorable for the suitable prosecution of the Work, or (3) failure on part of the Contractor or any subcontractor to carry out orders given by Engineer pursuant to the Contract or to perform any provisions of the Work in the manner prescribed by the Contract. Contractor shall immediately cease Work upon such order of Authority's Executive Director and shall not resume the Work until ordered in writing by the Authority.



## **26. EXTENSION OF CONTRACT TIMES.**

The Contract Times may be extended by Authority if all of the following three requirements are met:

- (a) The delay is the result of causes beyond the control of Contractor or its subcontractors or materialmen;
- (b) Within ten (10) days from the beginning of any such delay period Contractor notifies Engineer and Authority in writing of the cause of the delay, requests an extension of the time within which to complete the contract by reason of the delay and specifies the length of such requested extension; and
- (c) Authority, upon investigation, notifies Contractor in writing that the extension of time is granted or rejected. In the event contractor fails to timely complete the work or improvement, Authority may impose liquidated damages against contractor in the amount of \$1,200 per day.
- (d) The Contractor will not be granted additional overhead costs related to mobilization, demobilization, equipment rental fees, and General Conditions for contract extensions, unless those overhead costs are approved prior to the contract extension being granted.

## **27. TERMINATION FOR DEFAULT.**

Subject to the terms and conditions hereinafter set forth, Authority may, at its option, terminate Contractor from performance of the Work of Improvement if any of the following events occur:

- (a) A material breach of the Contract that, if curable, is not cured within ten (10) days from written notice of the breach served on Contractor by Authority.
- (b) Execution by Contractor of an assignment prohibited by paragraph 23.
- (c) Failure of Contractor to supply an adequate work force and equipment or material of proper quality reasonably required in order for Contractor to complete the Work of Improvement within the time specified in the Contract.
- (d) Failure of Contractor to diligently prosecute the Work in accordance with the established work time Schedule approved by the Authority so that in the opinion of the Authority, Contractor will be unable to complete Work of Improvement within the time specified in the Contract.
- (e) Failure of Contractor to pay promptly all subcontractors, materialmen and laborers for Work actually performed in, or materials actually furnished for, the Work of Improvement.

- (f) Neglect or refusal of Contractor to comply with (or provide satisfactory means for compliance with) the Contract as directed by Engineer and written orders of the Engineer pursuant to Paragraph 11 within the time specified by Engineer.

Termination of Contractor shall be by written notice served in the manner provided in Paragraph 29.

Upon termination, Contractor shall immediately cease Work on the Contract and Authority may complete the Work of Improvement by whatever method it deems expedient. Upon termination of the contract by Authority, Authority or its authorized representative may take possession of all or part of Contractor's materials, tools, equipment and appliances upon the job site and use the same for the purpose of completing the Contract and it may hire such forces and such labor and buy or rent such additional materials and supplies and equipment as may be necessary for the proper conduct of the Work and for the completion thereof, or it may employ other workers, substitute other machinery or materials and purchase the materials contracted for, in such manner as Authority may deem proper. Notwithstanding termination of the Contract, Contractor shall take timely, reasonable, and necessary action to protect and preserve property in the possession of the contractor in which the owner has an interest. Authority may hire another Contractor to complete the unfinished Work of Improvement. If the cost to Authority to complete the Work of Improvement after termination of Contractor exceeds the balance of the Contract price unpaid to Contractor, Contractor shall, on demand, pay such excess to Authority.

## **28. TERMINATION FOR CONVENIENCE CLAUSE**

1. *Termination.* The Procurement Officer of the MSPA may, when the interests of the MSPA so require, terminate this Contract in whole or in part, for the convenience of the MSPA. The Procurement Officer shall give written notice of the termination to the Contractor specifying the part of the Contract terminated and when termination becomes effective.
2. *Contractor's Obligations.* The Contractor shall incur no further obligations in connection with the terminated Work, and on the date set in the notice of termination the Contractor will stop Work to the extent specified. The Contractor shall also terminate outstanding orders and subcontracts as they relate to the terminated Work. The Contractor shall settle the liabilities and claims arising out of the termination of subcontracts and orders connected with the terminated Work. The Procurement Officer may direct the Contractor to assign the Contractor's right, title, and interest under terminated orders or subcontracts to the MSPA. The Contractor must still complete the Work not terminated by the notice of termination and may incur obligations as are necessary to do so. The Contractor shall be entitled to compensation for services performed up to the date of termination, and authorized and accepted by the MSPA.

## **29. WITHHOLDING OF PAYMENT**

Authority may withhold payment of money otherwise due to Contractor for any of the following reasons:

- (a) Defective work which has not been remedied.
- (b) Failure of Contractor to make payment properly to subcontractors, materialmen, laborers or other claimants.
- (c) The existence of reasonable doubt by Authority that the Contract can be completed for the balance of the Contract amounts then unpaid.
- (d) Failure of Contractor to accomplish the Work under this Contract.
- (e) Termination of Contractor under the provisions of Paragraph 25.
- (f) A breach of the Contract not heretofore specified above which, in the Authority's sole opinion, may cause damage to it.

Whenever the grounds giving rise to the above withholding have been removed, Authority shall pay to Contractor the amount withheld because of such grounds less any expenses incurred by Authority or damages sustained by Authority as a result of the withholding, the cause of the withholding or the removal of the cause of withholding, less retentions, if any.

### **30. NOTICES.**

Notice shall be served either personally or by telegram, by mail or by FAX. Notices by registered or certified mail shall be addressed as follows:

- (a) Notice to Authority shall be addressed to the Mississippi State Port Authority, P.O. Box 40, Gulfport, Mississippi (228) 865-4300 Fax: (228) 865-4347.
- (b) Notice to Contractor shall be addressed or sent by telecopier to Contractor at the address and FAX number shown on the introductory paragraph of the Contract.

Notices by mail shall be deemed served forty-eight (48) hours after deposit in the United States mail, postage prepaid. Notices by FAX are served when received.

### **31. GUARANTEE.**

By execution of the Contract, Contractor guarantees for a period of two years from acceptance that:

- (a) All Work to be in accordance with the Plans and Specifications and any written authorization by Authority to deviate from said Plans and Specifications;
- (b) All materials used are new except where otherwise expressly authorized by the Contract Documents; and
- (c) All Work shall be free from defects in workmanship or materials.

### **32. INSOLVENCY OF CONTRACTOR.**

In addition to any other remedy it may have herein or by law, Authority may at its option terminate the Contract and take possession of the Work of Contractor and of all materials, tools, equipment and appliances and finish the Work of Contractor by whatever method Authority deems expedient and proper under any of the following circumstances:

- (a) The insolvency of Contractor;
- (b) The filing of a petition or arrangement in bankruptcy by or against Contractor pursuant to the Bankruptcy Code and the trustee or debtor-in-possession, as appropriate, does not assume the Contract within the time and manner provided by the Bankruptcy Code or established by order of the Bankruptcy Court;
- (c) A general assignment for the benefit of creditors by Contractor; or
- (d) The appointment of a receiver for Contractor's property or a portion thereof.

Upon termination as provided in this paragraph, Contractor shall not be entitled to receive any further payment until the Work of Improvement is completed. If the unpaid balance of the Contract price exceeds the cost and expense of finishing the Work including compensation for additional managerial, legal, engineering and administrative services and all claims against Authority in connection with Work of Contractor, such excess shall be paid to Contractor. If such expenses and claims as set forth above exceeds the unpaid balance of the Contract price, Contractor shall pay the difference to Authority on demand.

### **33. ATTORNEYS' FEES.**

If either party hereto incurs attorneys' fees in order to enforce any of the terms, provisions or conditions of this Contract or because of the breach of this Contract by the other party, each party shall bear its own attorney' fees and court costs associated therewith.

### **34. CHANGE ORDERS.**

All changes, alterations or deviations to the Work of Improvement must be by a written change order executed by Authority and Contractor. Contractor shall be entitled to no extra compensation for additional work performed that is not accomplished pursuant to a written change order.

### **35. DAMAGES.**

If the Contractor fails to complete the work of improvement in accordance with this Contract, the Authority may be subject to damages. Damages may include construction stand by time resulting from the Contractor's failure to deliver the Building to the Project Site in accordance with the Contract. Further damages may include, but not be limited to: 1) Breach of Contract against the Authority for failure to complete the project in a timely manner, 2) Increased costs in the loading, unloading, and storage of cargo as a result of the project not being completed in a timely manner, and 3) Increased vessel costs as a result of the project not being completed in a timely manner.

**36. LONGSHOREMEN'S AND HARBOR WORKERS' ACT.**

Contractor shall secure (and shall require all of its subcontractors to secure) payment to employees of the compensation payable under the Longshoremen's and Harbor Workers' Act (33 United States Code section 90, et seq.) in the performance by Contractor (and any subcontractor) of the Work of this Contract.

**37. MITIGATION MEASURES.**

- (a) Contractor shall take all steps reasonably required to avoid the discharge of any liquids or materials into the harbor waters. Contractor shall comply and require all of Contractor's subcontractors and materialmen to comply with the Authority's tariff provisions pertaining to dangerous and hazardous materials. Contractor shall also comply and require all of Contractor's subcontractors and materialmen to comply with the Authority's General Permit to Discharge Storm Water Associated with Construction Activities.
- (b) Contractor shall coordinate all construction activities so as to minimize the disruption of the commercial activities at the Port of Gulfport to the extent reasonably feasible.

**38. REQUIRED PROVISIONS DEEMED INSERTED.**

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein; and if through mistake or otherwise any such provision is not inserted or is not correctly inserted, then upon the application of either party, the Contract shall forthwith be physically amended to make such insertion of correction.

**39. CONTRACTOR'S TITLE TO MATERIAL.**

No materials or supplies for the Work shall be purchased by the Contractor or by any subcontractor subject to any chattel mortgage or under a conditional sale contract or other Contract by which a security interest is retained by the seller. The Contractor warrants that Contractor has good title to all materials and supplies used by Contractor in the Work, free from all liens, claims or encumbrances.

**40. USE AND POSSESSION PRIOR TO COMPLETION.**

The Authority shall have the right to take possession of or use any completed or partially completed part of the Work. Before taking possession of or using any Work, the Authority shall furnish the Contractor a list of items of Work remaining to be performed or corrected on those portions of the Work that the Authority intends to take possession of or use. However, failure of the Authority to list any of item of Work shall not relieve the Contractor of responsibility for complying with the terms of the Contract. The Authority's possession or use shall not be deemed an acceptance of any Work under the Contract.

While the Authority has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to the Work resulting from the Authority's possession or use. If Contractor believes the prior possession or use by the Authority will delay the progress of the Work or cause additional expense to the Contractor, Contractor shall so notify the Authority; an equitable adjustment shall be made in the Contract price or the time of completion or both, and the Contract shall be modified in writing accordingly by a written change order before Authority takes possession.

#### **41. ACCIDENT PREVENTION.**

- (a) In performing this Contract, the Contractor shall provide for protecting the lives and health of employees and other persons; for preventing damage to property, materials, supplies and equipment; and for avoiding work interruptions. For these purposes, the Contractor shall comply with all OSHA regulations and rules and shall:
  - (1) Provide appropriate safety barricades, signs and signal lights.
  - (2) Ensure that any additional measures are taken that the Engineer determines to be reasonably necessary for this purpose.
- (c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to Work performed under this Contract resulting in death, traumatic injury, occupational disease or damage to property, materials, supplies or equipment. The Contractor shall report this data in the manner required by law.
- (d) The Authority shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the Contractor or the Contractor's representative at the site of the Work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Authority may issue an order stopping all or part of the Work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.
- (e) The Contractor shall be responsible for its subcontractors' compliance with this clause.
- (f) Before commencing the Work, the Contractor shall:
  - (1) Submit a written proposal for implementing this clause and
  - (2) Meet with the Authority to discuss and develop mutual understanding relative to administration of the overall safety program.

#### **42. COMPLETENESS OF CONTRACT.**

The Contract Documents constitute the complete Contract between the parties and supersede all negotiations, representations or oral Contracts reached prior to execution of the Contract.

**43. PROPRIETARY NAMES AND SUBSTITUTIONS.**

- (a) Whenever any equipment, material or process is indicated or specified by patent or proprietary name, or by name of manufacturer, such reference is used to establish the type, function and quality required. Unless the name is followed by words indicating that no substitution is permitted, such references shall be deemed to be preceded by the words "equal and similar to." The Contractor may offer any equipment, material or process substantially equal to that indicated or specified. Final determination of the acceptability of such substitute items shall rest with the Engineer. Engineer may consider the strength, appearance, durability, reliability, dimensions, finish, efficiency, maintainability, service history, life cycle cost and other characteristics of the proposed substitute in making the determination.
- (b) A substitute item shall be a standard catalogued product of a company regularly engaged in the manufacture of such items. No custom or prototype substitutes will be accepted. The Contractor shall certify that a substitute item will perform adequately the functions and achieve the results called for the general design, be similar and of equal substance, and be suited to the same use as the specified item. Contractor shall identify all differences between the proposed substitute and that specified, and state whether or not acceptance of the proposed substitute will require a change in the Contract Documents to adapt the design to the proposed substitute. Any redesign or changes in the Work resulting from acceptance of a substitute will be at the sole expense of the Contractor. The Contractor shall furnish such data concerning and perform such testing of the proposed substitute as may be required by the Authority to evaluate the substitute item and determine if it is substantially equal. Additional information requested by the Engineer shall be furnished by the Contractor within ten (10) days of such request.
- (c) Unless otherwise authorized by the Authority, offers of substitute items shall be made within 14 days after Notice of Award. Adequate time shall be allowed for the District to evaluate substitute items. No extension of the Contract time will be authorized for any circumstance developing from this provision. Failure to comply with this provisions will be sufficient cause for rejection of a proposed substitute.

**44. CONFLICTS.**

Unless otherwise specified, in the event that a conflict exists between a provision of the Special Provisions or Specifications and the Contract, including General Conditions, the provisions of the Contract and General Conditions shall apply.

**45. GOVERNING LAW.**

This Contract and all documents included herein are to be governed by the laws of the State of Mississippi.

**46. E-VERIFY**

Contractor represents and warrants that it will ensure its compliance with the Mississippi Employment Protection Act (Senate Bill 2988 from the 2008 Regular Legislative Session) and will register and participate in the status verification system for all newly hired employees. The term "employee" as used herein means any person that is hired to perform Work within the State of Mississippi. As used herein, "status verification system" means the Illegal Immigration Reform and Immigration Responsibility Act of 1996 that is operated by the United States Department of Homeland Security, also known as the E-Verify Program, or any other successor electronic verification system replacing the E-Verify Program. Contractor agrees to maintain records of such compliance and, upon request of the State, to provide a copy of each such verification to the state. Contractor further represents and warrants that any person assigned to perform services hereunder meets the employment eligibility requirements of all immigration laws of the State of Mississippi. Contractor understands and agrees that any breach of these warranties may subject Contractor to the following: (a) termination of this Contract and ineligibility for any state or public contract in Mississippi for up to three (3) years, with notice of such cancellation/termination being made public, or (b) the loss of any license, permit, certification or other document granted to Contractor by an agency, department or government entity for the right to do business in Mississippi for up to one (1) year, or (c) both. In the event of such termination/cancellation, Contractor would also be liable for any additional costs incurred by the state due to contract cancellation or loss of license or permit.

**47. TWIC**

The enforcement date for the Transportation Worker Identification Credential (TWIC) for the Mississippi State Port at Gulfport was December 30, 2008. If you require unescorted access to restricted areas at the Mississippi State Port at Gulfport you will need a TWIC card. Restricted areas are defined as areas at a facility over which the owner/operator has implemented security measures for access control. You can access TSA at [www.tsa.gov/twic](http://www.tsa.gov/twic) for further TWIC information.

**48. CONFIDENTIAL INFORMATION**

"Confidential Information" shall mean (a) those materials, documents, data, and other information which the Contractor has designated in writing as proprietary and confidential, and (b) all data and information which the Contractor acquires as a result of its contact with and efforts on behalf of the MSPA and any other information designated in writing as confidential by the MSPA. Each party to this Contract agrees to protect all confidential information provided by one party to the other; to treat all such confidential information as confidential to the extent that confidential treatment is allowed under State and/or federal law and, except as otherwise required by law, not to publish or disclose such information to any third party without the other party's written permission, and to do so by using those methods and procedures normally used to protect the party's own confidential information. Any liability resulting from the wrongful disclosure of



confidential information on the part of the Contractor, its subcontractors or its employees shall rest with Contractor. Disclosure of any confidential information by the Contractor, its subcontractors or employees without the express written approval of the MSPA shall result in the immediate termination of this Contract.

#### **49. THE PRIVACY ACT**

In furtherance of the purposes of this Contract, the MSPA may be required to provide to the Contractor certain information that is subject to the Privacy Act of 1974, Public Law 93-579 (5 U.S.C. 552a) (Privacy Act) and applicable regulations. By entering into this Contract, the MSPA commits to sharing such information with the Contractor on the following terms and conditions and the Contractor agrees that upon acceptance of such information that it will take all steps necessary to ensure that such information is used and protected as required by federal law. The Contractor further acknowledges that a breach of this trust could result in civil and/or criminal action. The Contractor agrees that it will abide by the requirements of the Privacy Act in handling this information and further agrees that said information shall be used only in furtherance of meeting the MSPA's obligations and responsibilities under the Grant or allocated State funds and to prevent duplication of effort and duplication of benefits.

**The Contractor acknowledges receipt of the following notification and agrees to abide by the terms of the Privacy Act.**

1) Privacy Act Notification --

The Contractor will be required to design, develop or operate a system of records on individuals, to accomplish an agency function subject to the Privacy Act of 1974, Public Law 93-579, December 31, 1974 (5 U.S.C. 552a) and applicable agency regulations. Violation of the Act may involve the imposition of criminal penalties.

2) The Contractor agrees to:

- A) Comply with the Privacy Act of 1974 and the agency rules and regulations issued under the Privacy Act in the design, development or operation of any system of records on individuals to accomplish an agency function when the contract specifically identifies:
  - i. The systems of records; and
  - ii. The design, development, or operation Work that the Contractor is to perform;
- B) Include the Privacy Act notification contained in this Contract in every solicitation and resulting subcontract and in every subcontract awarded without a solicitation, when the Work statement in the proposed subcontract requires the redesign, development or operation of a system of records on individuals that is subject to the Privacy Act; and
- C) Include this clause, including this paragraph (C), in all subcontracts awarded under this or any Contract with the MSPA, which requires the design, development or operation of such a system of records.

3) In the event of violations of the Privacy Act, a civil action may be brought against the Contractor when the violation concerns the design, development or operation of a system of records on individuals to accomplish an agency function, and criminal penalties may be imposed upon the officers or employees of the Contractor when the violation concerns the operation of a system of records on individuals to accomplish an agency function.

4) Definitions:

A) "Operation of a system of records," as used in this clause, means performance of any of the activities associated with maintaining the system of records, including the collection, use and dissemination of records.

B) "Record," as used in this clause, means any item, collection or grouping of information about an individual that is maintained by an agency including, but not limited to, education, financial transactions, medical history and criminal or employment history and that contains the person's name or the identifying number, symbol or other identifying particular assigned to the individual, such as a fingerprint or voiceprint or a photograph.

C) "System of records on individuals," as used in this clause, means a group of any records under the control of any agency from which information is retrieved by the name of the individual or by some identifying number, symbol or other identifying particular assigned to the individual.

## **50. VEHICLE REGISTRATION: SECURITY REQUIREMENT**

Contractor shall register company vehicles that will be used to transport personnel or equipment, supplies, etc. through the gates and to the job site.

DOCUMENTS NEEDED:

- 1) List of vehicles
- 2) License (plate) number for each vehicle
- 3) Registration and proof of insurance for each vehicle

This information must be sent to the attention of the Mississippi State Port Authority, Administrative Assistant of Engineering, P.O. Box 40, Gulfport, MS 39502.

Contractor is responsible for updating vehicle list as needed.

## **51. CONTACTS.**

The following list of agencies and telephone numbers is intended for the convenience of the Contractor and is not guaranteed to be complete or correct.

Mobile District, U.S. Army Corps of Engineers	(251) 690-2505
Mississippi Department of Marine Resources	(228) 375-5000
Mississippi Department of Environment Quality	(228) 432-1056
Gulfport Fire Department	(228) 868-5950
Gulfport Police Department	(228) 868-5900
Mississippi State Port Authority	(228) 865-4300

**52. MISSISSIPPI DEPARTMENT OF EMPLOYMENT (MDES) CERTIFIED EMPLOYMENT PLAN FORM**

The Mississippi State statutes require that all public works projects funded with Disaster Recovery Funds shall require the contractors on these projects to submit an employment plan (form is attached) to the MDES within seven days of Notice of Award. Engineer will require proof that this form has been submitted.

**53. CLOSE-OUT DOCUMENTS**

The MSPA shall own all documents, files, reports, Work papers and working documentation, electronic or otherwise, created in connection with the Project, which is the subject of this Contract, except for the Contractor's internal administrative and quality assurance files and internal Project correspondence. The Contractor shall deliver such documents and Work papers to MSPA upon termination or completion of this Contract. MSPA requires digital copies of all work product in PDF form and CAD (if applicable). MSPA requires one full size record set of plans and specifications, along with one ½ size set of record set drawings. The Contractor will provide MSPA both digital and physical set of “AS BUILT” drawings and specifications at the part of the project closeout documents. “AS BUILT” drawings and specifications should have any project changes, modifications, clarifications, and/or notations made in the color red. The foregoing notwithstanding, the Contractor shall be entitled to retain a set of such Work papers for its files. Contractor shall be entitled to use such Work papers only after receiving written permission from MSPA and subject to any copyright protections. The contractor shall submit all product and equipment warranty or service documentation to MSPA in a separate binder labeled by project, product manufacturer with contact information, installer, and warranty type or service information.

**END OF GENERAL CONDITIONS**



# CONTRACT

This Contract is made this \_\_\_\_\_ 20\_\_, by and between the MISSISSIPPI STATE PORT AUTHORITY ("Authority"), 2510 14<sup>th</sup> Street, Suite 1450, Gulfport, Mississippi, 39501, and whose telephone number is (228) 865-4300, and \_\_\_\_\_ Contractor) whose address is \_\_\_\_\_, Certificate of Responsibility issued the \_\_ day of \_\_\_\_, 202\_\_, classification as noted in their current Certificate of Responsibility No. \_\_\_\_ for, \_\_\_\_\_ and whose phone number is (\_\_\_\_)\_\_\_\_, e-mail:\_\_\_\_\_.

The parties agree that:

1. The term "Contract Documents" means the following:
  - A. This Contract.
  - B. Advertisement for Bids
  - C. Information for Bidders.
  - D. Bid of Contractor (including list of subcontractors).
  - E. General Conditions (basic contract terms).
  - F. Specifications prepared by MP Design Group.
  - G. Drawings prepared by MP Design Group.
  - H. Addendum (if any)
  - I. Change Orders executed pursuant to the terms of the General Conditions.
2. The term "Work of Improvement" means

## **“East Pier Deep Water Wharf for USM/NOAA”**

in accordance with the Contract Documents.

3. Contractor will furnish all materials, supplies, tools, equipment, labor and other things or services necessary to complete the Work of Improvement in accordance with the Contract Documents.
4. Time is of the Essence: All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

This provision specifies the procedure for determination of time extensions for unusually severe weather. In order for the Owner and Engineer to award a time extension under this clause, the following conditions must be satisfied:

- (a) The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.
- (b) The unusually severe weather must actually cause a delay to critical path activities and impact the completion of the project.

Contractor will commence the Work of Improvement within five (5) calendar days after the date of service of the **Notice to Proceed** and the Work will be fully complete and Ready for Final Payment based on the milestone schedule outlined below unless the Contract Times are extended in accordance with the Contract Documents. The Contract time includes anticipated adverse weather delays based on historical information from the National Oceanic and Atmospheric Administration (NOAA). Substantial completion must be achieved no later than thirty (30) days prior to Final Completion, per the Contract Times. Contractor shall provide MSPA, prior to issuance of Notice to Proceed, a project schedule indicating all notable completion milestones for the project including, but not limited to: mobilization, demolition, any phasing or staging completion, major equipment deliveries, inspection dates, substantial completion, and close-out documentation. Contractor shall identify all critical path activities in the project schedule.

The Contractor's activity durations in the progress schedule must reflect these anticipated adverse weather delays in all-weather dependent activities.

#### MONTHLY ANTICIPATED ADVERSE WEATHER DELAYS

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
(2)	(3)	(3)	(3)	(3)	(4)	(4)	(4)	(3)	(2)	(3)	(3)

Upon receipt of the Notice to Proceed (NTP) and continuing throughout the contract, the Contractor shall record on the daily report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on the overall project's critical activities for 50 percent or more of the contractor's schedule workday and register 0.50 inches of rain or more. The number of actual adverse weather days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated above, the Owner and Engineer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather days and issue a modification in accordance with the contract.

The Contractor must submit each month with his application for payment a separate letter stating that he is requesting an extension of time for abnormal adverse weather or that he has no claim for an extension for that period of time. No payment on a monthly application is due until the letter is received. Complete justification including an analysis verifying that conditions as stated herein above must accompany each request. A Contractor's letter or statement that it was delayed will not be considered as adequate justification. The receipt of this request and data by the Engineer will not be considered as Owner and Engineer approval of a time extension in any way.

The Contractor must submit each month with his application for payment a separate letter stating that he is requesting an extension of time for abnormal adverse weather or that he has no claim for an extension for that period of time. No payment on a monthly application is due until the letter is received. Complete justification including an analysis verifying that conditions as stated herein above must accompany each request. A Contractor's letter or statement that it was delayed will not be considered as adequate justification. The receipt of this request and data by the Engineer will not be considered as Owner and Engineer approval of a time extension in any way.

**Project Milestone Schedule:**

Milestone #1- Partial Substantial Completion: Contractor must have all items that are required to allow USM and NOAA vessels to be moored along the East Pier. Items to include the following: all new and modified fenders, all new bollards and bollards to be replaced, domestic water, sanitary sewer, fire water, lights, temporary power, and security fencing. Partial Substantial Completion must be achieved within 180 consecutive calendar days after the Notice to Proceed date.

Milestone #2 – Substantial Completion Date of Entire Project: Substantial completion for the entire project scope must be achieved within 280 consecutive calendar days after the Notice to Proceed date.

Milestone #3 – Final Completion/Acceptance: Project shall be fully complete and ready for final payment within 30 consecutive calendar days after the Milestone #2, Substantial Completion, date.

In the event that Contractor fails to reach Milestone #1, Partial Substantial Completion, on or before the date established in the Project Milestone Schedule, Contractor shall pay Owner liquidated damages in the amount of \$1,200 per day for each day beyond the Partial Substantial Completion Date that the Work is not partially substantial complete.

In the event that Contractor fails to reach Milestone #2, Substantial Completion, on or before the date of Substantial Completion, Contractor shall pay Owner liquidated damages in the amount of \$1,200 per day for each day beyond the Substantial Completion Date that the Work is not substantially complete.

In the event that Contractor fails to reach Milestone #3, Final Completion/Acceptance (including, without limitation, the completion of all close-out requirements as specified prior to the expiration of the date of Final Completion) Contractor shall pay, in addition to any amounts owed pursuant to Partial Substantial and Substantial Completion, liquidated damages in the amount of \$1,200.00 per day for each day beyond the Final Completion date that the Work is not fully completed and finally accepted (Final Acceptance) by Owner.

5. Construction Sequencing should proceed in a manner described in the Technical Specifications. In performance of the Work of Improvement, Contractor shall comply with the Contract Documents and accomplish the Work in accordance therewith.
6. Contractor and Owner recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified above, plus any extensions thereof allowed in accordance the General Conditions. They also recognize the delays, expense, and difficulties involved in proving, in a legal proceeding, the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty) Contractor shall pay Owner:

In the event that Contractor fails to reach Milestone #1, Partial Substantial Completion, on or before the date established in the Project Milestone Schedule, Contractor shall pay Owner liquidated damages in the amount of \$1,200 per day for each day beyond the Partial Substantial Completion Date that the Work is not partially substantial complete.

In the event that Contractor fails to substantially complete the Work on or before the date identified in the project milestone schedule, Contractor shall pay Owner liquidated damages in the amount of \$1,200.00 per day for each day beyond the Substantial Completion Date that the Work is not substantially complete.

In the event that Contractor fails to obtain Final Acceptance (including, without limitation, the completion of all execution and close-out requirements as specified prior to the expiration of the Contract Time, Contractor shall pay, in addition to any amounts owed pursuant to the immediately preceding paragraph (if applicable), liquidated damages in the amount of \$1,200.00 per day for each day beyond the Contract Time that the Work is not fully completed and finally accepted (Final Acceptance) by Owner.

7. In performance of the Work of Improvement, Contractor shall comply with the Contract Documents and accomplish the Work in accordance therewith.
8. Port Authority will pay Contractor for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to the following:

For all Work, at the prices stated in Contractor's Bid attached as an exhibit to this Agreement at execution.

**Total contract price not to exceed:** \_\_\_\_\_

9. The MSPA shall own all documents, files, reports, Work papers and Working documentation, electronic or otherwise, created in connection with the Project, which is the subject of this Contract, except for the Contractor's internal administrative and quality assurance files and internal Project correspondence. The Contractor shall deliver such documents and Work papers to MSPA upon termination or completion of this Contract. MSPA requires digital copies of all work product in PDF form and CAD (if applicable). MSPA requires one full size record set of plans and specifications, along with one 1/2 size set of record set drawings. The Contractor will provide MSPA both digital and physical set of "AS BUILT" drawings and specifications at the part of the project closeout documents. "AS BUILT" drawings and specifications should have any project changes, modifications, clarifications, and/or notations made in the color red. The foregoing notwithstanding, the Contractor shall be entitled to retain a set of such Work papers for its files. Contractor shall be entitled to use such Work papers only after receiving written permission from MSPA and subject to any copyright protections.



**CONTRACTOR:**

**MISSISSIPPI STATE PORT AUTHORITY**

\_\_\_\_\_  
Signature

\_\_\_\_\_  
John Rester, President

\_\_\_\_\_  
Name

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

\_\_\_\_\_  
Title

\_\_\_\_\_  
Mark Loughman, Secretary

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

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

**MISSISSIPPI DEVELOPMENT AUTHORITY**

\_\_\_\_\_  
William V. Cork Executive Director and  
Chief Economic Development Officer

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



**SECTION 012200  
UNIT PRICES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Measurement and payment criteria applicable to Work performed under a unit price payment method.

**1.02 COSTS INCLUDED**

- A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

**1.03 UNIT QUANTITIES SPECIFIED**

- A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

**1.04 MEASUREMENT OF QUANTITIES**

- A. Contractor will take all measurements and compute quantities. Measurements and quantities will be verified by Engineer/Architect or Engineer of Record.
- B. Assist by providing necessary equipment, workers, and survey personnel as required.
- C. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness. Soils muck out volume will be determined by Final Measure (FM).
- D. Measurement by Area: Measured by square dimension using mean length and width or radius. Area will be determined by Final Measure (FM).

**1.05 PAYMENT**

- A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Engineer/Architect, multiplied by the unit price. See Section 1.07 Schedule of Values for a description of work that is paid under each pay item.
- B. Payment will not be made for any of the following:
1. Products wasted or disposed of in a manner that is not acceptable.
  2. Products determined as unacceptable before or after placement.
  3. Products not completely unloaded from the transporting vehicle.
  4. Products placed beyond the lines and levels of the required Work.
  5. Products remaining on hand after completion of the Work.
  6. Loading, hauling, and disposing of rejected Products.

**1.06 DEFECT ASSESSMENT**

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

**1.07 SCHEDULE OF UNIT PRICES**

- A. All unit prices provided below should include all labor, materials, and equipment necessary to satisfactory complete the work as specified.
- B. Base Bid - Deep Water Wharf
1. Mobilization / Demobilization: Mobilization shall be paid for at the contract unit price per lump sum.
  2. General Conditions: Shall be paid for at the contract unit price per lump sum.
  3. Demolition: Shall be paid for at the contract unit price per lump sum, which shall include all items shown on the demolition plan sheets and information provided in Section 024100 - Demolition. Pay item should include all labor, materials and equipment necessary to satisfactory complete the work as specified.
  4. Grout Removal: Shall be paid for the contract unit price per cubic yard.

5. Asphalt Paving: Shall be paid for at the contract unit price per square yard. Pay item should include the cost 610 limestone, surface course, and binder course.
6. Concrete Paving (Wharf Deck): Shall be paid for at the contract unit price per square yard. Pay item should include the cost for concrete reinforcement.
7. Structural Grout Fill: Shall be paid for the contract unit price per cubic yard.
8. Security Fence: Shall be paid for at the contract unit price per linear foot.
9. Automatic Gate: Shall be paid for at the contract unit price per each. Pay item should include the gate, the gate operator, all mechanism and hardware for the gate system, traffic safety loops, traffic paint, access readers, pedestals for access readers, and all electrical wiring required for the gate system.
10. 4' Wide Pedestrian Gate: Shall be paid for at the contract unit price per each.
11. Above Grade Utility Trench (Detail #7, C620): Shall be paid for at the contract unit price per linear foot. Pay item should include the cost to install the utility trench shown in Detail #7 on Sheet C620. Conduit and utility piping should be paid for under other pay items.
12. Above Grade Utility Trench (Detail #9, C620): Shall be paid for at the contract unit price per linear foot. Pay item should include the cost to install the utility trench shown in Detail #8 on Sheect C620. Conduit and utility piping should be paid for under other pay items.
13. Above Grade Utility Trench (Detail #2, C621): Shall be paid for at he contract unit price per linear foot. Pay item should include the cost to install the utility trench shown in Detail #2 on Sheet C621. Conduit and utility piping should be paid for under other pay items.
14. Above Grade Utility Trench (Detail #3, C621): Shall be paid for at the contract unit price per linear foot. Pay item should include the cost to install the utility trench shown in Detail #3 on Sheet C621. Conduit and utility piping should be paid for under other pay items.
15. Above Grade Utility Trench (Detail #4, C621): Shall be paid for at the contract unit price per linear foot. Pay item should include the cost to install the utility trench shown in Detail #4 on Sheet C621. Conduit and utility piping should be paid for under other pay items.
16. Electrical Pull Box: Shall be paid for at the contract unit price per each. Pay item should include the cost to install pull box shwon in Detail #1 on Sheet C621. Conduit and utility piping should be paid for under other pay items.
17. 6" Sewer Force Main (Ductile Iron): Shall be paid for at the contract unit price per linear foot. Pay item should include the cost for valves, fittings, excavation, dewatering, backfilling, thrust blocks, marking tape, locator wire, sheathing, shoring, and pipe hangers to mount to the pier.
18. 6" Sewer Force Main (SDR 26 PVC): Shall be paid for at the contract unit price per linear foot. Pay item should include the cost for valves, fittings, excavation, dewatering, backfilling, thrust blocks, marking tape, locator wire, sheathing, shoring, connection to the existing manhole, and pipe embedment.
19. 2" Sewer Force Main (SCH 10 Stainless 316L): Shall be paid for at the contract unit price per linear foot. Pay item should include the cost for valves, fittings, excavation, dewatering, backfilling, thrust blocks, marking tape, locator wire, sheathing, shoring, and pipe hangers to mount to the pier.
20. Vessel Sewer Connection (2"): Shall be paid for at the contract unit price per each. Pay item should include the cost for the spill containment curb, 2" header, 2.5" M Camlock, and 2" check valve.
21. Vessel Sewer Connection (6"): Shall be paid for at the contract unit price per each. Pay item should include the cost for the spill containment curb, 6" header, 2.5" M Camlock, and 2" check valve.
22. 8" Water Main (Ductile Iron): Shall be paid for at the contract unit price per linear foot. Pay item should include the cost for excavation, dewatering, marking tape, locator wire, fittings, blocking, thrust blocks, backfilling, tie-ins for water lines, pipe hangers and clamps, and mounting hardware to mount the main to the pier.
23. Fire Hydrant Assembly: Shall be paid for at the contract unit price per each. Pay item should include the cost for valves required as part of the assembly.
24. 2" Water Service (SCH 10 Stainless 316L): Shall be paid for at the contract unit per per linear foot. Pay item should include the cost for excavation, dewatering, marking tape, locator wire, fittings, blocking, thrust blocks, backfilling, tie-ins for water lines, and

- mounting hardware to mount the service to the pier.
25. Vessel Water Connections: Shall be paid for at the contract unit price per each. Pay item should include the cost for 2" M Camlock, 1.5" threaded hose connection and 3/4" hose bib.
  26. New Fender (Type 1 Fender): Shall be paid for at the contract unit price per each. Pay item should include the cost for installation of the concrete foundation and new fender.
  27. New Fender (Type 2 Fender): Shall be paid for at the contract unit price per each. Pay item should include the cost for installation of the concrete foundation and new fender.
  28. Modified Type 2 Fender: Shall be pad for at the contract unit price per each. Pay item should include the cost for removing parts of the existing fender system and installing new fender parts.
  29. New Mooring Bollard: Shall be paid for at the contract unit price per each. Pay item should include the cost for installation of the concrete foundation and new bollard.
  30. New Ladder: Shall be paid for at the contract unit price per each.
  31. Electrical Platform #1: Shall be paid for at the contract unit price per each.
  32. Electrical Platform #2: Shall be paid for at the contract unit price per each.
  33. Electrical Conduit and Conductor: Shall be paid for at the contract unit price per lump sum. Pay item should include the cost all conduit, conductor, grounding, mounting beam, pipe hangers to mount conduit to the pier, duct bank spacers, and pipe clamps.
  34. Vessel Shore Power Enclosure: Shall be paid for at the contract unit price per each. Pay item should include the cost to install the concrete pedestal and enclosure.
  35. Site Lighting: Shall be paid for at the contract unit price per lump sum. Pay item should include the cost to install the concrete pedestal and light pole.
  36. Telecommunications: Shall be paid for at the contract unit price per lump sum. Pay item should include the cost for conduit, wire, pipe hangers, pipe clamps,
  37. MS Power Connection with Transformers: Shall be paid for at the contract unit price per lump sum.
  38. Temporary Power for Vessels: Shall be paid for at the contract unit price per lump sum. Pay item should include the cost for generators and fuel to provide temporary power to the vessels from the substantial completion of Milestone #1 through project completion.
  39. Steel Pipe Bollard: Shall be paid for at the contract unit price per each. Pay item should include the steel pipe, mounting hardware, installation, paint, and concrete to fill the pipe.
  40. Timber Rail: Shall be paid for at the contract unit price per linear foot. Pay item should include the timber rail, mounting hardware, and installation.
  41. 100% Coal Tar Epoxy: Shall be paid for at the contract unit price per lump sum. Pay item should include the cost for material and installation.
- C. Base Bid - Severe Weather Site
1. Mobilization / Demobilization: Mobilization shall be paid for at the contract unit price per lump sum.
  2. General Conditions: Shall be paid for at the contract unit price per lump sum.
  3. Demolition (Severe Weather Site): Shall be paid for at the contract unit price per lump sum, which shall include all items shown on the demolition plan sheets and information provided in Section 024100 - Demolition. Pay item should include all labor, materials and equipment necessary to satisfactory complete the work as specified.
  4. Stripping (Severe Weather Site) (AH)(FM): Shall be paid for at the contract unit price per cubic yard. Stripping excavation will consist of the removal of the top layer of vegetation at to a depth of 6". "AH" means the cost of hauling material off the site is absorbed in the cost of this pay item. "FM" means final measure and the volume should be measure by LVM (loose vehicle measure) and converted to Contract measurement by multiplying the loose measure by 80 percent.
  5. 610 Limestone (Severe Weather Site) (AH)(FM): Shall be paid for at the contract unit price per cubic yard. "AH" means the cost of hauling material off the site is absorbed in the cost of this pay item. "FM" means final measure and the volume should be measure by LVM (loose vehicle measure) and converted to Contract measurement by multiplying the loose measure by 80 percent.

6. Security Fence (Severe Weather Site): Shall be paid at the contract unit price per linear foot.
  7. 20' Double Gate (Severe Weather Site): Shall be paid at the contract unit price per each.
- D. Alternate #1 - Small Boat Pier Scope
1. Mobilization / Demobilization: Mobilization shall be paid for at the contract unit price per lump sum.
  2. General Conditions: Shall be paid for at the contract unit price per lump sum. Refer to General Requirements in the project manual for requirements.
  3. Concrete Slab: Shall be paid for at the contract unit price per square yard. Pay item should include the cost for all material and labor required to install the concrete slab.
  4. Crane Foundation: Shall be paid for at the contract unit price per lump sum. Pay item should include the cost for all material and labor required to install the concrete pad.
  5. Timber Piles: Shall be paid for at the contract unit price per each. Pay item should include the cost for all material and labor required to install the timber piles. Pay item should also include cost for installation of a test pile and all testing of trial pile.
  6. Security Fence with 6' Wide Gate: Shall be paid for at the contract unit price per lump sum.
  7. Electrical Pedestals: Shall be paid for at the contract unit price per each.
  8. Electrical Lighting: Shall be paid for at the contract unit price per lump sum.
- E. Alternate #2 - Severe Weather Electrical
1. Mobilization / Demobilization: Mobilization shall be paid for at the contract unit price per lump sum.
  2. General Conditions: Shall be paid for at the contract unit price per lump sum. Refer to General Requirements in the project manual for requirements.
  3. Light Poles: Shall be paid for at the contract unit price per lump sum.
  4. Pedestals: Shall be paid for at the contract unit price per each.
  5. Generator: Shall be paid for at the contract unit price per each. Pay item should include the cost of the generator and installation.
  6. Panels: Shall be paid for at the contract unit price per lump sum. Pay item should include the cost for installation of the panel supports.
  7. MS Power Connection and Transformers: Shall be paid for at the contract unit price per lump sum.
  8. Concrete Pad For Generator: Shall be paid for at the contract unit price per lump sum. Pay item should include the cost for all material and labor required to install the concrete pad.
  9. Concrete Pad for Transformer: Shall be paid for at the contract unit price per lump sum. Pay item should include the cost for all material and labor required to install the concrete pad.
- F. Alternate #3 - East Pier Fenders
1. Remove and Replace Fenders: Shall be paid for at the contract unit price per each.
- G. Alternate #4 - Small Boat Pier Crane
1. Marine Crane: Shall be paid for at the contract unit price per each. Pay item should include the cost for procurement of the new crane, delivery, and installation.

**PART 2 PRODUCTS - NOT USED****PART 3 EXECUTION - NOT USED****END OF SECTION**

**SECTION 013000  
ADMINISTRATIVE REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General administrative requirements.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Coordination drawings.
- F. Submittals for review, information, and project closeout.
- G. Number of copies of submittals.
- H. Requests for Interpretation (RFI) procedures.
- I. Submittal procedures.

**1.02 RELATED REQUIREMENTS**

- A. Section 016000 - Product Requirements: General product requirements.

**1.03 GENERAL ADMINISTRATIVE REQUIREMENTS**

- A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

**PART 2 PRODUCTS - NOT USED**

**PART 3 EXECUTION**

**3.01 COLLABORATION SOFTWARE**

- A. Summary
  - 1. The Contractor will be required to utilize a web based construction project management collaboration software to submit, track, distribute and collaborate on project documentation and action items.
  - 2. The intent of utilizing a web based construction management application is to reduce cost and schedule risk, improve quality and safety, and maintain a healthy team dynamic by improving information flow, reducing non-productive activities, reducing rework and decreasing turnaround times.
- B. Software
  - 1. General Contractor will be required to use Procore ([www.procore.com](http://www.procore.com))
  - 2. Access to said software be provided by the Architect/Engineer at no cost to the General Contractor.
  - 3. If unfamiliar, the Architect/Engineer's staff will assist the General Contractor in using the software or they will provide the resources necessary for the General Contractor to understand how to use the software.
- C. Architect/Engineer Responsibilities
  - 1. Upload signed/stamped drawings and any subsequent Architect/Engineer driven changes or revisions to the drawings.
  - 2. Upload signed/stamped specifications and any subsequent Architect/Engineer driven changes or revisions to the specifications.
  - 3. Add Design Team and Owner Contact Information
  - 4. Uploading all WCPR's as deemed necessary by the Architect/Engineer.
  - 5. Uploading all ASI's as deemed necessary by the Architect/Engineer.
  - 6. Uploading all contracts as deemed necessary by the Architect/Engineer.
  - 7. Creation of set distribution lists to the design team and Owner only.
  - 8. Creation of Deficiency Reports as deemed necessary by the Architect/Engineer.
  - 9. Site Visit Reports as deemed necessary by the Architect/Engineer.

- D. Contractor's Responsibilities:
1. Do not remove people from a set distribution list that preloads on RFIs and Submittals; only add to it.
  2. Make sure attachments actually attach in all RFIs, Submittals, and transmittals. Transmittals mostly because they have to select the 'ADD' button once the attachment is uploaded.
  3. Provide us with a Subcontractor list so that they are able to easily distribute information to their subs via Procore.
  4. Submittals must be created in the software:
    - a. Submittal titles must be by specification section. Grouping multiple specification sections into one submittal will result in immediate rejection.
    - b. The Contractor will be responsible for submitting all RFIs and Submittals through the software and assigning them to the appropriate parties.
    - c. Architects / Engineers / Consultants etc. are responsible for posting all responses to these items via the software, including all relevant attachments.
    - d. The Contractor will distribute responses to all affected subcontractors and confirm agreement with the response by closing the item.
    - e. GC is the only one to create submittals. They will create them on behalf of their subs when needed. The subs should never create the submittal themselves.
    - f. Once a submittal is labeled as 'Reject and Resubmit' the GC needs to close it out and create the revision as a completely new submittal. Never create the revision WITHIN the original submittal.
    - g. Distribute and CLOSE all submittals once you have received a sufficient review/response from the Architect/Engineer.
    - h. Be sure to select a spec section for submittals.
  5. Project Schedules must be uploaded to the software in one of the following accepted formats:
    - a. Microsoft Project
    - b. Primavera P3
    - c. Primavera P6
    - d. Asta Powerpoint
  6. Emails must be generated in the software
  7. Daily Logs must be created in the software
  8. RFI's must be created in the software
  9. All project photos must be uploaded to the software

### 3.02 PRECONSTRUCTION MEETING

- A. Engineer/Architect will schedule a meeting within 7 days after Notice of Award.
- B. Attendance Required:
  1. Owner.
  2. Engineer/Architect.
  3. Contractor.
- C. Agenda:
  1. Execution of Owner-Contractor Agreement.
  2. Submission of executed bonds and insurance certificates.
  3. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
  4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
  5. Owners requirements and work constraints.
- D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer/Architect, Owner, participants, and those affected by decisions made.

### 3.03 PROGRESS MEETINGS



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

### 3.04 CONSTRUCTION PROGRESS SCHEDULE

- A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- B. Within 7 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
  - 1. Include written certification that major contractors have reviewed and accepted proposed schedule.
- C. Within 3 days after joint review, submit complete schedule.
- D. Submit updated schedule with each Application for Payment.

### 3.05 REQUESTS FOR INTERPRETATION (RFI)

- A. Definition: A request seeking one of the following:
  - 1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.
- B. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
  - 1. Prepare a separate RFI for each specific item.
  - 2. Combine RFI and its attachments into a single electronic file. PDF format is preferred.
- C. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
  - 1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.
  - 2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::

- a. Approval of submittals (use procedures specified elsewhere in this section).
  - b. Approval of substitutions (see Section - 016000 - Product Requirements)
  - c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
  - d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
  4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.
- D. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
1. Official Project name and number, and any additional required identifiers established in Contract Documents.
  2. Owner's, Engineer/Architect's, and Contractor's names.
  3. Discrete and consecutive RFI number, and descriptive subject/title.
  4. Issue date, and requested reply date.
  5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
  6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
  7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.
- E. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.
- F. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
1. Maintain on the Electronic Document Submittal Service.
- G. Review Time: Engineer/Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.
1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.
- H. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.
1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
  2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
  3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
  4. Notify Engineer/Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

### 3.06 SUBMITTAL SCHEDULE

0297.23.001 / East Pier Deep Water Wharf for USM-NOAA	013000 - 4	Administrative Requirements
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- A. Submit to Engineer/Architect for review a schedule for submittals in tabular format.
  - 1. Submit at the same time as the preliminary schedule specified in Section - 013216 - Construction Progress Schedule.

### 3.07 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
  - 1. Product data.
  - 2. Shop drawings.
  - 3. Samples for selection.
  - 4. Samples for verification.
- B. The contractor who prepared the submittals for review must represent that they are licensed and qualified to perform the work in the submittal, and said work is in full compliance with applicable codes.
- C. Stamping the Submittals: The General Contractor is not required to stamp the submittal prior to submission to the Architect/Engineer for their review. However; it is highly encouraged, and if there is no General Contractor review stamp on a submittal then by default the General Contractor has agreed with the following statement:
  - 1. Acceptance is for general compliance with the contract documents only. The contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques for construction; coordinating its work with that of all other trades; and performing its work in a safe and satisfactory manner.
- D. The contractor agrees that all submittals have been reviewed by the Architect and/or Engineer only for conformance with the design concept of the project and with the information delineated in the contract drawings and specifications. A returned review whether marked as "No Exceptions" or "Exceptions as Noted" does not waive any provisions of the contract documents. Contractor shall verify all details, dimensions and quantities, and coordinate with the work of other trades. Architect and/or Engineer's review of a submittal shall not relieve the contractor from responsibility for deviations, errors, or omissions in the shop drawings or submittals.
- E. Samples will be reviewed for aesthetic, color, or finish selection.
- F. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

### 3.08 SUBMITTALS FOR INFORMATION

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

### 3.09 SUBMITTALS FOR PROJECT CLOSEOUT

- A. Submit Correction Punch List for Substantial Completion.
- B. Submit Final Correction Punch List for Substantial Completion.
- C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
  - 1. Project record documents.
  - 2. Operation and maintenance data.
  - 3. Warranties.
  - 4. Bonds.
  - 5. Other types as indicated.

- D. Submit for Owner's benefit during and after project completion.

### 3.10 SUBMITTAL PROCEDURES

#### A. General Requirements:

1. Use a separate transmittal for each item.
2. Transmit using approved form.
  - a. Use Contractor's form, subject to prior approval by Engineer/Architect.
3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
  - a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
  - a. Upload submittals in electronic form to Electronic Document Submittal Service website.
7. Schedule submittals to expedite the Project, and coordinate submission of related items.
  - a. For each submittal for review, allow 10 working days excluding delivery time to and from the Contractor.
  - b. For sequential reviews involving Engineer/Architect's consultants, Owner, or another affected party, allow an additional 7 working days.
8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
9. When revised for resubmission, identify all changes made since previous submission.
10. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.

#### B. Product Data Procedures:

1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Do not submit (Material) Safety Data Sheets for materials or products.
4. Submit manufacturer's standard published data. **Where multiple choices occur on a submittal, it will be the Contractor's responsibility to clearly mark in contrasting color by means of underlining, highlighting, circling, ect... each copy to identify applicable products, models, options, and other data.** Unmarked copies will be immediately rejected and sent back to the General Contractor. Supplement manufacturers' standard data to provide information specific to this Project.

#### C. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.
4. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances. **Canned or Typical drawings, unless they specifically apply to the project, will be immediatly rejected.**

#### D. Samples Procedures:

1. Transmit related items together as single package.

2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
  - a. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
  - b. **All submissions for the choosing of a products color must be physical samples indicating the products true and final color.** Digital and or printed samples will not be accepted.
- E. Transmit each submittal with a copy of approved submittal identification form.
- F. Contractor bears responsibility for all additional costs or work associated with work performed or materials installed prior to a returned approved submittal.

### 3.11 SUBMITTAL REVIEW

- A. Submittals for Review: Engineer/Architect will review each submittal, and provide no exceptions, or take other appropriate action.
- B. Submittals for Information: Engineer/Architect will acknowledge receipt and review. See below for actions to be taken.
- C. Engineer/Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
- D. Engineer/Architect's actions on items submitted for review:
  1. No Exceptions
    - a. Purchase, Fabrication, delivery, and/or installation may take place.
  2. Exceptions as Noted
    - a. Contractor's option to resubmit. However; all mark ups must be incorporated in the construction whether acknowledged in a resubmittal or not.
  3. Revise and Resubmit
    - a. Must be resubmitted
  4. Incomplete Submittal
    - a. Must be resubmitted
  5. Submit Specified Item
    - a. Must be resubmitted
  6. Submittal Rejected
    - a. Must be resubmitted
- E. Engineer/Architect's and consultants' actions on items submitted for information:

**END OF SECTION**



**SECTION 014000  
QUALITY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Submittals.
- B. Quality assurance.
- C. References and standards.
- D. Testing and inspection agencies and services.
- E. Control of installation.
- F. Tolerances.
- G. Manufacturers' field services.
- H. Defect Assessment.

**1.02 REFERENCE STANDARDS**

- A. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation; 2017.
- B. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2019.
- C. **CIRCLE ONE:            ADDITIVE ALTERNATE            DEDUCTIVE ALTERNATE**

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Test Reports: After each test/inspection, promptly submit two copies of report to Engineer/Architect and to Contractor.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test/inspection.
    - h. Date of test/inspection.
    - i. Results of test/inspection.
    - j. Compliance with Contract Documents.
    - k. When requested by Engineer/Architect, provide interpretation of results.
- C. Certificates: When specified in individual specification sections or by code, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer/Architect, in quantities specified for Product Data.
  - 1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

**1.04 QUALITY ASSURANCE**

- A. Testing Agency Qualifications:
  - 1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
  - 2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

**1.05 REFERENCES AND STANDARDS**

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

#### **1.06 TESTING AND INSPECTION AGENCIES AND SERVICES**

- A. As indicated in individual specification sections, Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

### **PART 3 EXECUTION**

#### **2.01 CONTROL OF INSTALLATION**

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

#### **2.02 TOLERANCES**

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer/Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

#### **2.03 TESTING AND INSPECTION**

- A. Testing Agency Duties:
  1. Test samples of mixes submitted by Contractor.
  2. Provide qualified personnel at site. Cooperate with Engineer/Architect and Contractor in performance of services.
  3. Perform specified sampling and testing of products in accordance with specified standards.
  4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  5. Promptly notify Engineer/Architect and Contractor of observed irregularities or non-compliance of Work or products.



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

#### **2.04 MANUFACTURERS' FIELD SERVICES**

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

#### **2.05 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not complying with specified requirements.
- B. If, in the opinion of Engineer/Architect, it is not practical to remove and replace the work, Engineer/Architect will direct an appropriate remedy or adjust payment.

**END OF SECTION**



**SECTION 015713  
TEMPORARY EROSION AND SEDIMENT CONTROL**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Monitoring and inspection of erosion and sediment control devices.
- D. Restoration of areas eroded due to insufficient preventive measures.
- E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

**1.02 REFERENCE STANDARDS**

- A. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
- B. Mississippi Department of Environmental Quality (MDEQ) Small Construction General Permit.
- C. Mississippi Standard Specifications for Road and Bridge Construction, 2004.

**1.03 PERFORMANCE REQUIREMENTS**

- A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.
- B. Comply with requirements of State of Mississippi Small Construction General Permit.
- C. Complete a Small Construction Notice of Intent (SCNOI) and all relative forms within the Small Construction General Permit. A copy of the Small Construction General Permit can be obtained from the MDEQ website.
- D. Follow an Storm Water Pollution Prevention Plan.
- E. Submit appropriate monitoring and inspection reports on a monthly basis.
- F. Maintain a copy of the Construction General Permit, Storm Water Pollution Prevention Plan, monitoring reports, and other relative information shall be maintained on the construction site and be made available upon request.
- G. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- H. Timing: Put preventive measures in place prior to disturbance of surface cover and before precipitation occurs.
- I. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
  - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
- J. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
  - 1. Control movement of sediment and soil from temporary stockpiles of soil.
  - 2. Prevent development of ruts due to equipment and vehicular traffic.
  - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- K. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
  - 1. Prevent windblown soil from leaving the project site.

2. Prevent tracking of mud onto public roads outside site.
  3. Prevent mud and sediment from flowing onto sidewalks and pavements.
  4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- L. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
  2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- M. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- N. Open Water: Prevent standing water that could become stagnant.
- O. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished. Reports shall be submitted on a monthly basis.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Mulch: Use one of the following:
  1. Straw or hay.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
- C. Silt Fence Fabric: Silt fence material shall be in accordance with Section 234.02 of the MDOT Specifications.
- D. Large Course Aggregate shall consist of No. 4 Railroad Ballast as approved by the Engineer.

### PART 3 EXECUTION

#### 3.01 GENERAL

- A. Implementation of all stormwater management and pollution prevention items of construction will be accomplished prior to any other construction activities which disturb ANY existing ground surface within the project limits.

#### 3.02 EXAMINATION

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

#### 3.03 PREPARATION

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

#### 3.04 SCOPE OF PREVENTIVE MEASURES

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Construction entrances/exits shall be constructed of 6" large course aggregate (No. 4 Railroad Ballast) at locations and dimensions shown on the plans and details or as directed by the Engineer.
- C. Perimeter Controls: Made of silt fences. Place Perimeter Controls at locations shown on the drawings or as directed by the Engineer. Generally Perimeters shall be placed along downhill perimeter edge of disturbed areas, including soil stockpiles
- D. Storm Drain Inlet Protection: All storm drain structures and piping within the land disturbance area shall be protected by an appropriate Best Management Practice as detailed on the drawings or as directed by the Engineer.
- E. Soil Stockpiles: Protect using an appropriate Perimeter Control or as directed by the Engineer.
- F. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
- G. Temporary Seeding: Use where temporary vegetated cover is required.

### 3.05 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Clean out temporary sediment control structures weekly and relocate soil on site.
- D. Place sediment in appropriate locations on site; do not remove from site.

### 3.06 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Engineer/Architect.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

**END OF SECTION**



**SECTION 016000  
PRODUCT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General product requirements.
- B. Transportation, handling, storage and protection.
- C. Product option requirements.
- D. Substitution limitations.
- E. Maintenance materials, including extra materials, spare parts, tools, and software.
- F. Non Asbestos containing materials certification.

**1.02 RELATED REQUIREMENTS**

- A. Section 014000 - Quality Requirements: Product quality monitoring.

**1.03 SUBMITTALS**

- A. Refer to Section 013000 Administrative Requirements for additional submittal requirements not indicated herein.
- B. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
  - 1. Submit within 7 days after date of Agreement of Notice of intent to award, whichever is sooner..
  - 2. For products specified only by reference standards, list applicable reference standards.
- C. Product Data Submittals: Submit manufacturer's standard published data. **Where multiple choices occur on a submittal, it will be the Contractor's responsibility to clearly mark in contrasting color by means of underlining, highlighting, circling, ect... each copy to identify applicable products, models, options, and other data.** Unmarked copies will be rejected and sent back to the General Contractor. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Shop Drawing Submittals: All shop drawings and details MUST be prepared specifically for this project; indicate all materials, all products, all connections, all dimensions, all utility and electrical characteristics, all utility connection requirements, and location of utility outlets for service for functional equipment and appliances. **Canned or Product/Company Typical drawings, unless they specifically apply to the project, will be rejected - No Exceptions.**

**PART 2 PRODUCTS**

**2.01 NEW PRODUCTS**

- A. Provide new products unless specifically required or permitted by Contract Documents.
- B. Use of products having any of the following characteristics is not permitted:
  - 1. Made using or containing CFC's or HCFC's.
  - 2. Containing lead, cadmium, or asbestos.

**2.02 PRODUCT OPTIONS**

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
  - 1. Where more than one manufacturer is specified for one use, the Drawings have been prepared for the one listed first; and building adjustments may be necessary to accommodate the others. The Contractor will be responsible for any changes in the building construction required due to product selection and shall make any such changes to the satisfaction of the Architect.

- C. If products are specified by naming one or more manufacturers with a provision for substitutions by "or approved equal" or "equal as approved," then the Bidder shall submit a request for substitution for any manufacturer not named **PRIOR TO BIDDING**. It must be approved by the Architect/Engineer through formal addendum in order for it to be accepted as a substitution.
- D. If products are specified by naming one or more manufacturers with a provision for substitutions by "or equal," then the General Contractor after bid award shall submit a request for substitution for any manufacturer not named. After review by the Architect/Engineer, if the substitution manufacturer or product is found not to be equal to those items specified, then the General Contractor will be required to provide those products specified or find an or equal product.

### 2.03 MAINTENANCE MATERIALS

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

## PART 3 EXECUTION

### 3.01 SUBSTITUTION LIMITATIONS

- A. Substitution Submittal Procedure:
  1. Submit substitution request at least 10 days prior to bid.
  2. The Architect/Engineer will notify all bidders via addendum of decision to accept a request.

### 3.02 TRANSPORTATION AND HANDLING

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

### 3.03 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
- E. For exterior storage of fabricated products, place on sloped supports above ground.
- F. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
- G. Comply with manufacturer's warranty conditions, if any.



- H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- I. Prevent contact with material that may cause corrosion, discoloration, or staining.
- J. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

**3.04 PRODUCT CERTIFICATION**

- A. Submit letter on company letterhead and signed by company executive stating and certifying that "This project (insert project name, description, and location) has been completed and that no asbestos containing materials were found at the project site that were not properly remedied and that no new materials were used or installed that contain asbestos." Final pay application will not be processed until certification is received.

**END OF SECTION**



**SECTION 017000  
EXECUTION AND CLOSEOUT REQUIREMENTS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Examination, preparation, and general installation procedures.
- B. Pre-installation meetings.
- C. Cleaning and protection.
- D. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.
- E. General requirements for maintenance service.

**1.02 RELATED REQUIREMENTS**

- A. Section 013000 - Administrative Requirements: Submittals procedures, Electronic document submittal service.
- B. Section 014000 - Quality Requirements: Testing and inspection procedures.
- C. Section 017800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
- D. Section 024100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

**1.04 QUALIFICATIONS**

- A. For asbestos demolition work, employ a firm specializing in the type of work required.
  - 1. Minimum of 5 years of documented experience.

**1.05 PROJECT CONDITIONS**

- A. Use of explosives is not permitted.
- B. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

**1.06 COORDINATION**

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

**PART 2 PRODUCTS****PART 3 EXECUTION****3.01 EXAMINATION**

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

**3.02 PREPARATION**

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

**3.03 PREINSTALLATION MEETINGS**

- A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section. A preinstall meeting with the contractor, roofing vendor, and Architect/Engineer will be required.
- B. Require attendance of parties directly affecting, or affected by, work of the specific section.
- C. Notify Engineer/Architect four days in advance of meeting date.
- D. Prepare agenda and preside at meeting:
  - 1. Review conditions of examination, preparation and installation procedures.
  - 2. Review coordination with related work.
- E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer/Architect, Owner, participants, and those affected by decisions made.

**3.04 GENERAL INSTALLATION REQUIREMENTS**

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

**3.05 ALTERATIONS**

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
  - 1. Verify that construction and utility arrangements are as indicated.
  - 2. Report discrepancies to Engineer/Architect before disturbing existing installation.
  - 3. Beginning of alterations work constitutes acceptance of existing conditions.

- B. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
  - 1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.
  - 2. Insulate existing ducts or pipes that are exposed to outdoor ambient temperatures by alterations work.
- C. Remove existing work as indicated and as required to accomplish new work.
  - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction specified.
  - 2. Remove items indicated on drawings.
  - 3. Relocate items indicated on drawings.
- D. Protect existing work to remain.
  - 1. Prevent movement of structure; provide shoring and bracing if necessary.
  - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
  - 3. Repair adjacent construction and finishes damaged during removal work.
- E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
  - 1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer/Architect.
- F. Comply with all other applicable requirements of this section.

### 3.06 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

### 3.07 PROTECTION OF INSTALLED WORK

- A. Protect installed work from damage by construction operations.
- B. Provide special protection where specified in individual specification sections.
- C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- D. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

### 3.08 FINAL CLEANING

- A. Execute final cleaning after Substantial Completion but before making final application for payment.
  - 1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
- B. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

### 3.09 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
  - 1. Provide copies to Engineer/Architect and Owner.
- B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.
- C. Notify Engineer/Architect when work is considered ready for Engineer/Architect's Substantial Completion inspection.
- D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Engineer/Architect's Substantial

Completion inspection.

- E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Engineer/Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Engineer/Architect.
- F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
- G. Notify Engineer/Architect when work is considered finally complete and ready for Engineer/Architect's Substantial Completion final inspection.
- H. Complete items of work determined by Engineer/Architect listed in executed Certificate of Substantial Completion.

### **3.10 MAINTENANCE**

- A. Provide service and maintenance of components indicated in specification sections.
- B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
- C. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

**END OF SECTION**

**SECTION 017800  
CLOSEOUT SUBMITTALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

**1.02 RELATED REQUIREMENTS**

- A. Section 013000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- B. Section 017000 - Execution and Closeout Requirements: Contract closeout procedures.
- C. Individual Product Sections: Specific requirements for operation and maintenance data.
- D. Individual Product Sections: Warranties required for specific products or Work.

**1.03 SUBMITTALS**

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

**PART 3 EXECUTION**

**2.01 PROJECT RECORD DOCUMENTS**

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Addenda.
  - 3. Change Orders and other modifications to the Contract.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Record Drawings: Legibly mark each item to record actual construction including:
  - 1. Field changes of dimension and detail.
  - 2. Details not on original Contract drawings.

**2.02 WARRANTIES AND BONDS**

- A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for

items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

- B. Verify that documents are in proper form, contain full information, and are notarized.
- C. Co-execute submittals when required.
- D. Retain warranties and bonds until time specified for submittal.

**END OF SECTION**



**SECTION 024100  
DEMOLITION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Selective demolition of built site elements.

**1.02 REFERENCE STANDARDS**

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.  
B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

**1.03 DEFINITIONS**

- A. Removal of Obstructions: This work shall consist of the removal and satisfactory disposal of all items and obstructions which are not designated to remain. This work also consists of necessary excavation incidental to the removal of structures and obstructions.

**PART 3 EXECUTION**

**2.01 DEMOLITION**

- A. Remove items as indicated on the drawings.

**2.02 GENERAL PROCEDURES AND PROJECT CONDITIONS**

- A. The Contractor will be required to conduct a site visit to field inspect and verify all existing conditions as it relates to the scope of work described in the drawings and specifications, and if necessary, submit an RFI to the Architect/Engineer and the Owner to bring up any potential conflicts.
- B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
1. Obtain required permits.
  2. Use of explosives is not permitted.
  3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
  4. Provide, erect, and maintain temporary barriers and security devices.
  5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
  7. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
  8. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
  9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- C. Do not begin removal until receipt of notification to proceed from Owner.
- D. Do not begin removal until built elements to be salvaged or relocated have been removed.
- E. Protect existing structures and other elements to remain in place and not removed.
1. Provide bracing and shoring.
  2. Prevent movement or settlement of adjacent structures.
  3. Stop work immediately if adjacent structures appear to be in danger.
- F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

**2.03 EXISTING UTILITIES**

0297.23.001 / East Pier Deep  
Water Wharf for USM-NOAA

024100 - 1

Demolition

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

#### **2.04 REPAIR**

- A. Unless otherwise indicated or directed on the drawings or elsewhere in the specifications, it will be the Contractor's responsibility to patch and repair all surfaces to match adjacent existing conditions where items are removed or altered.
- B. Exterior wall repair must not compromise the existing drainage plain.
- C. Roof repairs must not void or compromise the existing roof warranty.
- D. The Contractor will be required to conduct a site visit to field inspect and verify all existing conditions as it relates to the scope of work described in the drawings and specifications, and if necessary, submit an RFI to the Architect/Engineer and the Owner to bring up any potential conflicts.

#### **2.05 DEBRIS AND WASTE REMOVAL**

- A. Remove debris, junk, and trash from site.
- B. Remove materials not to be reused on site.
- C. Leave site in clean condition, ready for subsequent work.
- D. Clean up spillage and wind-blown debris from public and private lands.

**END OF SECTION**

**SECTION 033000  
CAST-IN-PLACE CONCRETE****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. The work includes the provision of cast-in-place concrete. In the ACI publications referred to herein, the advisory provisions shall be considered to be mandatory, as though the word "shall" has been substituted for "should" wherever it appears; reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" shall be interpreted to mean the Architect.

**1.02 SUBMITTALS**

- A. Shop Drawings: Reproductions of contract drawings are unacceptable. Submit shop drawings to the Architect prior to fabrication.
1. Shop Drawings for Reinforcing Steel: ACI 315. Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing rods. Submit to the Architect for approval.
  2. Shop Drawings for Reinforcing Steel Placement: The contract drawings shall not be used to prepare placement drawings. Prepare sections, details, elevations and other drawings for field personnel to properly place reinforcing. Indicate spacings, clearances, cover, bolsters and any other information for correct placing of the reinforcement. Submit for approval to the Architect with reinforcing steel shop drawings.
- B. Contractor Mix Design: Thirty (30) days minimum prior to concrete placement, submit for Architect approval a mix design for each strength and type of concrete. Proportioning of mix and submittal of mix design shall conform to ACI 318-95 Section 5.3. Cylinder break data used shall be submitted with the mix design submittal. Mix designs submitted without supporting cylinder break data will be rejected without review. If required cylinder break data is not available as required by ACI and the Standard Building Code, then increase design strength shown on the drawings by 1200 psi. Furnish complete list of materials including type, brand, source and amount of cement, fly ash, pozzolan, ground slag, and admixtures, and applicable reference specifications. Provide fly ash and pozzolan test results performed within 6 months of submittal date. Obtain approval before concrete placement. Submit additional data regarding concrete aggregates if the source of aggregate changes.
- C. Certificates of Compliance:
1. Aggregates
  2. Admixtures
  3. Reinforcement
  4. Cement
  5. Fly ash
  6. Pozzolan
  7. Ground slag
- D. Catalog Data:
1. Materials for curing concrete

2. Joint sealant
3. Joint filler
4. Vapor barrier
5. Reinforcing bolsters

**1.03 DELIVERY**

- A. Do not deliver concrete until vapor barrier, forms, reinforcement, embedded items, and chamfer strips are in place and ready for concrete placement.

**1.04 STORAGE**

- A. ACI 301 for job site storage of concrete aggregates. Store reinforcement of different sizes and shapes in separate piles or racks raised above the ground to avoid excessive rusting. Protect from contaminants such as grease, oil, and dirt. Provide for accurate identification after bundles are broken and tags removed.

**PART 2 - PRODUCTS**

**2.01 CONCRETE**

- A. Contractor-Furnished Mix Design: ACI 211.1 and ACI 301 and ACI 211.2. Concrete shall have a 28-day compressive strength of indicated or specified below.

Location	Strength	Max W/C Ratio	Air Entr.	Slump*
All work	4000 psi	0.50	4-6%	4"

\*Slump requirement is before the addition of high range water reducer or mid range water reducer admixture (HRWR or MRWR). Maximum slump after addition of HRWR or MRWR is 6 inches.

**2.02 MATERIALS**

- A. Cement: ASTM C 150, Type I or II or ASTM C 595, Type IP blended cement, except as modified herein. The blended cement shall consist of a mixture of ASTM C 150 cement and one of the following materials: ASTM C 618 pozzolan or fly ash, or ASTM C 989 ground iron blast furnace slag. The pozzolan/fly ash content shall not exceed 25 percent by weight of the total cementitious material and the ground iron blast furnace slag shall not exceed 50 percent by weight of total cementitious material. For exposed concrete, use one manufacturer for each type of cement, ground slag, fly ash, and pozzolan.
1. Fly Ash and Pozzolan: ASTM C 618, Class F, except that the maximum allowable loss on ignition shall be 6 percent for Type F. Add with cement.
  2. Ground Iron Blast-Furnace slag: ASTM C 989, Grade 120.
- B. Water: Water shall be fresh, clean, and potable.
- C. Aggregates: ASTM C 33, except as modified herein. Obtain aggregates for exposed concrete surfaces from one source. Aggregates shall not contain any substance which may be deleteriously reactive with the alkalis in the cement.

- D. Nonshrink Grout: COE CRD-C-621.
- E. Admixtures:
1. Air-Entraining: ASTM C 260.
  2. Accelerating: ASTM C 494, Type C.
  3. Retarding: ASTM C 494, Type B, D, or G.
  4. Water Reducing: ASTM C 494, Type A, E, or F.
- F. Materials for Forms: Provide wood, plywood, or steel. Use plywood or steel forms where a smooth form finish is required. Lumber shall be square edged or tongue-and-groove boards, free of raised grain, knotholes, or other surface defects. Plywood: PS 1, B-B concrete form panels or better. Steel form surfaces shall not contain irregularities, dents, or sags.
- G. Reinforcement:
1. Reinforcing Bars: ACI 301 unless otherwise specified.
  2. Welded Wire Fabric: ASTM A 185 or ASTM A 497. Provide flat sheets only of welded wire fabric for slabs.
  3. Wire: ASTM A 82 or ASTM A 496.
  4. Dowels: Plain steel; ASTM A 675, Grade 80 or ASTM A 499.
- H. Vapor Barrier: ASTM E1745-17, Class A:
1. Use full vapor retarder system in all areas under slabs, footings, and grade beams providing a complete moisture barrier between the subsurface ground and the concrete structure.
  2. Use 15 mil high density polyethylene sheet.
  3. Use greatest widths and lengths practical to eliminate joints whenever possible. Lap joints a minimum of 12 inches and seal with manufacturer's seam tape per manufacturer's recommendations. Remove torn, punctured, or damaged vapor barrier material and provide with new vapor barrier prior to placing concrete. Concrete placement shall not damage vapor barrier material.
- I. Materials for Curing Concrete:
1. Impervious Sheeting: ASTM C 171; waterproof paper, clear or white polyethylene sheeting, or polyethylene-coated burlap.
  2. Pervious Sheeting: AASHTO M 182.
  3. Liquid Membrane-Forming Compound: ASTM C 309, Type 2, Class B.
  4. Liquid Chemical Sealer-Hardener Compound: Shall be a magnesium fluosilicate compound which when mixed with water penetrates the concrete and seals and hardens the surface of the concrete. Do not use on exterior slabs exposed to freezing conditions. Compound shall not reduce the adhesion of resilient flooring, tile, paint, roofing, waterproofing, or other material applied to concrete.
- J. Expansion/Contraction Joint Filler: ASTM D 1751 or ASTM D 1752, 1/2-inch thick, unless otherwise indicated.
- K. Joint Sealants:

1. Horizontal Surfaces (3 percent slope, maximum):
    - a. Outside Buildings: ASTM D 1190.
    - b. Inside Buildings: ASTM D 1190 or ASTM D 1850.
  2. Vertical Surfaces (greater than 3 percent slope): ASTM C 920, Type M, Grade NS, Class 25, Use T.
- L. Release Agent for Fiberglass Forms: Nox-Crete as manufactured by The Kinsman Corp., Omaha, Nebraska.

**PART 3 - EXECUTION**

**3.01 FORMS**

- A. ACI 301. Provide forms, shoring, and scaffolding for concrete placement unless indicated or specified otherwise. Concrete for footings may be placed in excavations without forms upon inspection and approval by the Architect. Excavation width shall be a minimum of 4-inches greater than indicated. Set forms mortar-tight and true to line and grade. Chamfer above grade exposed joints, edges, and external corners of concrete 0.75 inch unless otherwise indicated. Provide formwork with clean-out openings to permit inspection and removal of debris. Forms submerged in water shall be watertight.
- B. Coating: Before concrete placement, coat the contact surfaces of forms with a nonstaining mineral oil, nonstaining form coating compound, or two coats of nitrocellulose lacquer. Do not use mineral oil on forms for surfaces to which adhesive, paint, or other finish material is to be applied.
- C. Removal of Forms: Prevent concrete damage during form removal. After placing concrete, forms shall remain in place for the following minimum time periods, not necessarily consecutive, where minimum temperatures specified in paragraph entitled "Curing Periods and Minimum Temperatures" are maintained adjacent to the concrete and formwork. The minimum time period for removal of forms shall govern where it exceeds the minimum specified curing period. Where the formwork for one element supports the formwork for another element, the greater time period shall apply to both elements.

Element	Time Period (Days Minimum)
Walls, column, pedestals, slabs, and beams	3

**3.02 PLACING REINFORCEMENT & MISCELLANEOUS MATERIALS**

- A. ACI 301. Provide bars, wire fabric, wire ties, supports, and other devices necessary to install and secure reinforcement. Reinforcement shall not contain rust, scale, oil, grease, clay, and foreign substances that would reduce the bond. Rusting of reinforcement is a basis of rejection if the effective cross sectional area or the nominal weight per foot of the reinforcement has been reduced to less than specified in paragraph entitled "Reinforcing Bars." Remove loose rust prior to placing steel. Tack welding is prohibited.
- B. Vapor Barrier: Provide beneath the on-grade concrete floor slab. Use the greatest widths and lengths practicable to eliminate joints wherever possible. Lap joints a minimum of 12-inches

and seal with manufacturer's seam tape per manufacturer's recommendations. Remove torn, punctured, or damaged vapor barrier material and provide with new vapor barrier prior to placing concrete. Concrete placement shall not damage vapor barrier material.

- C. Tolerances: Place reinforcement and secure with galvanized or noncorrodible chairs, spacers, or metal hangers. Use concrete or other noncorrodible material for supporting reinforcement on the ground.
- D. Splicing: AWS D1.4, except as otherwise indicated or specified. Splices shall be approved prior to use. Do not splice at points of maximum stress. Overlap welded wire fabric the spacing of the cross wires, plus 2- inches.
- E. Cover: ACI 301 for minimum coverage, unless otherwise indicated.
- F. Setting Miscellaneous Material: Place and secure anchors and bolts, pipe sleeves, conduits, and other such items in position before concrete placement. Plumb anchor bolts and check location and elevation. Temporarily fill voids in sleeves with readily removable material to prevent the entry of concrete.
- G. Construction Joints: Locate joints to least impair strength. Continue reinforcement across joints unless otherwise indicated.
- H. Expansion Joints and Contraction Joints: For slabs on grade provide as indicated. Make expansion joints 0.5-inch wide except as indicated otherwise. Fill expansion joints not exposed to weather with preformed joint filler material. Completely fill joints exposed to weather with joint filler material and joint sealant. Do not extend reinforcement or other embedded metal items bonded to the concrete through any expansion joint unless an expansion sleeve is used. Provide contraction joints, either formed or cut with a jointing tool, to the indicated depth after the surface has been finished. Protect joints from intrusion of foreign matter.
- I. Form Ties and Accessories: The use of wire alone is prohibited. Form ties and accessories shall not reduce the effective cover of the reinforcement.
- J. Waterstop: Install in strict accordance with manufacturer's recommendations and as indicated.

### **3.03 MEASURING, MIXING, TRANSPORTING AND PLACING CONCRETE**

- A. ASTM C 94, ACI 301, ACI 302.1R, and ACI 304, except as modified herein. ASTM C 94. Provide mandatory batch ticket information for each load of ready mix concrete.
- B. Measuring: Make moisture, weight, and air determinations at intervals as specified in paragraph entitled "Sampling and Testing." Allowable tolerances for measuring cement and water shall be 1 percent; for aggregates, 2 percent; and for admixtures, 3 percent.
- C. Mixing: ASTM C 94. Machine mix concrete. Begin mixing within 30 minutes after the cement has been added to the aggregates. Place concrete within 90 minutes of either addition of mixing water to cement and aggregates or addition of cement to aggregates if the air temperature is less than 85 degrees F. Reduce mixing time and place concrete within 60 minutes if the air temperature is greater than 85 degrees F. Additional water may be added, provided that both the specified maximum slump and water-cement ratio are not exceeded. Dissolve admixtures in the mixing water and mix in the drum to uniformly distribute the admixture throughout the batch.
- D. Transporting: Transport concrete from the mixer to the forms as rapidly as practicable.

Prevent segregation or loss of ingredients. Clean transporting equipment thoroughly before each batch. Do not use aluminum pipe or chutes. Remove concrete which has segregated in transporting and dispose of as directed.

- E. Placing: Place concrete as soon as practicable after the forms and the reinforcement have been inspected and approved. Do not place concrete when weather conditions prevent proper placement and consolidation; in uncovered areas during periods of precipitation; or in standing water. Prior to placing concrete, remove dirt, construction debris, water, snow, and ice from within the forms. Deposit concrete as close as practicable to the final position in the forms. Do not exceed a free vertical drop of 3 feet from the point of discharge. Place concrete in one continuous operation from one end of the structure towards the other. Position grade stakes on 10-foot centers maximum in each direction when pouring interior slabs and on 20-foot centers maximum for exterior slabs.
- F. Vibration: ACI 301. Furnish a spare vibrator on the job site whenever concrete is placed. Consolidate concrete slabs greater than 4-inches in depth with high frequency, internal, mechanical vibrating equipment supplemented by hand spading and tamping. Consolidate concrete slabs 4-inches or less in depth by wood tampers, spading, and settling with a heavy leveling straight edge. Operate vibrators with vibratory element submerged in the concrete, with a minimum frequency of not less than 6000 impulses per minute when submerged. Do not use vibrators to transport the concrete in the forms. Insert and withdraw vibrators approximately 18- inches apart. Penetrate the previously placed lift with the vibrator when more than one lift is required. Place concrete in 18-inch maximum vertical lifts. External vibrators shall be used on the exterior surface of the forms when internal vibrators do not provide adequate consolidation of the concrete.
- G. Cold Weather: ACI 306R. Provide 50 degrees F minimum concrete temperature. Obtain approval prior to placing concrete when the ambient temperature is below 40 degrees F or when concrete is likely to be subjected to freezing temperatures within 24 hours. Cover concrete and provide sufficient heat to maintain 50 degrees F minimum adjacent to both the formwork and the structure while curing. Limit the rate of cooling to 5 degrees F in any one hour and 50 degrees F per 24 hours after heat application.
- H. Hot Weather: ACI 305R. Provide and maintain required concrete temperature using Figure 2.1.5 in ACI 305R to prevent the evaporation rate from exceeding 0.2 pound of water per square foot of exposed concrete per hour. Cool ingredients before mixing or use other suitable means to control concrete temperature and prevent rapid drying of newly placed concrete. Shade the fresh concrete as soon as possible after placing. Start curing when the surface of the fresh concrete is sufficiently hard to permit curing without damage. Provide water hoses, pipes, spraying equipment. and water hauling equipment (where work site is remote to water source) to maintain a moist concrete surface throughout the curing period. Provide burlap cover or other suitable, permeable material with fog spray or continuous wetting of the concrete when weather conditions prevent the use of either liquid membrane curing compound or impervious sheets. For vertical surfaces, protect forms from direct sunlight and add water to top of structure once concrete is set.

### **3.04 SURFACE FINISHES (EXCEPT FLOOR & SLAB FINISHES)**

- A. Defects: Repair formed surfaces by removing minor honeycombs, pits greater than one square inch surface area or 0.25-inch maximum depth, or otherwise defective areas. Provide edges perpendicular to the surface and patch with nonshrink grout. Patch tie holes and defects when the forms are removed. Concrete with extensive honeycomb (including exposed steel reinforcement, cold joints, entrapped debris, separated aggregate, or other defects) which affect the serviceability or structural strength will be rejected, unless correction of defects is



approved. Obtain approval of corrective action prior to repair. The surface of the concrete shall not vary more than the allowable tolerances of ACI 347. Exposed surfaces shall be uniform in appearance and finished to a smooth form finish unless otherwise specified.

- B. Not Against Forms (Top of Walls): Surfaces not otherwise specified shall be finished with wood floats to even surfaces. Finish shall match adjacent finishes.
- C. Formed Surfaces:
  - 1. As-Cast Rough Form (for Surfaces Not Exposed to Public View): Remove fins and other projections exceeding 0.25-inch in height; level abrupt irregularities.
  - 2. As-Cast Smooth Form (for Surfaces Exposed to Public View): Form facing material shall produce a smooth, hard, uniform texture on the concrete. Remove fins and other projections. Provide light sandblast where indicated on the drawings.
  - 3. Sandblast and provide light sandblast finish where indicated on the drawings.
- B. Rubbed Finish: Provide concrete with a smooth form finish. Finish as follows:
  - 1. Smooth Rubbed: Provide on newly hardened concrete within 24 hours following form removal. Wet surfaces and rub with an abrasive tool to produce uniform color and texture. Use only the cement paste drawn from the concrete rubbing process.

### **3.05 FLOOR, SLAB & MISCELLANEOUS CONSTRUCTION**

- A. ACI 302.1R, unless otherwise specified. Slope floors uniformly to drains where drains are provided. Depress the concrete base slab where ceramic tile is indicated. Provide interior floor slabs with a steel troweled finish. After troweling is completed, apply a liquid chemical sealer-hardener compound on interior floor slabs that do not receive floor covering.
- B. Finish: Place, consolidate, and immediately strike off concrete to obtain proper contour, grade, and elevation before bleedwater appears. Permit concrete to attain a set sufficient for floating and supporting the weight of the finisher and equipment. If bleedwater is present prior to floating the surface, drag the excess water off or remove by absorption with porous materials. Do not use dry cement to absorb bleedwater.
  - 1. Floated: Provide for machinery pads and other exterior slabs where not otherwise specified. Float the surface by hand with a wood or magnesium float, or use a power-driven float.
  - 2. Steel Troweled: First, provide a floated finish. When slab attains a proper set, trowel to a smooth, hard, dense finish. Finished surfaces shall be free of troweled marks, uniform in texture, and a true plane, level and flat within specified tolerance; hand-finish portions of the slab not accessible to power finishing equipment (e.g., edges, corners) to match the remainder of the slab. Power trowel once and finally hand trowel where a finished floor covering (e.g., tile, carpet) is specified. Power trowel twice and finally hand trowel for exposed concrete floors.
  - 3. Broomed: Provide for exterior walks, platforms, patios, and ramps, unless otherwise indicated. Provide a floated finish, then finish with a flexible bristle broom. Permit surface to harden sufficiently to retain the scoring or ridges. Broom transverse to traffic or at right angles to the slope of the slab.

- C. Concrete Walks: Provide 4-inches thick minimum. Provide contraction joints spaced every 5 linear feet unless otherwise indicated. Cut contraction joints 3/4-inch deep with a jointing tool after the surface has been finished. Provide 0.5-inch thick transverse expansion joints at changes in direction where sidewalk abuts curb, steps, rigid pavement, or other similar structures; space expansion joints every 20 feet maximum apart. Provide walks with a broomed finish. Provide a transverse slope of 1/4-inch per foot. Limit variation in cross section to 1/4-inch in 5 feet.
- D. Pits and Trenches: Place bottoms and walls monolithically or provide waterstops and keys.
- E. Curbs: Reinforce as indicated. Provide contraction joints spaced every 10 feet maximum unless otherwise indicated. Cut contraction joints 3/4-inch deep with a jointing tool after the surface has been finished. Provide expansion joints 1/2-inch thick and spaced as indicated. Provide a pavement finish.

### 3.06 CURING AND PROTECTION

- A. ACI 301 unless otherwise specified. Begin curing immediately following form removal. Protect concrete from injurious action by sun, rain, flowing water, frost, mechanical injury, tire marks, and oil stains. Do not allow concrete to dry out from time of placement until the expiration of the specified curing period. Do not use membrane-forming compound on surfaces where appearance would be objectionable, on any surface to be painted, where coverings are to be bonded to the concrete, or on concrete to which other concrete is to be bonded. If forms are removed prior to the expiration of the curing period, provide another curing procedure specified herein for the remaining portion of the curing period.
- B. Moist Curing: Provide for the removal of water without erosion or damage to the structure.
  - 1. Ponding or Immersion: Continually immerse the concrete throughout the curing period. Water shall not be more than 20 degrees F less than the temperature of the concrete. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.
  - 2. Fog Spraying or Sprinkling: Provide uniform and continuous application of water throughout the curing period. For temperatures between 40 and 50 degrees F, increase the curing period by 50 percent.
  - 3. Pervious Sheeting: Completely cover surface and edges of the concrete with two thicknesses of wet sheeting. Overlap sheeting 6-inches over adjacent sheeting. Sheeting shall be at least as long as the width of the surface to be cured. During application, do not drag the sheeting over the finished concrete nor over sheeting already placed. Wet sheeting thoroughly and keep continuously wet throughout the curing period.
  - 4. Impervious Sheeting: Wet the entire exposed surface of the concrete thoroughly with a fine spray of water and cover with impervious sheeting throughout the curing period. Lay sheeting directly on the concrete surface and overlap edges 12-inches minimum. Provide sheeting not less than 18-inches wider than the concrete surface to be cured. Secure edges and transverse laps to form closed joints. Repair torn or damaged sheeting or provide new sheeting. Cover or wrap columns, walls, and other vertical structural elements from the top down with impervious sheeting, overlap and continuously tape sheeting joints, and introduce sufficient water to soak the entire surface prior to completely enclosing.
- C. Liquid Membrane-Forming Compound Curing: Seal or cover joint openings prior to application of curing compound. Prevent curing compound from entering the joint. Provide and maintain

compound on the concrete surface throughout the curing period. Do not use this method of curing where the use of Figure 2.1.5 in ACI 305R indicates that hot weather conditions will cause an evaporation rate exceeding 0.2 pound of water per square foot per hour.

1. Application: Unless the manufacturer recommends otherwise, apply compound immediately after the surface loses its water sheen and has a dull appearance, and before joints are sawed. Mechanically agitate curing compound thoroughly during use. Use approved power-spraying equipment to uniformly apply two coats of compound in a continuous operation. The total coverage for the two coats shall be 200 square feet maximum per gallon of undiluted compound unless otherwise recommended by the manufacturer's written instructions. The compound shall form a uniform, continuous, coherent film that will not check, crack, or peel. Immediately apply an additional coat of compound to areas where the film is defective. Respray concrete surfaces subjected to rainfall within 3 hours after the curing compound application.
  2. Protection of Treated Surfaces: Prohibit foot and vehicular traffic and other sources of abrasion for not less than 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair any damage.
- D. Liquid Chemical Sealer-Hardener Curing: Apply to interior floors that do not receive a floor covering. Apply the sealer-hardener in accordance with manufacturer's recommendations. Seal or cover joints and openings in which joint sealant is to be applied as required by the joint sealant manufacturer. The sealer-hardener shall not be applied until the concrete has cured for a minimum of 30 days. Apply a minimum of two coats of sealer-hardener.
- E. Curing Periods and Minimum Temperatures: After placing concrete, maintain air temperature adjacent to the concrete at 50 degrees F minimum for the specified time period, or 70 degrees F minimum for a period of 3 days after placing, and 40 degrees F minimum for the remainder of the specified time period.

Time Period (Days Minimum)	Concrete Structure or Cement Type
7	ASTM C 150, Type I or II, either with or without fly ash, pozzolan, or ground slag; and ASTM C 595 cement for concrete not specified otherwise.
10	Retaining walls that will be subjected to frost action or similar deteriorating conditions; pavement not under a roof.

Additional Curing: Double the required curing period if either one or the average of both 7-day test cylinders indicate less than 75 percent of the strength specified (f'c).

**3.07 SAMPLING AND TESTING**

- A. Sampling: ASTM C 172. Collect samples of fresh concrete to perform tests specified. ASTM C 31 for making test specimens.
- B. Testing:
  1. Slump Tests: ASTM C 143. Take concrete samples during concrete placement. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cement ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every

10 cubic yards (maximum) of concrete. Perform slump test before and after addition of superplasticizer.

2. Temperature Tests: Test the concrete delivered and the concrete in the forms. Perform tests in hot or cold weather conditions (below 50 degrees F and above 80 degrees F) for each batch (minimum) or every 10 cubic yards (maximum) of concrete, until the specified temperature is obtained, and whenever test cylinders and slump tests are made.
3. Compressive Strength Tests: ASTM C 39. Make five 4" x 8" test cylinders for each set of tests in accordance with ASTM C 31. Test one cylinder at 7 days, three cylinders at 28 days, and hold one cylinder in reserve. Samples for strength tests of each mix design of concrete placed each day shall be taken not less than once a day, nor less than once for each 50 cubic yards of concrete, nor less than once for each 5000 square feet of surface area for slabs or walls. For the entire project, there shall be no less than five sets of samples taken and strength tests performed for each mix design of concrete placed. Each strength test result shall be the average of two cylinders from the same concrete sample tested at 28 days. If the average of any three consecutive strength test results is less than  $f'_c$  or if any strength test result falls below  $f'_c$  by more than 500 psi, take a minimum of three ASTM C 42 core samples from the in-place work represented by the low test cylinder results and test. Concrete represented by core tests shall be considered structurally adequate if the average of three cores is equal to at least 85 percent of  $f'_c$  and if no single core is less than 75 percent of  $f'_c$ . Locations represented by erratic core strengths shall be retested. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.
4. Air Content: ASTM C 173 or ASTM C 231. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

#### END OF SECTION

**SECTION 051200  
STRUCTURAL STEEL****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. The work includes the fabrication, erection, and shop painting of structural steel. Provide in accordance with AISC "Manual of Steel Construction" except as specified herein. In the AISC "Manual of Steel Construction" referred to herein, the "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings," the "Code of Standard Practice for Steel Buildings and Bridges," and "Structural Joints Using ASTM A 325 or A 490 Bolts" shall be considered a part thereto.

**1.02 SUBMITTALS**

- A. Shop Drawings: Submit for approval by the Architect prior to fabrication. Prepare in accordance with the AISC "Detailing for Steel Construction" and AISC "Engineering for Steel Construction." Shop drawings shall not be reproductions of contract drawings. Include complete information for the fabrication and erection of the structure's components, including the location, type, and size of bolts, welds, member sizes and lengths, connection details, blocks, copes, and cuts. Use AWS standard welding symbols.
- B. Erection Plan: Submit for record purposes. Indicate the sequence of erection, temporary shoring and bracing, and a detailed sequence of welding, including each welding procedure required.
- C. Certificates of Compliance:
1. Steel
  2. Bolts, nuts, and washers
  3. Shop painting materials
  4. Welding electrodes and rods
  5. Nonshrink grout
  6. Galvanizing
- D. Welder, Welding Operation, and Tacker Qualification: Prior to welding, submit certification for each stating the type of welding and positions qualified for, the code and procedure qualified under, date qualified, and the firm and individual certifying the qualification tests.

**1.03 DELIVERY AND STORAGE**

- A. Handle, store, and protect materials in accordance with the manufacturer's recommendations. Replace damaged items with new items, or repair as approved by the Architect.

**1.04 REGULATORY REQUIREMENTS (SHOP PRIMER)**

- A. Comply with State and Local regulations regarding release to atmosphere of volatile organic (VOC) and proper disposal of excess and waste materials.

**PART 2 - PRODUCTS**

## **2.01 STEEL**

- A. Structural Steel: ASTM A 992 (Fy = 50 ksi) for all wide flange shapes. ASTM A 572 (Fy = 50 ksi) for all other shapes.
- B. Structural Steel Tubing: ASTM A 500, Grade B.
- C. Round Bars: ASTM A36 (Fy = 36)

## **2.02 BOLTS, NUTS, AND WASHERS**

- A. Provide the following unless indicated otherwise.
- B. Structural Steel:
  - 1. Bolts: ASTM A 325, Type 1 or 2.
  - 2. Nuts: ASTM A 563, Grade A, heavy hex style.
  - 3. Washers: ANSI B18.22.1, Type B.
- C. Stainless Steel:
  - 1. Bolts, Nuts, and Washers: ASTM A276, Type 316

## **2.03 SHOP PAINTING**

- A. Provide materials free from hazardous components, such as lead, mercury or asbestos filler, as determined by Federal and State regulations.
- B. Pretreatment: Mil. Spec. DOD-P-15328 or Fed. Spec. TT-C-490, Type I, II, or IV.
- C. Primer: Fed. Spec. TT-P-645.
- D. Rust Preventative: SSPC PS 8.01, suitable for temporary protection.

## **2.04 GALVANIZING**

- A. ASTM A 123 or A 153, as applicable, unless specified otherwise.
- B. Galvanizing Repair Paint: Mil. Spec. DOD-P-21035.

## **2.05 STRUCTURAL STEEL ACCESSORIES**

- A. Welding Electrodes and Rods: AWS D1.1.
- B. Nonshrink Grout: COE CRD-C-621, with no ASTM C 827 shrinkage. Grout shall be nonmetallic.

## **PART 3 - EXECUTION**

### **3.01 FABRICATION**

- A. Markings: Prior to erection, members shall be provided with a painted erection mark. In addition, connecting parts assembled in the shop for reaming holes in field connections shall be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded. Do not locate match markings in areas that will decrease member strength or cause stress concentrations.
- B. Shop Painting: Shop paint structural steel, except as modified herein. Do not paint steel surfaces embedded in concrete, galvanized surfaces, bearing surfaces, or surfaces within 1/2 inch of the toe of the welds prior to welding (except surfaces on which metal decking or shear studs are to be welded). Prior to assembly, paint surfaces which will be concealed or inaccessible after assembly. Do not apply paint in foggy or rainy weather; when the ambient temperature is below 45 degrees F or over 95 degrees F; or when paint may be exposed to temperatures below 40 degrees F within 48 hours after application, unless approved otherwise.
  - 1. Cleaning: SSPC SP 6, except as modified herein. SSPC SP 3 or SP 6 for steel surfaces exposed in spaces above ceilings, attic spaces, crawl spaces, furred spaces, and chases. In addition, maintain steel surfaces free from rust, dirt, oil, grease, and other contaminants through final assembly.
  - 2. Priming: Immediately after cleaning, apply primer to a minimum dry film thickness of 2.0 mil. Repair damaged primed surfaces with an additional coat of primer.
- C. Galvanizing: Provide as indicated or specified. Galvanize after fabrication where practicable.
  - 1. Galvanizing Repair: ASTM A 780, using galvanizing repair paint for galvanizing damaged by handling, transporting, cutting, welding, or bolting. Do not heat surfaces that repair paint has been applied to.
- D. Bearing Surfaces and Friction Type Joints: In the shop, coat with a temporary rust preventive. Remove coating, as recommended by the coating manufacturer, immediately prior to field erection.

### 3.02 ERECTION

- A. Calibration wrenches shall be calibrated every two working days on a minimum of three typical bolts of each diameter. Provide for drainage in structural steel.
- B. Base Plates and Bearing Plates: After final positioning of steel members, provide full bearing under plates using nonshrink grout. Place nonshrink grout in accordance with the manufacturer's instructions.

### 3.03 CONNECTIONS

- A. Connections not detailed shall be designed in accordance with AISC "Manual of Steel Construction." Build connections into existing work. Do not tighten anchor bolts set in concrete with impact torque wrenches. Punch, subpunch and ream, or drill bolt holes.

### 3.04 WELDING

- A. AWS D1.1. Provide AWS D1.1 qualified welders, welding operators, and tackers.
- B. Removal of Temporary Welds, Run-Off Plates, and Backing Strips: Remove only from finished areas.

### **3.05 HIGH-STRENGTH STRUCTURAL JOINTS**

- A. AISC "Manual of Steel Construction" for designing, assembling, and testing.

### **3.06 TESTS AND INSPECTIONS**

- A. Perform field tests, and provide labor, equipment, and incidentals required for testing.
- B. Welds:
  - 1. Visual Inspection: AWS D1.1, Section 6. Provide independent laboratory AWS-certified welding inspectors for fabrication/erection inspection and testing and verification inspections. Welding inspectors shall visually inspect and mark welds, including fillet weld end returns. Provide written report to Architect.
  - 2. Ultrasonic Testing: 10% of main frame beam connections to be ultrasonic tested by ASTM E273. Locations to be determined by Engineer of Record. Provide written report to Architect.
- C. Bolts: Provide independent laboratory personnel to check bolt tightness. Provide written report to Architect.

### **3.07 PAINTING**

- A. Paint steel that is not encased in concrete, plaster or sprayed fireproofing. Do not shop paint in areas to be field welded, contact surfaces of slip critical connections, or areas to receive special finishes.
- B. Field paint as required steel that has been welded or that is unpainted after connections have been tightened.

**END OF SECTION**



**SECTION 055000  
MISCELLANEOUS METAL**

**PART 1 - GENERAL**

**1.01 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment and incidentals required and install all miscellaneous metal complete as shown on the Drawings and as specified herein.

**1.02 RELATED WORK (N/A)**

**1.03 SUBMITTALS**

- A. Shop drawings and product data showing materials of construction and details of installation for:
1. Shop drawings, showing sizes of members, method of assembly, anchorage and connection to other members.
  2. Shop drawings of ladders and stair assemblies.
- B. Test Reports
1. Certified copy of mill test reports on each steel, stainless steel, aluminum proposed for use showing the physical properties and chemical analysis.

**1.04 REFERENCE STANDARDS**

- A. American Society for Testing and Materials (ASTM)
1. ASTM A36 - Standard Specification for Carbon Structural Steel.
  2. ASTM A48 - Standard Specification for Gray Iron Castings.
  3. ASTM A108 - Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
  4. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  5. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  6. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 Psi Tensile Strength.
  7. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  8. ASTM A366 - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.

9. ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  10. ASTM A536 - Standard Specification for Ductile Iron Castings.
  11. ASTM A570 - Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
  12. ASTM A572 – Standard Specification for High-Strength, Low Alloy Columbian Vanadium Structural Steel.
- B. American Iron and Steel Institute (AISI).
1. Specification for Structural Steel Buildings.
- C. American Welding Society (AWS)
1. AWS D1.1 - Structural Welding Code Steel.
- D. Federal Specifications
1. FS-FF-B-575C - Bolts, Hexagonal and Square
- E. Occupational Safety and Health Administration (OSHA)
- F. International Building Code (IBC)
- G. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

**1.05 QUALITY ASSURANCE**

- A. The work of this Section shall be completely coordinated with the work of other Sections. Verify, at the site, both the dimensions and work of other trades adjoining items of work in this Section before fabrication and installation of items herein specified.
- B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.
- C. All welding shall be performed by qualified welders and shall conform to the applicable AWS Welding Code. Welding of steel shall conform to AWS D1.1.

**1.06 SYSTEM DESCRIPTION**

- A. Provide assemblies indicated which, when installed, comply with the following minimum requirements for structural performance, unless otherwise noted.

**1.07 DELIVERY, STORAGE AND HANDLING**

- A. Deliver items to be incorporated into the work of other trades in sufficient time to be checked prior to installation.
- B. Repair items which have become damaged or corroded to the satisfaction of the Engineer prior to incorporating them into the work.

**1.08 PROJECT/SITE REQUIREMENTS**

- A. Field measurements shall be taken at the site, prior to fabrication of items, to verify or supplement indicated dimensions and to ensure proper fitting of all items.

**PART 2 - PRODUCTS****2.01 GENERAL**

- A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.
- B. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance and manufacturer's service.

**2.02 MATERIALS**

- A. Unless otherwise noted, materials for miscellaneous metals shall conform to the following standards:
- |    |   |  |
|----|---|--|
| 1. | Structural Steel                            | ASTM A572-50   |
| 2. | Gray Iron Castings                          | ASTM A48, Class 35   |
| 3. | Ductile Iron Castings                       | ASTM A536, Grade 65-45-12  |
| 4. | Carbon Steel Bolts and Studs                | F1554, Grade 36 (hot dip galvanized nuts and washers where noted)        |
| 5. | High Strength Steel Bolts, Nuts and Washers | ASTM A325 (mechanically galvanized per ASTM B695, Class 50, where noted) |
|    | a. Elevated Temperature Exposure            | Type I   |
|    | b. General Application                      | Type I or Type II  |
| 6. | Galvanizing                                 | ASTM A123, Zn w/0.5 percent minimum Ni                                   |
| 7. | Galvanizing, hardware                       | ASTM A153, Zn w/0.5 percent minimum Ni                                   |

**2.03 ANCHORS, BOLTS AND FASTENING DEVICES**

- A. Anchor bolt material shall be ASTM F1554 unless otherwise noted.
- B. Unless otherwise noted, bolts for the connection of carbon steel or iron shall be steel machine bolts; bolts for the connection of galvanized steel or iron shall be galvanized steel or stainless steel machine bolts; and bolts for the connection of aluminum or stainless steel shall be stainless steel machine bolts.

- C. Unless otherwise noted, expansion anchors shall be zinc plated carbon steel wedge type anchors complete with nuts and washers. Stainless steel, Type 316, wedge type anchors shall be used where they will be submerged or exposed to the weather or where stainless steel wedge type anchors are required. When the length or embedment of the bolt is not noted on the Drawings, provide length sufficient to place the wedge and expansion sleeve portion of the bolt at least one inch behind the concrete reinforcing steel. Expansion anchors shall be Hilti Kwick-bolt II; ITW Ramset; Redhead trubolt, or equal.
- D. Compound masonry expansion anchors shall be lead expansion sleeve type anchors complete with nuts and washers. Anchors shall be precision die-cast zinc alloy with a minimum of two lead alloy expansion sleeves. When the length or embedment of the bolt is not noted on the Drawings, provide length sufficient to place the wedge and expansion sleeve portion of the bolt at least one inch behind the concrete reinforcing steel. Expansion anchors shall be Star Expansion Industries Star SlugIn or equal.
- E. Adhesive capsule anchors shall be a two-part stud and capsule chemical resin anchoring system. Capsules shall contain premeasured amounts of polyester or vinyl ester resin, aggregate and a hardener contained in a separate vial within the capsule. Stud assemblies shall consist of an all-thread anchor rod with nut and washer. Adhesive capsule anchors shall be Hilti, HVU Adhesive Anchor; Molly Parabond; Rawlplug Rawl Chem-Stud, or equal.
- F. Adhesive anchors, for fastening to hollow concrete block or brick, shall be a three-part stud, screen and chemical dispenser anchoring system. Adhesive cartridges shall contain premeasured amounts of resin and hardener which are mixed and deposited in a screen tube by a dispenser. Stud assemblies shall consist of an all-thread anchor rod with nut and washer. Anchors shall be Hilti HIT HY-200 System or equal.
- G. Automatic end welded headed anchor studs shall be flux ended studs made from cold drawn steel, ASTM A108 Grades C-1010 through C-1020. Headed anchor studs shall be Nelson H4L Headed Concrete Anchors or equal.
- H. Machine bolts and nuts shall conform to ASTM F1554, Grade 36. Bolts and nuts shall be hexagon type. Stainless steel bolts, nuts, screws, washers and related appurtenances shall be Type 316.
- I. Toggle bolts shall be Hilti Toggler Bolt or equal.

#### **2.04 METAL PLATE**

- A. Plate shall be as indicated.
- B. Metal frames and supports for plate shall be of the same material as the plate unless otherwise shown on the drawings.

#### **2.05 MISCELLANEOUS STEEL**

- A. All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability. Holes shall be drilled or punched. Edges shall be smooth and without burrs. Fabricate supplementary pieces necessary to complete each item though such pieces are not definitely shown or specified.

- B. Connections and accessories shall be of sufficient strength to safely withstand the stresses and strains to which they will be subjected. Exposed joints shall be close fitting and jointed where least conspicuous. Threaded connections shall have the threads concealed where practical. Welded connections shall have continuous welds or intermittent welds as specified or shown. The face of welds shall be dressed flush and smooth. Provide holes for temporary field connections and for attachment of the work of other trades.
- C. Miscellaneous steel items shall include: beams, angles, support brackets, base plates for other than structural steel, closure angles, splice plates, and any other miscellaneous steel called for on the Drawings and not otherwise specified.
- D. All steel shall be hot dipped galvanized.
- E. Galvanizing, where required, shall be the hot-dip zinc process after fabrication. Coating shall be not less than 2 oz per sq ft of surface.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. Install all items except those to be embedded in concrete which shall be installed under Division 3. Items to be attached to concrete after such work is completed shall be installed in accordance with the details shown.
- B. Zinc coating which has been burned by welding, abraded, or otherwise damaged shall be cleaned and repaired after installation. The damage area shall be thoroughly cleaned by wire brushing and all traces of welding flux and loose or cracked zinc coating removed prior to painting. The cleaned area shall be painted with two coats of zinc oxide-zinc dust paint conforming to the requirements of Military Specifications MIL-P-15145. The paint shall be properly compounded with a suitable vehicle in the ratio of one part zinc oxide to four parts zinc dust by weight.
- C. Expansion bolts shall be checked for tightness a minimum of 24 hours after initial installation.
- D. Install adhesive capsule anchors using manufacture's recommended drive units and adapters and in compliance with the manufacturer's recommendations.
- E. Headed anchor studs shall be welded in accordance with manufacturer's recommendations.

#### **3.02 ADJUSTING AND CLEANING**

- A. Touch-Up Painting:
  - 1. For galvanized surfaces, clean welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A -780.

**END OF SECTION**



**SECTION 220517  
SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Pipe sleeves.
- B. Pipe sleeve-seals.

**1.02 REFERENCE STANDARDS**

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified this section.
  - 1. Minimum three years experience.
- C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.
- B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

**1.06 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective Work within a five year period after Date of Substantial Completion.

**PART 2 PRODUCTS****2.01 PIPE SLEEVES**

- A. Manufacturers:
  - 1. Flexicraft Industries; Pipe Wall Sleeve: [www.flexicraft.com/#sle](http://www.flexicraft.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Vertical Piping:
  - 1. Provide sealant for watertight joint.
  - 2. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- C. Brass: Pipe passing through floors.
  - 1. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Clearances:
  - 1. Floor: 1 inch greater than external pipe diameter.

**2.02 PIPE-SLEEVE SEALS**

- A. Manufacturers:
  - 1. Advance Products & Systems, LLC: [www.apsonline.com/#sle](http://www.apsonline.com/#sle).
  - 2. American Polywater Corporation: [www.polywater-haufftechnik.com/#sle](http://www.polywater-haufftechnik.com/#sle).

3. Flexicraft Industries: [www.flexicraft.com/#sle](http://www.flexicraft.com/#sle).
  4. Substitutions: See Section 016000 - Product Requirements.
- B. Modular Mechanical Sleeve-Seal:
1. Elastomer-based interlocking links continuously fill annular space between pipe and sleeve.
  2. Watertight seal between pipe and sleeve.
  3. Size and select seal component materials in accordance with service requirements.
  4. Service Requirements:
    - a. Corrosion resistant.
    - b. Underground, buried, and wet conditions.
  5. Glass-reinforced plastic pressure end plates.
- C. Sealing Compounds:
1. Provide packing and sealing compound to fill pipe to sleeve thickness.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

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

#### **3.02 INSTALLATION**

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Structural Considerations: Do not penetrate building structural members unless indicated.
- E. Provide sleeves when penetrating footings and floors.
  1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
  2. Aboveground Piping:
    - a. Pack solid using mineral fiber complying with ASTM C592.
    - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
  3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- F. Manufactured Sleeve-Seal Systems:
  1. Install manufactured sleeve-seal systems in sleeves located in grade slabs.
  2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  3. Locate piping in center of sleeve or penetration.
  4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  5. Tighten bolting for a water-tight seal.
  6. Install in accordance with manufacturer's recommendations.
- G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

#### **3.03 CLEANING**

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

### **END OF SECTION**



**SECTION 220519  
METERS AND GAUGES FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Liquid Meters:  
1. Positive displacement meters.

**1.02 REFERENCE STANDARDS**

- A. AWWA C700 - Cold-Water Meters -- Displacement Type, Metal Alloy Main Case; 2020.  
B. AWWA M6 - Water Meters -- Selection, Installation, Testing, and Maintenance; 2012, with Addendum (2018).  
C. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.  
D. NSF 372 - Drinking Water System Components - Lead Content; 2022.

**PART 2 PRODUCTS**

**2.01 LIQUID METERS**

- A. Positive Displacement Meters:  
1. Manufacturers:  
a. Badger Meter, Inc: [www.badgermeter.com/#sle](http://www.badgermeter.com/#sle).  
b. Dwyer Instruments, Inc: [www.dwyer-inst.com/#sle](http://www.dwyer-inst.com/#sle).  
c. Mueller Systems, Llc: [muellersystems.com/#sle](http://muellersystems.com/#sle).  
d. Niagara Meters: [www.niagarameters.com/#sle](http://www.niagarameters.com/#sle).  
e. Sensus, a Xylem brand: [www.sensus.com/#sle](http://www.sensus.com/#sle).  
f. Zenner USA: [www.zennerusa.com/#sle](http://www.zennerusa.com/#sle).  
g. Substitutions: See Section 016000 - Product Requirements.  
2. Utility Connection Size: 2 inch NPT female.  
3. Lead-free bronze alloy case and cap with hermetically-sealed mechanical register.  
4. Pressure and Temperature: Up to 150 psi and 100 degrees F.  
5. AWWA C700, with lead content below 0.25 percent when using non-lead-free materials on wetted surfaces according to NSF 61 and NSF 372.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verification of Conditions: Verify Utility Service Provider piping readiness to receive meter.  
B. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

**3.02 INSTALLATION**

- A. Install metering products in accordance with manufacturer's instructions for intended fluid type and service.  
B. Install water meters in compliance with AWWA M6.

**END OF SECTION**



**SECTION 220523  
GENERAL-DUTY VALVES FOR PLUMBING PIPING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Ball valves.
- B. Check valves.
- C. Air release valves
- D. Plug valves

**1.02 ABBREVIATIONS AND ACRONYMS**

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Non-rising stem.
- E. OS&Y: Outside screw and yoke.
- F. PTFE: Polytetrafluoroethylene.
- G. RS: Rising stem.
- H. TFE: Tetrafluoroethylene.
- I. WOG: Water, oil, and gas.

**1.03 REFERENCE STANDARDS**

- A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
- D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023.
- E. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- F. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- G. NSF 372 - Drinking Water System Components - Lead Content; 2022.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer:
  - 1. Obtain valves for each valve type from single manufacturer.
  - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Prepare valves for shipping as follows:
  - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
  - 2. Protect valve parts exposed to piped medium against rust and corrosion.
  - 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
  - 4. Secure check valves in either the closed position or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection and protect flanges and specialties from dirt.
    - a. Provide temporary inlet and outlet caps.
    - b. Maintain caps in place until installation.
  - 2. Store valves in shipping containers and maintain in place until installation.
    - a. Store valves indoors in dry environment.
    - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

**1.07 EXERCISE THE FOLLOWING PRECAUTIONS FOR HANDLING:**

- A. Handle large valves with sling, modified to avoid damage to exposed parts.
- B. Avoid the use of operating handles or stems as rigging or lifting points.

**PART 2 PRODUCTS****2.01 APPLICATIONS**

- A. See drawings for specific valve locations.
- B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
- C. Provide the following valves for the applications if not indicated on drawings:
  - 1. Shutoff: plug or Ball.
  - 2. Check: flexible swing
    - a. The check valve shall be of the full flow body type, with a domed access cover and only one moving part, the flexible disc.
- D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.
- E. Required Valve End Connections for Non-Wafer Types:
  - 1. Steel Pipe:
    - a. 2 inch and Smaller: Threaded ends.
    - b. 2-1/2 inch to 4 inch: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.
    - c. 5 inch and Larger: Grooved or flanged ends.
- F. Domestic, Water Valves:
  - 1. 2 inch and Smaller:
    - a. Bronze and Brass: Provide with threaded ends.
    - b. Ball: Two piece, full port, bronze with bronze trim.
- G. Sanitary Waste Water Valves:
  - 1. Plug valve.
  - 2. Flexible swing check.
  - 3. Air release valve.

**2.02 GENERAL REQUIREMENTS**

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
  - 1. Handwheel: Valves larger than 2 NPS.

2. Hand Lever: Quarter-turn valves 2 NPS and smaller.
- D. Valve-End Connections:
1. Threaded End Valves: ASME B1.20.1.
  2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
  3. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.
- E. Potable Water Use:
1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
  2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.
- F. Source Limitations: Obtain each valve type from a single manufacturer.

### 2.03 CHECK VALVES

- A. Scope
1. Flexible swing check valves suitable for cold working pressures up to 250 psig (1725 kPa), in water, wastewater, abrasive, and slurry service.
  2. The check valve shall be of the full flow body type, with a domed access cover and only one moving part, the flexible disc.
- B. Standards and Approvals
1. The valves shall be designed, manufactured, tested and certified to American Water Works Association Standard ANSI/AWWA C508.
  2. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body
- C. Connections
1. The valves shall have flanges with drilling to ANSI B16.1, Class 125.
- D. Design
1. The valve body shall be full flow equal to nominal pipe diameter at all points through the valve. The 4 in. (100mm) valve shall be capable of passing a 3 in. (75mm) solid. The seating surface shall be on a 45 degree angle to minimize disc travel. A threaded port with pipe plug shall be provided on the bottom of the valve to allow for field installation of a backflow actuator or oil cushion device without special tools or removing the valve from the line.
  2. The top access port shall be full size, allowing removal of the disc without removing the valve from the line. The access cover shall be domed in shape to provide flushing action over the disc for operating in lines containing high solids content. A threaded port with pipe plug shall be provided in the access cover to allow for field installation of a mechanical, disc position indicator.
  3. The disc shall be of one-piece construction, precision molded with an integral O-ring type sealing surface and reinforced with alloy steel. The flex portion of the disc contains nylon reinforcement and shall be warranted for twenty-five years. Non-Slam closing characteristics shall be provided through a short 35 degree disc stroke and a memory disc return action to provide a cracking pressure of 0.25 psig.
  4. The valve disc shall be cycle tested 1,000,000 times in accordance with ANSI/AWWA C508 and show no signs of wear, cracking, or distortion to the valve disc or seat and shall remain drop tight at both high and low pressures.
- E. Materials
1. The valve body and cover shall be constructed of ASTM A536 Grade 65-45-12 ductile iron.
  2. The disc shall be precision molded Buna-N (NBR), ASTM D2000-BG.
  3. The bolts shall be type 316 stainless steel.
- F. Manufacture
1. Manufacturer shall demonstrate a minimum of five (5) years' experience in the manufacture of resilient, flexible disc check valves with hydraulic cushions.

2. All valves shall be hydrostatically tested and seat tested to demonstrate zero leakage. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.
3. The exterior and interior of the valve shall be coated with a fusion bonded epoxy coating.

G. Manufacturers

1. Val-Matic
2. Substitutions: See Section016000-Product Requirements.

## 2.04 AIR RELEASE VALVES

A. Scope

1. This specification is intended to cover the design, manufacture, and testing of 2 in. (50 mm) through 4 in. (100 mm) Wastewater Air Release Valves suitable for pressures up to 150 psig (1000 kPa).
2. Wastewater Air Release Valves shall be automatic float operated valves designed to release accumulated air from a piping system while the system is in operation and under pressure. The capacity and pressure rating of the valve is dependent on the diameter of the precision orifice in the cover. A large inlet connection is required for proper air and water exchange.

B. Standards, Approvals, and Verification

1. Valves shall be manufactured and tested in accordance with American Water Works Association (AWWA) Standard C512.
2. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.

C. Design

1. The valves shall have full size NPT inlets and outlets equal to the nominal valve size. The body inlet connection shall be hexagonal for a wrench connection. The body shall have 2" NPT cleanout and 1" NPT drain connections on the sides of the casting. The cover shall be bolted to the valve body and sealed with a flat gasket. A threaded adjustable orifice button shall provide drop tight shut off to the full valve pressure rating.
2. Floats shall be unconditionally guaranteed against failure including pressure surges. Extended mechanical linkage shall provide suitable mechanical advantage so that the valve will open under full operating pressure.

D. Materials

1. The valve body and cover shall be constructed of ASTM A126 Class B cast iron.
2. The orifice, float and linkage mechanism shall be constructed of Type 316 stainless steel. Non-metallic floats or linkage mechanisms are not acceptable. The orifice button shall be Buna-N.
3. The bolts shall be type 316 stainless steel.

E. Options

1. Backwash accessories shall be furnished and shall consist of an inlet shut-off valve, and a blow-off valve. Accessory valves shall be quarter-turn, full ported bronze ball valves.
2. Valve interiors and exteriors shall be coated with a fusion bonded epoxy in accordance with AWWA C550 when specified.

F. Manufacture

1. The manufacturer shall demonstrate a minimum of five (5) years experience in the manufacture of wastewater air valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings, and operation and maintenance manuals.

G. Manufacturers

1. Val-Matic
2. Substitutions: See Section016000-Product Requirements.

## 2.05 PLUG VALVES

A. 2" and smaller

1. Scope
    - a. This specification covers the design, manufacture, and testing of 1/2 in. (15 mm) through 3 in. (80 mm) Threaded Eccentric Plug Valve suitable for water or wastewater service with pressures up to 250 psig (1725 kPa).
    - b. Plug Valves shall be quarter-turn, non-lubricated with resilient encapsulated plug.
  2. Standards, Approvals, and Verification
    - a. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.
  3. Connections
    - a. Threaded valves shall have threaded NPT full size inlets. The connection shall be hexagonal for a wrench connection.
  4. Design
    - a. Threaded and all other valves under 4" (100mm) shall have port areas of not less than 100% of pipe area.
    - b. Threaded valve seat shall be a machined seating surface.
    - c. Threaded valves shall have shaft seals which consist of V-type lip seal in a fixed gland with a resilient O-ring spring.
    - d. Permanently lubricated, radial shaft bearings shall be supplied in the upper and lower bearing journals. Thrust bearings shall be provided in the upper and lower journal areas, except for threaded type which only have upper thrust bearings.
    - e. Both the packing and bearings in the upper and lower journals shall be protected by a Grit-Guard™ "drip tight" Buna-N shaft seal located on the valve shaft to minimize the entrance of grit into the bearing journal and shaft seal areas.
    - f. The threaded valve body shall have 1/8" NPT upstream and downstream pressure ports.
  5. Materials
    - a. Valve bodies and covers shall be constructed of ASTM A126 Class B cast iron for working pressures up to 175 psig (1200 kPa) and ASTM A536 Grade 65-45-12 for working pressures up to 250 psig (1725 kPa). The words "SEAT END" shall be cast on the exterior of the body seat end.
    - b. Threaded valve plugs in sizes 1/2 in. (15 mm) through 3 in. (80 mm) shall be of one-piece construction and made of ASTM A126 Class B cast iron fully encapsulated with a resilient facing per ASTM D2000-BG and ANSI/AWWA C517 requirements.
    - c. Threaded valves shall have radial shaft bearings constructed of self-lubricating Type 316 stainless steel. The top thrust bearing shall be Teflon.
    - d. The bolts shall be type 316 stainless steel.
  6. Actuators
    - a. Threaded valves shall be equipped with a hand lever with a dial indicator and open memory stop.
  7. Options
    - a. The valve port area shall have not less than 100% of pipe area.
    - b. The interior and exterior of the valve shall be coated with a fusion bonded epoxy.
  8. Manufacture
    - a. Manufacturer shall demonstrate a minimum of ten (10) years' experience in the manufacture of plug valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings and operation and maintenance manuals.
    - b. Valve shall be marked with the Serial Number, Manufacturer, Size, Cold Working Pressure (CWP) and the Direct and Reverse Actuator Pressure Ratings on a corrosion resistant nameplate.
  9. Manufacturers
    - a. Val-Matic
    - b. Substitutions: See Section 016000-Product Requirements.
- B. 2-1/2" and larger
1. Scope

- a. This specification covers the design, manufacture, and testing of 3 in. (75 mm) through 72 in. (1800 mm) 100% Port Eccentric Plug Valves suitable for water or wastewater service with pressures up to 175 psig (1204 kPa).
- b. Plug Valves shall be quarter-turn, 100% port eccentric, with resilient encapsulated plug.
2. Standards and Approvals
  - a. Eccentric plug valves shall be designed, manufactured and tested in accordance with American Water Works Association Standard ANSI/AWWA C517.
  - b. Manufacturer shall have a quality management system that is certified to ISO 9001 by an accredited, certifying body.
3. Connections
  - a. Flanged valves shall have flanges with drilling to ANSIB16.1, Class 125.
  - b. Mechanical Joint valves shall fully comply with ANSI/AWWA C111/A21.11.
4. Design
  - a. Valves shall have port areas of not less than 100% of pipe area. 4.2 3 in. (75 mm) and larger valves shall have a valve seat that is a welded overlay of 95% pure nickel applied directly to the body on a pre-machined, cast seating surface and machined to a smooth finish.
  - b. 3 in. (75 mm) and larger plug valves shall have shaft seals which consist of V-type packing in a fixed gland with an adjustable follower and removable shims under the follower flange to provide for adjustment and prevent over compression.
  - c. Permanently lubricated, radial shaft bearings shall be supplied in the upper and lower bearing journals to eliminate the need for grease fittings. Thrust bearings shall be provided in the upper and lower journal areas, except for threaded type which only have upper thrust bearings.
  - d. Both the packing and bearings in the upper and lower journals shall be protected by Buna-N shaft seals located on the valve shaft to minimize the entrance of grit into the bearing journal and shaft seal areas.
5. Materials
  - a. Valve bodies and covers shall be constructed of ASTM A126 Class B for working pressures up to 175 psig (1200 kPa). The words "SEAT END" shall be cast on the exterior of the body seat end.
  - b. kPa). The words "SEAT END" shall be cast on the exterior of the body seat end.
  - c. 3 in. (75 mm) and larger plugs shall be of one-piece construction and made of ASTM A536 Grade 65-45-12 ductile iron and fully encapsulated with resilient facing per ASTM D2000-BG and ANSI/AWWA C517 requirements.
  - d. Plug valves shall have radial shaft bearings constructed of self-lubricating Type 316 stainless steel. The thrust bearings shall be PTFE. Cover bolts shall be corrosion resistant with zinc plating.
  - e.
6. Actuation
  - a. The packing gland shall include a friction collar and an open position memory stop. The friction collar shall include a nylon sleeve to provide friction without exerting pressure on the valve packing.
  - b. Valves 3 in. (75 mm) and larger shall include a totally enclosed and sealed worm gear actuator with position indicator (above ground service only) and externally adjustable open and closed stops. The worm segment gear shall be ASTM A536 Grade 65-45-12 ductile iron with a precision bore and keyway for connection to the valve shaft. Bronze radial bearings shall be provided for the segment gear and worm shaft. Alloy steel roller thrust bearings shall be provided for the hardened worm.
  - c. All gear actuators shall be designed to withstand, without damage, a rim pull of 200 lb. on the hand wheel and an input torque or 300 ft-lbs. for nuts.
  - d. Exposed worm gear shafts shall be stainless steel.
7. Options
  - a. The interior and exterior of the valve shall be coated with a fusion bonded epoxy.



8. Manufacture
  - a. Manufacturer shall demonstrate a minimum of ten (10) years' experience in the manufacture of plug valves. When requested, the manufacturer shall provide test certificates, dimensional drawings, parts list drawings and operation and maintenance manuals.
  - b. Valve shall be marked with the Serial Number, Manufacturer, Size, Cold Working Pressure (CWP) and the Direct and Reverse Actuator Pressure Ratings on a corrosion resistant nameplate.
9. Manufacturers
  - a. Val-Matic
  - b. Substitutions: See Section 016000-Product Requirements.

## 2.06 BRONZE, BALL VALVES

- A. General:
  1. Fabricate from dezincification resistant material.
  2. Copper alloys containing more than 15 percent zinc are not permitted.
- B. Two Piece, Full Port with Bronze Trim:
  1. Comply with MSS SP-110.
  2. WSP Rating: 150 psi.
  3. WOG Rating: 600 psi.
  4. Body: Forged bronze or dezincified-brass alloy.
  5. Ends Connections: Pipe thread.
  6. Seats: PTFE or TFE.
  7. Stem: Bronze, blowout proof.
  8. Ball: Chrome plated brass.
  9. Operator: Provide lockable handle.
  10. Manufacturers:
    - a. Apollo.
    - b. Substitutions: See Section 016000 - Product Requirements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

### 3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Install check valves where necessary to maintain direction of flow as follows:
  1. Swing Check: Install horizontal maintaining hinge pin level.

**END OF SECTION**



**SECTION 220529  
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Pipe hangers.
- B. Anchors and fasteners.

**1.02 REFERENCE STANDARDS**

- A. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- B. UL (DIR) - Online Certifications Directory; Current Edition.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems and post-installed concrete and masonry anchors.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

**1.05 QUALITY ASSURANCE**

- A. Comply with applicable building code.
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS****2.01 GENERAL REQUIREMENTS**

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
- D. Do not use wire, chain, perforated pipe strap, or wood for permanent supports.
- E. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

1. Outdoor, Damp, or Wet-Indoor Locations: Use type 316 stainless steel unless otherwise indicated.

## 2.02 PIPE HANGERS

### A. Clevis Hangers, Adjustable:

1. Manufacturers:
  - a. B-Line, a brand of Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
  - b. Substitutions: See Section 016000 - Product Requirements.
  - c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
2. Standard-Duty: MSS SP-58 type 1, stainless steel.
3. UL (DIR) listed: Pipe sizes 2-1/2 to 8 inch.

## 2.03 PIPE CLAMPS

### A. Riser Clamps:

1. Manufacturers:
  - a. B-Line, a brand of Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
  - b. Substitutions: See Section 016000 - Product Requirements.
  - c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
2. MSS SP-58 type 1 or 8, type 316 stainless steel with plain finish.
3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, stainless steel with plain finish.
4. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.

### B. Extension Split Pipe Clamp:

1. Manufacturers:
  - a. B-Line, a brand of Eaton Corporation; \_\_\_\_\_: [www.eaton.com/#sle](http://www.eaton.com/#sle).
  - b. Substitutions: See Section 016000 - Product Requirements.
  - c. Source Limitations: Furnish hardware, fittings, and accessories from single manufacturer.
2. MSS SP-58 type 12, hinged split ring and two bolt type 316 stainless steel hanger with plain finish.
3. Provide hanger rod and nuts of the same type and material for a given pipe run.
4. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

### C. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

## 2.04 ANCHORS AND FASTENERS

### A. Manufacturers - Mechanical Anchors:

1. Hilti, Inc: [www.us.hilti.com/#sle](http://www.us.hilti.com/#sle).
2. ITW Red Head, a division of Illinois Tool Works, Inc: [www.itwredhead.com/#sle](http://www.itwredhead.com/#sle).
3. Powers Fasteners, Inc: [www.powers.com/#sle](http://www.powers.com/#sle).
4. Simpson Strong-Tie Company Inc: [www.strongtie.com/#sle](http://www.strongtie.com/#sle).
5. Substitutions: See Section 016000 - Product Requirements.

### B. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

### C. Concrete: Use expansion anchors.

### D. Post-Installed Concrete Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.

- C. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- D. Secure fasteners according to manufacturer's recommended torque settings.
- E. Remove temporary supports.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**



**SECTION 220553  
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Tags.
- B. Stencils.
- C. Underground warning tape.

**1.02 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature for each product required.
- C. Project Record Documents: Record actual locations of tagged valves.

**PART 2 PRODUCTS****2.01 PLUMBING COMPONENT IDENTIFICATION GUIDELINE**

- A. Tags:
  - 1. Piping: 3/4 inch diameter and smaller.
  - 2. Manual operated and automated control valves.
- B. Stencil:
  - 1. Piping: 3/4 inch diameter and higher.

**2.02 IDENTIFICATION APPLICATIONS**

- A. Piping: Stencils.
- B. Valves: Tags.

**2.03 TAGS**

- A. Manufacturers:
  - 1. Advanced Graphic Engraving: [www.advancedgraphicengraving.com](http://www.advancedgraphicengraving.com).
  - 2. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
  - 3. Brimari Industries, Inc: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  - 4. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  - 5. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
  - 6. Seton Identification Products: [www.seton.com](http://www.seton.com).
  - 7. Substitutions: See Section 016000 - Product Requirements.
- B. Metal: Brass, 19 gauge 1-1/2 inch in diameter with smooth edges, stamped, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.
- C. Piping: 3/4 inch diameter and smaller. Include corrosion resistant chain. Identify service, flow direction, and pressure.

**2.04 STENCILS**

- A. Manufacturers:
  - 1. Brady Corporation: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  - 2. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  - 3. Insite Solutions, LLC: [www.stop-painting.com/#sle](http://www.stop-painting.com/#sle).
  - 4. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  - 5. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 6. Substitutions: See Section 016000 - Product Requirements.
- B. Pipe: Stencil size required per external pipe diameter.
  - 1. 3/4 to 1-1/4 inch Range: 1/2 inch text over 8 inch long background.

2. 1-1/2 to 2 inch Range: 3/4 inch text over 8 inch long background.
  3. 2-1/2 to 6 inch Range: 1-1/4 inch text over 12 inch long background.
  4. 8 to 10 inch Range: 2-1/2 inch text over 24 inch long background.
- C. Background Paint: Semi-gloss enamel in compliance with Section 099123.
- D. Stencil Paint: As specified in Section 099123, semi-gloss enamel, colors complying with ASME A13.1.
- E. Fluid Service Identification Scheme, ASME A13.1:
1. Waste Water: Black text on green background.
  2. Potable Water: White text on blue background.

## 2.05 PIPE MARKERS

- A. Manufacturers:
1. Brady Corporation: [www.bradycorp.com/#sle](http://www.bradycorp.com/#sle).
  2. Brimar Industries, Inc: [www.pipemarker.com/#sle](http://www.pipemarker.com/#sle).
  3. Craftmark Pipe Markers: [www.craftmarkid.com/#sle](http://www.craftmarkid.com/#sle).
  4. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  5. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
  6. Substitutions: See Section 016000 - Product Requirements.
- B. Comply with ASME A13.1.
- C. Underground Flexible Marker: Bright-colored continuously printed ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.
- D. Identification Scheme, ASME A13.1:
1. Primary: External Pipe Diameter, Uninsulated or Insulated.
    - a. 1-1/2 to 2 inches: Use 8 inch field-length with 3/4 inch text height.
    - b. 2-1/2 to 6 inches: Use 12 inch field-length with 1-1/4 inch text height.
  2. Secondary: Color scheme per fluid service.
    - a. Water; Potable, Cooling, Boiler Feed, and Other: White text on green background.

## 2.06 UNDERGROUND WARNING TAPE

- A. Manufacturers:
1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
  2. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
  3. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
  4. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
  5. Substitutions: See Section 016000 - Product Requirements.
- B. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- C. Foil-backed Detectable Type Tape: 6 inches wide, with minimum thickness of 5 mil, 0.005 inch, unless otherwise required for proper detection.
- D. Legend: Type of service, continuously repeated over full length of tape.
- E. Color:
1. Waste Water: Black text on green background.
  2. Potable Water: White text on blue background.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive identification products.

### 3.02 INSTALLATION

- A. Install tags in clear view and align with axis of piping
- B. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.



- C. Apply ASME A13.1 Pipe Marking Rules:
  - 1. Place pipe marker adjacent to changes in direction.
  - 2. Place pipe marker adjacent each valve port and flange end.
  - 3. Place pipe marker at both sides of floor and wall penetrations.
- D. Identify service, flow direction, and pressure.
- E. Install in clear view and align with axis of piping.
- F. 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.

**END OF SECTION**



**SECTION 221005  
PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sanitary waste piping.
- B. Domestic water piping.

**1.02 REFERENCE STANDARDS**

- A. ASME B31.9 - Building Services Piping; 2020.
- B. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; 2023.
- C. AWWA C651 - Disinfecting Water Mains; 2014, with Addendum (2020).
- D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).
- E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.
- F. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- G. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- H. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- I. NSF 372 - Drinking Water System Components - Lead Content; 2022.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Project Record Documents: Record actual locations of valves.

**1.04 QUALITY ASSURANCE**

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

**1.05 DELIVERY, STORAGE, AND HANDLING**

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

**1.06 FIELD CONDITIONS**

- A. Do not install underground piping when bedding is wet or frozen.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

**2.02 PRESSURE SEWER PIPING**

- A. Ductile Iron Pipe: AWWA C151/A21.51.
  - 1. Fittings: AWWA C110/A21.10, ductile or gray iron, standard thickness.
  - 2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch diameter rods.
- B. Stainless Steel Pipe and Fittings: ASTM A112.3.1 Schedule 10, Type 316L
  - 1. Flanged fittings (SBR gasket joints) or welded joints.

**2.03 POTABLE WATER PIPING**

- A. Ductile Iron Pipe: AWWA C151/A21.51.
  - 1. Fittings: AWWA C110/A21.10, ductile or gray iron, standard thickness.
  - 2. Joints: AWWA C111/A21.11, styrene butadiene rubber (SBR) or vulcanized SBR gasket with 3/4 inch diameter rods.
- B. Stainless Steel Pipe and Fittings: ASTM A312/A778 Schedule 10, Type 316L
  - 1. Flanged fittings (SBR gasket joints) or welded joints.

**2.04 PIPE FLANGES, UNIONS, AND COUPLINGS**

- A. Unions for Pipe Sizes 3 inch and Under:
  - 1. Ferrous Pipe: Class 150 malleable iron threaded unions.
- B. Flanges for Pipe Sizes Over 1 inch:
  - 1. Ferrous Pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

**2.05 PIPE HANGERS AND SUPPORTS**

- A. Provide hangers and supports that comply with MSS SP-58.
  - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
  - 4. Vertical Pipe Support: Steel riser clamp.
  - 5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
- B. Plumbing Piping:
  - 1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Type 316 Stainless Steel, adjustable swivel, split ring.
  - 2. Hangers for Pipe Sizes 2 inch and Over: Type 316 Stainless Steel, adjustable, clevis.
  - 3. Wall Support for Pipe Sizes to 3 inch: Type 316 Stainless Steel bracket and Type 316 Stainless Steel clamp.
  - 4. Wall Support for Pipe Sizes 4 inch and Over: Type 316 Stainless Steel bracket and wrought steel clamp.
  - 5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- C. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
  - 1. Concrete Wedge Expansion Anchors: Comply with ICC-ES AC193.
  - 2. Concrete Screw Type Anchors: Comply with ICC-ES AC193.
  - 3. Concrete Adhesive Type Anchors: Comply with ICC-ES AC308.
  - 4. Other Types: As required.

**2.06 BALL VALVES**

- A. Manufacturers:
  - 1. Apollo Valves; \_\_\_\_\_: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).

2. Substitutions: See Section 016000 - Product Requirements.

- B. Construction, 4 inch and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel or chrome plated brass ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, threaded or grooved ends with union.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

#### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.  
 B. Remove scale and dirt, on inside and outside, before assembly.  
 C. Prepare piping connections to equipment with flanges or unions.

#### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.  
 B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.  
 C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to structures.  
 D. Group piping whenever practical at common elevations.  
 E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.  
 F. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.  
 G. Provide access where valves and fittings are not exposed.  
 H. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.  
 I. Install bell and spigot pipe with bell end upstream.  
 J. Install valves with stems upright or horizontal, not inverted.  
 K. Install water piping to ASME B31.9.  
 L. Sleeve pipes passing through partitions, walls, and floors.  
 M. Pipe Hangers and Supports:
  1. Install in accordance with ASME B31.9.
  2. Support horizontal piping as indicated.
  3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  4. Place hangers within 12 inches of each horizontal elbow.
  5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- N. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

#### **3.04 APPLICATION**

- A. Install unions downstream of valves and at equipment or apparatus connections.  
 B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

#### **3.05 TOLERANCES**

- A. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

**3.06 FIELD TESTS AND INSPECTIONS**

- A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.
- B. Domestic Water Systems:
  - 1. Perform hydrostatic testing for leakage prior to system disinfection.
  - 2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
  - 3. General:
    - a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi.
  - 4. Metal Piping Systems:
    - a. Inject 40 psi of compressed air into piping to spot check for leaks with liquid soap. Document and repair leaks as necessary.
    - b. Raise injected compressed air pressure to 1.5 times rated service pressure or minimum pressure of 100 psi for a duration of 2 hours and verify with a gauge that no perceptible pressure drop is measured.
- C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

**3.07 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

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

**END OF SECTION**

**SECTION 221006  
PLUMBING PIPING SPECIALTIES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Double check valve assemblies.
- B. Hose bibs.

**1.02 REFERENCE STANDARDS**

- A. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.
- B. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.
- C. ASSE 1015 - Performance Requirements for Double Check Backflow Prevention Assemblies; 2021.
- D. NSF 61 - Drinking Water System Components - Health Effects; 2022, with Errata.
- E. NSF 372 - Drinking Water System Components - Lead Content; 2022.

**1.03 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- E. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- F. Project Record Documents: Record actual locations of equipment, backflow preventers.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements for additional provisions.
  - 2. Extra Loose Keys for Outside Hose Bibbs: One.
  - 3. Extra Hose End Vacuum Breakers for Hose Bibbs: One.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept specialties on site in original factory packaging. Inspect for damage.

**PART 2 PRODUCTS****2.01 GENERAL REQUIREMENTS**

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

**2.02 HOSE BIBBS**

- A. Manufacturers:
  - 1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
  - 2. Murdock Manufacturing, Inc: [www.murdockmfg.com/#sle](http://www.murdockmfg.com/#sle).
  - 3. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  - 4. Zurn Industries, LLC: [www.zurn.com](http://www.zurn.com).
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Hose Bibbs:
  - 1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, with handwheel, integral vacuum breaker in compliance with ASSE 1011.

**2.03 DOUBLE CHECK-VALVE ASSEMBLIES**

- A. Manufacturers:
  - 1. Apollo Valves: [www.apollovalves.com/#sle](http://www.apollovalves.com/#sle).
  - 2. MIFAB, Inc: [www.mifab.com/#sle](http://www.mifab.com/#sle).
  - 3. Watts Regulator Company, a part of Watts Water Technologies: [www.wattsregulator.com/#sle](http://www.wattsregulator.com/#sle).
  - 4. Zurn Industries, LLC: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 5. Substitutions: See Section 016000 - Product Requirements.
- B. Double Check Valve Assembly:
  - 1. ASSE 1015 and NSF 61 compliant cast bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.
  - 2. Size: 3/4 to 2 inch, NPS assembly with threaded full port ball valves.
  - 3. Maximum Working Parameters: 175 psi at 180 degrees F.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur.

**END OF SECTION**



**SECTION 260010  
BASIC ELECTRICAL REQUIREMENTS**

**PART 1 GENERAL**

**1.01 DESCRIPTION**

- A. This section is an extension of the General Requirements and certain items of a common or administrative nature that pertain to all electrical work.
- B. The work of this section consists of furnishing materials, equipment, constant competent supervision, special tools, test equipment, technicians, and labor necessary for installation of a complete working electrical system as indicated herein and on the Drawings.
- C. The work shall include but not necessarily be limited to the following:
  - 1. Temporary electrical service for construction.
  - 2. Lighting System.
  - 3. Power System.
  - 4. Communication System.
  - 5. Grounding and Bonding system.
  - 6. Medium Voltage System
  - 7. Generator and ATS

**1.02 QUALITY ASSURANCE**

- A. The electrical installation shall conform to the requirements of the latest edition of the National Electrical Code (NEC). Notify Architect/Engineer of conflicts before performance.
- B. Electrical material shall be built and tested in accordance with the applicable standards of the (NEMA), (ANSI), (ASTM), and (IEEE).
- C. Electrical materials shall be new and unused and shall be listed and labeled for the service intended by Underwriters' Laboratories, Inc., where such labeling service is available.
- D. Applicable sections of all codes and standards shall also be followed:
  - 1. NFPA – National Fire Protection Association including NFPA-101, Life Safety Code NFPA 70, National Electrical Code
  - 2. OSHA Code of Federal Regulations (for construction practices)
  - 3. International Building Code
  - 4. Applicable state and local codes/ordinances
  - 5. CBM – Certified Ballast Manufacturer
  - 6. IPCEA – Insulated Power Cable Engineers' Association
  - 7. FM – Factory Mutual
  - 8. ETL – Electrical Testing Laboratories
  - 9. IES – Illuminating Engineering Society
  - 10. NFPA – National Fire Protection Association, including NFPA 72

**1.03 REGULATORY REQUIREMENTS**

- A. Permits: Obtain and pay for all necessary permits, inspections, connection charges, fees, insurance, bond, licenses, and comply with all governing laws, ordinances, rules and regulations.

**1.04 COORDINATION**

- A. Contractor shall be responsible for coordination of all work with other disciplines.
- B. Arrange work in a neat, well organized manner with exposed conduit and similar services running parallel with primary lines of the building construction, high as possible with a minimum of 8'-0" overhead clearance or as directed by the Engineer.
- C. Where the method of installation is not certain, ask for details. Lack of details, not requested, will not be an excuse for improper installation, and any such work must be corrected at contractor's cost.

- D. Coordination Drawings: For locations where several elements of electrical or combined mechanical and electrical work must be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings showing the actual physical dimensions (at accurate scale, minimum 1/4") required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.
- E. All Bidders shall be responsible to insure that equipment selected, switchboards, panel boards, etc., fit in spaces selected, along with NEC compliance. If standard equipment does not fit, Contractor shall be required to utilize custom equipment as required.

#### 1.05 DRAWINGS AND SPECIFICATIONS

- A. Contract Documents (Drawings and Specifications) are intended to convey the scope of work and indicate general arrangements of equipment, fixtures and piping, and approximate sizes and locations of equipment and outlets. Follow these documents in laying out the work, check all Drawings to become familiar with all conditions affecting the work, and verify spaces in which the work will be installed.
- B. The contractor shall fully coordinate installation of electrical system with other disciplines. The Drawings show approximate locations only of selected feeders, branch circuits, outlets, etc., except where specific routing or dimensions are indicated. The Engineer reserves the right to make reasonable changes in locations indicated before roughing-in without additional cost to the Owner.
  - 1. Contractor shall investigate the structural and finish conditions affecting Division 26 work and shall arrange such work accordingly, furnishing fittings, bends, junction boxes, pull boxes, access panels, and accessories required to meet such conditions.
  - 2. These Specifications, together with the accompanying Drawings, contemplate apparatus fully erected, and in satisfactory operating condition with the Contractor furnishing and installing everything that may be necessary to complete the job.
  - 3. Contractor shall install circuits, breakers, equipment, etc. as indicated and label the above as noted. Contractor shall not deviate from equipment/circuit identification unless approved by Owner/Engineer.

#### 1.06 SUBMITTALS

- A. Shop Drawings:
  - 1. Listed below are shop drawings required for transmittal. Refer to Phasing Plan for scheduling of submittal. No time delays will be allowed for failure to be so informed.
    - a. Lighting Fixtures
    - b. Lighting Controls
    - c. Lamps
    - d. Raceways and Supports
    - e. Connectors
    - f. Safety Switches
    - g. Fuses
    - h. Circuit Breakers
    - i. Wiring Devices
    - j. Motor Controls
    - k. Panel boards
    - l. Conductors and Termination Hardware
    - m. Relays and Contactors
    - n. Transformers
    - o. Grounding products
    - p. Further descriptions or information required with shop drawings shall be included with the description of materials specified herein as follows:
      - 1) Grounding Products: Include a complete grounding system diagram with materials and ground conductor sizes.

- 2) Miscellaneous Electrical Controls and Control Wiring: Include control wiring diagrams for all miscellaneous electrical controls.
- 3) Housekeeping Pads: Include location and dimensions of housekeeping pads, including blockouts and anchor bolts.
- q. Contractor prepared, new, detailed, dimensioned shop Drawings for the installation of the work ON the electrical equipment platform areas shall be prepared and submitted for review. In preparing shop Drawings, establish lines and levels for the work
- r. specified and check the Drawings to avoid interference with structural features and the work of other trades. Immediately call to the attention of the Architect/Engineer in writing any interferences for clarification.
- s. Corrections or comments made on shop Drawings during the review do not relieve the Contractor from compliance with requirements of the contract documents. Review of shop Drawings shall not permit any deviation from Drawings and Specifications. Shop Drawings must be accompanied by signed statement from contractor, stating that he has reviewed the submittal and checked it for compliance.
- t. Contractor shall provide products as specified if submittals for review of materials are not received within thirty (30) days after award of the Contract.

### 1.07 PROJECT/SITE CONDITIONS

- A. Visit the site before bidding to become familiar with conditions under which the work will be performed.
- B. No additional compensation will be allowed for failure to be so informed.

### 1.08 CUTTING AND PATCHING

- A. Do all cutting, patching, fitting, and all other work that may be required to make the several parts come together and fit.
- B. Provide, everything required for the work or to conceal any of the work, in any part of the structure.
- C. Fireproofing:
  - 1. Plastic sleeves/pipe shall not be used within the building when penetrating a fire-resistant-rated wall, ceiling, partition, or floor.

### 1.09 RECORD DRAWINGS

- A. Upon completion of the project, provide a complete set of detailed electronic as-built drawings in AutoCAD 2005 format with all information required. Contractor shall also produce (2) sets of as-built drawings with modifications to construction documents in red ink. Contractor shall maintain a current set of as-built drawings on site at all times. As-built drawings shall include, but not be limited to detailed dimensions of all conduits, ductbank, etc. install in slab or below grade.
  - 1. Equipment Manuals:
    - a. Before the date of Ingalls substantial completion, Contractor shall furnish to the Architect/Engineer three (3) bound sets of descriptive, dimensional and parts data on all major items of electrical equipment and material including those items listed above under "Shop Drawings".
    - b. This submittal shall be accompanied by final Electrical Inspection Certificate from Ingalls.

### 1.10 WARRANTY/GUARANTEE

- A. Except where longer periods of warranty are specified, guarantee all labor and materials for a period of twelve (12) months from the date of substantial completion of the particular phase of the work. Repair all defective materials and work; replace with new materials and/or equipment, any material and/or equipment failing to give satisfactory service.
- B. During the period of guarantee, promptly correct any defects in equipment, materials or workmanship without cost to the Owner.

- C. Guarantee includes equipment capacity and performance ratings specified without excessive noise levels. Any deficiencies in equipment specified shall be promptly corrected.
- D. Contractor's warranty shall include an inspection of the system one (1) week before the end of the one (1) year warranty period. Replace or repair any items found to be defective at this time.

### 1.11 TESTS AND BALANCING

- A. At such times as the Engineer directs, conduct operating tests to demonstrate that the electrical systems are installed and will operate properly and in accordance with the requirements of this Specification. Tests shall be performed in the presence of the Engineer's representative. Furnish instruments and personnel required for such tests.
- B. Any work and materials tested and found varying from the requirements of the Drawings and Specifications shall be replaced without additional cost to the Owner.
- C. This section does not relieve the Contractor from testing equipment installed under this Division but not listed in this section. Contractor is required to test all equipment, feeders, etc., installed under this Division.

## PART 2 PRODUCTS

### 2.01 GENERAL

- A. Refer to DIVISION 1 sections for general requirements on products, materials and equipment. Refer to other DIVISION 26 sections for additional requirements.
- B. Provide products which are compatible with other products of the electrical work, and with other work requiring interface with the electrical work, including electrical connections and control devices. Determine in advance of purchase that equipment and materials proposed for installation will fit into the confines indicated, leaving adequate clearance as required by applicable codes, and for adjustment, repair, or replacement.

### 2.02 MANUFACTURERS' NAMEPLATES

- A. Each major component of the equipment shall have the manufacturer's name, address, model number, and rating on a plate securely affixed in a conspicuous place.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Visit the building site before bidding to determine existing conditions and assume all responsibility and bear all expenses in allowing for these conditions in the bid.
- B. No work shall be concealed until approved by the inspector and all Ingalls regulations are adhered to. Provide certificate of completion.
- C. Cooperate with other trades in installing work in order that there will be no conflict of space required by conduit, piping, ducts, outlets, etc.
- D. Verify dimensions with certified shop Drawings of the materials actually approved and purchased.

### 3.02 TEMPORARY WIRING, LIGHTING AND POWER AT THE SITE

- A. Furnish and install provisions for temporary electrical service and construction light and power during the construction period.
- B. Furnish, install, and maintain all temporary service equipment as required until permanent service is installed, switch-over temporary systems to the permanent service when latter is ready for same.
- C. Furnish, install, maintain, and switch on and off on all regular work days a complete temporary light system, for the building while under construction.
- D. Provide any and/or all relocations of temporary electric facilities as necessary to avoid the permanent installations of all trades.

### 3.03 WIRING FOR EQUIPMENT BY OTHERS

- A. Electrical service for all equipment furnished under this Specification and/or indicated on the Drawings shall be roughed-in and connected under this Section.
- B. Electrical work for equipment specified in Division 25 - Mechanical shall be as specified.
- C. Raceways, outlets, backboards, cabinets, grounding connections, handholes, underground distribution system, and other roughing-in indicated shall be provided as work of this division for telephone system and data system, (Contractor to provide cable as well).

#### **3.04 WORKMANSHIP**

- A. Install all materials and electrical components of the work in accordance with instructions of manufacturer following the best modern construction practices and conforming with the Contract Documents. Workmanship shall be first class, in both function and appearance, whether finally concealed or exposed and shall be performed by experienced workmen skilled in the type of work. As practicable, the lines of all components of the system shall be perpendicular or parallel. In general, workmanship shall conform to guidelines set forth in N.E.C.A. manuals.

#### **3.05 MOUNTING HEIGHTS**

- A. Upon approval of the Architect/Engineer mounting heights may be adjusted.

**END OF SECTION**



**SECTION 260051  
ELECTRICAL RELATED WORK**

**PART 1 GENERAL****1.01 DESCRIPTION**

- A. Extent of electrical related work required by this section is indicated on Drawings and/or specified in other Division 26 sections.

**1.02 PROJECT/SITE CONDITIONS**

- A. Protect property from damage which might result from excavating and backfilling.  
 B. Protect persons from injury at excavations by barricades, warnings and illumination.  
 C. Coordinate excavations with weather conditions, to minimize possibility of washouts, settlements and other damages and hazards.

**PART 2 PRODUCTS****2.01 ACCESS TO ELECTRICAL WORK**

- A. Provide removable access doors of types and sizes needed for access requirements of electrical Equipment.

**PART 3 EXECUTION****3.01 EXCAVATION, TRENCHING AND BACKFILLING**

- A. Perform all excavation of every description and of whatever substances encountered to the depths indicated on the Drawings or as otherwise specified or as required based on field condition. All excavated materials not required or not suitable for backfill shall be removed and hauled away.
- B. Sheeting and shoring shall be done as necessary for the protection of the work and for the safety of personnel.
- C. No excavation or trenches shall be cut near or under footings without first consulting the Engineer.
- D. Provide uniform circumferential support to lower third of each conduit or pipe. Each conduit or pipe shall be laid true to line and grade to prevent sudden offset to flow line. As work progresses, interior of conduit or pipe shall be cleared of dirt and superfluous materials of every description.
- E. Provide proper supporting material as required based on field condition.
1. Trenches for utilities shall be of a depth that will provide the following minimum depth of cover from existing grade or from indicated finish grade, whichever is lower, unless otherwise specifically shown:
    - a. 30-Inch Minimum Cover - Electrical Conduits/Cables over 600 volts
    - b. 24-inch Minimum (See NEC 300-5) - Electrical Cables/Conduits under 600 volts.
  2. Backfill shall be installed in layers 6" deep, adequately wetted and tamped using materials as noted above. Refer to Division 2 for compaction densities.
  3. Restore all hard finished surfaces such as roadways, sidewalks, grass, shrubbery, etc., removed for installation of utilities (and not shown on Drawings or specified to be reworked under other sections of the work) to their original condition. Restore to near original condition acceptable to Architect/Engineer.
  4. Carefully plan all work to avoid existing utilities and other interferences. The Drawings do not indicate all existing underground utilities. Existing utility lines to be retained that are shown on the Drawings or the locations of which are made known to the Contractor prior to excavation, as well as all utility lines uncovered during excavation operations, shall be protected from damage during excavation and backfilling and, if damaged, shall be repaired by Contractor at his expense. Prior to doing any excavation with power tools, carefully investigate and locate any exiting conduit, pipes, and other lines.

**3.02 FOUNDATIONS AND SUPPORTS**

- A. Provide concrete pedestals, bases, pads, curbs, anchor blocks, anchor bolts, slab inserts, hangers channels, cradles, saddles, etc. for installation of floor mounted equipment.
- B. Concrete pads for floor mounted electrical equipment shall be 3.5 inches high, unless otherwise indicated, poured integral with the floor slab wherever practical. Wherever integral slab poured pads are not practicable, construct 3.5 inch high housekeeping pads, reinforced with No. 3 steel wire mesh 6 X 6 inches, fastened to structural slabs with 1/2 inch diameter bolts embedded in structural slabs with expansion bolts at all corners (inset 3 inches) and no further apart than 18 inches. Score structural slab thoroughly to assure concrete bonding between structural slab and housekeeping pad. Construct in full accordance with "concrete" specifications for 2500 psi minimum compressive strength. Finish tops of housekeeping pads smooth and level within 1 percent of span. Pads shall be extended at least 4" (10 cm) beyond the equipment outline on all four sides with chamfered edges.

### 3.03 PAINTING

- A. Factory painted equipment shall have finish restored to Manufacturer's finish if scratched or damaged before acceptance or use by Owner.

**END OF SECTION**



**SECTION 260505  
SELECTIVE DEMOLITION FOR ELECTRICAL**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Electrical demolition.

**PART 2 PRODUCTS****2.01 MATERIALS AND EQUIPMENT**

- A. Materials and equipment for patching and extending work: As specified in individual sections.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on casual field observation .
- D. Report discrepancies to Engineer/Architect before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

**3.02 PREPARATION**

- A. Coordinate utility service outages with The Port of Gulfport.

**3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK**

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
  1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
  2. PCB- and DEHP-containing lighting ballasts.
  3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Remove abandoned wiring to source of supply.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- D. Repair adjacent construction and finishes damaged during demolition and extension work.
- E. Plug abandoned enclosure penetrations.

**3.04 CLEANING AND REPAIR**

- A. Clean and repair existing materials and equipment that remain or that are to be reused.



**SECTION 260519**  
**LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Underground feeder and branch-circuit cable.
- C. Wiring connectors.
- D. Electrical tape.
- E. Heat shrink tubing.
- F. Oxide inhibiting compound.
- G. Wire pulling lubricant.
- H. Cable ties.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

**1.03 REFERENCE STANDARDS**

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.
- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- M. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- Q. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
4. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

#### 1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

#### 1.08 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Engineer/Architect and obtain direction before proceeding with work.

### PART 2 PRODUCTS

#### 2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

#### 2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.

- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 260526.
- H. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
- I. Minimum Conductor Size:
  - 1. Branch Circuits: 12 AWG.
    - a. Exceptions:
      - 1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
      - 2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
      - 3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
- J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- K. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
    - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
  - 3. Color Code:
    - a. 480Y/277 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
      - 4) Neutral/Grounded: Gray.
    - b. 208Y/120 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
      - 4) Neutral/Grounded: White.
    - c. 240/120 V, 1 Phase, 3 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Neutral/Grounded: White.
    - d. Equipment Ground, All Systems: Green.

### 2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
  - 1. Copper Building Wire:
    - a. Cerro Wire LLC: [www.cerrowire.com/#sle](http://www.cerrowire.com/#sle).
    - b. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
    - c. General Cable Technologies Corporation: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
    - d. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
    - e. Or Approve Equal.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
  - 1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Stranded.

- b. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
  - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
    - a. Size 4 AWG and Larger: Type XHHW-2.
    - b. Installed Underground: Type XHHW-2.
    - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

## 2.04 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.
- C. Wiring Connectors for Splices and Taps:
  - 1. Copper Conductors Size 8 AWG and Smaller: Use mechanical connectors.
  - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors.
- D. Wiring Connectors for Terminations:
  - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
  - 4. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors where connectors are required.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for Barrel Crimp connectors.
- G. Mechanical or twist on Connectors: Provide bolted type or set-screw type.
  - 1. Manufacturers:
    - a. IlSCO: [www.ilSCO.com/#sle](http://www.ilSCO.com/#sle).
    - b. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
- H. Compression Connectors: Provide circumferential type or hex type crimp configuration.
  - 1. Manufacturers:
    - a. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - b. Or Approved Equal.

## 2.05 ACCESSORIES

- A. Electrical Tape:
  - 1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
  - 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
  - 3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
  - 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature

- environment up to 194 degrees F and short-term 266 degrees F overload service.
5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
  6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
  7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
  - C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
  - D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
  - E. Cable Ties: Material and tensile strength rating suitable for application.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that work likely to damage wire and cable has been completed.
- B. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70 and these specifications.
- C. Verify that field measurements are as indicated.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

#### **3.03 INSTALLATION**

- A. Circuiting Requirements:
  1. Unless dimensioned, circuit routing indicated is diagrammatic.
  2. When circuit destination is indicated without specific routing, determine exact routing required.
  3. Arrange circuiting to minimize splices.
  4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
- B. Install products in accordance with manufacturer's instructions.
- C. No conductor shall bear more than eighty percent (80%) of its rated ampacity.
- D. The system shall be properly grounded and continuously polarized throughout following the color coding specified.
- E. Do not use mechanical means to pull wire No. 8 AWG. or smaller.
- F. Perform work in accordance with NECA 1 (general workmanship).
- G. Installation in Raceway:
  1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  2. Pull all conductors and cables together into raceway at same time.
  3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

- H. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- I. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- J. Terminate cables using suitable fittings.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- L. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 3. Do not remove conductor strands to facilitate insertion into connector.
  - 4. Clean contact surfaces on conductors and connectors to suitably remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
  - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
  - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
    - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
  - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
  - 3. Wet Locations: Use heat shrink tubing.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- P. Identify conductors and cables in accordance with Section 260553.
- Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

### 3.04 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. prior to energization, test cable and wire for continuity of circuitry, and also for short circuits.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.



1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

**END OF SECTION**



**SECTION 260526  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground rod electrodes.

**1.02 RELATED REQUIREMENTS**

- A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
  - 1. Includes oxide inhibiting compound.
- B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.
- D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify exact locations of underground metal water service pipe entrances to building.
  - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
  - 3. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

**1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- B. Shop Drawings:
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Field quality control test reports.
- E. Project Record Documents: Record actual locations of grounding electrode system components and connections.

**1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

#### 1.08 DESCRIPTION OF WORK

- A. The work of this section consist of providing labor, materials, tools, appliances and miscellaneous accessories associated with grounding of the electrical system as required by and as indicated herein and/or on the drawings.
- B. Main electrical service equipment, raceways, motors, panelboards and other electrical equipment shall be effectively and permanently grounded to the grounding electrode system. This electrode shall be the nearest available effectively grounded structural metal member of the structure or the nearest available effectively grounded metal water pipe and also a driven rod. Provide grounding ring as shown on the drawings. Grounding connections and conductor sizes shall be in accordance with the requirements of the National Electrical Code, Article 250, local ordinances, and as described herein.
- C. A separate grounding conductor, sized in accordance with NEC Table 250-122 shall be provided in the conduit with the circuit conductors for all feeder and branch circuits. The grounding conductor may be bare or insulated copper; however, if this conductor is insulated, the insulating covering shall be green in color. Where bare copper grounding conductors are used, mark the conductor ends with green tape. Conduit runs shall be increased in size where necessary to accommodate the grounding conductor in addition to circuit conductors. The electrical continuity of all conduit runs shall be verified and corrected where necessary.
- D. Isolated Ground Connectors shall be insulated. Additional grounding conductors and conduit shall be provided as specified herein or shown on the drawings. All conduit for grounding system conductors, not run in conduit with circuit conductors, shall be rigid steel conduit.
- E. All electrical equipment enclosures and conductor enclosures shall be grounded. This includes but is not limited to metal raceways, outlet boxes, cabinets, switch boxes, work stations, motor frames, transformer cases and metallic enclosure for all electrical equipment.
- F. Under no circumstances shall neutral conductors again be grounded after they have been grounded once at the transformer secondary.
- G. Panelboards shall be equipped with a neutral bar which is insulated from the enclosure, and a grounding bar which is bonded to the enclosure. The grounding bar shall provide for terminating the green equipment grounding conductors in the panelboard or motor control center cabinets. Neutral busses shall be isolated from ground except at the transformer ground connection.
- H. Types of grounding in this section includes the following:
  1. Grounding electrodes
  2. Service Equipment
  3. Enclosures
  4. Systems
  5. Equipment
  6. Fencing
- I. Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.
- J. Provide bonding jumper across water meter. The bonding jumper shall be the same size as the grounding electrode conductor and long enough to allow the meter to be removed without

disconnecting the bonding jumper.

## PART 2 PRODUCTS

### 2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
  - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Engineer/Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- F. Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.
    - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
  - 2. Metal Underground Water Pipe(s):
    - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
    - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
  - 3. Metal In-Ground Support Structure:
    - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
  - 4. Concrete-Encased Electrode:
    - a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
  - 5. Ground Ring:
    - a. Provide a ground ring encircling the building or structure consisting of bare copper conductor not less than 4/0 AWG in direct contact with earth, installed at a depth of not less than 30 inches.
    - b. Where location is not indicated, locate ground ring conductor at least 24 inches outside building perimeter foundation.
    - c. Provide connection from ground ring conductor to:
      - 1) Perimeter columns of metal building frame.
      - 2) Ground rod electrodes located as indicated.
  - 6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.

- a. Ground Bar Size: as shown on drawings unless otherwise indicated or required.
  - b. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.
- G. Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
    - a. Transformers (except autotransformers such as buck-boost transformers).
  2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
  3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
  4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
  5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
  6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.
- H. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
  2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
  3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
  4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
  6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
  7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
    - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
    - b. Metal gas piping.
  8. Provide bonding for interior metal air ducts.
  9. Provide bonding for metal building frame.
  10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
- I. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
  2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.

- a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
- b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
- c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
- d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

J. Cable Tray Systems: Also comply with Section 260536.

## 2.02 GROUNDING AND BONDING COMPONENTS

### A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

### B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:

1. Use insulated copper conductors unless otherwise indicated.
  - a. Exceptions:
    - 1) Use bare copper conductors where installed underground in direct contact with earth.

### C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

### D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

### E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.
2. Material: Stainless steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.

### F. Grounding for Electrical Vault Fencing

1. The following items must be used for securing ground conductor to fence, gate, fabric frames, and posts: (Alternates must be submitted and approved by HII Facilities Engineering)
  - a. Fence Post Grounding Clamp - BURNDY - GAR194C
  - b. Frame Post Grounding Clamp - BURNDY - GAR174C
  - c. Fence Post Gate Grounding Clamp - BURNDY - GAR1929
  - d. Frame Post Gate Grounding Clamp - BURNDY - GAR1729
  - e. Flexible Gate Jumpers - HARGER - GJX2/024
  - f. Fence Fabric Ground Clamps - HARGER - FGC6
  - g. #6 AWG Solid, Bare copper Ground Conductor

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Weld grounding conductors to underground grounding electrodes/grounding ring. The building equipment grounding system shall consist of the ground wire and electrically continuous metallic conduit system. Every item of equipment served by the electrical system shall be bonded to the building equipment ground. Metallic piping and duct systems which are electrically isolated shall be bonded to the equipment grounding system with a flexible bonding jumper.
- D. The neutral shall be grounded to the grounding electrode system at the service entrance only, and shall be kept isolated from the building grounding system throughout the building. The neutral of separately derived systems shall be grounded at one point as specified herein below.
- E. Continuity of the building equipment grounding system shall be maintained throughout the project. Grounding jumpers shall be installed across conduit expansion fittings, all liquid-tight flexible metal and flexible metal conduit, light fixture pigtails in excess of 6' and all other non-electrically continuous raceway fittings.
- F. All main grounding conductors shall be stranded copper conductors, sized as shown and/or required, and run in a suitable raceway. All main grounding conductors shall be continuous without joints or splices over their entire length.
- G. Bond the case and neutral of each transformer directly to the nearest available effectively grounded structural metal member of the structure, the nearest available effectively grounded metal water pipe, or in accordance with the local electrical inspection department. Flexible conduit shall not be used as a ground path to a transformer.
- H. Ground telephone service equipment as required by Ingalls telecommunications department.
- I. Flexible conduit longer than 6' shall not be considered a ground path.
- J. Ground all grounding-type receptacles with a separate ground wire.
- K. Grounding of all motors or equipment connected to terminal box with flexible conduit shall be made with a separate grounding conductor between motor frame or equipment cabinet and rigid conduit system. Grounding conductor shall be sized in accordance with table 250-122 of the NEC.
- L. All grounding conductors shall be amply protected from mechanical injury and shall be supported in an approved manner. Where conductors are located in concrete, they shall be installed in conduit. Where ground conductors enter or emerge from slabs bearing directly on fill or soil, the voids between the conductor and the surrounding conduit shall be filled with compound to provide an effective water seal.
- M. Grounding conductors shall be not smaller than #12 AWG. Conductors shall be high conductivity copper, and sizes larger than #12 shall be stranded.
- N. Insulated bushings shall be installed on all raceways at transformers, switchboards, motor control centers, dry-type transformers, as well as switches used as service equipment.
- O. Install braided type bonding jumpers with clamps on water meter piping to electrically bypass the water meter.
- P. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.
- Q. Ground each steel structural column to a 4/0 ground loop. Connect the loop to the main service switchboard. "Cadweld" grounding conductor to steel column.
- R. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.



1. Outdoor Installations: Unless otherwise indicated, install with top of rod 12 inches below finished grade.
- S. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- T. Identify grounding and bonding system components in accordance with Section 260553.
- U. Vault Fencing:
1. The ground conductor (#6 AWG) must be weaved through fence fabric and continuous throughout.
  2. Each grounding clamp must be properly secured to fence structure to comply with manufacturer's torque rating.
  3. Fence grounding must be connected with a single #6 AWG solid, bare copper conductor to internal ground ring inside of vault, penetrating through concrete deck above.  
Connections to internal ground ring must be made in two (2) places, one (1) in the high voltage side and one (1) in the low voltage side.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

**END OF SECTION**



**SECTION 260529  
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

**1.02 RELATED REQUIREMENTS**

- A. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- B. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- C. Section 265600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

**1.03 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. MFMA-4 - Metal Framing Standards Publication; 2004.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- C. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
- D. Installer's Qualification Statement: Include evidence of compliance with specified requirements.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination,

preparation, and installation of product.

### 1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## PART 2 PRODUCTS

### 2.01 MANUFACTURED SUPPORTING DEVICES

- A. General: Provide supporting devices complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation and as herein specified. Where more than one type of device meets indicated requirements, selection is Installer's option.
- B. Support: Provide supporting devices of types, sizes and materials as required and having the following construction features:
  1. Clevis Hangers: For supporting 2" rigid metal conduit, galvanized steel with 1/2" diameter hole for round galvanized or stainless steel rod, approximately 54 pounds per 100 units.
  2. Riser Clamps: For supporting 5" rigid metal conduit, galvanized steel with 2 bolts and nuts and 4" ears, approximately 510 pounds per 100 units.
  3. Reducing Couplings: Steel rod reducing coupling, 1/2" x 5/8" galvanized or stainless steel approximately 16 pounds per 100.
  4. C-Clamps: Malleable iron, 1/2" rod size, approximately 70 pounds per 100 units.
  5. I-Beam Clamps: Steel, 1-1/4" x 3/16" stock, 3/8" cross bolt, flange width 2", approximately 52 pounds per 100 units.
  6. One-Hole Conduit Straps: For supporting 3/4" rigid metal conduit, galvanized steel, approximately 7 pounds per 100 units. Include with backing plates.
  7. Two-Hole Conduit Straps: For supporting 3/4" rigid metal conduit, galvanized steel, 3/4" strap width, and 2-1/8" between center of screw holes.
  8. Round Steel Rod: Hot dipped galvanized or Stainless Steel, 1/2" diameter, approximately 67 pounds per 100 feet.
  9. Hexagon Nuts: For 1/2" rod size, galvanized steel, approximately 4 pounds per 100 units.
  10. Offset Conduit Clamps: For supporting 2" rigid metal conduit, steel approximately 200 pounds per 100 units.
- C. Anchors: Provide anchors of types, sizes and materials as required and having the following construction features:
  1. Lead Expansion Anchors: 1/2", approximately 38 pounds over 100 units.
  2. Toggle Bolts: Springhead, 3/16" x 4", approximately 5 pounds per 100 units.
  3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering anchors which may be incorporated into the work include, but are not limited to the following:
    - a. Abbeon Cal Inc.
    - b. Ackerman Johnson Fastening System Inc.
    - c. Elcen Metal Products Co.
    - d. Ideal Industries, Inc.
    - e. Josyln Mfg. and Supply Co.

- f. McGraw Edison Co.
- g. Rawplug Co. Inc.
- h. Star Expansion Bolt Co.

D. U-Channel Strut System:

1. Provide U-Channel strut system for supporting electrical equipment, 16-gage hot dip galvanized steel or stainless steel, of types and sizes required: construct with 9/16" diameter holes, 8" on center on top surface, and with the following fittings which mate and match with U-channel:
  - a. Fixture Hangers
  - b. Channel Hangers
  - c. End caps
  - d. Beam clamps
  - e. Wiring stud
  - f. Thinwall conduit clamps
  - g. Rigid conduit clamps
  - h. Conduit hangers
  - i. U-bolts
2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel system which may be incorporated in the work include, but are not limited to, the following:
  - a. B-Line System, Inc.
  - b. Elcen metal Products Co.
  - c. Greenfield Mfg Co., Inc.
  - d. Midland-Ross Corp.
  - e. Power-Strut Div., Van Huffel Tube Corp.
  - f. Unistrut Div, GTE Products Corp.

E. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Do not use products for applications other than as permitted by NFPA 70 and product listing.
4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
  - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
  - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

F. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

## 2.02 FABRICATED SUPPORTING DEVICES

A. Pipe Sleeves: Provide pipe sleeves of one of the following:

1. Sheet-Metal: Fabricate from galvanized sheet metal round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gages: 3" and smaller, 20 gage; 4" or 6", 16 gage; over 6", 14 gage.
2. Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
4. Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.

B. Sleeve Seals: Provide Lead and Oakum sleeve seals, caulked between sleeve and pipe for sleeves located in foundation walls below grade or in exterior walls.

## PART 3 EXECUTION

**3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by Engineer/Architect, do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by Engineer/Architect, do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Equipment Support and Attachment:
  - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.
- K. Tighten sleeve seal nuts until sealing grommets have expanded to form a watertight seal.
- L. Coordinate all conduit penetrations into the building from the exterior with Division 1.

**3.03 FIELD QUALITY CONTROL**

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

**END OF SECTION**

**SECTION 260533.13  
CONDUIT FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Galvanized steel rigid metal conduit (RMC).
- B. Liquidtight flexible metal conduit (LFMC).
- C. Reinforced thermosetting resin conduit (RTRC).
- D. Conduit, fittings and conduit bodies.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.

**1.03 REFERENCE STANDARDS**

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2020.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- G. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- J. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- M. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- N. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- P. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- Q. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- R. UL 2420 - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.
- S. UL 2515 - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.
- T. UL 2515A - Standard for Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
  3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
  4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
  5. Notify Engineer/Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

### 1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- B. Product Data: Provide for metallic conduit, liquidtight flexible metal conduit, fittings, and conduit bodies.
- C. Project Record Documents: Accurately record actual routing of conduits larger than 2 inches.

### 1.06 QUALITY ASSURANCE

- A. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.
- B. Accept conduit on site. Inspect for damage.
- C. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

## PART 2 PRODUCTS

### 2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Exposed, Exterior: Use Reinforced thermosetting resin conduit (RTRC).

### 2.02 CONDUIT - GENERAL REQUIREMENTS

- A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.
- B. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
  1. Branch Circuits: 3/4-inch trade size.
  2. Branch Circuit Homeruns: 3/4-inch trade size.
- E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

### 2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)



- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
  - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

#### **2.04 METAL CONDUIT**

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

#### **2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
- C. Description: Interlocked steel construction with PVC jacket.
- D. Fittings: NEMA FB 1.

#### **2.06 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)**

- A. Manufacturers:
  - 1. Champion Fiberglass, Inc: [www.championfiberglass.com/#sle](http://www.championfiberglass.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).
- C. Supports: As recommended by manufacturer.
- D. Fittings: Same type and manufacturer as conduit to be connected.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.
- D. Verify routing and termination locations of conduit prior to rough-in.
- E. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. When conduit destination is indicated without specific routing, determine exact routing required.
  - 3. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.

4. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
  5. Group parallel conduits in same area on common rack.
- E. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
  2. Use conduit strap to support single surface-mounted conduit.
    - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
  3. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.
- F. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  3. Use suitable adapters where required to transition from one type of conduit to another.
  4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
  5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
  7. Secure joints and connections to provide mechanical strength and electrical continuity.
- G. Penetrations:
1. Make penetrations perpendicular to surfaces unless otherwise indicated.
  2. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
  3. Provide suitable sealing system where conduits penetrate exterior wall below grade.
  4. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
- H. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- I. Provide grounding and bonding; see Section 260526.

### 3.03 FIELD QUALITY CONTROL

- A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- B. Correct deficiencies and replace damaged or defective conduits.

### 3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

### 3.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.
- B. The concrete envelope shall be continuous throughout. Hang concrete envelope from slab with reinforcing rod. Where PVC is used below slab all final "turn up" elbows shall be made with Rigid Galvanized Steel, properly adapted to the PVC Sch. 40 PVC conduit.
- C. Install all miscellaneous fittings as required. Install standard expansion fittings in raceways every 200' linear run or wherever structural expansion joints are crossed, whatever is less.

- D. Mechanically fasten together all components of raceway to provide electrical continuity and firm mechanical assembly.
- E. Use similar metals throughout system to eliminate possibility of electrolysis.
- F. Size conduits for a conductor fill of 40% or less per Chapter 9 tables of NEC.
- G. Fasten conduit terminations in sheet metal enclosures by 2 locknuts, and terminate with bushing. Install locknuts inside and outside enclosure.
- H. Test every conduit run installed with a ball mandrel. Clear and restore/repair any conduit which rejects the ball mandrel.
- I. Provide permanent plastic tags at each end of each embedded conduit run stating what the conduit is servicing and where it is served from including location.
- J. Label all junction boxes, pull boxes, and wireways with engraved plastic nameplates.
- K. Conduit Fittings:
  - 1. Construct locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.
  - 2. Bushings for terminating conduits smaller than 1-1/4" are to have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulations.
  - 3. Install insulated type bushings for terminating conduits 1 1/4" and larger.
  - 4. Provide bushings or end bells as required at the ends of all conduits.

**END OF SECTION**



**SECTION 260533.16  
BOXES FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

**1.02 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- E. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (Reaffirmed 2020).
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
- M. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
- C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 016000 - Product Requirements, for additional provisions.
  2. Keys for Lockable Enclosures: Two of each different key.

### 1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

## PART 2 PRODUCTS

### 2.01 BOXES

- A. General Requirements:
  1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
  1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.

3. Use suitable concrete type boxes where flush-mounted in concrete.
  4. Use suitable masonry type boxes where flush-mounted in masonry walls.
  5. Use raised covers suitable for the type of wall construction and device configuration where required.
  6. Use shallow boxes where required by the type of wall construction.
  7. Do not use "through-wall" boxes designed for access from both sides of wall.
  8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  10. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
  11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  12. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
  13. Minimum Box Size, Unless Otherwise Indicated:
    - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
  14. Wall Plates: Comply with Section 262726.
  15. Manufacturers:
    - a. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
    - b. Hubbell Incorporated; Bell Products: [www.hubbell-rtb.com/#sle](http://www.hubbell-rtb.com/#sle).
    - c. Hubbell Incorporated; RACO Products: [www.hubbell-rtb.com/#sle](http://www.hubbell-rtb.com/#sle).
    - d. O-Z/Gedney, a brand of Emerson Electric Co: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - e. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - f. Or Approved Equal.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 12 painted steel.
    - b. Outdoor Locations: Type 3R, painted steel.
  3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
  4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    - b. Back Panels: Painted steel, removable.
    - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
  5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
  6. Manufacturers:
    - a. Cooper B-Line, a division of Eaton Corporation: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
    - b. Hoffman, a brand of Pentair Technical Products: [www.hoffmanonline.com/#sle](http://www.hoffmanonline.com/#sle).
    - c. Hubbell Incorporated; Wiegmann Products: [www.hubbell-wiegmann.com/#sle](http://www.hubbell-wiegmann.com/#sle).

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Round boxes are not acceptable where conduit must enter box through side of box.
- I. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- J. Box Locations:
  - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
  - 2. Unless dimensioned, box locations indicated are approximate.
  - 3. Locate boxes as required for devices installed under other sections or by others.
    - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
  - 4. Locate boxes so that wall plates do not span different building finishes.
  - 5. Locate boxes so that wall plates do not cross masonry joints.
  - 6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
  - 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
  - 8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
  - 9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
- K. Box Supports:
  - 1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
  - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
  - 4. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- L. Install boxes plumb and level.
- M. Flush-Mounted Boxes:



1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
  2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- N. Install boxes as required to preserve insulation integrity.
- O. Close unused box openings.
- P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- Q. Provide grounding and bonding in accordance with Section 260526.
- R. Identify boxes in accordance with Section 260553.

### **3.03 CLEANING**

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

### **3.04 PROTECTION**

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION**



**SECTION 260553  
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Exposed conduit color banding
- B. Cable/Conductor Identification
- C. Operation Instructions and Warnings
- D. Danger Signs
- E. Equipment/System Identification Signs
- F. Voltage markers.
- G. Underground warning tape.
- H. Floor marking tape.
- I. Ingalls Standard Nomenclature

**1.02 REFERENCE STANDARDS**

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011 (Reaffirmed 2017).
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
  - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  - 2. Do not install identification products until final surface finishes and painting are complete.

**1.04 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

**1.05 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70 and NFPA 70E

**1.06 FIELD CONDITIONS**

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

**PART 2 PRODUCTS****2.01 ELECTRICAL IDENTIFICATION MATERIALS**

- A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.
- B. Color-Coded Conduit Markers: Provide manufacturer's standard pre-printed, flexible or semi-rigid, permanent, plastic-sheet conduit markers. Except as otherwise indicated, provide lettering which indicates voltage of conductor(s) in conduit. Unless otherwise indicated or required by governing regulations, provide orange markers with black letters.
- C. Arc Fault Stickers: Contractor shall provide and install all arc fault stickers as required by NFPA 70E. Contractor shall provide all fault current studies necessary to provide appropriate stickers on all equipment.
- D. Cable/Conductor Identification Bands: Provide manufacturer's standard vinyl-cloth, self-adhesive cable/conductor wire markers or wrap-around type, numbered to show circuit identification.
- E. Self-adhesive Plastic Signs: Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings, of sizes suitable for application areas and adequate for visibility. Unless otherwise indicated or required by governing regulations, provide orange signs with black lettering.
- F. Danger Signs: Provide Manufacturer's standard "Danger" signs of baked enamel finish on 20-gage steel, of standard red, black, and white graphics for adequate vision (as examples: "High Voltage", "Keep Away", "Buried Cable", "Do Not Touch Switch").
- G. Engraved Plastic-Laminate Signs: Provide engraved stock melamine plastic-laminate, complying with FS L-P-387 in sizes and thicknesses indicated.
  - 1. Thickness: 1/16", for units up to 20 sq. in. or 8" length, 1/8" for larger units.
  - 2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.
- H. Manufacturers: Subject to compliance with requirements.

## 2.02 LETTERING AND GRAPHICS

- A. Coordinate names, abbreviations, and other designations used in electrical identification work with corresponding designations shown or specified for schedule. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical system and equipment.
- B. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Panelboards:
      - 1) Identify ampere rating.
      - 2) Identify voltage and phase.
      - 3) Identify Panelboard name.
      - 4) Identify power source and circuit number. Include location when not within sight of equipment.
      - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
      - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
    - b. Transformers:
      - 1) Identify kVA rating.
      - 2) Identify voltage and phase for primary and secondary.
      - 3) Identify transformer name
  - 2. Emergency System Equipment:

- a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
  - b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
3. Arc Flash Hazard Warning Labels: Comply with Section 260573.

### 2.03 VOLTAGE MARKERS

- A. Minimum Size:
1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
  2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
  3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
  4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- B. Legend:
1. Markers for Voltage Identification: Highest voltage present.
  2. Markers for System Identification:
    - a. Emergency Power System: Text "EMERGENCY".
- C. Color: Black text on orange background unless otherwise indicated.

### 2.04 UNDERGROUND WARNING TAPE

- A. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.
- B. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:
1. Tape for Buried Power Lines: Black text on red background.
  2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

### 2.05 FLOOR MARKING TAPE

- A. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlamine, 3 inches wide, with alternating black and white stripes.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. General Installation Requirements:
1. Coordination: Where identification to be applied to surfaces which require finish, install identification after completion of painting.
  2. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.
- C. Conduit Identification:
1. General: Apply color-coded identification on electrical conduit in a manner similar to piping identification. Except as otherwise indicated, use a color that matches surroundings as coded color for conduit.
- D. Cable/Conductor Identification:
1. Apply cable/conductor identification on each box/enclosure/cabinet where wires are present, match identification with marking system used in panelboards, shop drawings, contract documents, and similar previously established identification for project electrical work.
  2. All conductors shall be clearly and permanently identified, and color coded per NEC.

3. All control circuit and instrument circuit terminations shall be identified. For conductors #6 and smaller, conductor color-coding shall be color insulation. For conductor color coding of work larger than #6, use self-adhesive wrap around tape markers. Use markers for all panelboards, boxes, outlets, switches, circuit breakers and control centers.
  4. Operational Instructions and Warnings: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical and other related systems, and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instructions or warnings on switches, outlets and other control devices and covers of electrical enclosures.
- E. Equipment/System Identification:
1. Install engraved plastic-laminate sign on each major unit of electrical equipment in the building unless unit is specified with its own self-explanatory identification.
  2. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for the following categories of electrical work:
    - a. Panelboards, electrical cabinets and enclosures
    - b. Access panel/doors to electrical facilities
    - c. Major electrical substation and switchboard
    - d. Disconnect/safety switches
    - e. Telephone switching equipment
    - f. Fire Alarm Master Station

F. The following explains the nomenclature used to identify equipment on the drawings:

<b>DESIGNATION</b>	<b>DESCRIPTION</b>	<b>FUNCTION</b>
<b>XXLCXX</b>	<b>SUBSTATION</b>	<b>DISTRIBUTION VOLTAGE STEPPED DOWN FROM 13,800 VOLTS TO EQUIPMENT VOLTAGE ORIGINAL DESIGNATION PROBABLY STOOD FOR LOAD CENTER</b>
<b>XSWBX</b>	<b>SWITCHBOARD</b>	<p><b>A LARGE SINGLE PANEL, FRAME OR ASSEMBLY OF PANELS ON WHICH ARE MOUNTED SWITCHES, OVER CURRENT AND OTHER PROTECTIVE DEVICES. INGALLS SWITCHBOARDS ARE METAL ENCLOSED AND HAVE THE SWITCHES, OVER CURRENT AND TOHER PROTECTIVE DEVICES MOUNTED TO OPERATE FROM THE FRONT OF THE SWITCHBOARD. SWITCHBOARDS HAVE BUS BARS AND COULD INCLUDE INSTRUMENTS.</b></p> <p><b>SWITCHBOARDS ARE USED TO DISTRIBUTE RELATIVELY LARGE BRANCH CIRCUITS FROM THE SUBSTATIONS TO A NUMBER OF SMALLER BRANCH CIRCUITS THAT FEEDS EQUIPMENT, MOTOR CONTROL CENTERS, DISTRIBUTION PANELS, POWER PANELS OR LIGHTING PANELS. SWITCHBOARDS MAY BE USED AS A SERVICE EQUIPMENT TO FEED A BUILDING.</b></p> <p><b>FIRST NUMBER DESIGANTES SUBSTATION CIRCUIT BREAKER NUMBER, SECOND NUMBER DESIGNATES SWITCHBOARD NUMBER ON THAT CIRCUIT BREAKER BRANCH.</b></p>

		<b>EXAMPLE: ILC3-2SWB1</b>
<b>XMCCX</b>	<b>MOTOR CONTROL CENTER</b>	<p><b>AN ASSEMBLY OF ONE OR MORE ENCLOSED SECTIONS HAVING A COMMON POWER CENTER BUS AND PRINCIPALLY CONTAINING MOTOR CONTROL UNITS.</b></p> <p><b>FIRST NUMBER DESIGNATES SUBSTATION CIRCUIT BREAKER NUMBER OR SWITCHBOARD CIRCUIT BREAKER NUMBER. SECOND NUMBER DESIGNATES SWITCHBOARD ON THAT CIRCUIT BREAKER BRANCH.</b></p> <p><b>EXAMPLE ILC3-2MCC1 OR 1LC3-2SWB1-1MCC1</b></p>
<b>NDPX</b>	<b>DISTRIBUTION PANEL</b>	<p><b>PANELBOARD DISTRIBUTING ELECTRICAL SERVICE TO POWER PANELS, LIGHTING PANELS OR EQUIPMENT OTHER THAN LIGHTING APPLIANCES. DISTRIBUTION PANEL VOLTAGES ARE GENERALLY 480/277 OR 208/120. DISTRIBUTION PANELS SHOULD BE THREE PHASE FOUR WIRE AND WITH A EQUIPMENT GROUND.</b></p> <p><b>GENERALLY BRANCH CIRCUITS WILL BE THREE PHASE AND NETURAL WILL BE PROVIDED ONLY FOR FEEDING BRANCHES FROM POWER PANELS OR LIGHTING PANELS, NOT EQUIPMENT REQUIRING THE NETURAL FOR OPERATION.</b></p> <p><b>THE FIRST NUMBER DESIGNATES SUBSTATION CIRCUIT BREAKER NUMBER OR SWITCHBOARD CIRCUIT BREAKER NUMBER. THE SECOND NUMBER DESIGNATES DISTRIBUTION PANEL NUMBER ON THAT CIRCUIT BREAKER BRANCH.</b></p> <p><b>EXAMPLE: 1LC3-2DP3 OR 1LC3-2SWB1-2DP3</b></p>
<b>NDPX</b>	<b>POWER PANEL</b>	<p><b>PANELBOARD DISTRIBUTING ELECTRICAL SERVICE TO UTILITY OUTLETS, TIME CLOCKS, FIRE ALARM PANELS, TELECOMMUNICATION EQUIPMENT, ETC. IF LIGHTING EQUIPMENT AND UTILITY OUTLETS ARE BOTH FED FROM THE SAME PANELBOARD AND THE LIGHTING EQUIPMENT REPRESENTS LESS THAN TEN (10) PERCENT OF THE AVAILABLE CIRCUIT THE PANELBOARD WILL BE A POWER PANEL.</b></p> <p><b>POWER PANEL VOLTAGES GENERALLY ARE 480/277 OR 208/120. POWER PANELS SHOULD BE THREE PHASE, FOUR WIRE WITH AN EQUIPMENT GROUND, BUT IN SOME APPLICATIONS MAY BE SINGLE PHASE</b></p>

		<p><b>WITH A NEUTRAL (THREE WIRE) AND AN EQUIPMENT GROUND.</b></p> <p><b>GENERALLY BRANCH CIRCUITS WILL BE SINGLE PHASE WITH OR WITHOUT A NETURAL DEPENDING ON THE EQUIPMENT FED AND BE RATED AT 30 AMPS OR LESS.</b></p> <p><b>THE FIRST NUMBER DESIGNATES SUBSTATION CIRCUIT BREAKER NUMBER, SWITCHBOARD CIRCUIT BREAKER NUMBER, OR DISTRIBUTION PANEL CIRCUIT NUMBER, THE SECOND NUMBER DESIGNATES POWER PANEL NUMBER ON THAT CIRCUIT BREAKER BRANCH.</b></p> <p><b>EXAMPLE: 1LC3-2PP3 OR 1LC3-2SWB1-2PP3 OR 1LC3-2SWB1-2DP3-7PP1</b></p>
<b>XLPX</b>	<b>LIGHTING PANEL</b>	<p><b>PANELBOARD DISTRIBUTING ELECTRICAL SERVICE TO LIGHTING EQUIPMENT. IF LIGHTING EQUIPMENT AND UTILITY OUTLETS ARE BOTH FED FROM THE SAME PANELBOARD AND THE LIGHTING EQUIPMENT REPRESENTS MORE THAN TEN (10) PERCENT OF THE AVAILABLE BRANCH CIRCUITS THEN THE PANELBOARD WILL BE A LIGHTING PANEL.</b></p> <p><b>LIGHTING PANEL VOLTAGES ARE GENERALLY 480/277 OR 208/120. LIGHTING PANELS SHOULD BE THREE PHASE, FOUR WIRE WITH AN EQUIPMENT GROUND, BUT IN SOME APPLICAITONS MAY BE SINGLE PHASE WITH A NEUTRAL (THREE WIRE) AND AN EQUIPMENT GROUND. GENERALLY BRANCHES WILL BE SINGLE PHASE WITH OR WITHOUT A NEUTRAL DEPENDING ON EQUIPMENT FED AND BE RATED FOR 30 AMPS OR LESS.</b></p> <p><b>THE FIRST NUMBER DESIGNATES SUBSTATION CIRCUIT BREAKER NUMBER, SWITCHBOARD CIRCUIT BREAKER NUMBER, OR DISTRIBUTION PANEL CIRCUIT BREAKER NUMBER. THE SECOND NUMBER DESIGNATES LIGHTING PANEL NUMBER ON THAT CIRCUIT BREAKER.</b></p> <p><b>EXAMPLE: 1LC3-2LP3 OR 1LC3-2SWB1-2LP3 OR 1LC3-2SWB1-2DP3-7LP1</b></p>
<b>XDSX</b>	<b>DISCONNECT SWITCH</b>	<p><b>UNFUSED SWITCH WITH KNIFE BLADE SWITCH IN DEDICATED ENCLOSURE.</b></p>



		<p>THE FIRST NUMBER DESIGNATES SUBSTATION CIRCUIT BREAKER NUMBER, SWITCHBOARD CIRCUIT BREAKER NUMBER, OR DISTRIBUTION PANEL CIRCUIT BREAKER NUMBER ETC. THE SECOND NUMBER DESIGNATES DISCONNECT SWITCH NUMBER ON THAT CIRCUIT BREAKER BRANCH.</p> <p>EXAMPLE: 1LC3-2DP5-1DS1 OR 1LC3-2SWB1-2PP3-1DS1</p>
XSSX	SAFETY SWITCH	<p>FUSED SWITCH WITH KNIFE BLADE SWITCH IN DEDICATED ENCLOSURE.</p> <p>THE FIRST NUMBER DESIGNATES SUBSTATION CIRCUIT BREAKER NUMBER, SWITCHBOARD CIRCUIT BREAKER NUMBER OR DISTRIBUTION PANEL CIRCUIT NUMBER, ETC. THE SECOND NUMBER DESIGNATES SAFETY SWITCH NUMBER ON THAT CIRCUIT BREAKER BRANCH.</p> <p>EXAMPLE: 1LC3-2DP5-1SS1 OR 1LC3-2SWB1-2PP3-1SS1 OR 1LC3-2SWB1-2DP1-2PP3-1SS1</p>
XCBX	CIRCUIT BREAKER	<p>INDIVIDUAL CIRCUIT BREAKER IN DEDICATED ENCLOSURE.</p> <p>THE FIRST NUMBER DESIGNATES SUBSTATION CIRCUIT BREAKER NUMBER, SWITCHBOARD CIRCUIT BREAKER NUMBER, OR DISTRIBUTION PANEL CIRCUIT BREAKER NUMBER, ETC. THE SECOND NUMBER DESIGNATES SAFETY SWITCH NUMBER ON THAT CIRCUIT BREAKER BRANCH.</p> <p>EXAMPLE: 1LC3-2DP5-1CB1 OR 1LC3-2SWB1-2PP3-1CB1 OR 1LC3-2SWB1-2DP3-7PP1-1CB1</p>
XTX	TRANSFORMER	<p>DRY TYPE TRANSFORMER</p> <p>EXAMPLE: 1LC3-2SWB1-1DP1-1SS1-2T1</p>
XATSX	AUTOMATIC TRANSFER SWITCH	
XCTR	CONTACTOR	
XRLYX	RELAY	
XFCPX	FIRE CONTROL PANEL	
XLFX	LIGHT FIXTURE	ANY ELECTRIC DISCHARGE, INCANDESCENT, FLUORESCENT, OR LED LIGHT FIXTURE.

		<p><b>THE FIRST NUMBER DESIGNATES BRANCH CIRCUIT NUMBER OF THE LIGHTING PANEL FEEDING THE LIGHT FIXTURE. THE SECOND NUMBER DESIGNATES LIGHT FIXTURE NUMBER ON THAT BRANCH CIRCUIT.</b></p> <p><b>EXAMPLE: 1LP1-3LF11</b></p>
<b>XRX</b>	<b>RECEPTACLE</b>	<p><b>NEMA CONFIGURATION RECEPTACLES.</b></p> <p><b>RECEPTACLES VOLTAGE RANGE FROM 125, 208, 277 OR 480.</b></p> <p><b>RECEPTACLES CURRENT RATED 15 AMPS, 20 AMPS, 30 AMPS, 50 AMPS, OR 60 AMPS.</b></p> <p><b>THE FIRST NUMBER DESIGNATES BRANCH CIRCUIT NUMBER OF THE POWER PANEL FEEDING THE RECEPTACLE. THE SECOND NUMBER DESIGNATES RECEPTACLE NUMBER ON THAT BRANCH CIRCUIT.</b></p> <p><b>EXAMPLE: 1PP1-8R2</b></p>
<b>XMTRX</b>	<b>MOTOR</b>	
<b>XEUSX</b>	<b>ELECTRIC UTILITY STATION</b>	

#### 4.01 FIELD QUALITY CONTROL

- A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION**

**SECTION 260573  
POWER SYSTEM STUDIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Short-circuit study.
- B. Protective device coordination study.
- C. Arc flash and shock risk assessment.
  - 1. Includes arc flash hazard warning labels.
- D. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

**1.02 RELATED REQUIREMENTS**

- A. Section 260553 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

**1.03 REFERENCE STANDARDS**

- A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).
- B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).
- C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).
- D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.
- E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.
- F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).
- G. NEMA MG 1 - Motors and Generators; 2021.
- H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Existing Installations: Coordinate with equipment manufacturer(s) to obtain data necessary for completion of studies.
  - 2. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
  - 3. Coordinate with utility for service information.
  - 4. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Submit study reports prior to or concurrent with product submittals.
  - 2. Do not order equipment until matching study reports and product submittals have both been evaluated by Engineer/Architect.
  - 3. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

- C. Scheduling:
1. Arrange access to existing facility for data collection with Owner.
  2. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.

### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Study preparer's qualifications.
- C. Study reports, stamped or sealed and signed by study preparer.
- D. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.
  1. Include characteristic time-current trip curves for protective devices.
  2. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
  3. Include documentation of listed series ratings.
  4. Identify modifications made in accordance with studies that:
    - a. Can be made at no additional cost to Owner.
- E. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.
- F. Field quality control reports.
- G. Certification that field adjustable protective devices have been set in accordance with requirements of studies.
- H. Project Record Documents: Revise studies as required to reflect as-built conditions.
  1. Include hard copies with operation and maintenance data submittals.
  2. Include computer software files used to prepare studies with file name(s) cross-referenced to specific pieces of equipment and systems.

### 1.06 POWER SYSTEM STUDIES

- A. Scope of Studies:
  1. Perform analysis of new electrical distribution system as indicated on drawings.
  2. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of identified (selected) source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
- B. General Study Requirements:
  1. Comply with NFPA 70.
  2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.
- C. Data Collection:
  1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.
    - a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
      - 1) Obtain up-to-date information from Utility Company if necessary.
    - b. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 1 code letter designation.
    - c. Transformers: Include primary and secondary voltage ratings, kVA rating, winding configuration, percent impedance, and X/R ratio.
    - d. Protective Devices:

- 1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
  - 2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
  - e. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
  - f. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.
- D. Short-Circuit Study:
1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
  2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
    - a. Maximum utility fault currents.
    - b. Maximum motor contribution.
    - c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
  3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.
- E. Protective Device Coordination Study:
1. Comply with applicable portions of IEEE 242 and IEEE 399.
  2. Analyze alternate scenarios considering known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
  3. Analyze protective devices and associated settings for suitable margins between time-current curves to achieve full selective coordination while providing adequate protection for equipment and conductors.
- F. Arc Flash and Shock Risk Assessment:
1. Comply with NFPA 70E.
  2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
  3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
    - a. Maximum and minimum utility fault currents.
    - b. Maximum and minimum motor contribution.
    - c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
- G. Study Reports:
1. General Requirements:
    - a. Identify date of study and study preparer.
    - b. Identify study methodology and software product(s) used.
    - c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
    - d. Identify base used for per unit values.
    - e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
    - f. Include conclusions and recommendations.
  2. Short-Circuit Study:
    - a. For each scenario, identify at each bus location:
      - 1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
      - 2) Fault point X/R ratio.
      - 3) Associated equipment short circuit current ratings.

- b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
3. Protective Device Coordination Study:
  - a. For each scenario, include time-current coordination curves plotted on log-log scale graphs.
  - b. For each graph include (where applicable):
    - 1) Partial single-line diagram identifying the portion of the system illustrated.
    - 2) Protective Devices: Time-current curves with applicable tolerance bands for each protective device in series back to the source, plotted up to the maximum available fault current at the associated bus.
    - 3) Conductors: Damage curves.
    - 4) Transformers: Inrush points and damage curves.
    - 5) Generators: Full load current, overload curves, decrement curves, and short circuit withstand points.
    - 6) Motors: Full load current, starting curves, and damage curves.
    - 7) Capacitors: Full load current and damage curves.
  - c. For each protective device, identify fixed and adjustable characteristics with available ranges and recommended settings.
    - 1) Circuit Breakers: Include long time pickup and delay, short time pickup and delay, and instantaneous pickup.
    - 2) Include ground fault pickup and delay.
    - 3) Include fuse ratings.
    - 4) Protective Relays: Include current/potential transformer ratios, tap, time dial, and instantaneous pickup.
  - d. Identify cases where either full selective coordination or adequate protection is not achieved, along with recommendations.
4. Arc Flash and Shock Risk Assessment:
  - a. For each scenario, identify at each bus location:
    - 1) Calculated incident energy and associated working distance.
    - 2) Calculated arc flash boundary.
    - 3) Arcing fault current.
    - 4) Clearing time.
    - 5) Arc gap distance.
  - b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.
  - c. Include recommendations for reducing the incident energy at locations where the calculated maximum incident energy exceeds 8 calories per sq cm.

#### 1.07 QUALITY ASSURANCE

- A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in the preparation of studies of similar type and complexity using specified computer software.
  1. Study preparer may be employed by the manufacturer of the electrical distribution equipment.
  2. Study preparer may be employed by field testing agency.
- B. Field Testing Agency Qualifications: Independent testing organization specializing in testing, analysis, and maintenance of electrical systems with minimum five years experience; NETA Accredited Company.
- C. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.
  1. Acceptable Software Products:
    - a. EasyPower LLC: [www.easypower.com/#sle](http://www.easypower.com/#sle).
    - b. ETAP/Operation Technology, Inc: [www.etap.com/#sle](http://www.etap.com/#sle).
    - c. Power Analytics Corporation: [www.poweranalytics.com/#sle](http://www.poweranalytics.com/#sle).

- d. SKM Systems Analysis, Inc: [www.skm.com/#sle](http://www.skm.com/#sle).
- e. CYME.

## **PART 2 PRODUCTS**

### **2.01 ARC FLASH HAZARD WARNING LABELS**

- A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
  - 1. Materials: Comply with Section 260553.
  - 2. Minimum Size: 4 by 6 inches.
  - 3. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
    - a. Include orange header that reads "WARNING" where calculated incident energy is less than 40 calories per square cm.
    - b. Include red header that reads "DANGER" where calculated incident energy is 40 calories per square cm or greater.
    - c. Include the text "Arc Flash and Shock Hazard; Appropriate PPE Required" or approved equivalent.
    - d. Include the following information:
      - 1) Arc flash boundary.
      - 2) Available incident energy and corresponding working distance.
      - 3) Nominal system voltage.
      - 4) Date calculations were performed.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install arc flash warning labels in accordance with Section 260553.

### **3.02 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Adjust equipment and protective devices for compliance with studies and recommended settings.
- D. Notify Engineer/Architect of any conflicts with or deviations from studies. Obtain direction before proceeding.
- E. Submit detailed reports indicating inspection and testing results, and final adjusted settings.

### **3.03 CLOSEOUT ACTIVITIES**

- A. See Section 017800 - Closeout Submittals, for closeout submittals.

**END OF SECTION**





**SECTION 262100  
LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Electrical service requirements.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.
- B. Coordination:
  - 1. Verify the following with Utility Company representative:
    - a. Utility Company requirements, including division of responsibility.
    - b. Exact location and details of utility point of connection.
    - c. Utility easement requirements.
    - d. Utility Company charges associated with providing service.
  - 2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
  - 3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 4. Coordinate the work with other installers to provide communication lines required for Utility Company meters.
  - 5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.
- D. Utility Company charges associated with providing permanent service to be paid by Owner.
- E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.
- F. Scheduling:
  - 1. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.
  - 2. Arrange for inspections necessary to obtain Utility Company approval of installation.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

**1.06 QUALITY ASSURANCE**

- A. Comply with the following:
  - 1. IEEE C2 (National Electrical Safety Code).
  - 2. NFPA 70 (National Electrical Code).
  - 3. The requirements of the Utility Company.

**PART 2 PRODUCTS****2.01 ELECTRICAL SERVICE REQUIREMENTS**

- A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.
- B. Electrical Service Characteristics:
  - 1. Service Type: Underground.
  - 2. Service Voltage: 480Y/277 V, 3 phase, 60 Hz.
- C. Utility Company: Mississippi Power Company.
- D. Division of Responsibility: As indicated on drawings.
- E. Products Furnished by Contractor: Comply with Utility Company requirements.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions and Utility Company requirements.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances and required maintenance access.
- D. Provide required support and attachment components in accordance with Section 260529.
- E. Provide grounding and bonding for service entrance equipment in accordance with Section 260526.
- F. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 260553.

**END OF SECTION**

**SECTION 262200  
LOW-VOLTAGE TRANSFORMERS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. General purpose transformers.

**1.02 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260533.13 - Conduit for Electrical Systems: Flexible conduit connections.
- E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. 10 CFR 431, Subpart K - Energy Efficiency Program for Certain Commercial and Industrial Equipment - Distribution Transformers; Current Edition.
- B. IEEE C57.94 - IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers; 2015.
- C. IEEE C57.96 - IEEE Standard Guide for Loading Dry-Type Distribution and Power Transformers; 2013.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NECA 409 - Standard for Installing and Maintaining Dry-Type Transformers; 2015.
- F. NEMA ST 20 - Dry Type Transformers for General Applications; 2021.
- G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- H. UL 506 - Standard for Specialty Transformers; Current Edition, Including All Revisions.
- I. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.
  - 1. Vibration Isolators: Include attachment method and rated load and deflection.
- B. Shop Drawings: Provide dimensioned plan and elevation views of transformers and adjacent equipment with all required clearances indicated.
- C. Source Quality Control Test Reports: Include reports for tests designated in NEMA ST 20 as design and routine tests.
- D. Field Quality Control Test Reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Maintenance Data: Include recommended maintenance procedures and intervals.
- G. Project Record Documents: Record actual locations of transformers.
- H. Furnish all documents to Ingalls Facilities Department.

**1.05 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70.

- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to transformer internal components, enclosure, and finish.

#### 1.07 FIELD CONDITIONS

- A. Ambient Temperature: Do not exceed 86 degrees F average or 104 degrees F maximum measured during any 24 hour period during and after installation of transformers.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

- A. Schneider Electric; Square D Products: [www.schneider-electric.us/#sle](http://www.schneider-electric.us/#sle).
- B. Source Limitations: Furnish transformers produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

#### 2.02 TRANSFORMERS - GENERAL REQUIREMENTS

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed, classified, and labeled as suitable for the purpose intended.
- B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
  1. Altitude: Less than 3,300 feet.
  2. Ambient Temperature:
    - a. Greater than 10 kVA: Not exceeding 104 degrees F.
    - b. Less than 10 kVA: Not exceeding 77 degrees F.
  3. Ambient Temperature: Not exceeding 86 degrees F average or 104 degrees F maximum measured during any 24 hour period.
- C. Core: High grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Keep magnetic flux densities substantially below saturation point, even at 10 percent primary overvoltage. Tightly clamp core laminations to prevent plate movement and maintain consistent pressure throughout core length.
- D. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- E. Basic Impulse Level: 10 kV.
- F. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- G. Isolate core and coil from enclosure using vibration-absorbing mounts.
- H. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.

#### 2.03 GENERAL PURPOSE TRANSFORMERS

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.

- B. Primary Voltage: 480 volts delta, 3 phase.
- C. Secondary Voltage: 208Y/120 volts, 3 phase.
- D. Insulation System and Allowable Average Winding Temperature Rise:
  - 1. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- E. Coil Conductors: Continuous copper windings with terminations brazed or welded.
- F. Winding Taps:
  - 1. 3 kVA through 15 kVA: Two 5 percent full capacity primary taps below rated voltage.
  - 2. 15 kVA through 300 kVA: Six 2-1/2 percent taps 2 above and 4 below rated high voltage.
  - 3. 500 kVA and Larger: Two 2.5 percent full capacity primary taps above and two 2.5 percent full capacity primary taps below rated voltage.
- G. Energy Efficiency: Comply with 10 CFR 431, Subpart K.
- H. Mounting Provisions:
  - 1. Less than 15 kVA: Suitable for wall mounting.
  - 2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
  - 3. Larger than 75 kVA: Suitable for floor mounting.
- I. Transformer Enclosure: Comply with NEMA ST 20.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Outdoor locations: Type 3R.
  - 2. Construction: Steel.
    - a. 15 kVA and Larger: Ventilated.
  - 3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
  - 4. Provide lifting eyes or brackets.
- J. Accessories:
  - 1. Mounting Brackets: Provide manufacturer's standard brackets.
  - 2. Weathershield Kits: Provide for ventilated transformers installed outdoors to provide a listed NEMA 250, type 3R assembly.
  - 3. Lug Kits: Sized as required for termination of conductors as indicated on the drawings.

#### 2.04 SOURCE QUALITY CONTROL

- A. Factory test transformers according to NEMA ST 20.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that suitable support frames and anchors are installed where required and that mounting surfaces are ready to receive transformers.
- C. Perform pre-installation tests and inspections on transformers per manufacturer's instructions and as specified in NECA 409. Correct deficiencies prior to installation.
- D. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 260533.13, 2 feet minimum length, 3 feet maximum length for connections to transformer case. Make conduit connections to side panel of enclosure.

- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.
- F. Install transformers plumb and level.
- G. Transformer Support:
  - 1. Provide required support and attachment in accordance with Section 260529, where not furnished by transformer manufacturer.
  - 2. Use integral transformer flanges, accessory brackets furnished by manufacturer, or field-fabricated supports to support wall-mounted transformers.
  - 3. Unless otherwise indicated, mount floor-mounted transformers on properly sized 3 inch high concrete pad constructed in accordance with Section 033000.
  - 4. Use trapeze hangers assembled from threaded rods and metal channel (strut) to support suspended transformers. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- J. Where not factory-installed, install lugs sized as required for termination of conductors as indicated.
- K. Where furnished as a separate accessory, install transformer weathershield per manufacturer's instructions.
- L. Identify transformers in accordance with Section 260553.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS Sections 7.2.1.1 and 7.2.1.2. Tests and inspections listed as optional are not required.
  - 1. 167 kVA single phase, 500 kVA three phase and smaller:
    - a. Perform turns ratio tests at all tap positions.

### 3.04 ADJUSTING

- A. Measure primary and secondary voltages and make appropriate tap adjustments.
- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

### 3.05 CLEANING

- A. Clean dirt and debris from transformer components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 262413  
SWITCHBOARDS**

**PART 1 GENERAL**

**1.01 RELATED REQUIREMENTS**

**1.02 REFERENCE STANDARDS**

- A. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.
- D. UL 891 - Switchboards; Current Edition, Including All Revisions.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Switchboards:
  - 1. Schneider Electric: [www.se.com/#sle](http://www.se.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.

**2.02 SWITCHBOARDS**

- A. Provide switchboards consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Dead-front switchboard assemblies complying with NEMA PB 2, and listed and labeled as complying with UL 891; ratings, configurations and features as indicated on the drawings.
- D. Service Conditions:
  - 1. Provide switchboards and associated components suitable for operation under the following service conditions without derating:
    - a. Altitude: Less than 6,600 feet.
    - b. Ambient Temperature:
  - 2. Provide switchboards and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- E. Short Circuit Current Rating:
- F. Main Devices: Configure for top or bottom incoming feed as indicated or as required for the installation. Provide separate pull section and/or top-mounted pullbox as indicated or as required to facilitate installation of incoming feed.
- G. Bussing: Sized in accordance with UL 891 temperature rise requirements.
  - 1. Through bus (horizontal cross bus) to be fully rated through full length of switchboard (non-tapered). Tapered bus is not permitted.
  - 2. Provide solidly bonded equipment ground bus through full length of switchboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
  - 3. Phase and Neutral Bus Material: Aluminum.
  - 4. Ground Bus Material: Aluminum.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
  - 1. Line Conductor Terminations:
    - a. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
    - b. Main and Neutral Lug Type: Mechanical.
  - 2. Load Conductor Terminations:
    - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
    - b. Lug Type:

- I. Enclosures:
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Outdoor Locations: Type 3R.
  - 2. Finish: Manufacturer's standard unless otherwise indicated.
  - 3. Outdoor Enclosures:
    - a. Color: Manufacturer's standard.
    - b. Access Doors: Lockable, with all locks keyed alike.
- J. Future Provisions:
  - 1. Prepare designated spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Owner Metering:
  - 1. Provide microprocessor-based digital electrical metering system including all instrument transformers, wiring, and connections necessary for measurements specified.
  - 2. Measured Parameters:
    - a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
    - b. Current (Amps): For each phase and neutral.
    - c. Frequency (Hz).
    - d. Real power (kW): For each phase, 3-phase total.
    - e. Reactive power (kVAR): For each phase, 3-phase total.
    - f. Apparent power (kVA): For each phase, 3-phase total.
    - g. Power factor.
  - 3. Meter Accuracy: Plus/minus 1.0 percent.
- L. Instrument Transformers:
  - 1. Comply with IEEE C57.13.
  - 2. Select suitable ratio, burden, and accuracy as required for connected devices.
  - 3. Current Transformers: Connect secondaries to shorting terminal blocks.
  - 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

### **2.03 OVERCURRENT PROTECTIVE DEVICES**

**END OF SECTION**



**SECTION 262413.11  
SWITCHBOARDS - SCHNEIDER ELECTRIC SQUARE D FLEXSET / QED-2**

**PART 1 GENERAL****1.01 ABBREVIATIONS AND ACRONYMS**

- A. ERMS: Energy reduction maintenance setting.

**1.02 DEFINITIONS**

- A. Switchboards may also be identified as SWBD.

**1.03 REFERENCE STANDARDS**

- A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).
- B. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- C. ISO 9001 - Quality Management Systems — Requirements; 2015.
- D. ISO 14001 - Environmental Management Systems — Requirements with Guidance for Use; 2015.
- E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- F. NECA 400 - Standard for Installing and Maintaining Switchboards; 2007.
- G. NEMA PB 2 - Deadfront Distribution Switchboards; 2011.
- H. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 1000 Volts or Less; 2023.
- I. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- K. NFPA 70B - Recommended Practice for Electrical Equipment Maintenance; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- M. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- N. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- O. UL 891 - Switchboards; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Operation and Maintenance Data:
1. Provide detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.
  2. Digital Record Keeping:
    - a. Provide maintenance logbook application/website available on PC/mobile device to assist in compliance with NFPA 70B.
    - b. Include access to manufacturer's standard documentation, equipment serial number, as-built drawings, assembly and testing results, device settings, and spare parts list.
    - c. Provide password-protected access to Owner.
    - d. Provide access via scannable QR code on front face of equipment.
- C. Executed warranty.

## D. Project Record Documents:

1. Configured settings/parameters for adjustable components updated to as-installed and commissioned state, noted if different from factory default.

**1.05 QUALITY ASSURANCE**

## A. Comply with the following:

1. NFPA 70.
2. Requirements of local authorities having jurisdiction.
3. Applicable local codes.

## B. Manufacturer Qualifications:

1. Firm engaged in manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for minimum of 20 years.
2. Certified in accordance with ISO 9001 with applicable quality assurance system regularly reviewed and audited by third-party registrar. Develop and control manufacturing, inspection, and testing procedures under guidelines of quality assurance system.
3. Service, repair, and technical support services available 24 hours per day, 7 days per week from manufacturer or their representative.
4. Certified in accordance with ISO 14001, with product environmental profiles (PEPs) for specified products.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Prior to delivery to project site, verify suitable storage space is available to store materials in well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres.
- B. Protect materials during delivery and storage and maintain within manufacturer's written storage requirements. At minimum, store indoors in clean, dry space with uniform temperature to prevent condensation and protect electronics from potential damage from electrical and magnetic energy.
- C. Deliver materials to project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified in Contract Documents.
- D. Inspect products and report concealed damage or violation of delivery, storage, and handling requirements to Engineer.

**1.07 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

**1.08 WARRANTY**

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for 12 months from date of substantial completion. Complete forms in Owner's name and register with manufacturer.

**PART 2 PRODUCTS****2.01 MANUFACTURERS**

- A. Schneider Electric; Square D FlexSeT or QED-2 per project requirements; [www.se.com/#sle](http://www.se.com/#sle).
- B. Source Limitations: Furnish products produced by same manufacturer as other electrical distribution equipment for project and obtained from single supplier.

**2.02 LOW-VOLTAGE SWITCHBOARDS**

- A. Basis of Design: Schneider Electric; Square D FlexSeT or QED-2 per project requirements; [www.se.com/#sle](http://www.se.com/#sle).
- B. Switchboard Ratings/Configurations: As indicated on drawings.

- C. Switchboard Assemblies:
  - 1. Comply with NEMA PB 2; list and label as complying with UL 891.
  - 2. Provide front and rear alignment of adjacent sections.
- D. Short Circuit Current Rating: Where not specified, provide switchgear with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- E. Cable Terminations for Incoming Conductors:
  - 1. Provide lugs in quantity and size required for conductors indicated on drawings.
  - 2. Lug Type: Aluminum mechanical lugs, suitable for terminating aluminum or copper conductors unless otherwise indicated; rate for 167 degrees F.
- F. Bussing:
  - 1. Bus Density Rating: Standard, in accordance with UL 891 temperature rise requirements.
  - 2. Bus Material: Tin-plated, high-strength, electrical-grade aluminum alloy unless otherwise indicated.
  - 3. Plating: Apply to bus surfaces except cut edges. Plating on contact surfaces only is not permitted.
  - 4. Phase and Neutral Horizontal Bus: Ampacity equal to or greater than switchboard system rating. Tapered bus is not permitted.
  - 5. Group-Mounted Feeder Vertical Bus Stack:
    - a. Provide capability to mount feeder breakers with different frame sizes/poles across from one another on bus stack.
    - b. Design to remove nonconducting surface films during circuit breaker installation by wiping action of circuit breaker jaws.
    - c. Design in conjunction with circuit breaker jaws to create blow-on forces under fault conditions.
    - d. Bolted connections for group-mounted feeder breakers are not permitted.
  - 6. Ground Bus:
    - a. Size in accordance with NFPA 70 and UL 891.
    - b. Bus Material: Hard-drawn copper of 98 percent conductivity.
    - c. Equip with pressure connectors for feeder and branch circuit equipment grounding conductors.
- G. Enclosures:
  - 1. Construction: Steel.
  - 2. UL 50E Rating, Unless Otherwise Indicated:
    - a. Outdoor Locations: Type 3R.
  - 3. Front Covers: Removable with single tool.
  - 4. Doors: Hinged with removable hinge pins.
  - 5. Finish: Manufacturer's standard paint color over rust-inhibiting primer on treated metal surface.
  - 6. Enclosure Heaters:
    - a. Provide electric strip heaters in each switchboard vertical section installed outdoors and in unconditioned indoor spaces.
    - b. Size to maintain enclosure temperature above expected dew point.
    - c. Heater Control: Thermostat.
    - d. Heater Power Source: Provide connection internally from switchboard or from external 120 V circuit.
- H. Future Provisions:
  - 1. Future Switchboard Sections: Equip horizontal bus with splicing hardware for additional switchboard sections.
  - 2. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit breaker compartment.
- I. Markings and Labeling:

1. Provide identification and warning labels/nameplates exterior to equipment resistant to weather, UV, and intended installation environment.
  2. Provide warning labels/nameplates complying with ANSI Z535.4 at access locations to advise personnel of possible hazards in accordance with listing, NFPA 70, NFPA 70E, and other applicable standards.
  3. Provide scannable QR code on front face of equipment for access to maintenance logbook application/website available on PC/mobile device.
- J. Maintenance Mode Switches:
1. Description: Local, lockable switch with blue status indicator light that permits selection of maintenance mode with alternate electronic trip unit settings for reduced fault clearing time in accordance with NFPA 70.
  2. Provide for circuit breakers 1,200 A and larger and where indicated on drawings, unless providing other means of reducing clearing time in accordance with NFPA 70.
  3. Switch Type: Provide energy reduction maintenance settings (ERMS) switches or maintenance mode settings (MMS) switches as indicated.
    - a. ERMS Switches: Clearing time of less than 50 milliseconds when activated.
    - b. MMS Switches: Clearing time of less than 80 milliseconds when activated.
- K. Power Metering:
1. Factory installed, integrated within switchboard.
  2. Applications:
    - a. Low-Voltage Mains: Power and energy meter.
  3. Power and Energy Meters:
    - a. Capable of monitoring for network management, energy cost allocation, asset management, operational efficiency, and compliance reporting.
    - b. Products:
      - 1) Schneider Electric PowerLogic PM5563 Meter.

### 2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Circuit Breakers:
1. Interrupting Capacity: As required to provide short circuit current rating indicated.
  2. Molded Case Circuit Breakers (MCCBs):
    - a. Comply with FS W-C-375; listed and labeled as complying with UL 489.
    - b. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
    - c. Circuit Breaker Type:
    - d. Products:
      - 1) Schneider Electric; PowerPacT series.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install equipment in accordance with manufacturer's written instructions.
- B. Install switchboards in accordance with NECA 1, NECA 400, and NEMA PB 2.1.
- C. Unless otherwise indicated, install and anchor switchboards on raised concrete pad 4 inches high; see Section 033000.
- D. Set field-adjustable circuit breaker tripping function settings as determined by coordination study.

### 3.02 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Manufacturer Services: Provide services of manufacturer's field representative to perform functional testing, commissioning, and first parameter adjusting.
  1. Include necessary material, equipment, labor, and technical supervision.
  2. Replace damaged or malfunctioning equipment and report discrepancies or installation issues.

3. Identify switchboards with label indicating inspection/testing agency and date of service.
- C. Operational Readiness Testing:
1. Inspect and test equipment and associated systems for conformance to Contract Documents, including equipment manufacturer's recommendations, and readiness for operation.
    - a. Visually inspect for physical damage and proper installation.
    - b. Perform tests in accordance with manufacturer's instructions.
    - c. Perform tests to verify compliance with Contract Documents.
    - d. Perform tests to verify equipment is ready for operation.
    - e. Touch-up paint chips and scratches with manufacturer-supplied paint.
    - f. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
    - g. Measure, using high potential testing, insulation resistance of each bus structure phase-to-phase and phase-to-ground for one minute each, at minimum test voltage of 1,000 VDC.
      - 1) Comply with manufacturer's documented specific testing procedures.
      - 2) Minimum Insulation Resistance: 1 megohm.
    - h. Physically test key interlock systems for proper functionality prior to energizing.
    - i. Test continuity of each circuit.
    - j. Perform each electrical test and visual/mechanical inspection listed in NETA ATS as applicable. Certify compliance with test parameters.
      - 1) Switchboards: See Section 7.1.
      - 2) Fusible Switches: See Section 7.5.
      - 3) Circuit Breakers: See Section 7.6.
      - 4) Relays: See Section 7.9.
      - 5) Instrument Transformers: See Section 7.10.
      - 6) Meters: See Section 7.11.
      - 7) Ground Fault Protection Systems: See Section 7.14.
  - D. Correct deficiencies and replace damaged or defective switchboards or associated components.

### 3.03 PROTECTION

- A. Protect installed switchboards from subsequent construction operations.

**END OF SECTION**



**SECTION 262416  
PANELBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Overcurrent protective devices for panelboards.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.
- E. Section 262200 - Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.

**1.03 REFERENCE STANDARDS**

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- E. NEMA PB 1 - Panelboards; 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000 Volts or Less; 2023.
- G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 67 - Panelboards; Current Edition, Including All Revisions.
- J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
  - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
  - 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  - 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
  - 2. Include wiring diagrams showing all factory and field connections.
  - 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
  - 4. Include documentation of listed series ratings upon request.
  - 5. Coordinate Fault Current ratings with Study.
- C. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
- D. Field Quality Control Test Reports.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Panelboard Keys: Two of each different key.

#### 1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

#### 1.08 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
  - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

### PART 2 PRODUCTS

#### 2.01 MANUFACTURERS

0297.23.001 / East Pier Deep  
Water Wharf for USM-NOAA

262416 - 2

Panelboards



- A. Eaton Corporation; \_\_\_\_\_: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- B. Schneider Electric; Square D Products; \_\_\_\_\_: [www.schneider-electric.us/#sle](http://www.schneider-electric.us/#sle).
- C. Siemens Industry, Inc; \_\_\_\_\_: [www.usa.siemens.com/#sle](http://www.usa.siemens.com/#sle).
- D. Or Approved Equal.
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

## 2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
- C. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
  - 2. Listed series ratings are not acceptable.
- D. Main Breaker: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Mounted Main Circuit Breakers are not allowed.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
    - a. Outdoor Locations: Type 4X, stainless steel.
  - 2. Fronts:
    - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
  - 3. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K. Each Panelboard shall be complete with main tin plated copper bus run up the center and neutral bars where required and all proper sequence phase connections. Polarized panelboards will not be accepted. Capacities of copper busses and connections shall be based on a maximum density of 1000 amps per sq. in. spacing of busses shall not be less than code requirements.
- L. Busses shall be arranged as indicated on the drawings. Busses shall be provided with suitable phase identification.
- M. Directory holder with metal frame shall be furnished and installed upon the door of each cabinet, with complete typewritten circuit schedule inserted.
- N. The inside and outside of panelboard boxes, doors and trims shall be furnished with at least two coats of manufacturer's standard finish paint over a baked-on prime coat.
- O. Provide ground bus. Provide additional isolated ground bus where specified.

- P. Lighting and Appliance Panels: Panels shall be for use on voltage phase, number of wire system, 60 cycle, solid neutral service, with number and size of bolt-on type circuit breaker branches as shown on the drawings. Circuit breaker's interrupting capacity shall be 10,000 RMS symmetrical amperes unless otherwise noted.
- Q. Power and Distribution Panels:
1. Power and distribution panels shall be the dead-front type, with hinged doors, with fusible circuit breakers in the branches as indicated on the drawings. The panels shall be suitable for 208/120 volt, 3-Phase, 4-wire or 480/277 volt, 3-phase, 4-wire supply as shown.

### 2.03 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
1. Main and Neutral Lug Material: Copper suitable for terminating copper conductors only.
  2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
1. Phase and Neutral Bus Material: Copper.
  2. Ground Bus Material: Copper.
- D. Circuit Breakers:
1. Provide bolt-on type.
  2. Provide thermal magnetic circuit breakers unless otherwise indicated.
  3. Provide electronic trip circuit breakers where indicated.
- E. Enclosures:
1. Provide surface-mounted enclosures unless otherwise indicated.
  2. Nema 1 Indoors, Nema 12/3R outdoors.

### 2.04 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
1. Main and Neutral Lug Material: Copper suitable for terminating copper conductors only.
  2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  2. Phase and Neutral Bus Material: Copper.
  3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
1. Provide surface-mounted enclosures as indicated.
- F. Provide column-width panelboards with accessory column-width cable trough and pullbox where indicated.

### 2.05 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  2. Interrupting Capacity:

- a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
  - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
  - 2) 14,000 rms symmetrical amperes at 480 VAC.
- b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
  - a. Provide mechanical lugs unless otherwise indicated.
  - b. Provide compression lugs where indicated.
  - c. Lug Material: Copper suitable for terminating copper conductors only.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 110 amperes and larger.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide the following circuit breaker types where indicated:
  - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
  - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
  - c. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
  - d. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.
7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
8. Provide listed high intensity discharge lighting rated circuit breakers with HID marking for all branch circuits serving HID lighting.
9. Do not use tandem circuit breakers.
10. Do not use handle ties in lieu of multi-pole circuit breakers.
11. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
12. Provide the following features and accessories where indicated or where required to complete installation:
  - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
  - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.

## 2.06 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

- D. Secure all panelboards to building structure/walls to comply with tightening torques specified to UL stds. 486A and B.
- E. Panelboard loads shall be balanced between phases.
- F. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- G. Install panelboards plumb.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- I. Mount floor-mounted power distribution panelboards on properly sized 3 inch high concrete pad constructed in accordance with Section 033000.
- J. Provide grounding and bonding in accordance with Section 260526.
  - 1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
- K. Install all field-installed branch devices, components, and accessories.
- L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- M. Set field-adjustable circuit breaker tripping function settings per load study.
- N. Provide filler plates to cover unused spaces in panelboards.
- O. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads for the following:
  - 1. Fire detection and alarm circuits.
  - 2. Communications equipment circuits.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Test GFCI circuit breakers to verify proper operation.
- D. Test shunt trips to verify proper operation.
- E. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.
- F. Correct deficiencies and replace damaged or defective panelboards or associated components.

### 3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.
- C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

### 3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION**

**SECTION 262914  
SHORE POWER MOUND**

**PART 1 – GENERAL REQUIREMENTS**

**1.01 SCOPE:**

- A. Contractor shall furnish, deliver, install and test the Shore Power Mounds as specified herein and in accordance with the drawings.

**1.02 QUALITY ASSURANCE:**

- A. Shore power mounds shall comply with NFPA 70 and all applicable Military Specifications.  
B. Shore power mounds manufacturer shall provide a complete factory assembled and tested shore power mound.

**1.03 REFERENCES:**

- A. The Publications listed below form a part of this Specification to the extent referenced.
1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
  2. ASTM A 167 (1994; Rev. A Stainless and Heat-Resistant Chromium-Nickel Steel plate, sheet, and strip
  3. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
  4. NFPA 70 (2008) National Electrical Code

**1.04 RELATED REQUIREMENTS:**

- A. Section 16000, "Product Requirements," applies to this Section with additional and modifications specified herein.

**1.05 SUBMITTALS:**

- A. Contractor shall submit manufacturer's drawings and catalog data of shore power mounds for Engineer's approval prior to start of fabrication. Drawings and data shall include, as a minimum:
1. Manufacturer qualifications, including fab shop location and list of (3) U.S. government facilities where manufacturer's shore power mounds are currently in use.
  2. Manufacturer's dimensioned general arrangement drawings and wiring diagrams.
  3. Manufacturer's data for all components.
  4. Material callouts (type, thickness, plating, coating) for all fabricated items.
  5. Manufacturer's 3rd party certification of IEEC 57.12.29 coating process.
  6. Mounting provisions and installation instructions.
  7. Conduit entry locations.

**1.06 WARRANTY:**

- A. Shore power mounds shall be covered by manufacturer's warranty for a minimum period of (2) years from substantial completion.

**SECTION 2 - PRODUCTS**

**2.01 GENERAL:**

- A. All equipment shall be new.  
B. Shore power mound manufacturer must have produced and sold shore power mounds as a standard product for a minimum of (3) years.  
C. Contractor shall be responsible for the equipment until it has been installed and is finally inspected, tested and accepted in accordance with the requirements of this Specification.  
D. Shore power mounds shall be as manufactured by ESL Power Systems, Inc. or equal as approved by the Engineer.

**2.02 SHORE POWER MOUNDS:**

- A. Enclosure shall be NEMA type 4X, constructed of continuous seam-welded, 10 gauge 316 Stainless Steel conforming to ASTM 167. Enclosure shall be designed for severe service in an outdoor coastal marine environment. Enclosure shall be designed to accommodate Power

Modules as shown on the drawings. There shall be a gasketed, hinged front cover for access to the interior of the shore power mound, cover shall be large enough for field personnel to install and maintain field wiring.

- B. After enclosure fabrication there shall be an Engineer-approved coating system applied to all exterior and interior stainless steel surfaces. Coating systems shall be not be applied until Engineer has confirmed that the power mound manufacturer has proven the coating system has been independently tested to and is in compliance with IEEC 57.12.29. Finish color of coating system shall be Light Gray.
- C. Power Modules shall be Safety-interlocked ESL Power Module (Cat. No. R500-480-400-35XEMILC) or approved equal. Power modules shall be modular in design and made to easily slide out of the enclosure for field wiring, maintenance and replacement. Power modules shall be rated for 480volts, 400amperes, 60 hertz, three-pole continuous duty operation. Power Modules shall be compatible with Mil-C 24368/1 Male Plug. Power module shall include an integral molded case circuit breaker with 400 amp trip rated for 35KAIC at 480VAC. Power module shall include a Stop pushbutton to trip the power module circuit breaker, and shall also include a manual disconnect mechanism to independently operate the power module circuit breaker. The safety-interlock mechanism shall prevent the power module circuit breaker from being closed (energized) if a male plug is not properly and fully inserted into the receptacle. The safety-interlock mechanism shall also force the power module circuit breaker to the open position (de-energized) if the male plug is withdrawn from the power module.
- D. Enclosure shall be provided with the following
1. (4) Shore Power Modules. ( Mil-C 24368/2B)
  2. 480/277 volts, and 200amperes, 60 hertz industrial Russellstoll ds2304FRABO receptacle.
  3. 208/120 volt, 30amperes, 60 hertz receptacles
  4. (3) 120 volt, 20amperes, 60 hertz receptacles.
  5. Watertight phase sequence and rotation detector panel for each cable.
  6. Compartment for telecommunications with separate access.
  7. (1) 120 volt, 20 amperes, 60 hertz quad receptacle inside telecommunications compartment.
  8. Line insulation monitor for power module feeds (2x)
  9. (2) Russellstoll SKWR12XG receptacle.
  10. (2) Delphi 12 channel harsh environment fiber optic connectors

### SECTION 3 - EXECUTION

#### 3.01 INSTALLATION:

- A. Prior to installation of shore power mound, Contractor shall examine the areas and conditions under which the shore power mound is to be installed and notify the Engineer in writing if unsatisfactory conditions exist.
- B. Shore power mound shall be installed as shown on the drawings and per the manufacturer's written instructions.
- C. Conduit entry into the shore power mound shall be by Contractor; Contractor shall furnish and install listed watertight conduit hubs, as manufactured by MYERS or T&B, for each conduit entry on the shore power mound. The hub size shall match the conduit size for conductors and ground as shown on the drawings. Hubs shall be properly installed and tightened to maintain Type 4X integrity of the shore power mound.
- D. Contractor shall terminate conductors and ground per the manufacturer's instructions. All field wiring terminations in the shore power mound shall be torqued as required per the instructions on the shore power mound.

- E. Once all wiring and field testing is complete, Contractor shall completely seal the interior of all conduits at the hubs where the conduits enter the shore power mound. Conduit sealant shall be Handi-Foam polyurethane expanding sealant; Duct Seal is not acceptable.

**3.02 FIELD TESTING:**

- A. Prior to energizing shore power mound, the Contractor shall perform the following checks and tests as a minimum:
1. Verify mounting and connections are complete and secure.
  2. Verify internal components and wiring are secure.
  3. Perform continuity checks of all circuits.
  4. Perform 1,000 VDC megger test on phase and ground cables.
  5. Confirm operation of shore power mound by inserting a male plug into the power module's receptacle, actuating the operation mechanism to turn the power module "ON" and then verifying that the male plug is properly energized.

**END OF SECTION**





**SECTION 263213  
ENGINE GENERATORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Packaged engine generator system and associated components and accessories:
  1. Engine and engine accessory equipment.
  2. Generator set enclosure.

**1.02 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260529 - Hangers and Supports for Electrical Systems.
- D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 263600 - Transfer Switches.

**1.03 REFERENCE STANDARDS**

- A. ASTM D975 - Standard Specification for Diesel Fuel; 2023a.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA/EGSA 404 - Standard for Installing Generator Sets; 2014.
- D. NEMA MG 1 - Motors and Generators; 2021.
- E. NFPA 30 - Flammable and Combustible Liquids Code; 2024.
- F. NFPA 37 - Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines; 2021.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 99 - Health Care Facilities Code; 2024.
- I. NFPA 110 - Standard for Emergency and Standby Power Systems; 2022.
- J. UL 142 - Steel Aboveground Tanks for Flammable and Combustible Liquids; Current Edition, Including All Revisions.
- K. UL 1236 - Battery Chargers for Charging Engine-Starter Batteries; Current Edition, Including All Revisions.
- L. UL 2200 - Stationary Engine Generator Assemblies; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  1. Coordinate compatibility of generator sets to be installed with work provided under other sections or by others.
  2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for engine generator system.
  3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  4. Coordinate the work to provide electrical circuits suitable for the power requirements of the actual auxiliary equipment and accessories to be installed.
  5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition

requirements, and installed features. Include alternator starting capabilities, engine fuel consumption rates, and cooling, combustion air, and exhaust requirements.

- C. Fuel Storage Tank Calculations: Indicate maximum running time for generator set configuration provided.
- D. Manufacturer's factory emissions certification.
- E. Manufacturer's certification that products meet or exceed specified requirements.
- F. Provide NFPA 110 required documentation from manufacturer where requested by authorities having jurisdiction, including but not limited to:
  - 1. Certified prototype tests.
  - 2. Torsional vibration compatibility certification.
  - 3. NFPA 110 compliance certification.
  - 4. Certified rated load test at rated power factor.
- G. Manufacturer's detailed field testing procedures.

#### **1.06 QUALITY ASSURANCE**

- A. Comply with the following:
  - 1. NFPA 70 (National Electrical Code).
  - 2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for Level 1 system.
  - 3. NFPA 37 (Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines).
  - 4. NFPA 30 (Flammable and Combustible Liquids Code).
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### **1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store generator sets in accordance with manufacturer's instructions and NECA/EGSA 404.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's instructions to avoid damage to generator set components, enclosure, and finish.

#### **1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

#### **1.09 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.
- B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship from date of substantial completion.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Products other than basis of design are subject to compliance with specified requirements and prior approval of Engineer. By using products other than basis of design, Contractor accepts responsibility for costs associated with any necessary modifications to related work, including any design fees.

#### **2.02 PACKAGED ENGINE GENERATOR SYSTEM**

- A. Provide new engine generator system consisting of all required equipment, sensors, conduit, boxes, wiring, piping, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. System Description:
  - 1. Application: Emergency/standby.
  - 2. Configuration: Single packaged engine generator set operated independently (not in parallel).
- D. Packaged Engine Generator Set:
  - 1. Type: Diesel (compression ignition).
  - 2. Power Rating: As indicated on drawings, standby.
  - 3. Voltage: As indicated on drawings.
- E. Generator Set General Requirements:
  - 1. Prototype tested in accordance with NFPA 110 for Level 1 systems.
  - 2. Factory-assembled, with components mounted on suitable base.
  - 3. List and label engine generator assembly as complying with UL 2200.
  - 4. Power Factor: Unless otherwise indicated, specified power ratings are at 0.8 power factor for three phase voltages and 1.0 power factor for single phase voltages.
  - 5. Provide suitable guards to protect personnel from accidental contact with rotating parts, hot piping, and other potential sources of injury.
- F. Service Conditions: Provide engine generator system and associated components suitable for operation under the service conditions at the installed location.
- G. Starting and Load Acceptance Requirements:
  - 1. Cranking Method: Cycle cranking complying with NFPA 110 (15 second crank period, followed by 15 second rest period, with cranking limiter time-out after 3 cycles), unless otherwise required.
  - 2. Cranking Limiter Time-Out: If generator set fails to start after specified cranking period, indicate overcrank alarm condition and lock-out generator set from further cranking until manually reset.
  - 3. Start Time: Capable of starting and achieving conditions necessary for load acceptance within 10 seconds (NFPA 110, Type 10).
  - 4. Maximum Load Step: Supports 100 percent of rated load in one step.
- H. Exhaust Emissions Requirements:
  - 1. Comply with federal (EPA), state, and local regulations applicable at the time of commissioning; include factory emissions certification with submittals.
  - 2. Do not make modifications affecting generator set factory emissions certification without approval of manufacturer and Engineer. Where such modifications are made, provide field emissions testing as necessary for certification.

### 2.03 ENGINE AND ENGINE ACCESSORY EQUIPMENT

- A. Provide engine with adequate horsepower to achieve specified power output at rated speed, accounting for alternator efficiency and parasitic loads.
- B. Engine Fuel System - Diesel (Compression Ignition):
  - 1. Fuel Source: Diesel, ASTM D975 No. 2-D or approved cold weather diesel blends.
  - 2. Fuel Storage: Sub-base fuel tank.
  - 3. Engine Fuel Supply: Provide engine-driven, positive displacement fuel pump with replaceable fuel filter(s), water separator, check valve to secure prime, manual fuel priming pump, and relief-bypass valve. Provide fuel cooler where recommended by manufacturer.
  - 4. Engine Fuel Connections: Provide suitable, approved flexible fuel lines for coupling engine to fuel source.
  - 5. Sub-Base Fuel Tank:
    - a. Provide sub-base mounted, double-wall fuel tank with secondary containment; listed and labeled as complying with UL 142.
    - b. Tank Capacity: Size for minimum of 24 hours of continuous engine generator operation at 100 percent rated load, but not larger than permissible by applicable

- codes.
- c. Features:
- 1) Direct reading fuel level gauge.
  - 2) Normal atmospheric vent.
  - 3) Emergency pressure relief vent.
  - 4) Fuel fill opening with lockable cap.
  - 5) Dedicated electrical conduit stub-up area.
- C. Engine Starting System:
1. System Type: Electric, with DC solenoid-activated starting motor(s).
  2. Battery(s):
    - a. Battery Type: Lead-acid.
    - b. Battery Capacity: Size according to manufacturer's recommendations for achieving starting and load acceptance requirements under worst case ambient temperature; capable of providing cranking through two complete periods of cranking limiter time-outs without recharging.
    - c. Provide battery rack, cables, and connectors suitable for the supplied battery(s); size battery cables according to manufacturer's recommendations for cable length to be installed.
  3. Battery-Charging Alternator: Engine-driven, with integral solid-state voltage regulation.
  4. Battery Charger:
    - a. Provide dual rate battery charger with automatic float and equalize charging modes and minimum rating of 10 amps; suitable for maintaining the supplied battery(s) at full charge without manual intervention.
    - b. Capable of returning supplied battery(s) from fully discharged to fully charged condition within 24 hours, as required by NFPA 110 for Level 1 applications while carrying normal loads.
    - c. Recognized as complying with UL 1236.
    - d. Furnished with integral overcurrent protection; current limited to protect charger during engine cranking; reverse polarity protection.
    - e. Provide integral DC output ammeter and voltmeter with five percent accuracy.
    - f. Provide alarm output contacts as necessary for alarm indications.
  5. Battery Heater: Provide thermostatically controlled battery heater to improve starting under cold ambient conditions.
- D. Engine Speed Control System (Governor):
1. Single Engine Generator Sets (Not Operated in Parallel): Provide electronic isochronous governor for controlling engine speed/alternator frequency.
  2. Frequency Regulation, Electronic Isochronous Governors: No change in frequency from no load to full load; plus/minus 0.25 percent at steady state.
- E. Engine Lubrication System:
1. System Type: Full pressure, with engine-driven, positive displacement lubrication oil pump, replaceable full-flow oil filter(s), and dip-stick for oil level indication. Provide oil cooler where recommended by manufacturer.
  2. Oil Heater: Provide thermostatically controlled oil heater to improve starting under cold ambient conditions.
- F. Engine Cooling System:
1. System Type: Closed-loop, liquid-cooled, with unit-mounted radiator/fan and engine-driven coolant pump; suitable for providing adequate cooling while operating at full load under worst case ambient temperature.
  2. Fan Guard: Provide suitable guard to protect personnel from accidental contact with fan.
- G. Engine Air Intake and Exhaust System:
1. Air Intake Filtration: Provide engine-mounted, replaceable, dry element filter.
  2. Engine Exhaust Connection: Provide suitable, approved flexible connector for coupling engine to exhaust system.

**2.04 ALTERNATOR (GENERATOR)**

- A. Alternator: 4-pole, 1800 rpm (60 Hz output) revolving field, synchronous generator complying with NEMA MG 1; connected to engine with flexible coupling; voltage output configuration as indicated, with reconnectable leads for 3 phase alternators.
- B. Exciter:
  - 1. Exciter Type: Brushless; provide permanent magnet generator (PMG) excitation system; self-excited (shunt) systems are not permitted.
  - 2. PMG Excitation Short-Circuit Current Support: Capable of sustaining 300 percent of rated output current for 10 seconds.
  - 3. Voltage Regulation (with PMG excitation): Plus/minus 0.5 percent for any constant load from no load to full load.
- C. Temperature Rise: Comply with UL 2200.
- D. Insulation System: NEMA MG 1, Class H; suitable for alternator temperature rise.
- E. Enclosure: NEMA MG 1, drip-proof.
- F. Total Harmonic Distortion: Not greater than five percent.

**2.05 GENERATOR SET CONTROL SYSTEM**

- A. Provide microprocessor-based control system for automatic control, monitoring, and protection of generator set. Include sensors, wiring, and connections necessary for functions/indications specified.
- B. Control Panel:
  - 1. Control Panel Mounting: Unit-mounted unless otherwise indicated; vibration isolated.
  - 2. Generator Set Control Functions:
    - a. Automatic Mode: Initiates generator set start/shutdown upon receiving corresponding signal from remote device (e.g. automatic transfer switch).
    - b. Manual Mode: Initiates generator set start/shutdown upon direction from operator.
    - c. Reset Mode: Clears all faults, allowing generator set restart after a shutdown.
    - d. Emergency Stop: Immediately shuts down generator set (without time delay) and prevents automatic restarting until manually reset.
    - e. Cycle Cranking: Programmable crank time, rest time, and number of cycles.
    - f. Time Delay: Programmable for shutdown (engine cooldown) and start (engine warmup).
    - g. Voltage Adjustment: Adjustable through range of plus/minus 5 percent.
  - 3. Generator Set Status Indications:
    - a. Voltage (Volts AC): Line-to-line, line-to-neutral for each phase.
    - b. Current (Amps): For each phase.
    - c. Frequency (Hz).
    - d. Real power (W/kW).
    - e. Reactive power (VAR/kVAR).
    - f. Apparent power (VA/kVA).
    - g. Power factor.
    - h. Duty Level: Actual load as percentage of rated power.
    - i. Engine speed (RPM).
    - j. Battery voltage (Volts DC).
    - k. Engine oil pressure.
    - l. Engine coolant temperature.
    - m. Engine run time.
    - n. Generator powering load (position signal from transfer switch).
  - 4. Generator Set Protection and Warning/Shutdown Indications:
    - a. Comply with NFPA 110; configurable for NFPA 110 Level 1 or Level 2, or NFPA 99 systems including but not limited to the following protections/indications:
      - 1) Overcrank (shutdown).

- 2) Low coolant temperature (warning).
- 3) High coolant temperature (warning).
- 4) High coolant temperature (shutdown).
- 5) Low oil pressure (shutdown).
- 6) Overspeed (shutdown).
- 7) Low fuel level (warning).
- 8) Low coolant level (warning/shutdown).
- 9) Generator control not in automatic mode (warning).
- 10) High battery voltage (warning).
- 11) Low cranking voltage (warning).
- 12) Low battery voltage (warning).
- 13) Battery charger failure (warning).
- b. In addition to NFPA 110 requirements, provide the following protections/indications:
  - 1) High AC voltage (shutdown).
  - 2) Low AC voltage (shutdown).
  - 3) High frequency (shutdown).
  - 4) Low frequency (shutdown).
  - 5) Overcurrent (shutdown).
- c. Provide contacts for local and remote common alarm.
- d. Provide lamp test function that illuminates all indicator lamps.
5. Other Control Panel Features:
  - a. Event log.

## 2.06 GENERATOR SET ENCLOSURE

- A. Enclosure Type: Sound attenuating, weather protective.
- B. Enclosure Material: Steel or aluminum.
- C. Hardware Material: Stainless steel.
- D. Color: Manufacturer's standard.
- E. Access Doors: Lockable, with all locks keyed alike.
- F. Openings: Designed to prevent bird/rodent entry.
- G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance service.
- H. Sound Attenuating Enclosures: Line enclosure with non-hygroscopic, self-extinguishing sound-attenuating material.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of generator sets and auxiliary equipment are consistent with the indicated requirements.
- C. Verify that rough-ins for field connections are in the proper locations.
- D. Verify that mounting surfaces are ready to receive equipment.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install generator sets and associated accessories in accordance with NECA/EGSA 404.
- D. Arrange equipment to provide minimum clearances and required maintenance access.

- E. Unless otherwise indicated, mount generator set on properly sized, minimum 6 inch high concrete pad constructed in accordance with Section 033000.
- F. Provide required support and attachment in accordance with Section 260529.
- G. Use manufacturer's recommended oil and coolant, suitable for the worst case ambient temperatures.
- H. Provide grounding and bonding in accordance with Section 260526.
- I. Identify system wiring and components in accordance with Section 260553.

### 3.03 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Provide services of a manufacturer's authorized representative to prepare and start systems and perform inspection and testing. Include manufacturer's detailed testing procedures and field reports with submittals.
- C. Notify Owner and Engineer/Architect at least two weeks prior to scheduled inspections and tests.
- D. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- E. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank and fuel.
- F. Preliminary inspection and testing to include, at a minimum:
  - 1. Inspect each system component for damage and defects.
  - 2. Verify tightness of mechanical and electrical connections are according to manufacturer's recommended torque settings.
  - 3. Check for proper oil and coolant levels.
- G. Prepare and start system in accordance with manufacturer's instructions.
- H. Perform acceptance test in accordance with NFPA 110.
- I. Provide field emissions testing where necessary for certification.
- J. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

### 3.04 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### 3.05 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of system to Owner, and correct deficiencies or make adjustments as directed.

### 3.06 PROTECTION

- A. Protect installed engine generator system from subsequent construction operations.

**END OF SECTION**





## SECTION 263600 TRANSFER SWITCHES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
  1. Automatic transfer switches.

#### 1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 263213 - Engine Generators: For interface with transfer switches.

#### 1.03 REFERENCE STANDARDS

- A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- B. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2020.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 110 - Standard for Emergency and Standby Power Systems; 2022.
- E. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  1. Coordinate compatibility of transfer switches to be installed with work provided under other sections or by others.
  2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
  3. Coordinate arrangement of equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
  5. Notify Engineer/Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

#### 1.06 QUALITY ASSURANCE

- A. Comply with the following:
  1. NFPA 70 (National Electrical Code).
- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

**1.08 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

**1.09 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

**PART 2 PRODUCTS****2.01 MANUFACTURERS****2.02 TRANSFER SWITCHES**

- A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.
- D. Comply with NEMA ICS 10 Part 1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).
- E. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.
- F. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.
- G. Switching Methods:
  - 1. Obtain control power for transfer operation from line side of source to which the load is to be transferred.
- H. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.
- I. Enclosures:
  - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
  - 2. Finish: Manufacturer's standard unless otherwise indicated.
- J. Short Circuit Current Rating:

**END OF SECTION**

**SECTION 263613  
MANUAL TRANSFER SWITCHES - SCHNEIDER ELECTRIC ASCO 300**

**PART 1 GENERAL****1.01 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 263213 - Engine Generators.

**1.02 ABBREVIATIONS AND ACRONYMS**

- A. MTS: Manual transfer switch.

**1.03 DEFINITIONS**

- A. Manual transfer switches may also be identified as MTS, MUS, MGQ, MPQ, MGDQ, MTDQ, MTQ, or MUQ.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Review material selections and installation procedures with manufacturer's representative and affected installers.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Executed warranty.
- C. Project Record Documents:
  - 1. Configured settings/parameters for adjustable components updated to as-installed and commissioned state, noted if different from factory default.

**1.06 QUALITY ASSURANCE**

- A. Comply with the following:
  - 1. NFPA 70.
  - 2. Requirements of authorities having jurisdiction.
  - 3. Applicable local codes.
- B. Manufacturer Qualifications:
  - 1. Firm engaged in manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for minimum of 10 years.
  - 2. Certified in accordance with ISO 9001 with applicable quality assurance system regularly reviewed and audited by third-party registrar. Develop and control manufacturing, inspection, and testing procedures under guidelines of quality assurance system.
  - 3. Service, repair, and technical support services available 24 hours per day, 7 days per week, 365 days per year from manufacturer or their representative.
  - 4. Maintain records of each switch, by serial number, for minimum of 20 years.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Prior to delivery to project site, verify suitable storage space is available to store materials in well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres.
- B. Protect materials during delivery and storage and maintain within manufacturer's written storage requirements. At minimum, store indoors in clean, dry space with uniform temperature to prevent condensation and protect electronics from potential damage from electrical and magnetic energy.
- C. Deliver materials to project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name,

and equipment tag number or service name as identified in Contract Documents.

- D. Inspect products and report damage or violation of delivery, storage, and handling requirements to Engineer.

### 1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide manufacturer warranty for defects in material and workmanship for 24 months from date of substantial completion. Complete forms in Owner's name and register with manufacturer.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Schneider Electric; ASCO 300 Series; [www.ascopower.com/#sle](http://www.ascopower.com/#sle).
- B. Source Limitations: Provide manual transfer switches and accessories produced by same manufacturer as other electrical distribution equipment for project and obtained from single supplier.

### 2.02 LOW-VOLTAGE MANUAL TRANSFER SWITCHES

- A. Basis of Design: Schneider Electric; ASCO 300 Series; [www.ascopower.com/#sle](http://www.ascopower.com/#sle).
- B. Description: Transfer switches consisting of three-position, center-off mechanically held power transfer switch unit for manual operation.
- C. Do not use double-throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.
- D. List and label as complying with UL 1008 and, for systems with integrated circuit breakers, UL 891.
- E. Transfer Switch Construction:
1. Manually operated, mechanically held.
  2. Positively locked, unaffected by momentary outages, such that contact pressure is maintained at constant value and contact temperature rise is minimized for maximum reliability and operating life.
  3. Mechanically interlocked to allow only one of three possible positions:
    - a. Connected to SOURCE 1 (preferred).
    - b. Connected to SOURCE 2 (alternate).
    - c. CENTER OFF (disconnected position).
  4. Provide capability to pad-lock switch when connected to SOURCE 1 or SOURCE 2.
  5. Main Contacts: Silver composition.
  6. Switches Rated 600 A and Greater: Provide segmented, blow-on construction for high withstand and close-on capability, protected by separate arcing contacts.
  7. Designed to allow inspection of contacts from front without disassembly of operating linkages and disconnection of power conductors.
  8. Devices utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.
  9. Manual Operating Handle: Capable of external operation without opening enclosure door.
  10. Provide same contact-to-contact speed as automatic operation.
- F. Withstand and Closing Ratings: Rate to close on and withstand available RMS symmetrical short circuit current at terminals with overcurrent protection indicated.
- G. Neutral Configurations:
1. Solid Neutral: Provide neutral conductor plate with fully rated AL-CU pressure connectors.
  2. Switched Neutral: Provide fully-rated switched (break-before-make) neutral transfer contacts.
- H. Endurance Ratings:
1. Switches Rated 260 A and Less: 6,000 cycles.

2. Switches Rated 400 A: 4,000 cycles.
  3. Switches Rated 600 A to 3,000 A: 3,000 cycles.
- I. Enclosures:
1. Construction: Steel.
  2. Mounting: Free-standing, floor-mounted.
  3. Comply with UL 50.
  4. Finish: ANSI 61 grey powder coat.
  5. UL 50E Rating, Unless Otherwise Indicated:
    - a. Outdoor Locations: Type 4x.
  6. Provide nameplate with drawing numbers and serviceable part numbers to facilitate maintenance.
- J. Status Indication: Provide yellow mechanical position indicators visible to operator for SOURCE 1 (preferred), SOURCE 2 (alternate), and CENTER OFF.

### **2.03 SOURCE QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Factory test for proper operation of individual components and compliance with sequence of operation.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install equipment in accordance with manufacturer's written instructions.
- B. Install transfer switches in accordance with NECA 1.
- C. Unless otherwise indicated, install and anchor floor-mounted transfer switches on raised concrete pad 4 inches high; see Section 033000.

### **3.02 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Manufacturer Services: Provide services of manufacturer's field representative to perform functional testing, commissioning, and first parameter adjusting.
  1. Include necessary material, equipment, labor, and technical supervision.
  2. Replace damaged or malfunctioning equipment and report discrepancies or installation issues.
  3. Identify transfer switches with label indicating inspection/testing agency and date of service.
- C. Correct deficiencies and replace damaged or defective transfer switches or associated components.

### **3.03 PROTECTION**

- A. Protect installed transfer switches from subsequent construction operations.

**END OF SECTION**



**SECTION 263623.13****AUTOMATIC/NONAUTOMATIC TRANSFER SWITCHES - SCHNEIDER ELECTRIC ASCO 7000****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Low-voltage automatic/nonautomatic transfer switches.

**1.02 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.
- B. Section 263213 - Engine Generators.

**1.03 ABBREVIATIONS AND ACRONYMS**

- A. ATS: Automatic transfer switch.
- B. NTS: Nonautomatic transfer switch.

**1.04 DEFINITIONS**

- A. Automatic transfer switches may also be identified as ATS, ADTS, ACTS, ATB, ADTB, ACTB, AUS, ADUS, ACUS, AUB, ADUB, or ACUB.
- B. Nonautomatic transfer switches may also be identified as NTS, NDTs, NCTS, NTB, NDTB, NCTB, NUS, NDUS, NCUS, NUB, NDUB, or NCUB.

**1.05 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. IEC 60947-6-1 - Low-Voltage Switchgear and Controlgear – Part 6-1: Multiple Function Equipment – Transfer Switching Equipment; 2021.
- D. IEC 61000-4-2 - Electromagnetic Compatibility (EMC) - Part 4-2: Testing and Measurement Techniques - Electrostatic Discharge Immunity Test; 2008.
- E. IEC 61000-4-3 - Electromagnetic Compatibility (EMC) – Part 4-3: Testing and Measurement Techniques – Radiated, Radio-Frequency, Electromagnetic Field Immunity Test; 2020.
- F. IEC 61000-4-4 - Electromagnetic Compatibility (EMC) - Part 4-4: Testing and Measurement Techniques – Electrical Fast Transient/Burst Immunity Test; 2012.
- G. IEC 61000-4-5 - Electromagnetic Compatibility (EMC) - Part 4-5: Testing and Measurement Techniques - Surge Immunity Test; 2014, with Amendment (2017).
- H. IEC 61000-4-6 - Electromagnetic Compatibility (EMC) – Part 4-6: Testing and Measurement Techniques – Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields; 2013 (Corrigendum 2015).
- I. IEC 61000-6-2 - Electromagnetic Compatibility (EMC) – Part 6-2: Generic Standards – Immunity Standard for Industrial Environments; 2016.
- J. IEC CISPR 11 - Industrial, Scientific and Medical Equipment – Radio-Frequency Disturbance Characteristics – Limits and Methods of Measurement; 2015, with Amendments (2019).
- K. ISO 9001 - Quality Management Systems — Requirements; 2015.
- L. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- M. NEMA ICS 10 Part 1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2020.
- N. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

- P. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- Q. UL 891 - Switchboards; Current Edition, Including All Revisions.
- R. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.
- S. UL 1558 - Switchgear; Current Edition, Including All Revisions.

#### 1.06 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Provide sufficient information to determine compliance with Contract Documents. Identify submittal data with specific equipment tags and/or service descriptions to which they pertain. Identify specific model numbers, options, and features of equipment proposed.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
- D. Manufacturer's qualification statement.
- E. Executed warranty.
- F. Project Record Documents:
  - 1. Configured settings/parameters for adjustable components updated to as-installed and commissioned state, noted if different from factory default.

#### 1.07 QUALITY ASSURANCE

- A. Comply with the following:
  - 1. NFPA 70.
  - 2. Requirements of authorities having jurisdiction.
  - 3. Applicable local codes.
- B. Manufacturer Qualifications:
  - 1. Firm engaged in manufacture of specified products of types and sizes required, and whose products have been in satisfactory use in similar service for minimum of 10 years.
  - 2. Certified in accordance with ISO 9001 with applicable quality assurance system regularly reviewed and audited by third-party registrar. Develop and control manufacturing, inspection, and testing procedures under guidelines of quality assurance system.
  - 3. Service, repair, and technical support services available 24 hours per day, 7 days per week, 365 days per year from manufacturer or their representative.
  - 4. Maintain records of each switch, by serial number, for minimum of 20 years.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Prior to delivery to project site, verify suitable storage space is available to store materials in well-ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres.
- B. Protect materials during delivery and storage and maintain within manufacturer's written storage requirements. At minimum, store indoors in clean, dry space with uniform temperature to prevent condensation and protect electronics from potential damage from electrical and magnetic energy.
- C. Deliver materials to project site in supplier's or manufacturer's original wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and equipment tag number or service name as identified in Contract Documents.
- D. Inspect products and report damage or violation of delivery, storage, and handling requirements to Engineer.

#### 1.09 WARRANTY

- A. See Section 017800 - Closeout Submittals for additional warranty requirements.

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- B. **Manufacturer Warranty:** Provide manufacturer warranty for defects in material and workmanship for 24 months from substantial completion. Complete forms in Owner's name and register with manufacturer.
1. Except for circuit breakers in service entrance transfer switches and soft load transition switches, provide replacements for parts determined to be defective at no charge for 5 years from substantial completion.
  2. Provide replacements for main contacts determined to be defective at no charge for 10 years from substantial completion.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Schneider Electric; ASCO 7000 Series; [www.ascopower.com/#sle](http://www.ascopower.com/#sle).
- B. or Approved Equal.
- C. **Source Limitations:** Provide automatic transfer switches, controllers, and accessories produced by same manufacturer as other electrical distribution equipment for project and obtained from single supplier.

### **2.02 LOW-VOLTAGE AUTOMATIC/NONAUTOMATIC TRANSFER SWITCHES**

- A. **Basis of Design:** Schneider Electric; ASCO 7000 Series; [www.ascopower.com/#sle](http://www.ascopower.com/#sle).
- B. **Description:** Transfer switches consisting of inherently double-throw power transfer switch with solenoid-operated mechanism and microprocessor controller; automatic or nonautomatic operation as indicated.
  1. **Automatic Transfer Switches:** Transfer switches with automatically initiated transfer between sources.
  2. **Nonautomatic Transfer Switches:** Transfer switches with manually initiated transfer between sources.
- C. Comply with NEMA ICS 10 Part 1 and IEC 60947-6-1; list and label as complying with UL 1008 and, where applicable, UL 891 or UL 1558.
- D. **Service Entrance Rated Transfer Switches:**
  1. **Overcurrent Protective Device:**
    - a. **Switches Rated Less Than 1,000 A:** For normal connection, provide molded case circuit breaker with current rating and number of poles as indicated.
    - b. **Switches Rated 1,000 to 4,000 A:** For normal connection, provide stationary-mounted circuit breaker with current ratings and number of poles as indicated. Provide instantaneous and ground fault trip settings; trip circuit breaker open when ground fault setting is exceeded.
  2. **Configuration:**
    - a. **Switches Rated 400 A or Less:** Provide single enclosure including utility source service disconnect circuit breaker and emergency source feeder disconnect circuit, power transfer switch, and grounding/bonding provisions.
    - b. **Switches Rated 600 A and Above:** Provide multi-section switchboard with the following sections:
      - 1) Service equipment section containing utility source service disconnect circuit breaker and grounding/bonding provisions.
      - 2) Non-service section containing power transfer switch and controls.
  3. **Grounding/Bonding Provisions:**
    - a. Provide ground bus for connection of grounding conductor to grounding electrode.
    - b. Provide disconnect link for neutral-to-ground bonding jumper to connect normal neutral connection to ground bus.
  4. **Service Entrance Bypass-Isolation Switches:**
    - a. **Switches Rated Greater Than 1,000 A:** Make connection between normal disconnecting device and transfer bypass-isolation switch with appropriately sized, silver-plated copper bus.

- E. Transfer Switch Construction:
1. Electrically operated, mechanically held.
  2. Provide one type of main operator for available sizes for ease of maintenance and commonality of parts.
  3. Positively locked, unaffected by momentary outages, such that contact pressure is maintained at constant value and contact temperature rise is minimized for maximum reliability and operating life.
  4. Main Contacts: Silver composition.
  5. Designed to allow inspection of contacts from front without disassembly of operating linkages and disconnection of power conductors.
  6. Stationary and Moveable Contacts: Removable and replaceable without removing power conductors and/or bus bars.
  7. Switches Rated 800 A and Greater: Provide segmented, blow-on construction for high withstand and close-on capability, protected by separate arcing contacts.
  8. Devices utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.
- F. Transition Modes:
1. Open Transition:
    - a. Transfer load between power sources using 2-position, break-before-make switch.
    - b. Maximum Transfer Time to Alternate Source: 100 milliseconds.
    - c. Electrical Operator: Momentarily energized, single-solenoid mechanism.
    - d. Mechanically interlocked to allow only two possible positions, normal or emergency.
    - e. Main operators which include overcurrent disconnect devices, linear motors, or gears are not acceptable.
  2. Delayed Transition:
    - a. Transfer load between power sources using 2-position, break-before-make switch with user-defined interruption period in both directions.
    - b. Delay: Adjustable from 0 to 6 minutes with 1-second resolution.
    - c. Electrical Operator: Dual solenoid mechanism, momentarily energized.
    - d. Provide both electrical and mechanical interlocks to prevent both sets of main contacts from being closed at same time.
    - e. Main operators which include overcurrent disconnect devices, linear motors, or gears are not acceptable.
  3. Closed Transition:
    - a. Transfer load between power sources without interruption by momentarily connecting both sources of power only when both sources are present and acceptable.
    - b. Source Requirements for Transfer:
      - 1) Voltage Differential: Maximum of 5 percent.
      - 2) Frequency Differential: Maximum of 0.2 Hz.
      - 3) Phase Angle Differential: Maximum of 5 degrees.
    - c. Maximum Interconnection Time: 100 milliseconds.
      - 1) If both normal and emergency main contacts remain closed in excess of 100 milliseconds, after preset time delay attempt to return transfer switch to "safe" state by removing paralleled condition using the following procedure:
        - (a) Open last set of contacts that closed to remove overlap condition.
        - (b) Activate red "TS Locked Out" indicator light.
        - (c) Lock out controller from further automatic operation until reset with "TS Locked Out" pushbutton.
      - 2) If main contacts still remain paralleled after procedure above, use separate independent extended parallel alarm timer to operate output relay with two form C contacts to alarm extended overlap condition and shunt trip either normal or emergency source circuit breaker.

- d. Operate as open transition, break-before-make switch when power source serving load fails or becomes unacceptable.
  - e. Accomplish transfer with no power interruption, without altering or actively controlling standby generator.
  - f. Electrical Operator: Dual solenoid mechanism, momentarily energized.
  - g. Main operators which include overcurrent disconnect devices, linear motors, or gears are not acceptable.
- G. Withstand and Closing Ratings:
- 1. Rate to close on and withstand available RMS symmetrical short circuit current at terminals with overcurrent protection indicated.
  - 2. Label with UL 1008, 0.025- or 0.050-second, time-based ratings, or appropriate short-time rating(s) as applicable. Transfer switches which have only series or specific-breaker ratings are not acceptable.
  - 3. Include 0.3-second, 18-cycle, short-time rating as standard for switch sizes 600 through 4,000 A for selective coordination purposes.
- H. Neutral Configurations:
- 1. Solid Neutral: Provide neutral conductor plate with fully rated AL-CU pressure connectors.
  - 2. Switched Neutral: Provide fully-rated switched (break-before-make) neutral transfer contacts.
  - 3. Overlapping Neutral:
    - a. Provide fully rated overlapping neutral transfer contacts.
    - b. Connect neutrals of normal and emergency power sources together only during transfer and retransfer operation; maintain connection until power source contacts close on source to which transfer is being made.
    - c. Maximum Neutral Overlapping Time: 100 milliseconds.
- I. Enclosures:
- 1. Comply with UL 50.
  - 2. UL 50E Rating, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 1 or Type 12.
    - b. Outdoor Locations: Type 3R or Type 4.
- J. Pilot Devices:
- 1. Provide 0.63 inch, industrial-grade, door-mounted switches and pilot lights to facilitate viewing and replacement.
  - 2. Provide separate removable plate for door controls, supplied loose for open type units.
  - 3. Provide three-position momentary switch for test/automatic/reset modes.
    - a. Test Position: Simulates normal source failure.
    - b. Reset Position: Bypass time delays on either transfer to emergency or retransfer to normal.
  - 4. Provide 0.63 inch, industrial-grade, type 12 LED indicating lights, consisting of one green LED to indicate when transfer switch is connected to normal source and one red LED to indicate when transfer switch is connected to emergency source.
  - 5. Provide 0.63 inch, industrial-grade, type 12 LED indicating lights, energized by controller outputs to indicate true source availability of normal/emergency sources as determined by voltage sensing trip/reset settings for each source.
- K. Controller:
- 1. Construction:
    - a. Provide single, built-in microprocessor for controller's sensing and logic for maximum reliability and minimum maintenance.
    - b. Provide capability for serial communication through separate module.
    - c. Provide single controller with 12 selectable nominal voltages for maximum application flexibility and minimal spare part requirements.
    - d. Connect controller to transfer switch with interconnecting wiring harness, including keyed disconnect plug to enable controller disconnection from transfer switch for

- routine maintenance.
- e. Provide multi-layer printed circuit boards for sensing and control logic.
  - f. Provide industrial-grade, plug-in interfacing relays with dust covers.
  - g. Provide enclosure with protective cover mounted separately from transfer switch unit for safety and ease of maintenance. Include built-in pocket for storage of operator's manuals.
  - h. Wire customer connections to common terminal block to simplify field-wiring connections.
2. Voltage Sensing: True RMS, accurate to within plus/minus 1 percent of nominal voltage.
  3. Frequency Sensing: Accurate to within plus/minus 0.2 percent.
  4. Service Conditions:
    - a. Ambient Operating Temperature: Between minus 4 degrees F and 140 degrees F.
    - b. Ambient Storage Temperature: Between minus 67 degrees F and 185 degrees F.
  5. Electromagnetic Compatibility (EMC):
    - a. IEC CISPR 11, Group 1, Class A.
    - b. IEC 61000-4-2.
    - c. IEC 61000-4-3.
    - d. IEC 61000-4-4.
    - e. IEC 61000-4-5.
    - f. IEC 61000-4-6.
    - g. IEC 61000-6-2.
  6. Controller Display/Keypad:
    - a. Provide integral four-line, 20-character LCD display and keypad for viewing available data and setting operational parameters.
    - b. Make operational parameters available for viewing and limited control through serial communications input port.
    - c. Make the following operational parameters adjustable only via controller DIP switches:
      - 1) Nominal line voltage and frequency.
      - 2) Single or three phase sensing.
      - 3) Operating parameter protection.
      - 4) Transfer operating mode configuration (open, closed, or delayed transition).
    - d. Controller Instructions and Settings: Accessible, readable, and accomplished without use of codes, calculations, or instruction manuals.
  7. Provide the following integral features, capable of being activated through keypad programming:
    - a. Commit to Transfer: Selectable to determine whether load should be transferred to emergency generator if normal source restores before generator is ready to accept load.
    - b. Engine Exerciser:
      - 1) Enables user to program up to seven different exercise routines.
      - 2) Programmable Routine Parameters:
        - (a) Enable/disable routine.
        - (b) Enable/disable transfer of load during routine.
        - (c) Start Time: By time of day, day of week, and week of month (first, second, third, fourth, alternate, or every week).
        - (d) Duration of run.
      - 3) At end of specified duration, transfer load back to normal source and run generator for specified cool down period.
    - c. Provide terminals for remote contact which close to signal transfer to emergency source. If emergency source fails while connected to emergency source, but normal source is acceptable, override transfer command and return to normal source.
    - d. System Status: Provide system status screen for controller LCD display, accessible from menu by pressing "ESC" key maximum of two times. Display clear description of

- active operating sequence and switch position, such as 'Normal Failed; Load on Normal; TD Normal to Emergency; 2 min 15 s'.
- e. Self-Diagnostics: Provide diagnostics screen for detecting system errors. Provide information on status input signals to controller, which may prevent load transfer commands from being completed.
  - f. Data Logging: Log data, storing previous 99 events in nonvolatile memory, retained in event of total power loss; include the following:
    - 1) Event Logging:
      - (a) Data, time, and reason for transfer from normal to emergency.
      - (b) Data, time, and reason for transfer from emergency to normal.
      - (c) Data, time, and reason for engine start.
      - (d) Data and time engine stopped.
      - (e) Data and time emergency source available.
      - (f) Data and time emergency source not available.
    - 2) Statistical Data:
      - (a) Total number of transfers.
      - (b) Total number of transfers due to source failure.
      - (c) Total number of days controller has been energized.
      - (d) Total number of hours both normal and emergency sources have been available.
- L. Voltage, Frequency, and Phase Rotation Sensing:
1. Voltage and Frequency Sensing: Continuously monitored on normal and emergency sources with the following minimum pickup and dropout/trip capabilities:
    - a. Undervoltage:
      - 1) Sources: Normal and emergency, 3 phase.
      - 2) Dropout/Trip: 70 to 98 percent.
      - 3) Pickup/Reset: 85 to 100 percent.
    - b. Overvoltage:
      - 1) Sources: Normal and emergency, 3 phase.
      - 2) Dropout/Trip: 102 to 115 percent.
      - 3) Pickup/Reset: 2 percent below trip.
    - c. Under Frequency:
      - 1) Sources: Normal and emergency.
      - 2) Dropout/Trip: 85 to 98 percent.
      - 3) Pickup/Reset: 90 to 100 percent.
    - d. Over Frequency:
      - 1) Sources: Normal and emergency.
      - 2) Dropout/Trip: 102 to 110 percent.
      - 3) Pickup/Reset: 2 percent below trip.
    - e. Voltage Unbalance:
      - 1) Sources: Normal and emergency.
      - 2) Dropout/Trip: 5 to 20 percent.
      - 3) Pickup/Reset: 1 percent below dropout.
  2. Repetitive Accuracy of Settings: Within plus/minus 0.5 percent over operating temperature range of minus 4 degrees F to 140 degrees F.
  3. Voltage and Frequency Settings: Field adjustable in 1-percent increments locally via display/keypad or remotely via serial communications port access.
  4. When activated by keypad or through serial port, capable of sensing phase rotation of both normal and emergency sources and rejecting source if phase rotation does not match rotation reference selected in settings (ABC or CBA).
  5. Source Status Screens: For normal and emergency sources, display digital readout of voltage on each phase, frequency, and phase rotation.
  6. Include selectable algorithm to:

- a. Prevent repeated transfer cycling to source which experiences primary-side, single-phase failures on grounded-wye-to-grounded-wye transformer then regenerates voltage when unloaded.
  - b. Inhibit retransfer to normal/utility source upon detection of single-phasing condition until dedicated timer expires, alternate source fails, or normal source fails and is restored during time delay period; time delays adjustable via display/keypad.
- M. Time Delays:
- 1. Provide adjustable time delay of 0 to 6 seconds for override of momentary normal source outages and delay of transfer and engine starting signals. Provide capability to extend time delay to 60 minutes by providing external 24 VDC power supply.
  - 2. Provide time delay on transfer to emergency, adjustable from 0 to 60 minutes, for controlled timing of load transfer to emergency source.
  - 3. Delayed Transition:
    - a. Provide adjustable time delay of 0 to 6 seconds to override momentary emergency source outage to delay retransfer signals during initial loading of engine generator set.
    - b. Provide adjustable time delay of 0 to 5 minutes for load disconnect position for delayed transition operation.
    - c. Time Delays: Adjustable via display/keypad; value displayed on LCD or remote device to represent remaining time until next event occurs.
  - 4. Closed Transition:
    - a. Provide adjustable time delay of 1 to 5 minutes on failure to synchronize normal and emergency sources prior to transfer.
    - b. Provide adjustable time delay of 0.1 to 1 second on extended parallel condition of both power sources during transfer.
  - 5. Provide two time delay modes on retransfer to normal source, independently adjustable from 0 to 60 minutes; one for normal source power failures and one for test mode function. Automatically bypass time delay if emergency source fails and normal source is acceptable.
  - 6. Provide time delay on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.
  - 7. Provide time-delay-activated output signal to drive external relay(s) for selective load disconnect control; capable of activating adjustable time delay of 0 to 5 minutes in following modes:
    - a. Prior to transfer only.
    - b. Prior to and after transfer.
    - c. Normal to emergency only.
    - d. Emergency to normal only.
    - e. Normal to emergency and emergency to normal.
    - f. All transfer conditions or only when both sources are available.
  - 8. Time Delays: Adjustable in 1 second increments, except extended parallel time to be adjustable in 0.01 second increments.
- N. Provide SPDT contact, rated 5 A at 30 VDC, for low-voltage engine start signal; prevents dry cranking of engine by requiring generator set to reach proper output and run for duration of cool-down setting, regardless of whether normal source restores before load is transferred.
- O. Provide auxiliary contacts, rated 10 A at 250 VAC, consisting of one contact which is closed when transfer switch is connected to normal source and one contact which is closed when transfer switch is connected to emergency source.

### 2.03 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Factory test for proper operation of individual components and compliance with sequence of operation. Verify operating transfer time, voltage, frequency, and time delay settings.

### PART 3 EXECUTION

0297.23.001 / East Pier Deep Water Wharf for USM-NOAA	263623.13 - 8	Automatic/Nonautomatic Transfer Switches - Schneider Electric ASCO 7000
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**3.01 EXAMINATION**

- A. Examine equipment exterior and interior for damage, including but not limited to, structure, moisture, and mildew.
- B. Examine for conditions detrimental to completion of work.
- C. Do not proceed with work until unsatisfactory conditions have been corrected.

**3.02 INSTALLATION**

- A. Install equipment in accordance with manufacturer's written instructions.
- B. Install transfer switches in accordance with NECA 1.
- C. Unless otherwise indicated, install and anchor floor-mounted transfer switches on raised concrete pad 4 inches high; see Section 033000.

**3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for additional requirements.
- B. Manufacturer Services: Provide services of manufacturer's field representative to perform functional testing, commissioning, and first parameter adjusting.
  - 1. Include necessary material, equipment, labor, and technical supervision.
  - 2. Replace damaged or malfunctioning equipment and report discrepancies or installation issues.
  - 3. Identify transfer switches with label indicating inspection/testing agency and date of service.
- C. Correct deficiencies and replace damaged or defective transfer switches or associated components.

**3.04 PROTECTION**

- A. Protect installed transfer switches from subsequent construction operations.

**END OF SECTION**





**SECTION 265600  
EXTERIOR LIGHTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Exterior luminaires.
- B. Ballasts.
- C. Lamps.
- D. Poles and accessories.
- E. Luminaire accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260529 - Hangers and Supports for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.

**1.03 REFERENCE STANDARDS**

- A. ANSI O5.1 - American National Standard for Wood Poles: Specifications and Dimensions; 2022.
- B. IEEE C2 - National Electrical Safety Code(R) (NEC(R)); 2023.
- C. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.
- D. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.
- E. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- G. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2000 (Reaffirmed 2006).
- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- J. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
  - 2. Notify Engineer/Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.
  - 1. LED Luminaires:
    - a. Include estimated useful life, calculated based on IES LM-80 test data.

- b. Include IES LM-79 test report upon request.
- 2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
- 3. Lamps: Include rated life and initial and mean lumen output.
- C. Field Quality Control Reports.
  - 1. Include test report indicating measured illumination levels.

### 1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.
- C. Receive, handle, and store wood poles in accordance with ANSI O5.1.

### 1.08 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

## PART 2 PRODUCTS

### 2.01 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

### 2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. LED Luminaires:
  - 1. Components: UL 8750 recognized or listed as applicable.
  - 2. Tested in accordance with IES LM-79 and IES LM-80.
  - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- H. Exposed Hardware: Stainless steel.

### 2.03 BALLASTS AND DRIVERS

- A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

#### **3.03 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires in accordance with NECA/IESNA 501.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- F. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- G. Install accessories furnished with each luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.
- I. Install lamps in each luminaire.

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

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Engineer/Architect.

#### **3.05 ADJUSTING**

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Engineer/Architect. Secure locking fittings in place.
- B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Engineer/Architect.

#### **3.06 CLEANING**

- A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

#### **3.07 CLOSEOUT ACTIVITIES**

- A. See Section 017800 - Closeout Submittals, for closeout submittals.

- B. Demonstration: Demonstrate proper operation of luminaires to Engineer/Architect, and correct deficiencies or make adjustments as directed.
- C. Just prior to Substantial Completion, replace all lamps that have failed.

**3.08 PROTECTION**

- A. Protect installed luminaires from subsequent construction operations.

**END OF SECTION**

**SECTION 270533.13  
CONDUIT FOR COMMUNICATIONS SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Rigid polyvinyl chloride (PVC) conduit.
- B. Reinforced thermosetting resin conduit (RTRC).

**1.02 RELATED REQUIREMENTS**

- A. Section 260533.13 - Conduit for Electrical Systems.
- B. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

**1.03 REFERENCE STANDARDS**

- A. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.
- B. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.
- C. BICSI TDMM - Telecommunications Distribution Methods Manual, 14th Edition; 2020.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- E. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- F. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- G. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
- H. NEMA TC 14.AG - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015 (Reaffirmed 2021).
- I. NEMA TC 14.BG - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015 (Reaffirmed 2020).
- J. NEMA TC 14.XW - Extra Heavy Wall Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; 2015 (Reaffirmed 2021).
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. TIA-568.0 - Generic Telecommunications Cabling for Customer Premises; 2020e.
- M. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).
- N. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- O. UL 2420 - Belowground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.
- P. UL 2515 - Aboveground Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.
- Q. UL 2515A - Standard for Supplemental Requirements for Extra Heavy Wall Reinforced Thermosetting Resin Conduit (RTRC) and Fittings; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittals procedures.

**1.05 QUALITY ASSURANCE****1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

0297.23.001 / East Pier Deep Water Wharf for USM-NOAA	270533.13 - 1	Conduit for Communications Systems
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**2.01 CONDUIT - GENERAL REQUIREMENTS**

- A. Comply with NFPA 70 and TIA-569.
- B. Provide conduit, fittings, supports, and accessories required for complete communications pathway.
- C. Provide products listed, classified, and labeled as suitable for purpose intended.
- D. Where conduit size is not indicated, size to comply with NFPA 70, TIA-569, and BICSI TDMM, but not less than applicable minimum size requirements specified. Where specified standards differ, comply with most stringent.

**2.02 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT**

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage.
- B. Fittings:
  - 1. Manufacturer: Same as manufacturer of conduit to be connected.
  - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.
  - 3. Conduit Bodies: Use only conduit bodies specifically designed for communications cabling. Standard conduit bodies designed for electrical raceways are not permitted.
    - a. Comply with TIA-568.0 minimum bend radius requirements for fiber optic cables.

**2.03 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)**

- A. Manufacturers:
  - 1. Champion Fiberglass, Inc: [www.championfiberglass.com/#sle](http://www.championfiberglass.com/#sle).
  - 2. Substitutions: See Section 016000 - Product Requirements.
- B. Applications:
  - 1. Above Ground, Subject to Physical Damage: Use aboveground (AG), XW (Extra Heavy Wall) RTRC.
  - 2. Underground, Direct-Buried: Use belowground (BG), DB (direct-burial) RTRC or aboveground (AG) RTRC.
- C. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).
  - 1. Aboveground (AG) RTRC: Comply with NEMA TC 14.AG and list and label as complying with UL 2515.
  - 2. Aboveground (AG), XW (Extra Heavy Wall) RTRC: Comply with NEMA TC 14.XW and list and label as complying with UL 2515A.
  - 3. Belowground (BG) RTRC: Comply with NEMA TC 14.BG and list and label as complying with UL 2420.
- D. Supports: As recommended by manufacturer.
- E. Fittings: Same type and manufacturer as conduit to be connected.
  - 1. Conduit Bodies: Standard conduit bodies designed for electrical raceways are not permitted.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.
- C. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- D. Conduit Support:
  - 1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Connections and Terminations:
1. Use suitable adapters where required to transition from one type of conduit to another.
  2. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect cables.
  3. Secure joints and connections to provide mechanical strength and electrical continuity.
- F. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Provide sleeves and/or slots for penetrations as indicated or as required to facilitate installation.
  4. Conceal bends for conduit risers emerging above ground.
  5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
- G. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed cables or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
  3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
  4. Where conduits are subject to earth movement by settlement or frost.
- H. Provide grounding and bonding.

**END OF SECTION**





**SECTION 271000  
STRUCTURED CABLING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Communications system design requirements.
- B. Communications pathways.
- C. Copper cable and terminations.
- D. Fiber optic cable and interconnecting devices.
- E. Communications grounding and bonding.
- F. Communications identification.

**1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 260526 - Grounding and Bonding for Electrical Systems.
- C. Section 260533.13 - Conduit for Electrical Systems.
- D. Section 260533.16 - Boxes for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems: Identification products.

**1.03 REFERENCE STANDARDS**

- A. ICEA S-83-596 - Indoor Optical Fiber Cable; 2021.
- B. NECA/BICSI 568 - Standard for Installing Commercial Building Telecommunications Cabling; 2006.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).
- E. TIA-492CAAB - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak; 2000 (Reaffirmed 2005).
- F. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 Edition 2: Fibre-Optic Communications Subsystem Test Procedures – Part 4-2: Installed Cable Plant – Single-Mode Attenuation and Optical Return Loss Measurement; 2015a (Reaffirmed 2022).
- G. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2020.
- H. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).
- I. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2022e.
- J. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).
- K. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).
- L. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.
- M. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d, with Addendum (2021).
- N. UL 444 - Communications Cables; Current Edition, Including All Revisions.
- O. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.
- P. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.
- Q. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
1. Coordinate requirements for facilities director. Pay for all utility work.
  2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
  3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  4. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

**1.05 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
- C. Evidence of qualifications for installer.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.
- E. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.
- F. Field Test Reports.
- G. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
1. Record actual locations of outlet boxes and distribution frames.
  2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
  3. Identify distribution frames and equipment rooms by room number on drawings.
- H. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

**1.06 QUALITY ASSURANCE**

- A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.
- C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
  2. Supervisors and installers factory certified by manufacturers of products to be installed.
  3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Keep stored products clean and dry.

**1.08 WARRANTY**

- A. Correct defective Work within a 2 year period after Date of Substantial Completion.

**PART 2 PRODUCTS****2.01 SYSTEM DESIGN**

- A. Provide a complete permanent system of cabling and pathways for data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
  2. Comply with Communications Service Provider requirements.
  3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
  4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
- B. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

**2.02 PATHWAYS**

- A. Conduit: As specified in Section 260533.13; provide pull cords in all conduit.
- B. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

**2.03 COPPER CABLE AND TERMINATIONS**

- A. Manufacturers:
1. CommScope; \_\_\_\_\_: [www.commscope.com/#sle](http://www.commscope.com/#sle).
  2. General Cable Technologies Corporation; \_\_\_\_\_: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
  3. Siemon Company; \_\_\_\_\_: [www.siemon.com/#sle](http://www.siemon.com/#sle).
  4. Substitutions: See Section 016000 - Product Requirements.
- B. Copper Horizontal Cable:
1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
  2. Cable Type - Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
  3. Cable Capacity: 4-pair.
  4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
- C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.
- D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
1. Performance: 500 mating cycles.
  2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

**2.04 FIBER OPTIC CABLE AND INTERCONNECTING DEVICES**

- A. Fiber Optic Backbone Cable:
1. New Fiber Optic Backbone Cable:
    - a. Description: Tight buffered, non-conductive fiber optic cable complying with TIA-568.3, TIA-598, ICEA S-83-596 and listed as complying with UL 444 and UL 1651.
    - b. Cable Type: Single-mode, 8.3/125 um (OS2) complying with TIA-492CAAB.
    - c. Cable Capacity: 12 -fiber.
- B. Fiber Optic Interconnecting Devices:
1. Connector Type: Type LC.

2. Connector Performance: 500 mating cycles, when tested in accordance with TIA-455-21.
3. Maximum Attenuation/Insertion Loss: 0.3 dB.

## 2.05 GROUNDING AND BONDING COMPONENTS

- A. Comply with TIA-607.
- B. Comply with Section 260526.

## 2.06 IDENTIFICATION PRODUCTS

- A. Comply with TIA-606.
- B. Comply with Section 260553.

## 2.07 SOURCE QUALITY CONTROL

- A. Factory test cables according to TIA-568 (SET).

## PART 3 EXECUTION

### 3.01 INSTALLATION - GENERAL

- A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), NECA/BICSI 568, NFPA 70, and SYSTEM DESIGN as specified in PART 2.
- B. Comply with Communication Service Provider requirements.
- C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.
- D. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

### 3.02 INSTALLATION OF PATHWAYS

- A. Install pathways with the following minimum clearances:
  1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
  2. 12 inches from power conduits and cables and panelboards.
  3. 5 inches from fluorescent and high frequency lighting fixtures.
  4. 6 inches from flues, hot water pipes, and steam pipes.
- B. Conduit, in Addition to Requirements of Section 260533.13:
  1. Arrange conduit to provide no more than the equivalent of two 90 degree bend(s) between pull points.
  2. Conduit Bends: Inside radius not less than 10 times conduit internal diameter.
  3. Arrange conduit to provide no more than 100 feet between pull points.
  4. Minimum Cover - Underground Service Entrance: Comply with NFPA 70 and Communications Service Provider requirements.
- C. Outlet Boxes:
  1. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of telecommunications outlets provided under this section.
    - a. Mounting Heights: Unless otherwise indicated, as follows:
      - 1) Telephone and Data Outlets: 18 inches above finished floor.
    - b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
    - c. Provide minimum of 24 inches horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
    - d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
    - e. Locate outlet boxes so that wall plate does not span different building finishes.
    - f. Locate outlet boxes so that wall plate does not cross masonry joints.

### 3.03 INSTALLATION OF EQUIPMENT AND CABLING

- A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
  2. Do not over-cinch or crush cables.
  3. Do not exceed manufacturer's recommended cable pull tension.
  4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
- B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
1. At Distribution Frames: 120 inches.
  2. At Outlets - Copper: 12 inches.
- C. Copper Cabling:
1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch from point of termination.
  2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
  3. Use T568B wiring configuration.
- D. Fiber Optic Cabling:
1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
  2. Support vertical cable at intervals as recommended by manufacturer.
- E. Identification:
1. Use wire and cable markers to identify cables at each end.
  2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
  3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

### 3.04 FIELD QUALITY CONTROL

- A. Comply with inspection and testing requirements of specified installation standards.
- B. Visual Inspection:
1. Inspect cable jackets for certification markings.
  2. Inspect cable terminations for color coded labels of proper type.
  3. Inspect outlet plates and patch panels for complete labels.
- C. Testing - Copper Cabling and Associated Equipment:
1. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
  2. Test operation of shorting bars in connection blocks.
  3. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.
  4. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.
- D. Testing - Fiber Optic Cabling:
1. Backbone: Perform optical fiber end-to-end attenuation test using an optical time domain reflectometer (OTDR) and manufacturer's recommended test procedures; perform verification acceptance tests and factory reel tests.
  2. Single Mode Backbone: Perform tests in accordance with TIA-526-7.
- E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

**END OF SECTION**



**SECTION 274133  
MASTER ANTENNA TELEVISION SYSTEMS**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Television service entrance.
- B. Cable and accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260533.13 - Conduit for Electrical Systems.
- C. Section 260533.16 - Boxes for Electrical Systems.

**1.03 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 SYSTEM DESCRIPTION**

- A. Service entrance from local cable utility. Coordinate with USM facilities director.
- B. Premises wiring for broadband distribution of television signal, including individual outlets at ship power assemblies.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

**1.06 QUALITY ASSURANCE**

- A. Comply with requirements of NFPA 70 and cable television utility company.

**PART 2 PRODUCTS****2.01 RECEIVING COMPONENTS****2.02 AMPLIFIERS AND CONVERTERS****2.03 ACCESSORIES**

- A. Main Distribution Cable:
- B. Branch Distribution Cable:

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Connect cable television service in accordance with cable utility instructions.
- C. Provide proper grounding of television system components and wiring. Bond outdoor components to lightning protection system.

**3.02 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Measure signal level at each outlet.

**END OF SECTION**





**SECTION 281000  
ACCESS CONTROL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Access control system requirements.
- B. Access control units and software.
- C. Access control point peripherals, including readers and keypads.
- D. Accessories.

**1.02 RELATED REQUIREMENTS**

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260533.13 - Conduit for Electrical Systems.
- C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

**1.03 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
- B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 294 - Access Control System Units; Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include elevations and details of proposed equipment arrangements. Include system interconnection schematic diagrams. Include requirements for interface with other systems.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include ratings, configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

**1.05 QUALITY ASSURANCE**

- A. Comply with the following:
  - 1. NFPA 70.
  - 2. The requirements of the local authorities having jurisdiction.
  - 3. Applicable TIA/EIA standards.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.
- B. Store products in manufacturer's unopened packaging, keep dry and protect from damage until ready for installation.

**1.07 FIELD CONDITIONS**

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

**1.08 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Readers and Keypads - Basis of Design: HID Global RP40-920P

**2.02 ACCESS CONTROL SYSTEM REQUIREMENTS**

- A. Provide new access control system consisting of required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
  - 1. Access Control Units and Readers: Listed and labeled as complying with UL 294.

### **2.03 ACCESS CONTROL UNITS AND SOFTWARE**

- A. Provide access control units and software compatible with readers to be connected.
- B. Unless otherwise indicated, provide software and licenses required for fully operational system.

### **2.04 ACCESS CONTROL POINT PERIPHERALS**

- A. Provide devices compatible with control units and software.
- B. Provide devices suitable for operation under the service conditions at the installed location.
- C. Readers and Keypads:
  - 1. General Requirements:
    - a. Provide readers compatible with credentials to be used.
- D. Door Locking Devices (Electric Strikes and Magnetic Locks): Comply with Section 087100.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that ratings and configurations of system components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive system components.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to system.
- E. Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A. Install access control system in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Provide grounding and bonding in accordance with Section 260526.
- D. Identify system wiring and components in accordance with Section 260553.

### **3.03 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for additional requirements.
- B. Prepare and start system in accordance with manufacturer's instructions.
- C. Program system parameters according to requirements of Owner.
- D. Test for proper interface with other systems.
- E. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

### **3.04 CLEANING**

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### **3.05 PROTECTION**

- A. Protect installed system components from subsequent construction operations.

**END OF SECTION**

**SECTION 312200  
GRADING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Removal of topsoil.
- B. Rough grading the site for site structures, building pads, and sidewalks.
- C. Finish grading.

**1.02 QUALITY ASSURANCE**

- A. Perform Work in accordance with State of Mississippi, Highway Department standards.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Topsoil: Topsoil shall consist of natural friable soil that is representative of soils in the vicinity which produce heavy growths of crops, grass, or other vegetation and is reasonably free from underlying subsoil, clay lumps, objectionable weeds, litter, brush, matted roots, toxic substances, or any material that might be harmful to plant growth or be hindrance to grading, planting, or maintenance operations.
- B. Obtain approved topsoil material off-site when satisfactory topsoil materials are not available on-site.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.
- C. Poor soils conditions and groundwater may be encountered and should be expected on the site.

**3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Notify utility company to remove and relocate utilities.
- E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
- F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.
- G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.
- H. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

**3.03 TOPSOIL STRIPPING**

- A. Once all demolition and clearing operations have been completed, topsoil stripping excavations shall be continued to the limits and depths indicated on the drawings.

**3.04 SOIL STOCKPILING**

- A. Stockpile topsoil to be re-used on site; remove remainder from site.
- B. Locate stockpiles where they will not interfere with the construction phases and at least 15 feet away from areas of concentrated flows or pavements.

- C. Protect stockpiles from erosion.

### 3.05 FINISH GRADING

- A. Before Finish Grading:
  - 1. Verify building and trench backfilling have been inspected.
  - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 2 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 2 inches.
- E. Place topsoil in areas where sodding are indicated.
- F. Place topsoil where required to level finish grade.
- G. Place topsoil to nominal depth of 2 inches.
- H. Place topsoil during dry weather.
- I. Remove roots, weeds, rocks, and foreign material while spreading.
- J. Near plants spread topsoil manually to prevent damage.
- K. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- L. Lightly compact placed topsoil.
- M. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

### 3.06 TOLERANCES

- A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.
- B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

### 3.07 REPAIR AND RESTORATION

- A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.
- B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Engineer/Architect as to remedy.
- C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.
- D. Protecting Graded Areas: Protect newly graded areas from traffic and erosion.
- E. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

### 3.08 FIELD QUALITY CONTROL

- A. See Section 312323 for compaction density testing.

### 3.09 CLEANING

- A. Leave site clean and raked, ready to receive landscaping.

**END OF SECTION**

**SECTION 312316.13  
TRENCHING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Backfilling and compacting for utilities outside the building to utility main connections.

**1.02 RELATED REQUIREMENTS**

- A. Section 312316 - Excavation: Building and foundation excavating.  
B. Section 312323 - Fill: Backfilling at building and foundations.

**1.03 REFERENCE STANDARDS**

- A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2022, with Errata .  
B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.  
C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).  
D. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2015, with Editorial Revision (2016).  
E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).  
F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.  
G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).  
H. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).  
I. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.  
J. Mississippi Standard Specifications for Road and Bridge Construction, 2004.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.  
B. Materials Sources: Submit name of imported materials source.  
C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.  
D. Compaction Density Test Reports.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. When necessary, store materials on site in advance of need.  
B. When fill materials need to be stored on site, locate stockpiles where they will not interfere with the construction phases and at least 15 feet away from areas of concentrated flows or pavemtns.  
1. Separate differing materials with dividers or stockpile separately to prevent intermixing.  
2. Prevent contamination.  
3. Protect stockpiles from erosion and deterioration of materials.

**PART 2 PRODUCTS**

**2.01 BEDDING AND FILL MATERIALS**

- A. Select Backfill Material: Select Backfill material shall meet the requirements of Structural Fill per Section 312323.

- B. See Section 312323 for additional fill material requirements.

## 2.02 ACCESSORIES

- A. Warning Tape: Warning tape shall be metallic or polyethylene film warning tape manufactured for making and identifying underground utilities, 3 inches wide and 4 mils thick, continuously inscribed with a description of the utility.
- B. Locator Wire: Locator wire shall be fourteen (14) gauge solid copper insulated wire.

## 2.03 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the work are as indicated.

### 3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Engineer/Architect.

### 3.03 TRENCHING

- A. Excavate trenches to indicated widths, gradients, lines, depths, and elevations as indicated on the drawings.
- B. All pipe and associated fittings/structures will be installed in accordance with manufacturer's recommendations unless more stringent requirements are imposed by the drawings and these specifications.
- C. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape sub-grade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- D. Remove projecting stones and sharp objects along trench sub-grade.
- E. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Engineer/Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- F. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Engineer/Architect.

### 3.04 FOUNDATION FOR UTILITY PLACEMENT

- A. When native material at the bottom of the trench is not a suitable foundation for the pipe or conduit, excavate trench an additional 6 inches and replace with approved Foundation Material.

### 3.05 BEDDING FOR UTILITY PLACEMENT

- A. Place and compact bedding material on trench bottoms as indicated on the drawings. Shape bedding material to provide continuous support of bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. The bedding material shall be Suitable Soil secured from the trench excavation and shall be thoroughly compacted to a minimum 95 percent of Standard Proctor Density (ASTM D 698).

- C. When the native soil is not suitable for bedding material then a minimum of 4 inches of Select Bedding Material shall be compacted to a minimum of 95 percent of the Standard Proctor Density (ASTM D 698).

### 3.06 INITIAL BACKFILLING

- A. Coordinate backfilling with utility testing.
- B. Place and compact initial backfill to a height of 12 inches over the utility pipe or conduit. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit.
- C. The backfill material shall be Suitable Soil secured from the trench excavation and shall be thoroughly compacted to a minimum 95 percent of Standard Proctor Density (ASTM D 698).
- D. When the native soil is not suitable for backfill material then backfill with Select Backfill Material compacted to a minimum of 95 percent of the Standard Proctor Density (ASTM D 698).
- E. See Section 312323 for further backfill requirements.
- F. Correct areas that are over-excavated.
- G. Reshape and re-compact fills subjected to vehicular traffic.

### 3.07 TOLERANCES

- A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.
- B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

### 3.08 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").
- D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

### 3.09 CLEANING

- A. Leave unused materials in a neat, compact stockpile.
- B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

**END OF SECTION**





## SECTION 312316 EXCAVATION

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Excavating for paving.
- B. Trenching for utilities to utility main connections.
- C. Temporary excavation support and protection systems.

#### 1.02 RELATED REQUIREMENTS

- A. Section 015713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.
- B. Section 017000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring. General requirements for dewatering of excavations and water control.
- C. Section 024100 - Demolition: Shoring and underpinning existing structures.
- D. Section 312323 - Fill: Fill materials, backfilling, and compacting.

#### 1.03 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

#### 1.05 DEFINITIONS

- A. Unclassified Excavation: Unclassified Excavations will consist of all excavation materials of whatever character encountered in the work except for those classes of excavation for which separate pay items are provided.
- B. Muck Excavation: Muck Excavation will consist of the excavation removal, hauling, and disposal of all unsatisfactory and unsuitable material in accordance with the plans and specifications.
- C. Excess Excavation: Excess Excavation will consist of excavation which cannot be satisfactorily used or disposed of within the project limits. Excess Excavation may include any type, kind, or class of excavation determined by the Engineer that must be removed.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Bedding and Fill to Correct Over-Excavation:
  1. See Section 312323 for bedding and corrective fill materials at general excavations.
  2. See Section 312316.13 for bedding and corrective fill materials at utility trenches.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the work are as indicated.

#### 3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. Locate, identify, and protect utilities that remain and protect from damage.
- C. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until

no longer needed, or as directed by Engineer/Architect.

### 3.03 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

- A. Excavation Safety: Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.

### 3.04 EXCAVATING

- A. Excavate to accommodate construction operations.
- B. Notify Engineer/Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Do not interfere with 45 degree bearing splay of foundations.
- D. Provide temporary means and methods, as required, to remove all water from excavations until directed by Engineer/Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

### 3.05 FIELD QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for field inspection and testing.
- B. Provide for visual inspection of load-bearing excavated surfaces by Engineer/Architect before placement of foundations.

### 3.06 PROTECTION

- A. Divert surface flow from rains or water discharges from the excavation.
- B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.
- D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- E. Keep excavations free of standing water and completely free of water during concrete placement.

**END OF SECTION**

**SECTION 312323  
FILL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Filling and compacting for slabs-on-grade and paving.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

**1.02 RELATED REQUIREMENTS**

- A. Section 015713 - Temporary Erosion and Sediment Control: Slope protection and erosion control.
- B. Section 312316 - Excavation: Removal and handling of soil to be re-used.
- C. Section 312316.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

**1.03 REFERENCE STANDARDS**

- A. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2019.
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).
- C. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017, with Editorial Revision (2020).
- D. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where they will not interfere with the construction phases and at least 15 feet away from areas of concentrated flows or pavements.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.

**PART 2 PRODUCTS**

**2.01 FILL MATERIALS**

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations free from debris, roots, wood, scrap materials, vegetable matter, refuse or frozen material. Obtain approved fill materials off-site when satisfactory soil materials are not available on site.
- B. Suitable Soils: Suitable Soils shall be ASTM D 2487 Soil Classification Groups GW, GP, GM, SW, SP, and SM or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Fill: Approved material with less than about 25 percent of the soil particles (by weight) passing the No. 200 mesh sieve, less than about 65 percent of the soil particles (by weight) passing the No. 40 mesh sieve and a liquid limit of less than 25..

1. Fill materials should be placed above clean sand and compacted in 8-inch loose lifts to at least 95 percent of the soil's Standard Proctor maximum dry density as determined by ASTM D 698, Method..

D. Sand: Clean sand with less than ten percent (10%) passing the No. 200 sieve.

## 2.02 ACCESSORIES

- A. Geotextile Fabric: non-woven, geotextile; N-Series manufactured by Mirafi or approved equal.
- B. Vapor Retarder: 10 mil thick, polyethylene.

## 2.03 SOURCE QUALITY CONTROL

- A. See Section 014000 - Quality Requirements, for general requirements for testing and analysis of soil material.
- B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.
- C. Verify areas to be filled are not compromised with surface or ground water.

### 3.02 PREPARATION

- A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

### 3.03 DRAINAGE

- A. Effective drainage, including ditching and/or positive grading, should be established during the initial stages of site development and modified as necessary during construction.
- B. Groundwater may be encountered and should be expected during excavation work. When required the Contractor shall provide a system for controlling groundwater below excavations.
- C. Surface water shall be prevented from flowing into excavations and from flooding the project site and surrounding areas by methods approved by the Engineer.
- D. Contractor shall not allow water to accumulate in excavations. Remove water to prevent softening of foundation soils, undercutting of footings, and soil changes detrimental to the stability of sub-grades and foundations. Contractor shall not use trench excavation as temporary drainage ditches.
- E. Maintain grades so that the surface is well drained. When required the Contractor shall provide dewatering system necessary to convey water away from excavations.

### 3.04 EXCAVATION

- A. After clearing, grubbing, and stripping excavation are completed, excavate existing soils to depths necessary to accommodate site structures and install the required pavement sections.
- B. Suitable excavation materials shall be used as general fill in areas outside building or pavement areas as approved by the Engineer. If the site conditions permit, additional suitable excavation material may be wasted on site as approved by the Engineer.

### 3.05 UNAUTHORIZED EXCAVATION

- A. The Contractor will not be compensated for excavation beyond the dimensions and elevations as shown on the plans or that has been directed and approved by the Engineer.
- B. Any unauthorized excavation that requires filling shall be corrected at the Contractor's expense.
- C. No payment will be made for the removal, disposal, or replacement of material determined to be loosened or undercut through carelessness or negligence on the part of the Contractor.

### 3.06 SUB-GRADE INSPECTION AND PREPARATION

- A. After clearing, grubbing, and stripping excavations are completed, proof-roll the entire site using a loaded dump truck, having an axle weight of at least 10 tons to aid in identifying any additional localized soft or unsuitable material that should be removed.
- B. The existing sub-grade soils shall be thoroughly compacted until the soils at a depth of 12 inches achieve at least 95 percent of maximum dry density according to Standard Proctor Density (ASTM D 698).
- C. If unsatisfactory sub-grades are encountered or if the required compaction of in place soils cannot be achieved, additional undercutting and placement of appropriate fill material will be required.

### 3.07 REMOVAL OF UNSUITABLE MATERIALS

- A. When excavations encounter unsuitable materials below the bottom of the stripping or excavation to the depths required to accommodate the grading plan and other improvements, the Contractor will be required to remove the materials and backfill with appropriate fill material as approved by the Engineer.
- B. The depth and width of unsuitable or muck excavation will be as directed or approved by the Engineer.
- C. All muck and fill formations below the bottom of the stripping or excavation to the depths required to accommodate the grading plan and other improvements shall be measured as unit price pay items in the Unsuitable Soils Allowance.

### 3.08 GENERAL FILL PLACEMENT AND COMPACTION

- A. Fill materials shall be placed on prepared and inspected sub-grade to contours and elevations indicated using appropriate materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. In areas where groundwater or saturated soil conditions are encountered during the required fill excavations, the initial lift of fill material should consist of Clean Sand placed to at least 2 feet above the static water table or to a distance to adequately bridge over the saturated soils. during placement below the groundwater table, the Clean Sand may be thoroughly "tracked" with a bulldozer in lieu of measured compaction tests.
- F. Fill material meeting the requirements of Suitable Soils shall be placed to obtain final grade outside of building and pavement areas. This material should be compacted in 8 inch loose lifts to not less than 95 percent of the maximum dry unit weight according to ASTM D 698 (Standard Proctor).
- G. Correct areas that are over-excavated.
- H. Reshape and re-compact fills subjected to vehicular traffic.

### 3.09 FILL PLACEMENT AND COMPACTION FOR SITE STRUCTURES AND PAVEMENTS

- A. Fill material meeting the requirements of Structural Fill shall be placed to the required grades, lines, cross sections, and thickness as shown on the plans. This material should be compacted in 8 inch loose lifts to not less than 95 percent of the maximum dry unit weight according to ASTM D 698 (Standard Proctor).

### 3.10 FILL AT SPECIFIC LOCATIONS

0297.23.001 / East Pier Deep Water Wharf for USM-NOAA	312323 - 3	Fill
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**3.11 TOLERANCES**

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

**3.12 CLEANING AND PROTECTION**

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.
- C. Protect newly graded areas from traffic and erosion.
- D. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

**END OF SECTION**

## **SECTION 31 62 19 ROUND TIMBER PILES**

### **PART 1 - GENERAL**

**1.01 DESCRIPTION:** This section includes the requirements for labor, materials, and equipment to furnish and drive the timber piles which are a part of the sign foundation system as shown on the plans and specified herein.

#### **1.02 SUBMITTALS**

- A. Mill Certificates including chemical analysis and retention volume of preservative treatment.
- B. Pile driving equipment specifications.

#### **1.03 APPROVALS**

- A. No piles shall be driven except those which have been approved by the Engineer.

#### **1.04 RELATED WORK SPECIFIED ELSEWHERE**

- A. SECTION 05 12 00 Structural Steel

#### **1.05 STORAGE AND HANDLING**

- A. Timber piles shall be stored and handled to avoid injury to the piles. Special care shall be exercised to avoid breaking the surface of the treated piles. Cant hooks, peaveys or spikes shall not be used.
- B. Cuts or breaks in the surfaces of treated piles shall be given three brush coats of preservative of approved quality as specified in AWP A M4.

### **PART 2 - MATERIALS**

#### **2.01 TIMBER PILES**

- A. Piles shall conform to the requirements of ASTM D 25 Class B or Modified Class B as follows: Piles should be free from short crooks in which the distance from the center of the pile in the crook to a line from the center of the pile below the crook exceeds three percent of the length of the crook at any point, short crooks being defined as those not exceeding five feet in length; and twist of grain or spiral grain in any 30 feet of length shall not exceed one-half the circumference at the midpoint of the length measured. Piling should have a minimum circumference of 38 inches, three feet from butt and 31 inches minimum tip circumference for 10" piles.
- B. The piles shall be southern pine, pressure treated with Chromated Copper

Arsenate (CCA) solution so that at least 2.5 pounds of preservative per cubic foot will be retained in each pile. Treatment and penetration shall conform to AWPA Standard C1 and C3, latest edition.

## **2.02 BOLTS**

- A. Bolts shall be dome head timber bolts with heavy hex nuts; bolts and nuts shall be manufactured in accordance with ASTM Designation A-307.
- B. All bolts, nuts and hardware shall be galvanized in accordance with ASTM Designation A-153.

## **2.03 WASHERS**

- A. Washers shall be cast iron, ogee of standard manufacture and plain hardened washers to conform to ASTM Designation A-325. All washers shall be galvanized in accordance with ASTM Designation A-153.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. The Contractor shall provide the Engineer three (3) working days notice prior to driving piling.
- B. Contractor shall provide adequate markings on the driving equipment and all piling as well as follow satisfactory driving procedures so as to allow accurate observation and recording of driving operations.
- C. Contractor shall provide a record of blow counts for full installation of each pile completed by an independent testing agency and provide to Engineer for review.
- D. All piles shall be driven at the locations shown in the Contract Drawings or as ordered in writing by the Engineer. Driving of all piles shall be continuous without intermissions until the pile has been driven to the final tip elevation.
- E. All piles which are damaged or imperfect in any way shall be removed. Defective piles or piles injured in driving or handling shall be replaced with a new pile, all as directed by the Engineer and at no additional cost to the Owner.
- F. Piles which upheave during the driving of adjacent piles shall be re-driven to their original elevations. Any piles driven too low must be corrected without extra charge. Any discrepancies in top elevation shall be called to the attention of the Engineer.

### **3.02 PILE DRIVING EQUIPMENT**

- A. Timber piles shall be driven with a driving hammer and equipment capable of driving piles to the depth and accuracy required. Piles shall be driven with an



approved hammer with a minimum energy rating of 15,000 ft-lbs. Driving of timber piles should be limited to the rate of 48 blows per foot. Contractor shall keep a complete and accurate record of each pile driven. Record shall indicate location, butt and tip diameter, original length, tip elevation, cut-off elevation, penetration in blow per foot for entire driving length, hammer data, and any unusual pile behavior during installation. After installation, submit records to Architect.

### **3.03 DRIVING**

- A. All piles shall be driven in accordance with lines, spacing and batter shown on the Contract Drawings. Piles shall not be driven with a variation greater than 1/4-inch per foot from the vertical or batter shown on the drawings. Any pile damaged by reason of internal defect or improper driving shall be withdrawn and replaced by a new, and if necessary, a longer pile driven to greater penetration, at Contractor's expense.
- B. All piles shall be furnished in sufficient length and driven to a minimum penetration as specified on the Contract Drawings.
- C. Cushions, or cap blocks, shall consist of one solid block of hard wood of proper shape and dimensions to fit the hammer or of laminated material properly engineered to transmit the hammer energy efficiently. The grain of the block shall be perpendicular (parallel to the axis of the pile). If laminated materials are used, the strength of such materials shall be equal to or greater than hard wood. The use of wood chips, small wood blocks, shavings, rope or any similar material which excessively dampens the hammer blow shall not be permitted. The continuous or frequent introduction of materials to cushion the hammer blows will be prohibited. Details of cap block arrangements shall be submitted to the Engineer before piles are driven.

### **3.04 REQUIRED PENETRATION**

- A. Pipe piling shall be driven to the tip elevations shown on the plans. No less penetration than that shown on the plans will be accepted unless "refusal" is met.  
  
"Refusal" shall be defined by Engineer following completed PDA test and analysis. If "refusal" is met prior to attaining required penetration, the Engineer shall interpret the driving record of the pile and instruct the Contractor if additional penetration is required. If additional penetration is required, jetting and/or impact hammer driving shall be performed to set the piling to the required tip elevation.

### **3.05 BEARING CAPACITY**

- A. Ten inch tip (10") diameter timber piling shall have minimum bearing capacity of twenty (20) tons compression and ten (10) tons tension.
- B. Pile bearing capacity (compression) shall be determined by the following formula; if an impact hammer is used:

$$R = \frac{2E}{S+0.1}$$

Where R = Safe bearing value in pounds

S = The average penetration per blow, in inches for the last 5 to 10 hammer blows.

E = Energy of blow in foot pounds for power hammers; which shall be the product WH, for single-acting hammers the manufacturer's rated capacity when operating at the actual speed used in driving, for double-acting hammers; or the capacity as established for combustion hammers.

The above formula is applicable only when:

The hammer is operating at 90% of rated speed.

The hammer has a free fall.

The head of the piles is not damaged.

The penetration is reasonably uniform. There is not sensible bounce after the blow.

A follower is not used.

### 3.06 LOAD TEST

- A. Piles shall be tested in accordance with ASTM D4945 (Standard Test Method for High-Strain Dynamic Testing of Deep Foundations).
- B. Dynamic testing involves attaching at least two strain transducers and two accelerometers to the pile near the pile head during initial driving or at a convenient location during restrike testing. A cable or wireless transmission connects the sensors near the pile head with the Pile Driving Analyzer located a safe distance from the pile, but not more than 150 ft from the pile.
- C. Dynamic pile testing shall be performed on 1 test pile as indicated. The production pile testing shall be performed during initial driving and restrike to monitor hammer and drive system performance. Additional tests required following any hammer or driving system modifications or if another hammer is to be used on the site. Assess pile installation stresses and integrity, and evaluate pile capacity.
- D. Equipment and Personnel
  1. The dynamic monitoring shall be performed using a Pile Driving Analyzer (Model PAK, PAX or PAL). All equipment necessary for the dynamic monitoring such as sensors, cables or wireless transmitters, etc., shall be

furnished by the Dynamic Testing Consultant. The equipment shall conform to the requirements of ASTM D-4945.

2. A licensed engineer with a minimum of 5 years of experience and Advanced Level or better certification on the Foundation QA Examination for Providers of PDF Testing Services shall be responsible for Pile Driving Analyzer (PDA) operation and interpretation of results.
3. To prepare the pile for sensor attachment, a drill of sufficient power, operated by either a DC battery (preferred) or a generator, shall be provided by the Contractor.

#### E. Construction Access

1. Prior to lifting the pile to be dynamically tested, the Contractor shall provide a minimum of 3 ft of clear access to 180 degree opposite faces of the pile for pile preparation. The Contractor shall then drill and prepare holes for sensor attachment. Sensors are attached near the top of the pile as required by the ASTM D4945.
2. The Contractor's personnel shall attach the sensors to the pile after the pile has been lifted, leads positioned and driven to the penetration depths identified in Part 1.01 B. Driving shall then continue using routine pile installation procedures. When the level of the sensors is within 1 ft of any obstruction endangering the survival of sensors or cables, driving shall be halted to remove the sensors from the pile. If additional driving is required, the obstruction shall be removed or the pile shall be spliced and the sensors shall be reattached to the head of the next pile segment prior to the resumption of driving.

#### F. Testing Procedures

##### 1. Preconstruction Wave Equation Analyses

- a. Ten days prior to driving the indicator piles, the Contractor shall submit the pile and complete driving equipment data to the Engineer. The Engineer shall use the submitted information to perform wave equation analyses and shall prepare a summary report of the wave equation results. The wave equation analyses shall be used to assess the ability of the proposed driving system to install the pile to the required capacity and desired penetration depth within the allowable driving stresses.
- b. Approval of the proposed driving system by the Engineer shall be based upon the wave equation analyses indicating that the proposed driving system can develop a pile capacity of pile design load as indicated times 2 at a driving resistance not greater than 120 blows per inch within allowable driving stress limits. The hammer should also be sized or adjustable such that the penetration per blow at the required ultimate capacity does not exceed 0.5 inches.

##### 2. Test Pile Program

- a. Test piles shall be driven to an ultimate capacity of pile capacity of pile design load as indicated times 2 based upon the preliminary driving resistance indicated by wave equation results. Adjustments to the preliminary driving criteria may be made by the Engineer based upon the dynamic testing results.
- b. All indicator piles shall be re-driven with dynamic testing after a minimum waiting period of 14 days. The restrike driving sequence shall be performed with a warmed up hammer and shall consist of striking the piles for 50 blows or until the pile penetrates an additional three inches, whichever occurs first. In the event the pile movement is less than  $\frac{1}{4}$  inch during the restrike at satisfactory hammer energy output, the restrike may be terminated after 20 blows.

#### G. Dynamic Testing Reports

##### 1. Test Pile Program

- a. The Dynamic Testing Consultant shall prepare a written report of the indicator pile program. This report shall include the results of the static load test and shall contain a discussion of the pile capacity obtained from the dynamic and static testing. The report shall also discuss hammer and driving system performance, driving stress levels, and pile integrity.
- b. CAPWAP analyses of the dynamic pile testing data shall be performed on data obtained from the end of initial driving and the beginning of restrike of the test piles. CAPWAP analyses shall be performed by an engineer who has achieved Advanced Level or better on the Foundation QA Examination for Providers of PDA Testing Services. The Engineer may request additional analyses at selected pile penetration depths.
- c. For a blow count based driving criterion, the Dynamic Testing Consultant shall perform a refined wave equation analysis or analyses based upon the variations in the subsurface conditions and/or drive system performance observed in the indicator pile program results. Refined wave equation analyses are not required for restrike situations or when piles are driven to depth.

### 3.07 CUT-OFF

- A. Cut-off tops of all piles horizontally and at the elevations shown on the plans.
- B. Any discrepancies in elevation of cut-offs shall be called to the attention of the Architect.
- C. Immediately after completing the cut-off, drill four 1/2-inch diameter holes 2-inches deep into the head of the pile to form a reservoir for field-applied preservative. Place preservative in holes as required.

- D. Withdraw rejected piles and dispose.

### **3.08 INSTALLATION OF BOLTS AND ANCHOR DEVICES**

- A. Holes for bolts shall be drilled with a bit of the same diameter as that of the bolt to be used. All holes bored after treatment of the lumber shall be treated thoroughly by swabbing with approved preservative. Any unfilled holes after being treated with preservative shall be plugged tightly with treated wood plugs. All bolts shall be securely tightened to the satisfaction of the Engineer. All bolt heads and nuts shall be backed up with washers as required on the Contract Drawings.

**END OF SECTION**



**SECTION 321123  
AGGREGATE BASE COURSES**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Aggregate base course.

**1.02 RELATED REQUIREMENTS**

- A. Section 312323 - Fill: Compacted fill under base course.
- B. Section 321216 - Asphalt Paving: Finish and binder asphalt courses.

**1.03 REFERENCE STANDARDS**

- A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements for submittal procedures.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Aggregate Storage, General:
  1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  2. Prevent contamination.
  3. Protect stockpiles from erosion and deterioration of materials.

**PART 2 PRODUCTS****2.01 MATERIALS**

- A. Coarse Aggregate: Crushed granular limestone, complying with State of MS Highway Department standard for 610 gradation.

**2.02 SOURCE QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for general requirements for testing and analysis of aggregate materials.

**PART 3 EXECUTION****3.01 EXAMINATION****3.02 PREPARATION**

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.

**3.03 INSTALLATION**

- A. Under Bituminous Concrete Paving:
  1. Compact to 95 percent of maximum dry density per ASTM D 698..
- B. Place aggregate in maximum 4 inch layers and roller compact to specified density.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

**3.04 TOLERANCES**

- A. Scheduled Compacted Thickness: Within 1/4 inch.
- B. Variation From Design Elevation: Within 1/2 inch.

**3.05 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements for general requirements for field inspection and testing.
- B. If tests indicate work does not meet specified requirements, remove work, replace and retest.

**3.06 CLEANING**

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

**END OF SECTION**



**SECTION 321216  
ASPHALT PAVING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Hot Mix Asphalt (HMA) Pavements

**1.02 RELATED REQUIREMENTS**

- A. Section 321123 - Aggregate Base Courses: Aggregate base course.

**1.03 REFERENCE STANDARDS**

- A. Mississippi Standard Specifications for Road and Bridge Construction, 2004.

**1.04 QUALITY ASSURANCE**

- A. Perform Work in accordance with State of Mississippi Highways standard.
- B. Mixing Plant: Complying with State of MS Highways standard.
- C. Obtain materials from same source throughout.

**1.05 FIELD CONDITIONS**

- A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Hot Mix Asphalt (HMA): In accordance with State of Mississippi Highways standards.
- B. Primer: In accordance with State of Mississippi Highways standards.
- C. Tack Coat: In accordance with State of Mississippi Highways standards.

**2.02 ASPHALT PAVING MIXES AND MIX DESIGN**

- A. Base Course: Hot Mix Asphalt (HMA), HT, 19 mm in accordance with State of Mississippi Highways standards.
- B. Base Course: Hot Mix Asphalt (HmA), HT, 12.5 mm in accordance with State of Mississippi Highways standards.
- C. Surface Course: Hot Mix Asphalt (HMA), HT, 9.5 mm in accordance with State of Mississippi Highways standards.
- D. Submit proposed mix design of each class of mix for review prior to beginning of work.

**2.03 SOURCE QUALITY CONTROL**

- A. Test mix design and samples in accordance with State of Mississippi Highway standards.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.
- B. Verify gradients and elevations of base are correct.

**3.02 GRANULAR BASE COURSE**

- A. See Section 321123.

**3.03 PREPARATION - PRIMER**

- A. Apply primer in accordance with manufacturer's instructions.
- B. Apply primer on aggregate base or subbase at uniform rate of 1/3 gal/sq yd.
- C. Use clean sand to blot excess primer.

**3.04 PREPARATION - TACK COAT**

- A. Apply tack coat in accordance with manufacturer's instructions.
- B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.

**3.05 TOLERANCES**

- A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.
- B. Variation from True Elevation: Within 1/2 inch.

**3.06 FIELD QUALITY CONTROL**

- A. See Section 014000 - Quality Requirements, for general requirements for quality control.
- B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

**3.07 PROTECTION**

- A. Immediately after placement, protect pavement from mechanical injury for 24 hours or until surface temperature is less than 140 degrees F.

**END OF SECTION**

**SECTION 333123  
SANITARY SEWERAGE FORCE MAIN PIPING**

**PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Sanitary sewerage force main piping, fittings, and accessories.
- B. Valves and Thrust Restraints.
- C. Connection of facility sanitary force main system to municipal sewer.

**1.02 DEFINITIONS**

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

**1.03 REFERENCE STANDARDS**

- A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- B. ASTM D3308 - Standard Specification for PTFE Resin Skived Tape; 2012 (Reapproved 2022).
- C. AWWA C104/A21.4 - Cement-Mortar Lining for Ductile Iron Pipe and Fittings; 2022.
- D. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.
- E. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.
- F. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.
- G. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).
- H. AWWA C203 - Coal-Tar Protective Coatings and Linings for Steel Water Pipe; 2020.
- I. AWWA C210 - Liquid-Epoxy Coatings and Linings for Steel Water Pipe and Fittings; 2015, with Addendum (2020).
- J. AWWA C508 - Swing-Check Valves for Waterworks Service, 2-In. Through 48-In. (50-mm Through 1,200-mm) NPS; 2017.
- K. AWWA C600 - Installation of Ductile-Iron Mains and Their Appurtenances; 2017.
- L. MSS SP-25 - Standard Marking System for Valves, Fittings, Flanges and Unions; 2018, with Errata (2023).

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the installation of sewer force main with size, location and installation of service utilities.
- B. Sequencing: Execute utility connections in an orderly and expeditious manner.

**1.05 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data indicating pipe, pipe accessories, and valves.
- C. Product Data: Manufacturer's data sheets for each item of equipment and material provided, showing compliance with requirements; include materials, pressure ratings, seats and seals, clearances for operation and maintenance, and other characteristics.
- D. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- E. Hydrostatic Test Report: Document results of field quality control testing. Submit copies of all reports of field tests.
- F. Project Record Documents:
  1. Record location of piping, connections, valves, and invert elevations.
  2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Do not damage pipe, fittings and accessories, and pipe coatings during delivery, handling, and storage.

## **PART 2 PRODUCTS**

### **2.01 FORCE MAIN PIPE MATERIALS**

- A. Provide products that comply with applicable code(s).
- B. Ductile Iron Pipe:
1. Ductile Iron Pipe: As specified in Section 331416; standard cement mortar lining, outside coated, unless otherwise shown on drawings.
  2. Ductile Iron Pipe: AWWA C151/A21.51; AWWA C104/A21.4, standard cement mortar lining, outside coated, unless otherwise shown on layout drawings.
    - a. Pipe - 3 inches to 12 inches: Pressure Class - 350 psi.
  3. Fittings - Mechanical: AWWA C110/A21.10, rated same as pipe. Fittings to be cement mortar lined and outside coated same as pipe.
  4. Joints:
    - a. Mechanical Joints: AWWA C111/A21.11 as modified by AWWA C151/A21.51.
- C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

### **2.02 PIPE COATINGS AND LININGS**

- A. Steel, Interior: AWWA C203 or AWWA C210.
- B. Steel, Exterior, Buried: AWWA C203.
- C. Steel, Exterior, Exposed: AWWA C210.

### **2.03 VALVE APPLICATIONS**

- A. Valve Applications: Provide valves as follows whether shown on layout drawings or not.

### **2.04 REQUIREMENTS APPLICABLE TO ALL VALVES**

- A. See drawings for valve sizes, valve ratings, operator types, and piping types and sizes.
- B. Provide valves suitable for the service indicated and coordinated to piping system.
1. Provide valves that will withstand working pressure indicated or working pressure of pipe to which valve is connected, whichever is greater.
  2. Provide valves of sizes indicated or of port diameter/area equal to that of pipe to which valve is connected, whichever is larger.
  3. Provide valves that open by turning counterclockwise, with direction of opening integrally marked on operating nut or operator.
  4. Valve End Connections: As indicated; if not indicated, provide end connections of the same type as indicated for joints in pipe to which valve is connected.
  5. Factory install operators and accessories.
- C. Identification and Tagging: Mark valves in accordance with MSS SP-25 using identification tags securely attached; on tags show the service, valve identification number from layout drawings, manufacturer's name and model number.
1. Identification Tags: 1.375 inches diameter, minimum; stamped brass with black lettering.
  2. Attachment: Chrome-plated beaded chain.

### **2.05 REQUIREMENTS APPLICABLE TO METAL-BODY VALVES**

- A. Valve End Connections:
1. Flanged Ends: In accordance with ASME B16.1; Class 125.
  2. Mechanical Joint Ends: Styrene butadiene rubber (SBR) or vulcanized SBR gasketed type, in accordance with AWWA C111/A21.11 and AWWA C110/A21.10.

### **2.06 CHECK VALVES**

- A. Manufacturers:
1. Valmatic.

2. Substitutions: See Section 016000 - Product Requirements.
- B. Check Valves - General Requirements: These requirements apply to all check valves unless otherwise indicated.
  1. Function: Permit free flow forward and provide positive check against backflow.
  2. Rating: 250 psig.
  3. Body: In metallic pipelines, iron body.
  4. Identification: Directly cast on body; manufacturer's name, initials, or trademark; size of valve, working pressure; direction of flow.
- C. Swing Check Valves - Sizes 2.5 inches through 12 inch:
  1. Comply with AWWA C508.
  2. Rating: 200 psig.
  3. Body: Ductile iron.
  4. Disc: Bronze-mounted swing type, bronze disc, with solid bronze hinges and stainless steel hinge shaft with outside lever and weight.
  5. End Connections: Flanged.

## 2.07 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Concrete for Thrust Restraints: Concrete type specified in Section 033000.
- B. Joint Lubricants: Joint lubricants: As recommended by the pipe manufacturer.
- C. Bolts, Nuts, Rods, Brackets, and Glands: Comply with AWWA C111/A21.11.
- D. Joint Compound: A stiff mixture of graphite and oil or inert filler and oil.
- E. Joint Tape: Comply with ASTM D3308.
- F. Polyethylene Jackets: AWWA C105/A21.5 polyethylene jacket. Single layer, lapped over pipe joint 1 foot minimum, and secured with 10 mil polyethylene tape.

## PART 3 EXECUTION

### 3.01 GENERAL

- A. Perform work in accordance with applicable code(s).

### 3.02 EXCAVATION, TRENCHING, AND BACKFILLING

- A. Hand trim excavation for accurate placement of pipe to elevations indicated.
- B. Form and place concrete for pipe thrust restraints at bends, tees, and each change of pipe direction. Place concrete to permit full access to pipe and pipe accessories.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling. Correct over-excavation. See Section 312316.13 for additional requirements.
- D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling. Correct over-excavation. See Section 312323 for additional requirements.

### 3.03 PREPARATION

- A. Cut pipe ends square with mechanical cutters. Use wheel cutters where practicable. Remove burrs, sharp and rough edges and grind smooth. Remove loose material from pipe before laying.

### 3.04 INSTALLATION - PIPE

- A. Maintain horizontal and vertical separation of force main from water main piping in accordance with code.
- B. Maintain horizontal separation of force main from water main piping of at least 10 feet in all horizontal directions.
- C. Maintain vertical separation of force main from water main piping of at least 18 inches in all vertical directions.

- D. Verify trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- E. Before lowering and while suspended, inspect pipe and each fitting for defects. Installation of defective material is not permitted.
- F. Where pipe, fittings or joint materials have been soiled by earth in handling, thoroughly clean soiled surfaces by wire brushing and wiping until all traces of earth are removed before joining pipe.
- G. Maintain interior of all pipes thoroughly clean. After each line of pipe has been laid, carefully inspect, identify and remove dirt, trash, rags and other foreign matter from interior. Protect completed work.
- H. Lay pipe with bell ends facing the direction of laying, against the direction of flow.
  - 1. Where pipe is laid on a grade of ten percent or greater, start at bottom and proceed upward with bell ends of pipe upgrade.
- I. Install force mains with a minimum grade of one percent downhill slope away from sewage air release valve to force entrapped air to accumulate at air release valve.
- J. Install pipe, fittings, and accessories at the locations indicated on layout drawings and in accordance with manufacturer's instructions. Seal watertight.
  - 1. Ductile Iron: Comply with AWWA C600.
- K. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch in 10 feet.
- L. Route piping in straight, true line.
- M. Backfill trenches immediately after the pipe has been installed. Do not displace or damage pipe when compacting.
- N. Connect to municipal sewer system, through installed sleeves.

### 3.05 JOINTING

- A. Joints for Ductile Iron Pipe:
  - 1. Installation of Mechanical Joints: Comply with AWWA C600 and manufacturer's instructions.

### 3.06 INSTALLATION - VALVES

- A. Install in accordance with manufacturer's instructions.
- B. Clean valves of foreign matter prior to installation and inspect for damage. Fully open and close valves to verify parts are properly operating.
- C. Install valves with stem oriented in the vertical position.

### 3.07 THRUST RESTRAINT

- A. Thrust Restraints:
  - 1. Provide thrust restraint for plugs, caps, tees and bends deflecting 11-1/4 degrees or more, either vertically or horizontally.
  - 2. Provide thrust restraints at valves, unless otherwise securely anchored to prevent movement.
- B. Restrained Joints: Provide at ductile-iron pipe.
  - 1. Provide as indicated on layout drawings.

### 3.08 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 014000 - Quality Requirements.
  - 1. If tests indicate Work does not meet specified requirements, remove defective Work, replace and retest at no cost to Owner.
- B. Hydrostatic Tests
  - 1. Pipeline testing includes both a pressure test and a leakage test.
    - a. Testing is the responsibility of the Contractor.

2. Pressure Test:
  - a. After the pipe has been installed, joints completed, thrust restraints have been in place for at least five days, and the trench has been partially backfilled, leaving the joints exposed for examination, fill pipe with water to expel all air.
  - b. Subject pipeline to a test pressure of 150 psi or 150 percent of the working pressure, whichever is greater, for a period of at least one hour.
  - c. Open and close each valve several times during the test.
  - d. Examine exposed pipe, joints, fitting, and valves for leaks.
  - e. Stop visible leaks or replace the defective pipe, fitting, joints, or valve.
3. Leakage Test:
  - a. Conduct leakage test subsequent to, or concurrently with, the pressure test.
  - b. No other source of supply is permitted to be applied to the pump or line under test.
  - c. Pump water into line by test pump, as required, to maintain the specified test pressure as described for pressure test for a two hour period.
  - d. Exhaustion of the supply or the inability to maintain the required pressure is considered test failure.
  - e. Consult manufacturer prior to testing for special testing considerations.
4. Retesting:
  - a. If any deficiencies are revealed during any test, identify and correct deficiencies and reconduct tests and correct new deficiencies revealed until the results of the tests are within specified allowances, without additional cost to the Owner.

### 3.09 PROTECTION

- A. Water is not permitted to run or stand in trench while pipe laying is in progress, before the joints are completely set, or before trench has been backfilled.
- B. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

**END OF SECTION**





## SECTION 663720 FENDER SYSTEMS

### PART 1 - GENERAL

#### 1.01 INTRODUCTION

- A. Mississippi State Port Authority is planning the upgrade of the East Pier Wharf as indicated. This specification details the fender systems as offered by Trelleborg Marine Systems USA (or approved equal).

#### 1.02 ARRANGEMENT

- A. The proposed Type 1 fender systems shall be comprised of two elastomeric buckling type leg fenders with a steel frontal frame complete with UHMW face pads, and all related hardware including restraint chains, anchor plates, bolts, and anchor bolts suitable for mounting the fender systems onto an existing concrete face.
- B. The proposed Type 2 fender systems shall be comprised of one elastomeric buckling type cone fender with a steel frontal frame complete with UHMW face pads, and all related hardware including restraint chains, anchor plates, bolts, and anchor bolts suitable for mounting the fender systems onto an existing concrete face.
- C. The existing Type 2 fender systems to be modified shall include reuse of existing one elastomeric buckling type cone fender and steel frontal frame complete with UHMW face pads. A new steel frame mount to extend the fender line from existing and all related hardware including restraint chains, anchor plates, bolts, and anchor bolts as determined to be required to meet nominal performance requirements per the qualified fender manufacturer to mount the modified fender system onto an existing concrete face.
- D. All of the fender components must be supplied by a qualified fender manufacturer.

### PART 2 - PRODUCTS

#### 2.01 FENDER

- A. General
  - 1. The proposed fenders shall be modern buckling type elastomeric fenders capable of absorbing sufficient energy to prevent overloading of the fender and contact of the panel and/or vessel with the mounting surface.
- B. Performance
  - 1. The proposed fenders shall be capable of absorbing the design energy before reaching the design reaction at the design deflection stated below. The tolerance for performance shall be +/-10%.

2. The performance listed below is for two MV 1000 x 900B leg fenders (Type 1 Fender System) manufactured by Trelleborg Marine Systems USA or approved equal.

Reaction = 152 kips  
 Energy Absorption = 226 ft-kips  
 Deflection = 72%

3. The performance listed below is for one SCN 800 F2.4 super cone fender (Type 2 Fender System) manufactured by Trelleborg Marine Systems USA or approved equal.

Reaction = 136 kips  
 Energy Absorption = 200 ft-kips  
 Deflection = 72%

\*\*All of the fenders being supplied must be compressed to its rated deflection at least once before being shipped to the jobsite in order to break in the fenders.

C. Materials

1. The rubber for the proposed fender to be vulcanized natural or synthetic rubber or a mixture of them. The fender(s) shall be reinforced with carbon black and resistant to aging, seawater, abrasion, and ultraviolet rays. A certified test report showing compliance with the rubber properties shown in section 2.1.4 must be provided before the fenders arrive on the jobsite.
2. The rubber is to be homogenous in quality and free from foreign materials, bubbles, tears, cracks and other harmful defects.
3. The embedded fixing steel plates are to be firmly bonded into the rubber body through the process of vulcanization, and completely encapsulated so that no steel is exposed except where female bolting nuts are present.

D. Rubber Properties

	Property Tested	Test Method	Acceptance Requirements
Before Aging	Hardness	ASTM D2240 Shore A	78° Max
	Tensile Strength	ASTM D412 Die C	16 MPa Min [2320 psi]
	Ultimate Elongation		300% Min

After Aging	Change in Hardness	ASTM D573 96 hrs @ 70°C	+8° Max
	Change in Tensile Strength		-20% Max
	Change in Ultimate Elongation		-20% Max
Compression Set		ASTM D395 Method B 22 hours at 70°C	30% Max
Ozone Resistance		ASTM D1171 Method A	No Visible Cracks
Abrasion Resistance		BS 903.A9 Method B - 1000 rev	Volume Loss < 1500mm <sup>3</sup>
Tear Resistance		ASTM D624 Die B	70 kN/m [4800 lbs/ft] Min

E. Performance Verification

1. The performance of the fender is to be expressed by the value of the energy absorbed at the maximum value of the reaction load generated when the fender is compressed to its rated or maximum deflection.
2. In the performance test of the fender, compression is to be applied toward the top face of the fender. The compression speed shall follow current PIANC Fender Performance Testing guidelines and shall be recorded during testing. The fender is to be cycled for three times up to the designed deflection. Let the fender stand for at least one hour. Then, a fourth deflection cycle is to be performed using constant or decreasing velocity compression. The fourth cycle shall determine the fender performance. The room temperature at the time of the tests shall be recorded. The fenders shall achieve a performance with +/-10% of the stated nominal design performance.

F. INDEPENDENT 3<sup>RD</sup> PARTY TESTING

1. Performance tests must be conducted in the United States on 10% of the fenders delivered, with a minimum of one fender, by an independent testing agency with a minimum of five years experience testing rubber marine fenders.
2. The fenders that are to be tested will be selected at random at the jobsite by the port's representative from the full lot of fenders delivered to the port or designated delivery point. The cost of these tests shall be paid by the contractor. If any of the tested fenders fail to meet the performance

required by the project specification, then another 10% of the fenders shall be tested. If any of the second 10% fail to meet the performance requirement all of the remaining fenders shall be tested at the manufacturer’s expense. All of the fenders that fail to meet the performance required by the specification shall be rejected.

G. Sampling

1. The specimen for testing and inspection of the materials, dimensions, and performance shall be sampled as specified below. The specimen to be used for the material test shall be taken directly from the product or from the rubber prepared in the quality check and under the condition of the same vulcanization as the products.

Test Item	Number of Sampling
Break-in Cycle	All fenders
Material	1 set from the lot of compound for the manufacture of the fenders.
Dimensions	All fenders.
Performance	1 piece per 10 pieces of fender.

**2.02 PANEL**

A. Design and Construction

1. The proposed panel shall be of the close box type and be rectangular in shape. The vertical length and horizontal width of the panel shall be as called out in the project drawings. The panel shall be designed so as to limit the average hull pressure and prevent barges from sliding underneath the fender panel when fully loaded and mean low water. The panel shall be designed and constructed according to the AISC Steel Construction Manual Specifications 13<sup>th</sup> edition.
2. The panel shall be designed to include all possible loads imparted by the vessel onto the fender and shall include, but not be limited to, two line loads at the extreme top and bottom of the flat portion of the panel.
3. All welding is to be in accordance with AWS D1.1 latest edition standards. External fillet welds to be seal welds to prevent corrosion. Pressure testing shall be performed to ensure an air and water tight seal. Pressure test results must be provided to the approval engineer prior to delivery of the panels.
4. All steel shall be ASTM A36, or stronger. All bolt holes to be drilled or punched. The manufacturer is to supply current welding procedures as

well as individual welder qualifications and certifications as part of their submittal documentation.

## B. Coating

1. The proposed panel to be coated with:  

1 <sup>st</sup> Coat:	7 mils of Carboguard 890
2 <sup>nd</sup> Coat:	7 mils of Carboguard 890
3 <sup>rd</sup> Coat:	2 mils of Carbothane 134 (green)
2. Surface preparation is to be performed as per specification SSPC-SP10 with an anchor profile of 1.5 to 2.5 mills. The minimum D.F.T. of the coating is to be 16 mils nominal inspected as per SSPC-PA2.

## 2.03 HARDWARE

### A. Bolts and Fender Anchors

1. All hardware for mounting the fender to the panel and the mounting surface including bolts, nuts, and washers shall be supplied by the fender manufacturer to ensure a proper fit. All mounting hardware shall be ASTM A153 hot dipped galvanized unless specified otherwise. Any socket type hardware must have a 316 stainless steel female socket.
2. Fender bolts shall be ASTM A307 hot dipped galvanized.
3. Pad eye bolts shall be ASTM F1554, Gr 105 and shall be hot-dipped galvanized.
4. Proof Load Testing: Proof load a minimum of 1 anchor per new fender installation as directed by the Engineer and in accordance with ACI 355.4. Proof loading will be done by a Third Party testing agency that is approved by the Engineer. Proof testing will consist of a tensile pull on the anchor to a level of 200% of the design load. The test loads shall be provided during construction by the Fender Manufacturer.

### B. Chains

1. The proposed chain system shall prevent excessive shear and weight-induced deflection of the fender. All hardware such as shackles and tensioners required for attaching the chains are to be included and supplied by fender manufacturer. All items to be hot dipped galvanized. All chains are mandatory and must be included in the design. All chain calculations shall include a minimum factor of safety of at least 3.

- a. Weight Chains: Sizing calculations for the weight chains are to include the shearing force from friction as well as the weight of the panel and one-half the weight of the proposed fenders.
- b. Tension Chains: Tension chains shall be sized considering a low impact on the panel resulting in at least 90% of the rated reaction of the fender transferred to the tension chain assembly.
- c. Shear Chains: The chains and related hardware are to be sized considering the maximum possible shearing and tension forces on the fender. Shearing forces on the panel shall be calculated from the maximum reaction of the fender and a coefficient of friction of 0.20 for the UHMW face pads.

C. Anchorage for Chains

1. All anchor pad eyes for attaching the proposed chains to mounting surface are to be included and supplied by the fender manufacturer. All pad eyes and mounting hardware to be hot dipped galvanized.

## 2.04 Face Pads

- A. UHMW face pads shall be made of 100% virgin material and cover the face of the panel including the faces of the bevels. The pads shall be a minimum of 1.5" thick and black in color. The proposed UHMW must be UV stabilized. UHMW materials must meet the following minimum standards.
  1. Properties

Property	Test Method	SI Unit	SI Value	English Unit	English Value
Density	ASTM D-792	km/m <sup>3</sup>	930	lbs/ft <sup>3</sup>	58.01
Molecular Weight	Viscosimetric	g/mol	4,200,000	g/mol	4,200,000
Yield Strength	ASTM D-638	MPa	21	psi	3050
Ultimate Strength	ASTM D-638	MPa	40	psi	5800
Elongation at Break	ASTM D-638	%	250	%	250
Hardness	ASTM D-2240	Type D	68	Type D	68
IZOD Impact Strength	ASTM D-4020	kJ/m <sup>2</sup>	70	ft-lbs/in <sup>2</sup>	34
Tensile Impact	DIN 53448	kJ/m <sup>2</sup>	2200	ft-lbs/in <sup>2</sup>	1050
Sand Wheel Wear	ASTM G-65	AR-01 Steel=10 0	90	AR-01 Steel=100	90
Static Friction	ASTM D-1894	Unitless	0.15	Unitless	0.15
Dynamic Friction	ASTM D-184	Unitless	0.12	Unitless	0.12
Coefficient of Thermal Exp.	ASTM D-696	°C <sup>-1</sup>	0.0002	°F <sup>-1</sup>	0.00011
Melting Point	ASTM D-3417	°C	137-143	°F	278-289
Water Absorption	ASTM D-570	%	nil	%	nil

2. UHMW Installation: The pads shall be drilled and counter bored for the studs or mounting bolts. The counter bored hole shall leave a minimum of ½" of material between the panel and the washer. The wear surface shall be a minimum of ½". All mounting studs (or bolts) shall be a minimum of 5/8" in diameter. All studs, bolts, washers and nuts shall be 316 stainless steel. All exposed edges of the UHMW shall include ¾" X ¾" chamfers.

### PART 3 - EXECUTION

#### 3.01 Schedule

- A. A schedule for delivery of all items included in the fender systems shall be included with the bid proposal. Bids must including shipping all the way to the jobsite.

#### 3.02 Packaging

- A. The rubber fenders shall be packaged prior to delivering to the port so as to prevent damage to the fenders. The fender manufacturer shall install the UHMW onto the steel panel prior to delivery. All chains and hardware shall be packaged for shipment to the customer.
- B. Packaging and delivery procedures must be included in the submittal package.

## PART 4 - SUBMITTALS

- A. Bid: Items to be included with the bid proposal shall include at a minimum the following items:
1. A general arrangement drawing of the proposed fender.
  2. Catalog data sheets for the proposed fender.
  3. Catalog data sheets for the proposed paint system
  4. Price for supply of the fender systems including all items required to complete and mount the system including all crating and shipping to jobsite
  5. Product liability insurance certificate for the vendor with a minimum of \$2 million total coverage and \$1 million coverage per incident including design errors or omissions.
  6. Five reference letters from US clients with contact information.
  7. A list of 10 completed projects with the same or similar fender type installed for more than 5 years.
- B. Project: Items to be provided upon award of the project shall include at a minimum the following items:
1. Final revisions of all drawings submitted for bid proposal.
  2. Detailed construction drawings for the steel panel.
  3. Calculations justifying the proposed design for the steel panel and chains.
  4. Welding procedures and individual qualifications and certifications.
  5. UHMW material data sheet
  6. Fender performance curves and material specifications.
  7. Packing and delivery procedures.
- C. Delivery: Items to be provided before delivery of the fender systems shall include at a minimum the following items:
1. Pressure test report as required in section 2.2 of this specification.
  2. Test certificates for the rubber material properties as required in section 2.1.4 of this specification.
  3. Test certificates for the performance testing of the rubber fenders per section 2.1.5 and 2.1.6.
  4. Detailed installation and handling procedures for the supplied fender system.
- D. Manufacturer: The fender system to be of the type as manufactured and supplied by or approved equal;
- Trelleborg Marine Systems USA  
1186 Petroleum Prkwy  
Broussard, LA 70518
- Ph. 337-321-4240



Fax 337-321-4241  
E-mail [sales@maritime-international.com](mailto:sales@maritime-international.com)

Appendix A: Acceptable Fender Performance Testing Agencies

1. Trelleborg Marine Systems USA  
1186 Petroleum Pkwy  
Broussard, LA 70518  
337-321-4240  
Contact: Donald Nassar
  
2. University of Washington  
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**END OF SECTION**