CONSTRUCTION SPECIFICATIONS
AND
CONTRACT DOCUMENTS

FOR

WASTEWATER LIFT STATION TELEMETRY SYSTEM

ST. JOHN THE BAPTIST PARISH DEPARTMENT OF PUBLIC WORKS

PUBLIC WORKS PROJECT NO. 3711-41930

NOVEMBER 2014
ISSUE FOR BID

Prepared By:

Burk-Kleinpeter, Inc.
Engineers, Architects, Planners, Environmental Scientists
4176 Canal St., New Orleans , Louisiana

BKI NO.13.060

SET NO. _____

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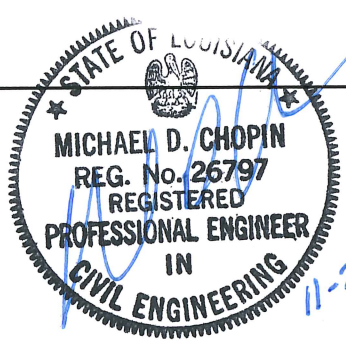

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ADVERTISEMENT FOR BIDS
ST. JOHN the BAPTIST PARISH

Sealed bids will be received by the **Parish of St. John the Baptist** (herein referred to as "Owner") for the construction of the project described as follows:

WASTEWATER LIFT STATION TELEMETRY SYSTEM FOR ST. JOHN THE BAPTIST PARISH

Proposals shall be addressed to the **St. John the Baptist Parish Purchasing & Procurement Department**, and delivered to the Office of **St. John the Baptist Parish Purchasing & Procurement Department, Parish President's reception desk** located at 1801 W. Airline Hwy., LaPlace LA 70068 not later than 2:45 p.m., on the 20th day of January, 2015. Thereafter sealed bids will be publicly opened and read aloud at 3:00 p.m. in **St. John the Baptist Joel S McTopy Council Chambers**, 1801 W. Airline Hwy., LaPlace LA 70068. Bids must be submitted on the proper form. Each bid shall be enclosed in a sealed envelope showing the **name, address, and license number of the bidder** and **clearly marked "Sealed Bid - Wastewater Lift Station Telemetry System for St. John the Baptist Parish"**. Any bid received after the specified time and date will not be considered. Vendors may submit electronic bids with no fee for submission by using **Central Bidding,** www.centralbidding.com.

The Bidding Documents (including construction drawings and specifications) may be examined at the Owner's office located at 1801 W. Airline Hwy., LaPlace LA 70068. Bidding documents will be available electronically at **Central Bidding,** www.centralbidding.com. The Bid Documents may also be viewed at the St. John the Baptist Parish website, www.sjbparish.com. Prime Bidders with a valid LA. Contractor's License must obtain copies of the Bidding Documents from the Owner at 1801 W. Airline Highway free of charge.

Bidders are invited to attend a Pre-bid meeting to be held at 1801 W. Airline Hwy., LaPlace LA 70068 on the 8th day of January, 2015 at 2:00 P.M. Attendance is not mandatory.

The Owner reserves the right to reject any and all bids for just cause. Such actions shall be in accordance with Louisiana R.S. 38:2214.

St. John the Baptist Parish Council, being a government agency, is exempt from all sales tax. The vendor awarded the contract will be provided documentation to support their tax free purchases for this project. **Therefore, the amount that you bid should contain no sales tax**.

The Owner requires that each bidder attach to his bid a certified check, cashier's check, or bid bond equivalent to 5% of the total bid as evidence of good faith of the bidder. Sureties used for obtaining bonds must appear as acceptable on the U. S. Department of the Treasury' Circular 570.

No bidder may withdraw his/her bid within forty-five (45) days after the actual date of the opening thereof except as provided by law.

The Attention of Bidders is called particularly to the requirements for conditions of employment to be observed and minimum wage rates to be paid under the Contract, Section 3, Segregated Facilities, Section 109, Executive Order 11246, and all applicable laws and regulations of the Federal government and State of Louisiana and bonding and insurance requirements.

Any person with disabilities requiring special accommodations must contact the **Parish of St. John the Baptist, (985) 652-9569,** no later than seven (7) days prior to bid opening.

Publish:

December 17, 2014
December 24, 2014
December 31, 2014

INFORMATION FOR BIDDERS

1. Receipt and Opening of Bids: The **Parish of St. John the Baptist** (herein called the "Owner"), invites bids on the form attached hereto. All blanks must be appropriately filled in. Bids will be received by the Owner at the office of **St. John the Baptist Parish Purchasing & Procurement Department, reception desk** until 2:45 p.m. CST, the 20h day of January, 2015, and then publicly opened and read aloud 3:00 p.m. in **St. John the Baptist Joel S. McTopy Council Chambers.** The envelopes containing the bids must be sealed, addressed to **St. John the Baptist Parish Purchasing & Procurement Department** and clearly marked **"Sealed bid Wastewater Lift Station Telemetry System for St. John the Baptist Parish."**

   The Owner may reject any and all bids for just cause; such actions will be in accordance with Title 38 of the Louisiana Revised Statutes. 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 forty-five (45) calendar days after the actual date of the opening thereof except as provided by law.

2. Preparation of Bid: Each bid must be submitted on the prescribed form. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures.

   Each bid must be submitted in a sealed envelope bearing on the outside the bidder's name and address, and clearly marked "Sealed bid Wastewater Lift Station Telemetry System for St. John the Baptist Parish." If forwarded by mail, the sealed envelope containing the bid must be enclosed in another envelope addressed as specified in the bid form.

   Vendors may submit electronic bids with no fee for submission by using Central Bidding, www.centralbidding.com. Vendors may contact St. John the Baptist Parish Purchasing Department for further information regarding Central Bidding.

3. Subcontractors: The bidder is specifically advised that any person for or other party to whom it is proposed to award a subcontract under this contract must be acceptable to the Owner.

4. Method of Bidding: The Owner invites the following bid(s):
   Wastewater Lift Station Telemetry System for St. John the Baptist Parish.

7. Prices: In the event of a discrepancy between the prices quoted in words and those quoted in figures in the bid, the words shall control. The prices are to include the

furnishing of all materials, plant, equipment, tools, and all other facilities, and the performance of all labor and services necessary or proper for the completion of the work except as may be otherwise expressly provided in the contract documents.

8. Qualifications of Bidder: The Owner may make such investigations deemed necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is responsible and is properly qualified to carry out the obligations of the contract and complete the work contemplated therein. Any conditions placed on a submitted bid shall result in rejection of such bid.

9. Bid Security: Each bid must be accompanied by cashier's check, certified check of the bidder, or a bid bond, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5 percent of the bid. Such cashier's check, certified checks or bid bonds will be returned to all except the three lowest bidders within three days after the opening of bids, and the remaining cashier's checks, certified checks or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the contract, or, if no award has been made within 60 calendar days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid.

10. Liquidated Damages for Failure to Enter into Contract: The successful bidder, upon his failure or refusal to execute and deliver the contract and bonds within 10 days after he receives notice of the acceptance of his bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his bid.

11. Time of Completion and Liquidated Damages: Bidder must agree to fully complete the project within 270 consecutive calendar days. Thereafter Bidder must agree to pay as liquidated damages the sum of $500 for each consecutive calendar day thereafter until acceptance as hereinafter provided.

12. Conditions of Work: Each bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his obligation to furnish all materials and labor necessary to carry out the provisions of his contract. Insofar as possible the contractor, in carrying out the work, must employ such methods or means as will not cause any interruption of or interference with the work of any other contractor.

13. Addenda and Interpretations: No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally.

Every request for such interpretation should be in writing addressed to Burk-Kleinpeter, Inc., at 4176 Canal St., New Orleans LA 70119 and to be given consideration must be received at least seven (7) days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by certified mail with return receipt requested to all prospective bidders (at the respective addresses furnished for such purposes), not later than three (3) days prior to the date fixed for the opening of bids.

Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the contract documents.

14. Security for Faithful Performance: Simultaneously with his delivery of the executed contract, the successful bidder shall furnish a surety bond or bonds as security for faithful performance of this contract and for the payment of all persons performing labor on the project under this contract and furnishing materials in connection with this contract. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner. Only those surety companies currently on the U. S. Department of Treasury Financial Management Services list (Circular 570) of approved bonding companies will be accepted. The agent selling the bond must be currently licensed to do business in Louisiana. This will be verified by the Owner.

    The successful bidder will be required to file a performance bond in the amount (100-percent) of the contract price for the full period of the contract and a payment bond in the amount (100-percent) of the contract price for the full period of the contract.

15. Power of Attorney: Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

16. Laws and Regulations: The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances and rules and regulations of authorities having jurisdiction over construction of the project shall apply to the contract throughout, and will be deemed to be included in the contract the same as written herein in full.

17. Method of Award: The contract, if awarded, will be awarded to the lowest responsible bidder.

18. Obligation of Bidder: At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and contract documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation with respect to his bid.

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BID BOND FORMS

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____ as Principal, and _____ _____, as Surety, are hereby held and firmly bound into _____ _____, as owner in the penal sum of _____ for which, well and truly to be made, hereby jointly and severally bind ourselves, our heirs, executives, administrators, successors and assigns.

Signed, this _____ day of _____, 20____.

The condition of the above obligation is such that whereas the Principal has submitted to _____ _____, a certain Bid, attached hereto and hereby made a part hereof, to enter into a contract in writing, for the _____ _____.

NOW, THEREFORE,

(a) If said Bid shall be rejected, or in the alternate,

(b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his/her faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said Bid,

Then this obligation shall be void, otherwise the same shall remain in force and effect, it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees, that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of time within which the Owner may accept such Bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed these presents to be signed by their proper officers, the day and year first set forth herein above.

Principal: _____ (L.S.)

Surety: _____

SEAL

By: _____

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the Secretary of the Corporation named as Principal in the within bond; that _____, who signed the said bond on behalf of the Principal was then _____ of said corporation; that I know his/her signature, and his/her signature thereto is genuine; and that said bond was duly signed, sealed, and attested to, for, and on behalf of said corporation by authority of this governing body.

Signature: _____

Title: _____

(Corporate Seal)

CERTIFICATE AS TO SURETY

I, _____, certify that I am the _____(Title)_____ of the Surety who signed the bond. I certify that we are licensed to do business in the State of Louisiana and are currently recognized by the U. S. Department of the Treasury as acceptable sureties.

Signature: _____

Title: _____

Power of Attorney for person signing for surety company must be attached to bond.

LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: **St. John the Baptist Parish**
1801 W. Airline Hwy.
LaPlace, LA 70068
(Owner to provide name and address of owner)

BID FOR: Wastewater Lift Station Telemetry System
For St. John the Baptist Parish

(*Owner to provide name of project and other identifying information)*

The undersigned bidder hereby declares and represents that she/he; a) has carefully examined and understands the Bidding Documents, b) has not received, relied on, or based his bid on any verbal instructions contrary to the Bidding Documents or any addenda, c) has personally inspected and is familiar with the project site, and hereby proposes to provide all labor, materials, tools, appliances and facilities as required to perform, in a workmanlike manner, all work and services for the construction and completion of the referenced project, all in strict accordance with the Bidding Documents prepared by: **Burk-Kleinpeter, Inc., 4176 Canal St., New Orleans, LA 70119** dated: November 21, 2014

Bidders must acknowledge all addenda. The Bidder acknowledges receipt of the following **ADDENDA:** (Enter the number the Designer has assigned to each of the addenda that the Bidder is acknowledging) _____ .

TOTAL BASE BID: For all work required by the Bidding Documents (including any and all unit prices designated "Base Bid" * but not alternates) including Lift Stations identified as Base Bid on sheet E2.0 for the lump sum of:

_____ Dollars ($ _____)

ALTERNATES: For any and all work required by the Bidding Documents for Alternates including any and all unit prices designated as alternates in the unit price description.

Alternate No. 1 Lift Stations identified as Alternate No. 1 on sheet E2.0 for the lump sum of:

_____ Dollars ($ _____)

Alternate No. 2 Lift Stations identified as Alternate No. 2 on sheet E2.0 for the lump sum of:

_____ Dollars ($ _____)

Alternate No. 3 Lift Stations identified as Alternate No. 3 on sheet E2.0 for the lump sum of:

_____ Dollars ($_____)

NAME OF BIDDER: _____

ADDRESS OF BIDDER: _____

_____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER **: _____

DATE: _____

* The Unit Price Form shall be used if the contract includes unit prices. Otherwise it is not required and need not be included with the form. The number of unit prices that may be included is not limited and additional sheets may be included if needed.

** If someone other than a corporate officer signs for the Bidder/Contractor, a copy of a corporate resolution or other signature authorization shall be required for submission of bid. Failure to include a copy of the appropriate signature authorization, if required, may result in the rejection of the bid unless bidder has complied with La. R.S. 38:2212(A)(1)(c) or RS 38:2212(O) .

BID SECURITY in the form of a bid bond, certified check or cashier's check as prescribed by LA RS 38:2218.A is attached to and made a part of this bid.

IMPORTANT NOTICE TO ALL BIDDERS – BID REQUIREMENTS

Vendors may submit electronic bids with no fee for submission by using Central Bidding, www.centralbidding.com. Vendors may contact St. John the Baptist Parish Purchasing Department for further information regarding Central Bidding.

By submitting a bid, vendor agrees to comply with all provisions of Louisiana Law as well as compliance with the St. John the Baptist Parish Code of Ordinances, Louisiana Code of Ethics, as published on http://ethics.la.gov and applicable St. John the Baptist Parish ethical standards.

As per LA R.S. 38:2212(A)(3)(c)(ii), the bid form shall contain Bid Security or Bid Bond, Acknowledgment of Addenda, Base Bid, Alternates, Signature of Bidder, Name, Title and Address of Bidder, Name of Firm or Joint Venture Corporate Resolution or other appropriate signature authorization, if required, Louisiana Contractors License Number, and on public works projects where unit prices are utilized, a section on the bid form where the unit price utilized in the bid shall be set forth; however, unit prices shall not be utilized for the construction of building projects, unless the unit price is incorporated into the base bid. Other documentation required shall be furnished by the low bidder within ten calendar days after the bid opening. Such documentation shall be supplied as originals (no copies).

All such required information or documentation not provided with the bid must be provided by the low bidder within 10 calendar days after the bid opening (originals only, no copies). Failure to provide said information and documentation within 10 calendar days after bid opening shall be grounds to declare the bid non-responsive. This information and documentation includes, but is not limited to, the non-collusion affidavit, campaign contribution affidavit, non-conviction affidavit, employment verification affidavit, current W-9 Form and Tax Identification number (if currently not registered as a Parish vendor), and proof of insurance. However, the payment and performance bond must be supplied upon contract signing.

Contractor's Louisiana License shall be in the following category (to be determined and filled in by the department): Prime Electrical, General Contracting.

Bidder agrees that this bid shall be good and may not be withdrawn for a period of forty-five (45) calendar days after the scheduled closing time for receiving bids. In the event the OWNER issues the Letter of Award during this period, the bid accepted shall continue to remain binding until the execution of the Contract. The OWNER shall execute a contract within sixty (60) calendar days of award. A Notice to Proceed shall be issued within thirty (30) calendar days of execution of contract.

Attached hereto are affidavits which must be provided by the low bidder as originals (not copies) within ten (10) calendar days after bid opening. All affidavits must be completed, signed and notarized. Failure to do so will cause bid to be rejected.

Low Bidder will execute the formal agreement within sixty (60) calendar days after the original date of OWNER's Notification of award and will deliver a Performance Bond or Bonds for the faithful performance of the Contract.

Bid Security, in the sum of five percent (5%) of the total bid price (Base Bid and any Alternates), is to become the property of the OWNER in the event the information or documentation required within 10 calendar days after opening are not supplied, or if the

Contract and Performance Bond are not executed within the time above set forth. If submitting a bid online, vendors must submit bond through respective online clearinghouse bond management system as indicated in Central Bidding.
Further, upon receiving a notice to proceed, the Bidder agrees that all work shall be completed as follows (to be determined and filled in by the department): In compliance with the Contract Documents within 270 calendar days from the issue date of the Notice to Proceed.

Further, as per Resolutions 113646 and 113647, the Bidder agrees to pay, as liquidated damages, the sum of (to be determined and filled in by the department): $500.00 as follows for: (1) each consecutive calendar day after the agreed date of completion that the work remains substantially incomplete, or (2) each consecutive calendar day after substantial completion that the work has not been finally completed.

In addition to and not in lieu of the per diem liquidated damages, OWNER shall also be entitled to recover from Contractor or Contractor's Surety additional liquidated damages as detailed in Resolutions 113646 and 113647. These additional liquidated damages may include, but are not limited to the following, in the amounts and for each of the items identified in the Supplementary Conditions (to be determined and filled in by the department):

(1) Extended architectural and/or engineering fees $260/day;
(2) Extended Resident Project Representative fees $300/day;
(3) Extended construction management fees $_____;
(4) Extended OWNER's overhead and personnel expenses $_____; and
(5) OWNER's other costs directly related to the delay in completion beyond the Contract Times.

In addition to liquidated damages, in accordance with Section 6.02, "Labor; Working Hours," whenever Contractor's work requires inspections in excess of the budgeted amount for inspection, Contractor shall reimburse OWNER for the additional costs incurred by the OWNER with respect to inspection of the contracted project provided the additional costs for inspections are above the budgeted amount for the contracted project.

For this project, the Project Representative Services, in accordance with the terms of the Engineer's agreement with the OWNER, provides that the average hourly rate to be charged for resident inspection for this construction project is $75.00 and the reasonable budget for such inspections is $19,500 (the overtime rates shall be $112.5 per hour). The cost of inspection in excess of this budgeted amount shall be assessed against Contractor's progress payments, all in accordance with LSA R.S. 38:2216(L)(2).

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that _____ (Name of Contractor) _____ (Address of Contractor) a _____ (Corporation, Partnership, or Individual), hereinafter called Principal, and _____ (Name of Surety) _____ (Address of Surety) hereinafter called Surety, are held and firmly bound unto _____ (Name of Owner) _____ (Address of Owner) hereinafter called Owner, in the penal sum of _____ Dollars, $(_____)

in lawful money of the United States for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20_____, a copy of which is hereto attached and made a part hereof for the construction of:

_____

_____

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety and during the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the Work to be performed thereunder or the Specifications accompanying the same shall in any wise affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the Work or to the Specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ (Number) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20_____.

ATTEST:

_____ (PRINCIPAL) SECRETARY

(SEAL)

_____ PRINCIPAL (BIDDER)

By:_____ AUTHORIZED OFFICER-OWNER-PARTNER

_____

_____ WITNESS AS TO PRINCIPAL

_____ ADDRESS

ATTEST:

_____ SURETY

By: _____(SEAL) ATTORNEY-IN-FACT

_____ WITNESS AS TO SURETY

_____ TYPED OR PRINTED NAME

COUNTERSIGNATURE

I certify that I am, as of the date of this Bond, contracted with the surety company or bond issuer as an agent of the company or issuer as a licensed agent in the State of Louisiana in good standing with the Louisiana Insurance Commission.

By: _____

_____ TYPED OR PRINTED NAME

_____ NAME OF AGENCY

_____ AGENT LICENSE NUMBER

_____

_____ ADDRESS

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is Partnership, all partners should execute bond.

IMPORTANT: Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the project is located.

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the Secretary of the Corporation named as Principal in the within bond; that _____who signed the said bond on behalf of the Principal was then _____ _____of said corporation; that I know his/her signature, and his/her signature thereto is genuine; and that said bond was duly signed, sealed, and attested to on behalf of said corporation by authority of this governing body.

Signature : _____

Title: _____

(Corporate Seal)

CERTIFICATE AS TO SURETY

I, _____, certify that I am the _____(Title)_____of the Surety who signed the bond. I certify that we are licensed to do business in the State of Louisiana and are currently recognized by the U. S. Department of the Treasury as acceptable sureties.

Signature: _____

Title: _____

Power of Attorney for person signing for surety company must be attached to bond.

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that _____ (Name of Contractor) _____ (Address of Contractor a _____ (Corporation, Partnership, or Individual), hereinafter called Principal, and _____ (Name of Surety) _____ (Address of Surety) hereinafter called Surety, are held and firmly bound unto _____ (Name of Owner) _____ (Address of Owner) hereinafter called Owner, in the penal sum of _____ Dollars, $(_____) in lawful money of the United States for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the Owner, dated the _____ day of _____, 20_____, a copy of which is hereto attached and made a part hereof for the construction of:

_____

_____

NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, Subcontractors, and corporations furnishing materials for or performing labor in the prosecution of the Work provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such Work, and all insurance premiums on said Work, and for all labor, performed in such Work whether by Subcontractor or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the Work to be performed thereunder or the Specifications accompanying the same shall in any wise affect its obligation on this Bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the Work or to the Specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Contractor shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in _____ (Number) counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20_____.

ATTEST:

_____
(PRINCIPAL) SECRETARY

(SEAL)

PRINCIPAL (BIDDER)

By:
_____
AUTHORIZED OFFICER-OWNER-PARTNER

_____

_____
WITNESS AS TO PRINCIPAL

_____
ADDRESS

_____

_____

ATTEST:

_____
SURETY

By: _____(SEAL)
ATTORNEY-IN-FACT

_____
WITNESS AS TO SURETY

_____
TYPED OR PRINTED NAME

COUNTERSIGNATURE

I certify that I am, as of the date of this Bond, contracted with the surety company or bond issuer as an agent of the company or issuer as a licensed agent in the State of Louisiana in good standing with the Louisiana Insurance Commission.

_____
NAME OF AGENCY

By:
_____

_____
TYPED OR PRINTED NAME

_____

_____
ADDRESS

_____
AGENT LICENSE NUMBER

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is Partnership, all partners should execute Bond.

IMPORTANT: Surety companies executing Bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the State where the project is located.

CERTIFICATE AS TO CORPORATE PRINCIPAL

I, _____, certify that I am the Secretary of the Corporation named as Principal in the within bond; that _____who signed the said bond on behalf of the Principal was then _____ _____of said corporation; that I know his/her signature, and his/her signature thereto is genuine; and that said bond was duly signed, sealed, and attested to on behalf of said corporation by authority of this governing body.

Signature : _____

Title: _____

(Corporate Seal)

CERTIFICATE AS TO SURETY

I, _____, certify that I am the _____(Title)_____of the Surety who signed the bond. I certify that we are licensed to do business in the State of Louisiana and are currently recognized by the U. S. Department of the Treasury as acceptable sureties.

Signature: _____

Title: _____

Power of Attorney for person signing for surety company must be attached to bond.

CONTRACT

THIS AGREEMENT, made this _____ day of _____, 20 ____, by and between **St. John the Baptist Parsh, LA**,
(Corporate Name of Owner)

herein called "Owner," acting herein through its _____

_____
, and
(Title of Authorized Official)

_____ a corporation, a partnership, an

individual doing business as _____
(Strike Out Inapplicable Terms)

of _____, Parish of _____, and State of _____
_____,

hereinafter called "Contractor."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the construction described as follows:

hereinafter called the project, for the sum of _____ Dollars ($_ _____) and all extra work in connection therewith, under the terms as stated in the General and Special Conditions of the contract; and at his/her (its/their) own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the General conditions and Supplemental General Conditions and Special Conditions _____ _____ prints, and other drawings and printed or written explanatory matter thereof, the specifications and contract documents therefore as prepared by _____ _____, herein entitled the Architect/ Engineer, and as enumerated in Paragraph 1

of the Supplemental General Conditions, all of which are made a part hereof and collectively evidence and constitute the contract.

The Contractor hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" of the Owner to fully complete the project within _consecutive calendar days thereafter. The Contractor further agrees to pay, as Liquidated Damages, the sum of $_____ for each consecutive calendar day thereafter as hereinafter provided for herein.

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the contract, subject to additions and deductions, as provided in "Payment to Contractor," of the General Conditions.

IN WITNESS WHEREOF, the parties to these present have executed this contract in six (6) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

(Seal)
ATTEST:

_____
(Owner)

By _____
(Secretary)

_____
(Witness) (Title)

(Seal)

_____
(Contractor)

By _____
(Secretary)

_____
(Witness) (Title)

_____
(Address and Zip Code)

NOTE: Secretary of the Owner should attest. If Contractor is a corporation, Secretary should attest.

AFFIDAVIT

STATE OF LOUISIANA
St. JOHN the BAPTIST PARISH

BEFORE ME, the undersigned authority, personally came and appeared _____who after being by me duly sworn, deposed and said that he is the fully authorized_____ of _____ (hereinafter referred to as bidder) the party who submitted a bid for_____

_____

which bid was received by the St. John the Baptist Parish on _____ ___and said affiant further said:

(1) That bidder employed no person, corporation, firm, association, or other organization, either directly or indirectly, to secure the public contract under which he received payment, other than persons regularly employed by the bidder whose services in connection with the construction of the public building or project or in securing the public contract were in the regular course of their duties for bidder; and

(2) That no part of the contract price received by bidder was paid or will be paid to any person, corporation, firm, association, or other organization for soliciting the contract, other than the payment of their normal compensation to persons regularly employed by the bidder whose services in connection with the construction of the public building or project were in the regular course of their duties for bidder.

(3) Said bid is genuine and the bidder has not colluded, conspired or agreed directly or indirectly with any other bidder to offer a sham or collusive bid.

(4) Said bidder has not in any manner directly or indirectly agreed with any other person to fix the bid price of affiant or any other bidder, or to fix any overhead profit or cost element of said bid price, or that of any other bidder, or to induce any other person to refrain from bidding.

(5) Said bid is not intended to secure an unfair advantage of benefit from the Parish of Jefferson or in favor of any person interested in the proposed contract.

(6) All statements contained in said bid are true and correct.

(7) Neither affiant nor any member of his company has divulged information regarding said bid or any data relative thereto to any other person, firm or corporation.

SWORN TO AND SUBSCRIBED
BEFORE ME THIS _____
DAY OF _____, 20_____

Signed: _____

_____
Title

_____
NOTARY PUBLIC

SECTION 01 10 99

MISCELLANEOUS REQUIREMENTS

1.0 GENERAL

1.01 DIVISIONS AND SECTIONS

A. Separation of these specifications into Divisions and Sections is done for convenience only and is not intended to establish responsibilities of work, nor shall it operate to make the Owner's Representative arbiter to establish limits to the Contracts between Contractor and Subcontractors.

B. Bidding and Contract Requirements

1. The Contractor, by execution of the subject documents agrees to comply with all applicable contract conditions.

1.02 NOT IN CONTRACT

A. Items indicated on drawings as "NIC", or noted "Not in Contract", are shown for convenience only and are not a part of this Contract.

1.03 ACCEPTANCE

A. Signing of the Contract will be deemed evidence that site and documents have been examined and that the Contractor is familiar with conditions under which the work will be done.

B. The Contractor shall verify measurements at site and accept responsibility for accuracy of same. The beginning of work indicates acceptance of conditions under which the work will be done.

C. Extra payments will not be authorized for work that could have been determined by a careful examination of site conditions and coordination with the Contract Documents.

1.04 FACILITATING OVERHEAD UTILITIES

A. The Contractor shall examine the site in detail in conformance with other requirements of these specifications. All overhead utilities are not shown on the drawings but are to be noted by the Contractor prior to submission of a bid.

Contractor accepts responsibility for execution of the contract duties by submission of his bid.

B. The responsibility of the Contractor includes facilitating overhead lines throughout the completion of the project and assuming all costs for coordinating, de-energizing, re-energizing, temporarily relocating, permanently relocating, or using special construction methods to complete the work as indicated.

1.05 INTERFERENCES

A. Drawings are generally diagrammatic. Contractor shall organize or coordinate his work with that of the different trades so that interferences of different equipment, piping, etc., shall be avoided and each piece of equipment, piping, etc., installed to function properly.

B. In the case where an interference develops, the Engineer is to be consulted to determine which equipment, piping, etc., is to be relocated regardless of which item was first installed.

1.06 PERMITS

A. The Contractor shall obtain and pay for all required permits and inspection certificates.

B. The Contractor shall be responsible for obtaining all permits necessary for the construction of the project including but not limited to St. John the Baptist Parish Building Permits, etc. The contractor shall pay all fees associated with obtaining any permits.

C. Before commencing any work on the job-site, the Contractor shall obtain a general building permit and all permits, licenses and inspections required for all various trades.

D. The Contractor shall include verification of a building permit to the Owner's Representative with the first partial payment request.

E. Owner will obtain approval of the State Fire Marshal if required. Contractor shall cooperate during any Fire Marshal Inspection.

1.07 NOTICE TO PROCEED

A. After notification from the Owner that the Contractor has signed the construction contract and submitted all necessary bonds, etc., the Owner's Representative shall send the Contractor a written "Notice to Proceed". The Engineer will issue the Owner's Notice to Proceed directing the Contractor to start work within ten (10)

days after the date of the Notice to Proceed. The Full Notice to Proceed will not be issued prior to submittal and approval of the Contractor's Construction Progress Schedule. The contract time shall commence with the issuance of the Full Notice to Proceed. The Full Notice to Proceed shall include the following information.:

1. Number of calendar days in the construction contract.

2. Date of the beginning and end of the contract time.

3. Liquidated damages.

4. A statement indicating the Owner's intention to collect liquidated damages if the Contractor exceeds the contract time and any approved extensions.

1.08 JOBSITE MAINTENANCE

A. Keep areas within and about working and storing spaces free from trash, debris, garbage, etc.

B. Throughout the construction period, dirt and dust accumulated in the working, storing and access roadway areas shall be kept to a minimum.

1.09 PERSONNEL AND EQUIPMENT

A. Maintain a construction force at site, including competent, qualified superintendent, mechanics, craftsmen and laborers, sufficient to expedite work to completion on date indicated in Contract Documents.

B. Maintain construction equipment at site, in good condition, sufficient for efficient execution of work.

C. A responsible member of Contractor's organization shall be kept on site while work is in progress as herein specified. All communications given to the Superintendent, or his assistant in his absence, shall be as binding as if given to the Contractor.

1.10 LOCATION

A. Datum shall be assumed as shown on the Contract Documents. Use established bench marks on the site.

B. The Contractor shall lay out all pavement, curbs, new construction and floor elevation from the Contract Documents, and he shall furnish and put in all stakes

and batter boards as may be deemed necessary. Contractor shall be solely responsible for all grades, lines and levels.

1.11 OBSTRUCTION TO CONSTRUCTION

A. The Contractor shall anticipate and remove all subsurface as well as above surface obstructions to construction of his work, unless information on subsurface obstructions is not available.

B. General Contractor shall not commence foundation work in areas where existing underground utilities interfere with new construction, until the locations and extent of all existing underground utilities are established and removed, rerouted or abandoned.

1. Contractor shall refer to mechanical and electrical drawings for sequence of work and coordinate his work with his subcontractors.

2. Contractor shall notify the utility companies and/or the Using Agency to remove, re-route or abandon lines which are in or near the line of excavation.

3. Contractor shall notify the Respective Owner well in advance of any work in order to coordinate "tie-ins" and disruption of any services.

1.12 DEMANDS AND CAUSES OF ACTION

A. Contractor shall defend, indemnify, and hold harmless Owner and Engineer and their agents, employees, related and companion corporations (collectively referred to as Owner and Engineer) from and against any and all claims, demands, and personal injury, wrongful death, or property damage, in any way arising out of or resulting from, directly or indirectly, errors, omissions, or negligence related to the work performed by the Contractor or any of his subcontractors, suppliers, agents, or any party under the contract, including all damages, losses, expenses, attorneys' fees and costs.

B. These defense and indemnification obligations are due regardless of whether or not the claims, demands, or causes of action result from the Owner's and/or Engineer's sole, joint, concurrent, or partial negligence, strict liability, fault, or breach of any contract, statute, or law. The parties to this contract also agree that the indemnitor(s) shall reimburse the indemnitee(s) for any and all attorneys' fees, costs, and other expenses associated with the enforcement of this or any other provision in the contract.

1.13 EXISTING UNDERGROUND UTILITIES

A. The Contractor shall verify the location of all existing off site underground utilities which he is to relocate or to which he is to connect his work.

B. Interruption of Services

1. It is essential that all utilities be kept in operation at all times, except when specific written permission of the Owner is given to the contrary. Before any lines are shutdown for tie-ins or rearranging of services, arrangements shall be made a minimum of 48 hours in advance with the Owner. It may be necessary to do this work at night, on Sunday or at a special time of the year, as the Owner may direct, with the length of shutdown agreed upon before work is begun. Any overtime work costs in this connection shall be borne by the Contractor. Normally, only one shutdown will be allowed. The length of shutdown shall be held to a minimum.

C. Protection of Existing Underground Utilities

1. The contractor is responsible for thorough protection of existing underground utilities within the limits of work. Where utilities are to be encountered, only hand digging shall be allowed. Any damage must be immediately repaired to restore service to the Owner including work at night and weekends.

1.14 WATCHMAN

A. Services of a watchman are not required, but the Contractor shall be fully responsible for and shall provide reasonable protection to prevent damage to all the work and all materials and equipment to be incorporated therein.

1.15 SUPERINTENDENCE

A. The Contractor shall employ a competent Superintendent and necessary assistants who shall be in attendance at the project site during the progress of the Work. The Owner's Representative shall be advised of the Superintendent to be employed and he shall not be changed, except with the consent of the Engineer, unless Superintendent proves to be unsatisfactory to the Contractor and ceases to be in his employ. The Superintendent shall represent the Contractor and all communications given to the Superintendent shall be as binding as if given to the Contractor. Important communications will be confirmed in writing. Other communications will be so confirmed on written request in each case.

1.16 SERVICE CHARGES

A. Include all service charges that may be applicable for execution and completion of the Work.

B. Temporary service charges shall be determined by Contractor's arrangements with respective Utility Companies.

1.17 SALVAGE AND DISPOSITION OF MATERIAL AND EQUIPMENT

A. The Owner shall have priority for the selection of salvaged equipment and materials. Any equipment and materials selected to remain the property of the Owner shall be removed and delivered to a location as designated by the Owner on the Site. Material not retained by the Owner shall become the property of the Contractor and shall be removed from the site by him at no direct cost to the Owner.

1.18 RESIDENT PROJECT REPRESENTATIVE

A. The Engineer may furnish a Resident Project Representative and assistants to aid Engineer in carrying out his responsibilities at the site. The duties, responsibilities, and limitations of authority of the Resident Project

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 10 99

SECTION 01 10 00

SUMMARY OF WORK

1.0 GENERAL

1.01 APPLICATION

A. The General CONTRACTOR and all Subcontractors shall familiarize themselves with the Bidding Requirements and Division 1 - General Requirements, and shall comply with all parts of these documents pertinent to their work.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. System description: Each sub sewer lift station pump controller shall be programmed and operate independently in the event of communications failure. Each pump controller shall be capable of transmitting failure contact to the Master Station. Each Master Station shall receive and transmit diagnostic data to the Main SCADA SERVER. Each sewer lift station site may transmit communications signals directly to the Master Station or operate as a client station sending the communications signal to the nearest sewer lift station acting as a repeater for signal transmission. Repeater stations may transmit signal directly to Master Station or through another repeater station. Arrangement shall be determined by the CONTRACTOR based on the topography and/or obstructions in the path of transmission. The transmitting and receiving antenna shall be mounted at an elevation to provide a clear line of sight at Master Stations. The complete and operational system shall be provided as a packaged system in a NEMA 4, fiberglass enclosure consisting of a PLC based pump station controller, radios, PLC power supplys, 120 VAC surge suppression, analog surge suppression, antenna coax surge suppression, coax connections, and proper antennas. CONTRACTOR is responsible for a complete and operational system at both the transmitter and receiver sites. All surface mounted raceway shall be rigid galvanized steel. All raceways requiring flexible connections shall be PVC coated steel interlocking flexible raceway. OWNER is responsible for furnishing and installing all 120-volt power sources and 120-volt 20 amp breakers. CONTRACTOR shall furnish all terminals, fusing, 316 stainless steel mounting hardware, etc. CONTRACTOR is solely responsible for coordinating the installation of the radio frequency wireless system with the OWNER to provide a complete and operational system. The complete radio frequency system shall be provided with a 1 year unconditional parts and labor warranty.

B. The Contract work includes all plant, labor, materials and equipment necessary to complete all work shown on the Drawings and herein specified.

C. CONTRACTOR shall plan, develop, and license a wireless system for (50) sewer lift station sites. Contactor shall determine the location of required antenna poles as needed in order to transmit/receive communications signals from the Main SCADA Control Center receiving station to each sewer lift station site. CONTRACTOR shall furnish and install a PLC based pump station controller in a NEMA 4 enclosure at each sewer lift station location. Provide design and installation drawings detailing a complete telemetry system for the ENGINEER's/OWNER's approval. The system shall be installed by a firm certified and actively engaged in the design and installation of wireless radio telemetry communications systems.

D. The system is required to operate in the 2.4 GHz frequencies for SCADA operations.

E. Contactor shall furnish and install all required FAA obstruction lights for poles as required. CONTRACTOR shall provide all conduit, conductors, supports, etc. as required to provide complete and functional installation.

F. The completed installation shall meet the requirements of the 2011 National Electrical Code.

G. Installer's Qualifications: Firms with a minimum of (5) years of design and installation experience with projects utilizing wireless radio telemetry communications systems similar to that required for this project.

H. Comply with NEC requirements pertaining to lightning (surge) arresters, grounding, grounding electrodes, and down conductor clearances.

I. NFPA Compliance: Comply with requirements of NFPA No. 780, "Lightning Protection Code" as applicable to lightning protection systems for structures and towers.

J. UL Compliance: Provide components which are UL-listed and labeled.

K. All poles, supports, etc. shall comply with ASCE 7-10 Wind Speeds (3-sec peak gust MPH*): Risk Category I: 126.

L. Product Data: Submit layout drawings of a complete wireless radio telemetry communications system equipment and components including, but not limited to:
   1. Pump station control panel and all interior components.
   2. Exterior enclosures
   3. Bi-directional antennas
   4. Raceway
   5. Conductors

6. Poles
7. Hardware, straps, etc.
8. Fabricated support structures.

M. CONTRACTOR shall design a Telemetry system for the Parish Wastewater Lift Stations to include:

1. Run time and cycle time for each pump
2. Motor / Pump failure
3. Auto shut off for motor and pump
4. Water level indicators
5. Alarm to notify personnel if and when a problem arises
6. Dry well failures and flooding
7. System shall poll and report at 30 second intervals for all stations.

N. The work shall be performed within 270 calendar days from the Notice to Proceed.

O. The work shall include, but not be limited to:
   1. Fabrication and installation of (50) sewer lift station control NEMA 4 panels complete with power supplies, radio, and communication antenna.
   2. Fabrication and installation of (50) support structures to mount NEMA 4 panels.
   3. This project also includes the installation of the Main SCADA server, Workstations, radio panels, antenna hardware, and cables at the Main SCADA Control Center located at 434 Elm St., LaPlace, LA. Any CONTRACTOR connected with this project shall comply with all Federal, State, Parish, and City codes and regulations applicable to such work and perform the work in accordance with the plans and specifications of this contract document.
   4. Supplying and installing antenna support structures, and poles.
   5. Directional antenna(s) of quantity and gain necessary at each station and master.
   6. Foundations for poles, etc.

P. CONTRACTOR's duties:

1. Except as specifically noted, provide and pay for:

   a. Labor, materials and equipment.

   b. Tools, construction equipment and machinery.

   c. Temporary facilities required for construction.

d. Other facilities and services necessary for proper execution and completion of work.

e. Field radio path study and analysis.

f. Insurance as required by the Contract Documents.

2. Obtain tax exempt certificate from OWNER.

3. Secure and pay for, as necessary for proper execution and completion of work, and as specified at time of receipt of bids:

a. Permits

b. Government fees

c. License

d. All FAA fees.

4. Give required notices.

5. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of work.

6. Promptly submit written notice to the OWNER of observed variances of contract documents from legal requirements.

7. Enforce strict discipline and good order among employees.

8. Verify measurements at site and accept responsibility for accuracy of same.

9. Remove obstructions as necessary for proper completion of work.

1.03 ITEMS BY OWNER

A. Testing Laboratory Services

1.04 CONTRACT

A. Construct the work under single unit price contract.

1.05 OWNER FURNISHED DOCUMENTS

A. The CONTRACTOR will be furnished, free of charge, six (6) copies of Drawings and six (6) copies of Specifications. Additional copies may be furnished at the cost of reproduction. CONTRACTOR may not reproduce (or have reproduced) contract drawings without specific written permission of the ENGINEER.

1.06 CONTRACTOR'S USE OF PREMISES

A. Confine operations at site to areas permitted by:

1. Law

2. Ordinances

3. Permits

4. Contract Documents

B. Do not unreasonably encumber site with materials or equipment.

C. Do not load slabs, walks or drive surfaces with weight that may endanger structures.

D. Assume full responsibility for the protection and safekeeping of products stored on premises.

E. Do not interfere with the operation or use of any existing structures on the site.

F. Coordinate any interruption in utility service and obtain permission from Owner prior to interruption, see Section 01 10 99 - Miscellaneous Requirements.

G. Protect existing underground utilities in and adjacent to the construction limits. Use caution in excavating, pile driving and use of equipment, see Section 01 10 99 - Miscellaneous Requirements.

H. Coordinate all traffic control with the OWNER.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 11 00

SECTION 01 14 16

COORDINATION

1.0 GENERAL

1.01 DESCRIPTION OF RESPONSIBILITIES

A. The Contractor shall coordinate scheduling, submittals and work of the various sections of the Specification to assure efficient and orderly sequence of installation of construction elements, with provisions for accommodating items to be installed later.

B. Each Contractor and subcontractor involved shall assume all liability, financial or otherwise, in connection with his work and shall protect and save harmless the Owner from any and all damages or claims that may arise because of inconvenience, delay or loss experienced by him because of the presence and operations of any other Contractors working within the limits of this project.

C. The Contractor shall arrange his work and shall place and dispose of the materials being used so as not to interfere with operations of others working in the surrounding area. He shall join his work with that of others in an acceptable manner and shall perform it in proper sequence to that of the others.

D. The contracting agency will not be responsible for any delays or inconvenience to the Contractor in carrying on his work while any public utility companies or agencies are making necessary adjustments of their fixtures or appurtenances, nor will the contracting agency be responsible for any cost incurred by the Contractor or utility owners for making said adjustments, by delays, etc.

1.02 EASEMENTS AND RIGHT-OF-WAY (SERVITUDE)

A. The easements and rights-of-way for the work will be provided by the Owner, Contractor shall confine his construction operations within the limits indicated on the drawings, and shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies, so as to cause the least possible damage to property and interference with traffic.

B. Servitudes across private property, if they exist, are indicated on the Drawings. Contractor shall set stakes to mark the boundaries of construction servitudes across private property. The stakes shall be protected and maintained until completion of construction and cleanup.

C. Certain permits shall be obtained by Owner. All Work performed and all operations of Contractor, his employees or Subcontractors, within the limits of rights-of-way, shall be in conformity with the requirements and be under the control (through Owner) of the authority owning, or having jurisdiction over and control of, the right-of-way.

1.03 NOTICES TO OWNERS AND AUTHORITIES

A. Contractor shall, as provided in General Conditions, notify owners of adjacent property and utilities when prosecution of the Work may affect them.

B. When it is absolutely necessary to temporarily deny access by owners or tenants to their property, or when any utility service connection must be interrupted, Contractor shall give notices sufficiently in advance to enable the affected persons to provide for their needs. Notices shall conform to any applicable local ordinance and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instruction on how to limit their inconvenience.

C. Utilities and other concerned agencies shall be contracted at least 24 hours prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

1.04 CONNECTIONS TO EXISTING FACILITIES

A. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities including structures, drain lines, and utilities such as water, and electric. In each case, Contractor shall receive permission from Owner or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.

B. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

C. Materials shall be cut and removed to the extent indicated on the Plans or as required to complete the Work. Materials shall be removed in a careful manner with no damage to adjacent facilities or materials. Materials which are not salvageable shall be removed from the site by Contractor.

D. All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to Engineer, to obtain a

finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 14 16

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SECTION 01 25 00

SUBSTITUTION PROCEDURES

1.0 GENERAL

1.01 RELATED WORK

A. Section 01 33 00 - Submittals, Etc.

1.02 DESCRIPTION

A. These Contract Documents include provisions for use of equivalent materials and equipment. Requests for review of equivalency shall be submitted in accordance with the General Requirements and the Miscellaneous Requirements and as herein specified.

1.03 SUBSTITUTIONS OF MATERIALS OR EQUIPMENT

A. Whenever, in the plans or project specifications, any materials, process or equipment is specified by patent, proprietary or brand name, or name of manufacturer, such wording is intended to establish the quality and type of materials, processes and equipment, and shall be deemed to be followed by the words "or approved equal". Lists of acceptable materials in the plans or specifications are not intended to be comprehensive lists, or in order of preference. The Contractor may offer any material, process or equipment which meets specifications.

B. Requests for substitution of equal products for those specified shall be submitted for approval to the Engineer as soon as possible after the award of contract and before installation.

C. Manufactured products shall be installed in accordance with the manufacturer's recommendations. Products, when delivered to the site, shall be labeled as to the manufacturer's name and catalog number; also, products shall have manufacturer's certification that the product conforms to specifications.

D. If required by the Engineer, the Contractor, at his expense, shall have the proposed material tested as to its physical and chemical characteristics, durability, finish efficiency, dimensions, and suitability for its intended use. The method of test shall be subject to approval, and test results shall be reported promptly to the Engineer. Material shall not be installed until approved.

E. No additional payment will be made for revisions in the project made necessary by the substituted equipment, materials or product, and no extension of contract time will be granted because of the use of substituted materials, processes or equipment.

1.04 SAMPLES

A. Samples shall be of sufficient size and quantity to clearly illustrate:

1. Functional characteristics of the product with integrally related parts and attachment devices.

2. Full range of color texture, and pattern.

B. Label each sample with identification required for transmittal letter.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

3.01 PROCEDURE

A. Submit a separate request for each product, supported with complete data, drawings and samples as appropriate including changes required in other elements of the Work because of the substitution, effect on construction schedule, cost data comparing the proposed substitution with the specified products, comparison if availability of maintenance, service and replacement cost.

1. Any supporting test data or results shall use the same test procedures for the proposed substitution and the specified products to facilitate comparison.

B. Request for substitution constitutes a representation that the Contractor:

1. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.

2. Will provide the same or better warranties, bonds and guarantees for the substitution as for the specified product.

3. Will coordinate the installation of an accepted substitution into the Work and make the Work complete in all respects.

4. Waives all claims for additional costs, related to the substitution which may subsequently become apparent.

END OF SECTION 01 25 00

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SECTION 01 26 63

CHANGE ORDERS

1.0 GENERAL

1.01 CHANGE ORDER PROCEDURES

A. Without invalidating the Contract, the Owner may make reasonable changes by altering, adding to, or deducting from the Work, the Contract Price being adjusted accordingly. No claim for extra work or materials shall be allowed and no alteration of or deduction from the work shall be made, unless same is ordered in writing by the Owner.

B. Where changes ordered by the Owner involve a monetary consideration, the Contract shall be adjusted by negotiation with the terms of said negotiation being expressed in a supplemental agreement or Change Order signed by the Owner, the Contractor and the Engineers.

C. If the Owner and the Contractor are unable to reach an agreement as to the monetary consideration of a Contract addition, the Engineers acting as the Owner's representative may order the Contractor to do such work on a force account or time and materials basis.

D. The Contractor shall furnish labor, equipment and materials necessary to complete the work in a satisfactory manner and within a reasonable period of time. For the work performed, payment will be made for the documented actual necessary expense of the following:

1. Field labor and foremen, who are directly assigned to the time and materials work (actual payroll cost, including wages, fringe benefits as established by negotiated labor agreements, and labor taxes as established by law). The cost of labor shall include any payment to or on behalf of the worker for health and welfare, pension, vacation and similar purposes. Where subsistence and travel allowances are required for performance of extra work, the charges shall consist of the actual amount paid to each worker. No other fixed labor burdens will be considered unless approved in writing by the Owner.

2. Material delivered and used on the designated work, including sales tax, if paid by the Contractor or his subcontractor.

3. Rental, or equivalent rental cost of equipment, including necessary transportation, for items having a value in excess of $200. When equipment is

not rented, the equivalent rental cost of equipment shall be based on the standard rental rate for Contractor-owned equipment, but in no event shall exceed the locally adjusted rental rates set forth in the "Rental Rate Blue Book for Construction Equipment" and the "Rental Rate Blue Book for Older Construction Equipment" which are published by the Equipment Guidebook Company, P. O. Box 10113, Palo Alto, California 94303. For equipment not listed in said documents, the rental rate shall be as listed for the local section of the Associated General Contractors. If the equipment is not listed by the Associated General Contractors, the rental rate will be mutually agreed upon in writing between the Contractor and the Owner prior to the use of said unlisted equipment. The reasonable cost of moving equipment onto and off the jobsite shall be included, but equipment rental shall not be paid when the equipment is inoperative due to breakdowns. Individual pieces of equipment or small tools considered as included in the overhead allowance and no additional payment therefor shall be made.

When equipment is used on the extra work for less than five (5) days, daily rates shall be used. When equipment is used on the extra work for more than four (4) days, weekly rates shall apply. Less than four (4) hours of operation shall be considered to be 1/2 day of operation. More than 5 hours of operation shall be considered a day if performed on a single day. Less than thirty (30) minutes of operation shall be considered 1/2 hour of operation.

Rental or equivalent rental cost will be allowed for only those days or hours during which the equipment is in actual use. Rental and transportation allowances shall not exceed the current equipment cost and shall be understood to cover all fuel, supplies, repairs, and renewals.

The Owner reserves the right to furnish such materials and equipment as he deems expedient, and the Contractor shall have no claim for profit or added fees on the cost of such materials and equipment.

4. One percent (1%) for additional bond, when required and approved by the Owner.

5. Additional insurance (other than labor insurance) as required and approved by the Owner.

6. Professional services shall be included in "actual necessary expense" only when the Owner has determined that such services are necessary and the provision of such services has been authorized in advance in writing by the Engineer.

To the preceding actual necessary expenses, there shall be added the following fixed fees for either the Contractor or subcontractor actually executing the work:

A fixed fee of 15 percent (15%) of the cost of Item 1.

A fixed fee of 10 percent (10%) added to the cost of Items 2 and 3.

A fixed fee of 6 percent (6%) added to the cost of Items 4 and 5.

A fixed fee of 10 percent (10%) added to the cost of Item 6.

An additional fixed fee of 10 percent (10%) shall be allowed the Contractor for the administrative handling of portions of the Work that are executed by an approved subcontractor. No additional fixed fee will be allowed for the administrative handling of work executed by a subcontractor of a subcontractor, unless by written permission from the Owner.

The added fixed fees shall be full compensation for the cost of general supervision, overhead, profit, and any other general expense.

If a dispute occurs over payment for work provided on a time and material basis, the dispute shall not be cause of stopping work.

The Contractor shall maintain accurate records for all work performed on a time and material basis. These records will reflect all the actual necessary expenses pertaining to the extra work and shall at all times be available for audit by the Owner.

The Contractor's records shall make clear distinction between the direct costs of work paid for on a time and material basis and costs of other work. The Contractor shall furnish the Engineer report sheets in duplicate of each day's work. The daily report sheets shall itemize the labor, materials and equipment used. The daily report sheets shall provide names, identifications and classifications of workers, the hours worked, the sizes, types and identification numbers of equipment, and hours operated. Daily report sheets shall be signed by the Contractor or his authorized agent and verified by the Engineer.

To receive partial payments and final payment for time and materials work, the Contractor shall submit to the Engineer in a manner approved by the Engineer, detailed and complete documented verification of the Contractor's and any of his subcontractor's actual costs incurred. Material and rental charges shall be substantiated by copies of vendor's invoices. Such costs shall be submitted within thirty (30) days after said work has been satisfactorily completed.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 26 63

SECTION 01 29 00

APPLICATIONS FOR PAYMENT

1.0 GENERAL

1.01 DESCRIPTION

A. Submit applications for payment to Engineer in accordance with the established schedule of payments required by Conditions of the Contract and Agreement between Owner and Contractor.

B. Adhere to all applicable requirements indicated in - Progress Payments, Retainages and Final Payment clauses in the Conditions of the Contract.

C. Within 30 days after award of contract, Contractor shall furnish to Engineer a schedule of estimated monthly payments. The schedule shall be revised and submitted each time an application for payment varies more than 10 percent from the estimated payment schedule.

1.02 RELATED REQUIREMENTS

A. Section 01 32 16 - Construction Schedules

B. Section 01 77 00 - Contract Closeout

1.03 FORMAT AND DATA REQUIRED

A. Submit itemized applications on completed Application and Certificate for Payment. Blank forms shall be supplied by the Engineer.

B. Provide itemized data on continuation sheets:

1. Format, schedules, line items and values: Those of the Schedule of Values approved by Engineer.

C. A progress report shall accompany all applications.

1.04 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Form:

1. Fill in required information, including that for Change Orders executed prior to the date of submittal of application.

2. Fill in summary of dollar values to agree with the respective totals indicated on the continuation sheets.

3. List all on site stored items.

4. List of all responsible members and officers of the construction company.

5. Execute certification with the signature of an authorized, responsible officer of the Contract firm as required by Owner and Engineer.

B. Continuation Sheets.

1. Fill in total lists of all scheduled component items of Work, with item number and the scheduled dollar value for each item.

2. Fill in the dollar value in each column for each scheduled line item when work has been performed or products stored.

   a. Round off values to the nearest dollar, or as specified for the Schedule of Values.

3. List each Change Order executed prior to the date of submission, at the end of the continuation sheets.

C. Progress Reports shall conform to requirements of Section 01 32 16.

1.05 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. When the Owner or the Engineer require substantiating data, to justify dollar amounts Contractor shall submit suitable information, with a cover letter identifying:

1. Project.

2. Application number and date.

3. Detailed list of enclosures.

4. Information for stored products including:

   a. Item number and identification as shown on application.

b. Description of specific material.

B. Submit one copy of data and cover letter for each copy of application.

1.06 PREPARATION OF APPLICATION FOR FINAL PAYMENT

A. Fill in Application form as specified for progress payments.

B. Use continuation sheet for presenting the final statement of accounting as specified in Section 01 77 00 - Contract Closeout.

1.07 SUBMITTAL PROCEDURE

A. Submit Applications for Payment to Engineer at the times stipulated in the Agreement.

B. Number: Five copies of each Application.

C. When Engineer finds the Application properly completed and correct, he will transmit a certificate for payment to Owner.

D. All payment requests or invoices must be sent first to the Engineer for review and comment on the proper forms, which are then forwarded to the Owner. Contractors who fail to follow this procedure will not be paid on a timely basis due to the unnecessary delays in re-routing the payment requests.

1.08 RETAINAGE

A. The Owner agrees to make payment to its Contractor promptly sums due under this contract and to retain only such amounts as may be justified by specific circumstances specifically provided for in the construction contract, to the following schedule:

a. Retention of up to ten (10) percent of payments for projects with contract prices of less than $500,000.

b. Retention of five (5) percent of payments for projects with contract prices of $500,000 or more.

1.09 TOTAL PAYMENT

A. Wherever an item of work to be performed under this contract is specified in any of the bid documents as being paid at an item total price, the Contractor shall be paid the entire amount that appears in his bid proposal for that item.

B. Wherever the estimated quantities (i.e., cubic yards of sand, shell, etc.) of materials to be furnished under this contract are shown in any of the documents, including the Proposal, they are given for use in comparing bids and are not to be construed as exact quantities. The Owner reserves the right to increase or diminish these quantities as may be necessary to complete the work contemplated by this contract. The Contractor shall be paid for the actual quantity of items or material used, and payment will be at the respective unit price bid for these items or materials.

C. The sum of the products of approximate quantities multiplied by the unit price bid, constitute the total base bid price or total alternate bid price which sums shall be used in comparison of bids, and the awarding of the Contract.

D. It shall be understood that the total base bid or alternate bid price figure, wherever specified in the bid document, may not reflect the actual amount the Contractor will receive upon completion of the work. This figure shall be adjusted in accordance with the actual quantity of unit price items used.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 29 00

SECTION 01 32 16

CONSTRUCTION AND PROGRESS SCHEDULES

1.0 GENERAL

1.01 WORK INCLUDED

A. The Contractor shall prepare and submit to the Engineer at the Preconstruction Conference and on a monthly basis, estimated construction progress schedules for the Work with sub-schedules of related activities which are essential to its progress. Provide a minimum of six (6) copies.

1.02 RELATED WORK

A. Section 01 11 00 - Summary of Work

B. Section 01 29 00 - Applications for Payment

C. Section 01 39 19 - Project Meetings

D. Section 01 33 00- Submittals

1.03 FORMAT OF SCHEDULES

A. Prepare schedules in the form of a horizontal bar chart.

B. Provide separate horizontal bar for each trade or operation.

C. Identify the first work day of each week and of commencement of each Work Phase.

D. Scale and spacing shall to allow space for notations and future revisions.

E. Minimum sheet size: 11" x 17".

F. Format of listings shall match the table of contents of this Project Manual.

G. Listings shall be in the chronological order of the start of each item of work.

H. Listings shall be identified by major specification section numbers.

I. Listings of items other than major equipment shall include values of each item or portion of work which will not exceed $50,000.

1.04 CONTENT OF SCHEDULES

A. Show the complete sequence of construction by activity.

B. Show the dates for the beginning and completion of each major element of construction and each Work Phase.

C. Show projected percentage of completion for each item, as of the first day of each month.

D. Show values for each item and accumulated values completed at the stages indicated.

1.05 SUBMITTALS

A. Submit six (6) copies of the initial at the Preconstruction meetings.

B. Submit six (6) revised progress schedules monthly with requests for payment.

C. Submit Schedule for Shop Drawings, Product Data and Samples.

D. Include progress reports with each submittal.

1.06 REVISIONS TO SCHEDULES

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

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

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

1.07 DISTRIBUTION

A. Distribute copies of the reviewed schedules to the job site file, subcontractors, suppliers, and other concerned parties.

B. Instruct recipients to report promptly to the Contractor, in writing, any problems anticipated by the projections shown in the schedules.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 32 16

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SECTION 01 32 23

SITE CONDITIONS SURVEY

1.0 GENERAL

1.01 DESCRIPTION OF WORK INCLUDED

A. The Contractor, prior to mobilizing onto the jobsite, shall conduct a detailed survey of the jobsite, surrounding area and access routes.

B. This survey is intended to document existing conditions with respect to any conditions which may be noticed after construction begins. Post construction conditions shall also be compared to this data.

C. This documentation shall be provided by the Contractor and submitted to the Engineer as preparation to resolve any damage claims which may arise due to the construction of this project.

D. These records shall become property of the Owner upon delivery to the Engineer or Owner's Representative.

1.02 OWNER'S QUALITY AUTHORITY

A. The Owner shall have the authority to reject all or any portion of the photographic/video documentation not conforming to the Specifications. Those rejected portions shall be re-photographed/re-videoed at no additional cost to the Owner.

2.0 PRODUCTS

2.01 COVERAGE OF THE SURVEY

A. Photographs shall be taken of the exterior and interior of all public and private buildings and structures along any pipeline work and within 100' of any excavation or 250’ of any pile driving.

B. Underground video shall be taken of all existing underground sewer and drainage piping located within the project construction limits. Videos shall be taken and submitted to the Engineer and Owner’s Representative prior to mobilization of the project. A second video of each underground sewer and drainage pipe shall also

be taken after the project has been completed and shall be submitted to the Engineer and Owner's Representative.

C. The Contractor shall make every attempt to gain permission from property owners for access to private property for documenting preconstruction conditions. If a property owner refuses access after multiple attempts, the Contractor will notify the Engineer and log all contacts with the property owner. The attempts shall include a formal letter and upon refusal, a registered or certified letter to supplement the log of verbal and/or telephone contacts.

D. Elevations shall be taken on house slabs, driveway pavement, walkway paving, sidewalks, and paving elements in street sections adjacent to the project site and within 100' of any excavation or 250' of any pile driving. These elevations shall be recorded and produced under the supervision of a registered licensed surveyor in the State of the project site. Elevations on abutting drives and walks shall be taken at approximately 20 foot intervals and at the point of juncture with any structure to which they are attached. In addition, elevations shall be taken of all corners of house slabs along the job route.

E. Video tapes of the access routes shall be made to show existing street and right-of-way conditions. The camera shall be mounted on a tripod or platform upon a vehicle which places the camera approximately 10' above the path being traveled upon. The travel speed of the vehicle shall be no greater than 48 feet per minute. Photographs shall be taken to supplement the video tapes to give more detailed documentation of pre-existing conditions.

F. A carefully prepared log shall be maintained to show the name of the individual taking the photographs, the stationing as shown on the Plans, or as directed by the Engineer, the name of the street, easement or building being documented, the project name, and the direction of travel and the viewing side.

2.02 PHOTOGRAPHS

A. All still photographs shall be taken on digital format.

B. Photographs shall be sharp clear, bright, well focused with accurate colors free from distortion or any other form of picture imperfection.

C. The date, time, and identification number of each photograph shall be displayed onto the electronic media filename and print.

D. The Engineer and Owner shall be furnished with 3 - 8" x 10" color glossy prints of each exposure positioned individually in plastic pages with full descriptions of each photograph (origin, location, etc.) attached to the back of the print. In addition to the photo images, each image shall be provided in an electronic

format, stored on CD or DVD with references to the photo provided. The prints and media disc shall be bound in sets in heavy duty 3 ring binders and delivered no later than on the date of mobilization.

E. No photography shall be done during periods of significant precipitation, mist or fog.

F. The photography shall only be done when sufficient sunlight is present to properly illuminate the subjects of recording. Proper flash lighting shall be used inside the buildings and less lighted areas.

3.0 EXECUTION

A. MEASUREMENT

1. All required work under this section shall not be measured for payment

B. PAYMENT

1. All required work under this section shall be done at NO DIRECT PAYMENT.

END OF SECTION 01 32 23

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SECTION 01 32 33

CONSTRUCTION PHOTOGRAPHS

1.0 GENERAL

1.01 RELATED WORK

NOT USED

1.02 DESCRIPTION

A. The Contractor shall be responsible for the production of construction photographs showing the regular progress of the Work. The Engineer shall be able to designate the subject of additional photographs as required.

B. Before commencement of the Work and continuing through the duration of the contract, the Contractor shall take not less than ten (10) exposures consisting of different subjects or angles of view for each exposure. The exposures shall be taken from various locations on the construction site for adequate documentation of the Work. The photographer shall attempt to use the same locations for four (4) exposures at each interval. The exposures shall be taken at intervals not exceeding two (2) weeks in duration. The Contractor shall take ten (10) additional exposures at the completion of the Work as directed by the Engineer. All photographs shall be furnished to the Engineer within two (2) weeks after each exposure.

C. All still photographs shall be taken in digital format. Photographs shall be sharp clear, bright, well focused with accurate colors free from distortion or any other form of picture imperfection. The date, time, and identification number of each photograph shall be displayed onto the electronic media and print. Each image shall be provided in an electronic format, stored on CD or DVD with references to the photo provided. No photography shall be done during periods of significant precipitation, mist or fog. The photography shall only be done when sufficient sunlight is present to properly illuminate the subjects of recording. Proper flash lighting shall be used inside the buildings and less lighted areas.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

A. MEASUREMENT

1. All required work under this section shall not be measured for payment

B. PAYMENT

1. All required work under this section shall be done at NO DIRECT PAYMENT.

END OF SECTION 01 32 33

SECTION 01 33 00

SUBMITTALS

1.0 GENERAL

1.01 RELATED REQUIREMENTS

A. DIVISION 1

1.02 DESCRIPTION

A. Engineering data covering all equipment and fabricated materials to be furnished under this contract shall be submitted to the Engineer for review after the contractor verifies all applicable field measurements, quantities, dimensions, performance criteria, etc. This data shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and operation of component materials and devices; the external operation of connections, anchorages, and supports required, wiring diagrams; piping diagrams; controls; performance characteristics and capacities; and dimensions and clearances needed for installation and correlation with other materials and equipment. If manufacturer's standard drawings are submitted, modify and delete information which is not applicable to the Work. The Engineer will not be required to review incomplete submittals.

B. All submittals, regardless of origin, shall be stamped with the approval of Contractor and identified with the name and number of this contract, Contractor's name, date, and references to applicable specification paragraphs and Contract Drawings. By approving Submittals, Contractor represents that he has determined and verified all materials, field measurements and field construction criteria related thereto and that he has checked and coordinated the information within the submittal with the requirements of the Work. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data. Submittals shall reference sheet and/or section numbers of the Contract Documents to which they relate.

C. All deviations from the Contract Documents shall be specifically and clearly identified on each submittal and shall be tabulated in Contractor's letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor (including modifications to other

facilities that may be a result of the deviation) and all required piping and wiring diagrams.

D. Contractor shall accept full responsibility for the completeness of each submission, and, in the case of a resubmission, shall verify that all exceptions previously noted by Engineer have been taken into account. In the event that more than one resubmission is required because of failure of Contractor to account for exceptions previously noted, Contractor shall reimburse Owner for the charges of Engineer for review of the additional resubmission.

E. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time unless delay of the Work is directly caused by a change in the Work authorized by a Change Order or by failure of Engineer to return any submittal within 28 calendar days after its receipt in the Engineer's office.

F. Engineer's review of drawings and data submitted by Contractor will cover only general conformity to the Contract Documents. Engineer's review does not indicate a thorough review of all dimensions, quantities, and details of the material, equipment, device, or item shown. Engineer's review of submittals shall not relieve Contractor from responsibility for errors, omissions, or deviations, nor responsibility for compliance with the Contract Documents.

G. Six (6) copies of each drawing and necessary data shall be submitted to Engineer. Engineer will not accept submittals from anyone but Contractor. Submittals shall contain all applicable specification sections in accordance with the submittal, and be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.,) to indicate the sequence of the resubmittal.

H. When the drawings and data are returned marked REJECTED or REVISE AND RESUBMIT, the corrections shall be made as required, as noted thereon, and as indicated by Engineer and corrected copies shall be resubmitted. Commence no portion of work requiring submittals until submittal has been approved by Engineer.

I. When corrected copies are resubmitted, Contractor shall, in writing, direct specific attention to all revisions and shall list separately any revisions made other then those called for by Engineer on previous submissions. Resubmittals shall be clearly and obviously labeled as such.

J. When the drawings and data are returned marked REVIEWED or REVIEWED AS NOTED, no additional copies need be furnished. Contractor is responsible for distributing copies to his subcontractors and material suppliers.

1.03 SAMPLES

A. Samples shall be of sufficient size and quantity to:

1. Clearly illustrate the functional characteristics of the product with integrally related parts and attachment devices.

2. Clearly illustrate the full range of color texture, and pattern.

3. Serve as a sample for testing.

B. Label each sample with identification required for transmittal letter.

1.04 SCHEDULE OF MAJOR EQUIPMENT

A. The Proposal Form **may** include a list of the major items of Equipment to be furnished and installed on this project. Each Bidder shall state in the space provided in the Proposal Form the name of the manufacturer of the equipment he proposes to use. Only one manufacturer shall be listed for each item. The successful bidder shall be bound to furnish the particular equipment listed in his proposal and no substitutions will be permitted unless the substitution meets the requirements of the contract and is specifically approved in writing by the Owner.

B. Where manufacturers of this major equipment are mentioned in the specifications followed by the words "or approved equal" any substitution equipment shall be submitted for the Engineer's review. Performance specifications where no manufacturer is mentioned do not require prior review. Structural, electrical and mechanical changes to suit the equipment bid will be the responsibility of, and paid for by, the Contractor.

1.05 EQUIPMENT CONFIGURATIONS

The indicated sizes of equipment shown on the plans and specified herein represent sizes that were used for the design. In the event the Contractor, supplier, or manufacturer changes the size of the equipment, the changes to the adjacent equipment, piping, or required additional wiring in order to provide for adaptation of equipment to the project shall be coordinated by the Contractor and shall be called to the attention of the Engineer at the time of the affected submittal. Any expense incurred in changing equipment sizes shall be borne by the Contractor.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

3.01 AGREEMENT IN PRODUCTION OF SUBMITTALS

A. Contractor agrees that Shop Drawing Submittals processed by the Engineer are not Change Orders; that the purpose of Shop Drawing Submittals by the Contractor is to demonstrate to the Engineer that the Contractor understands the design concept, that he demonstrates his understanding by indicating which equipment and material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use.

Contractor further agrees that if deviations, discrepancies, or conflicts between Shop Drawing Submittals and the contract documents in the form of design drawings and specifications are discovered either prior to or after Shop Drawing Submittals are processed by the Engineer, the design drawings and specifications shall control and shall be followed.

END OF SECTION 01 33 00

SECTION 01 39 19

PROJECT MEETINGS

1.0 GENERAL

1.01 SCOPE

A. The Owner's Representative may schedule and administer pre-bid and pre-construction meetings, periodic progress meetings, and specially called meetings throughout the progress of the work.

1. Specially called meetings may be held at the job site during normal working hours, as necessary to expedite the progress of the job.

B. The Owner's Representative shall direct individuals attending the meeting to:

1. Prepare agenda for meetings.

2. Distribute written notice of each meeting.

3. Preside at meetings.

4. Record the minutes; include all significant proceedings and decisions.

5. Reproduce and distribute copies of minutes.

C. Representatives of Contractors, subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.02 RELATED WORK

A. Section 01 77 00 - Contract Closeout

1.03 PRE-CONSTRUCTION MEETING

A. After notification that the contract has been executed and prior to the commencement of the Work at the site, the Owner's Representative shall arrange with the Owner, Using Agency and the Contractor to conduct a Pre-Construction Conference.

B. Location: Project site or where directed by the Owner's Representative.

C. Attendance:

1. Owner's Representative.

2. Using Agency's Representative.

3. Engineer, his Professional Consultants, and his Project Representative.

4. Contractor.

5. Contractor's Superintendent.

6. Principal Subcontractors.

7. Principal Suppliers and manufacturer's representatives as appropriate.

8. Others as Appropriate.

D. The Contractor shall coordinate and be responsible for the attendance of his principal Subcontractors.

E. The Contractor shall furnish at the time of the pre-construction meeting to the Owner's Representative, the Engineer and Using Agency six (6) copies of the following documents:

1. Schedule of Values.

2. List of Subcontractors.

3. List of major material suppliers.

4. Construction Schedule.

5. Procurement Schedule.

6. Shop Drawings and Submittal Schedule

7. Excavation Plan.

F. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

1. Contractor's tentative schedules.

2. Transmittal, review, and distribution of Contractor's submittals.

3. Processing applications for payment. Application format.

4. Maintaining record documents.

5. Critical Work sequencing.

6. Field decisions and Change Orders.

7. Use of premised, office and storage areas, security, housekeeping, and Owner's needs.

8. Major equipment deliveries and priorities.

9. Contractor's assignments for safety and first aid.

10. Submission of executed bonds and insurance certificates if not previously submitted.

1.04 PROGRESS MEETINGS

A. Progress meetings will be scheduled by the Owner's Representative or the Engineer after consulting with the Owner and the Using Agency. These meetings shall be no more often than one per week as required by progress of the work, exclusive of any other meetings scheduled by the Owner's Representative, Owner or Using Agency.

1. It shall be the responsibility of the Owner's Representative to notify the Owner, Using Agency, and the Contractor of the time, place and date of the "Progress Meeting".

2. It shall be the responsibility of the Contractor to notify all suppliers and subcontractors.

B. The purpose of these regular meetings is to assess, realistically, the current status and progress of the work, to effect coordination, cooperation and assistance in every practical way and to discuss changes in scheduling, and to resolve other problems which may develop. This should maintain the progress of the project on schedule and complete the project within the contract time.

C. These meetings will be called as required during progress of the work.

D. Location of the meetings: The project field office or other location where directed by the Owner's Representative.

E. Attendance:

1. Owner's representative.
2. Using Agency's representative.
3. Engineer, his professional consultants, and his Project Representative.
4. Contractor.
5. Contractor's Superintendent.
6. Principal Subcontractors, and all subcontractors active on the site.
7. Principal Suppliers and Manufacturer's Representatives.
8. Others as appropriate.

F. Suggested Agendum:

1. Review and approve minutes of previous meeting.
2. Review of work progress since previous meeting.
3. Note field observations, problems, conflicts.
4. Identify problems which impede Construction Schedule.
5. Review off-site fabrication, delivery schedules.
6. Develop corrective measures and procedures to regain projected schedule.
7. Revise Construction Schedule as required.
8. Plan progress, schedule, during succeeding work period.
9. Coordination of schedules.
10. Review submittal schedules; expedite as required to maintain schedule.
11. Review maintenance of quality and work standards.

12. Review proposed changes for the effect on Construction Schedule, completion date, and coordination.

13. Complete other current business.

END OF SECTION 01 39 19

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SECTION 01 42 00

REFERENCE STANDARDS AND DEFINITIONS

1.0 GENERAL

1.01 RELATED REQUIREMENTS

NOT USED

1.02 REFERENCE STANDARDS

A. Reference to the standards of any technical society, organization, or association, or to codes of local or state authorities, shall mean the latest standard, code, specification, or tentative standard adopted and published at the date of receipt of bids, unless specifically stated otherwise.

1.03 PROJECT DEFINITIONS

A. OWNER. The Owner of the subject project is Jefferson Parish.

B. ENGINEER. The Engineer of the subject project is Burk-Kleinpeter, Inc.

1.04 DEFINITIONS

A. ADDENDUM. A Written revision, correction, interpretation, clarification or supplement to the plans, specifications or other contract documents issued by authority of the Engineer prior to opening bids, which will become a part of the contract.

B. ADVERTISEMENT. A public announcement inviting bids for work to be performed or materials to be furnished.

C. BASE COURSE. The layer or layers of specified material of designed thickness or a subbase or subgrade to support a surface course.

D. BIDDER. An individual, partnership, firm, corporation, or any acceptable combination thereof, or joint venture submitting a proposal.

E. CALENDAR DAY. Every day shown on the calendar, beginning and ending at midnight.

F. CONTRACTING AGENCY. City Council or other governing authority of a Parish, State Office, Agency, Board, Commission, Public Corporation or other political subdivision of the State, in whose name the contract will be executed. The Contracting Agency is further defined in the Notice to Contractors.

G. CONTRACT. The written agreement between Owner and the Contractor setting forth obligations of the parties thereunder, for performance of the prescribed work.

The contract includes the invitation for bids, proposal, contract form and contract bond, specifications, supplemental specifications, special provisions, general and detailed plans; also, any plan changes and supplemental agreements that are required to complete construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument.

H. CONTRACT BOND. The approved form of security, executed by the Contractor and his surety or sureties, guaranteeing complete execution of the contract and all supplemental agreements pertaining thereto and payment of all legal debts pertaining to construction of the project.

I. CONTRACT ITEM (Pay Item). A specific unit of work for which a price is provided in the contract.

J. CONTRACTOR. The individual, partnership, firm, corporation or any acceptable combination thereof, or joint venture contracting for performance of prescribed work.

K. EQUIPMENT. All machinery and equipment, with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for proper construction and acceptable completion of the work.

L. EXTRA WORK. An item of work not provided for in the contract as awarded but found essential by the Owner for satisfactory completion of the contract within its intended scope.

M. HIGHWAY, STREET OR ROAD. A general term denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way. Recommended usage in urban areas - highway or street; in rural areas - highway or road.

N. INSPECTOR. The Owner's authorized representative assigned to make detailed inspections of contract performance.

O. ADVERTISEMENT FOR BIDS. The advertisement for proposals for all work or materials on which bids are required. Such advertisement will indicate location and description of the work, and time and place of opening bid proposals.

P. LABORATORY. The Owner's testing laboratory or any other testing laboratory approved by the engineer.

Q. MATERIALS. Any substances specified for use in the construction of the project and its appurtenances.

R. NOTICE TO PROCEED. Written notice to the Contractor to proceed with the contract work, including the date of beginning of contract time.

S. PARISH. The Parish in which the specified work is to be done.

T. PLAN CHANGE. A general term denoting changes to the contract.

U. PLANS. The contract drawings which show location, type, and dimensions of the prescribed work and may include layouts, profiles, cross sections and other details.

V. PROJECT. A specific undertaking of construction as described by the plans and specifications within prescribed limits.

W. PROPOSAL. The offer of a bidder, on the prescribed form, to perform the stated work and to furnish the labor and materials at the prices quoted.

X. PROPOSAL FORM. The prescribed form on which the offer of a bidder must be submitted.

Y. PROPOSAL GUARANTY. The required security furnished with a bid proposal.

Z. RIGHT OF WAY. Land, property or interest therein, reserved for use in constructing, maintaining and protecting an improvement.

AA. SPECIAL PROVISIONS. Additions and revisions to the standard and supplemental specifications covering conditions applicable to the project.

BB. SPECIFICATIONS. The compilation of provisions and requirements for the performance of prescribed work.

Standard Specifications - A book of specifications for general application and repetitive use.

Supplemental Specifications - Additions and revisions to the Standard Specifications.

Project Specifications - All Standard Specifications, Supplemental Specifications, Technical Specifications, Special Provisions and other provisions that are applicable to the project.

Technical Specifications - Requirements pertaining to specific items or methods of performing the work and to quantities and qualities of materials to be furnished, and shall be considered part of the contract.

CC. SPECIFIED. Set forth or stipulated in the plans or specifications or elsewhere in the contract documents; such as materials, equipment or methods.

DD. STATE. The State which the project is being constructed or the Governing body of this state acting through its authorized representative.

EE. STRUCTURES. Bridges, culverts, catch basins, junction boxes, retaining walls, cribbing, manholes, end walls, buildings, sewers, dams, floodgates, plumbing stations, docks, wharves, levees, boat ramps, pile dolphins, jetties, service pipes, underdrains, foundation drains and other features encountered in the work and not otherwise classed herein.

FF. SUBBASE. The layer or layers of specified or selected material of designed thickness placed on a subgrade to support a base course.

GG. SUBCONTRACTOR. An individual, partnership, firm, corporation, or any acceptable combination thereof, or joint venture, to which the Contractor sublets part of the contract.

HH. SUBGRADE. The surface of a foundation layer upon which the pavement structure and shoulders are constructed.

II. SUBSTRUCTURE. That part of the structure below the bearings of simple and continuous spans, skewbacks or arches and tops of footings or rigid frames, including back walls, wing walls and wing protection railings.

JJ. SUPERINTENDENT. The Contractor's authorized representative in responsible charge of the work.

KK. SUPERSTRUCTURE. The entire structure above the substructure including but not limited to the deck, girders, bearings, deck drainage system, etc.

LL. SUPPLEMENTAL AGREEMENT. A written agreement made and entered into by and between the Contractor and the Owner covering work not otherwise

provided for, revisions in or amendments to terms of the contract or conditions specifically prescribed in the specifications as requiring supplemental agreements. Such supplemental agreement becomes a part of the contract when approved and properly executed.

MM. SURETY. The corporation, partnership or individual, other than the contractor, executing a bond furnished by the contractor.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 42 00

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SECTION 01 42 13

ABBREVIATIONS AND SYMBOLS

1.0 GENERAL

1.01 RELATED REQUIREMENTS:

NOT USED

1.02 DESCRIPTION

A. Abbreviations used in the Contract Documents are defined as follows:

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ACEC	American Consulting Engineers Council
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AFBMA	Antifriction Bearing Manufacturers Association
AGA	American Gas Association
AGC	Associated General Contractors of America
AGMA	American Gear Manufacturers Association
AHA	American Hardboard Association
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
APWA	American Public Works Association
ARI	Air Conditioning and Refrigeration Institute
ARIB	Asphalt Roofing Industry Bureau
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASLA	American Society of Landscape Architects

ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
AWI	American Woodworking Institute
AWPA	American Wood Preservers Association
AWPA	American Wood Products Association
AWPB	American Wood Preservers Bureau
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Water Works Association
BIA	Brick Institute of America
BHMA	Builders Hardware Manufacturers Association
BOCA	Building Officials Council of America
CE	Corps of Engineers, U.S. Army
CISPI	Cast Iron Soil Pipe Institute
CMA	Crane Manufacturing Association
CPSC	U. S. Consumer Products Safety Commission
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard
CSI	Construction Specifications Institute
DHI	Door and Hardware Institute
EJCDC	Engineers Joint Contract Documents Committee
EPA	Environmental Protection Agency
Fed Spec	Federal Specifications
FDA	Food & Drug Administration
FGMA	Flat Glass Marketing Association
FM	Factory Mutual Engineering Corporation
FMA	Flat Glass Marketing Association
FS	Federal Specifications
FSS	Federal Specifications and Standards, General Services Administration
GA	Gypsum Association
HMI	Hoist Manufacturers Institute
IBBM	Iron Body, Bronze Mounted
ICBO	International Conference of Building Officials
IEEE	Institute Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IFI	Industrial Fasteners Institute
IPCEA	Insulated Power Cable Engineers Association
IPS	Iron Pipe Size
ISA	Instrument Society of America
LADOTD	Louisiana Department of Transportation and Development
LSGA	Laminators Safety Glass Association
MBMA	Metal Building Manufacturers Association
MIL	Military Specification

ML/SFA	Metal Lath/Steel Framing Association
MSS	Manufacturers Standardization Society
MUTCD	Manual on Uniform Traffic Control Devices
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NBC	National Building Code
NBHA	National Builders Hardware Association
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NPA	National Particleboard Association
NPCA	National Pest Control Association
NPT	National Pipe Thread
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NSPE	National Society for Professional Engineers
NWMA	National Woodwork Manufacturers Association
NWWDA	National Wood Window and Door Association
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PDI	Plumbing & Drainage Institute
PFI	Pipe Fabrication Institute
PPI	Plastic Pipe Institute
PS	Product Standards
RCSC	Research Council on Structural Connections
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers
SBCCI	Southern Building Code Congress International
SCPRF	Structural Clay Products Research Foundation
SCS	Soil Conservation Service, U.S. Department of Agriculture
SDI	Steel Deck Institute
SDI	Steel Door Institute
SFPA	Southern Forest Products Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPI	Society of the Plastics Industry
SPIB	Southern Pine Inspection Bureau
SSPC	Steel Structures Painting Council
STI	Steel Tank Institute
SWI	Sealant and Waterproofers Institute
SWI	Steel Window Institute

TCA	Tile Council of America
TPI	Truss Plate Institute
UL	Underwriters' Laboratories
US	U. S. Bureau of Standards
WPRS	Water and Power Resources Service
WRI	Wire Reinforcement Institute
WWPA	Western Wood Products Association

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 42 13

SECTION 01 45 00

QUALITY CONTROL

1.0 GENERAL

1.01 QUALITY CONTROL, GENERAL

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship on this project.

B. Perform work only by persons qualified by equivalent applicable union standards to produce workmanship of the specified quality.

C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

D. Comply with manufacturer's instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, notify and request clarification from Engineer before proceeding.

1.02 SITE INVESTIGATION AND CONTROL

A. The Contractor shall verify all dimensions in the field and shall check field conditions continuously during construction. The Contractor shall be solely responsible for any inaccuracies built into the Work due to his failure to comply with this requirement.

B. The Contractor shall inspect related, adjacent, and appurtenant Work and shall report in writing to the Engineer any conditions which will prevent proper completion of the Work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair or replacement caused by unsuitable conditions shall be performed by the Contractor at its sole cost and expense.

1.03 INSPECTION OF THE WORK

A. The Work shall be conducted under the general observation of the Engineer and shall be subject to inspection by representatives of the Engineer acting on behalf of the Owner to insure strict compliance with the requirements of the Contract Documents. Such inspection may include mill, plant, shop or field inspection, as

required. The Engineer shall be permitted access to all parts of the Work, including plants where materials or equipment are manufactured or fabricated.

B. The presence of the Engineer or any inspector(s), however, shall not relieve the Contractor of the responsibility for the proper execution of the work in accordance with all requirements of the Contract Documents. Compliance is a duty of the Contractor, and said duty shall not be avoided by any act or omission on the part of the Engineer or any inspector(s).

C. All materials and articles furnished by the Contractor shall be subject to rigid inspection, and no materials or articles shall be used in the Work until they have been inspected and accepted by the Owner or his representative. No Work shall be backfilled, buried, cast in concrete, hidden or otherwise covered until it has been inspected. Any Work so covered in the absence of inspector shall be subject to uncovering. Where uninspected work cannot be uncovered, such as in concrete cast over reinforcing steel, all such Work shall be subject to demolition, removal and reconstruction under proper inspection, and no additional payment will be allowed therefor.

1.04 TIME OF INSPECTIONS AND TESTS

A. Samples and test specimens required under these Specifications shall be furnished and prepared for testing in ample time for the completion of the necessary tests, analyses and reporting of results before said articles or materials are to be used. The Contractor shall furnish and prepare all required test specimens at its own expense. Except as otherwise provided in the Contract Documents, performance of the required tests will be by the Owner, and all costs thereof will be borne by the Owner at no extra cost to the Contractor; except, that the costs of any tests which show unsatisfactory results shall be borne by the Contractor.

B. Whenever the Contractor is ready to backfill, bury, cast in concrete, hide or otherwise cover any Work under the Contract, the Engineer shall be notified not less than 24 hours in advance to request inspection before beginning any such Work of covering. Failure of the Contractor to notify the Engineer at least 24 hours in advance of any such inspections shall be reasonable cause for the Engineer to order a sufficient delay in the Contractor's schedule to allow time for such inspections and any remedial or corrective Work required, and all costs of such delays, including its effect upon other portions of the Work, shall be borne by the Contractor. Payment for items which are built uninspected or unverified may be delayed by the Engineer until satisfactory evidence of compliance is attained.

1.05 SAMPLING AND TESTING

A. When not otherwise specified, all sampling and testing shall be in accordance with methods prescribed in the current standards of the ASTM or related standard entity, as applicable to the class and nature of the article or materials considered; however, the Owner reserves the right to use any generally-accepted system of inspection which, in the opinion of the Engineer, will insure the Owner that the quality of the workmanship is in full accordance with the Contract Documents.

B. Any waiver of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial Work, shall not be construed as a waiver of any technical or qualitative requirements of the Contract Documents.

C. Notwithstanding the existence of such waiver, the Engineer shall reserve the right to make independent investigations and tests as specified in the following paragraph and, upon failure of any portion of the Work to meet any of the quantitative requirements of the Contract Documents, shall be reasonable cause for the Engineer to require the removal or correction and reconstruction of any such Work.

D. In addition to any other inspection or quality assurance provisions that may be specified, the Engineer shall have the right to independently select, test and analyze, at the expense of the Owner, additional test specimens of any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests and analyses made by the Contractor to determine compliance with the applicable specifications for materials so tested or analyzed; provided that wherever any portion of the Work is discovered, as a result of such independent inspection and investigation, and all costs of removal, correction and reconstruction, or repair of any such Work shall be borne by the Contractor.

1.06 RIGHT OF REJECTION

A. The Engineer, acting for the Owner, shall have the right, at all times and places, to reject any articles or materials to be furnished herein which, in any respect, fail to meet the requirements of the Contract Documents, regardless of whether the defects in such articles or materials are detected at the point of manufacture or after completion of the Work at the site. If the Engineer or inspector, through an oversight or otherwise, has accepted materials or Work which is defective or which is contrary to the Contract Documents, such material, no matter in what stage or condition of manufacture, delivery or erection, may be rejected by the Engineer or the Owner.

B. The Contractor shall promptly remove rejected articles or material from the site of the Work after notification of rejection.

C. All costs of removal and replacement of rejected articles or materials from the site of the Work after notification of rejection shall be borne by the Contractor.

1.07 TESTING LABORATORY SERVICES

A. The Owner will select and pay for the services of an independent testing laboratory to perform specified testing quality control and services.

1. Contractor shall cooperate with the laboratory to facilitate the execution of its required services.

2. Employment of the laboratory shall in no way relieve Contractor's obligations to perform the Work of the Contract.

3. Excluding written protest by the Contractor in advance of processing or use of materials, services of the testing laboratory shall be understood as constituting full acceptance by and approval of the Contractor.

B. Related Requirements

1. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities as mentioned in the Conditions of the Contract.

2. Certification of Products indicated in respective Specification Sections.

C. Testing laboratory inspecting, sampling, and testing is required for, but not limited to:

1. Soils Compaction and Control.

2. Paving.

3. Cast-in-Place Concrete.

4. Structural Steel Welding

5. Metal Fabrications.

6. Concrete Piles.

7. Paintwork.

D. Qualification of Laboratory

1. Meet "Recommended Requirements of Independent Laboratory Qualification," latest edition, published by American Council of Independent Laboratories.

2. Meet basic requirements of ASTM E 329, "Standard Recommended Practice for inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction".

3. Authorized to operate in the State in which the Project is located.

E. Laboratory Duties

1. Cooperate with Engineer and Contractor; provide qualified personnel after due notice.

2. Perform specified inspections, sampling and testing and reporting of results of materials and methods of construction:

a. Comply with specified standards.

b. Ascertain compliance of materials with requirements of Contract Documents.

c. Tests and inspections shall be conducted in accordance with specified requirements and if not specified, in accordance with applicable standards of American Society of Testing and Materials and other recognized authorities as applicable.

3. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products.

4. Promptly submit written reports of each test and inspection; at least one copy each to Engineer, Owner, and Contractor.

5. Perform any additional tests as required by the Engineer or Owner.

F. Limitations of Authority of Testing Laboratory.

1. Laboratory is not authorized to:

a. Release, revoke, alter or enlarge any requirements of Contract Documents.

b. Approve or accept any portion of the Work.

c. Perform any duties of the Contractor.

G. Contractor's Responsibilities

1. Cooperate with laboratory personnel, provide access to Work and to Manufacturer's operations.

2. Provide to the laboratory and to the Engineer the preliminary design mix proposed to be used for concrete and other materials and mixes which require control by the testing laboratory.

3. Furnish copies of Products test reports as requested.

4. Furnish incidental labor and facilities:

a. To provide access to Work to be tested.

b. To obtain and handle samples at the Project Site or at the source of the product to be tested.

c. To facilitate inspections and tests.

d. For protection, storage and curing of test samples.

5. Costs of tests, samples and mock-ups of substitute and specified material, where the substitution is requested by the Contractor and the tests are necessary in the opinion of the Engineer to establish equality qualified with specified items, shall be borne by the Contractor.

6. Notify laboratory and Owner's Representative sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

7. Employ and pay for the services of a separate, equally qualified independent testing laboratory to perform additional inspections, sampling and testing required:

a. For the Contractor's convenience.

b. When initial tests indicate Work does not comply with Contract Documents.

c. When required by laws, ordinances, rules, regulations, orders or approvals of public authorities.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 45 00

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SECTION 01 51 00

TEMPORARY UTILITIES

1.0 GENERAL

1.01 RELATED WORK

NOT USED

1.02 TEMPORARY UTILITIES

A. Comply with National Electric Code

B. Contractor shall provide and maintain all temporary utilities such as heating, lighting and electricity for the operation of Contractor's plant or equipment or for any other use by Contractor. Heating, air conditioning and lighting shall be maintained at the project office and project site if applicable until the Work is granted final acceptance. General construction and safety lighting: five (5) foot-candles minimum; and finishing work and testing: twenty-five (25) foot-candles minimum.

C. Contractor shall discover characteristics of available sources of electrical power (voltage, phases, amps, etc.) and shall coordinate with his needs as required.

1.03 TEMPORARY TELEPHONE SERVICE (Not Required)

A. Contractor shall make all necessary arrangements with the telephone utility for telephones in the temporary field office(s) for the duration of Project. All telephone numbers shall be in the name of the Contractor, and all charges after installation shall be billed to and paid by the Contractor.

B. All Contractors and others performing work or furnishing services at the site shall be permitted to use Contractor's telephone without charge for toll-free calls pertaining to the Work.

1.04 TEMPORARY WATER

A. All water (including extensions of lines and connections) required for and in connection with the Work to be performed and for any specified tests of piping, equipment, devices, etc., or for any other use as may be required for proper completion of the Work shall be provided by and maintained at the expense of the

Contractor. No separate payment for water used or required will be made and all costs in connection therewith shall be included in the contract bid price.

B. Size piping to supply construction needs.

C. All drinking water on the site during construction shall be furnished by the Contractor and shall be bottled water.

1.05 TEMPORARY SANITARY FACILITIES

A. Contractor shall furnish temporary sanitary facilities at the site, as provided herein, for the needs of all construction workers and other performing work or furnishing services on the Project.

B. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 men. Contractor shall enforce the use of such sanitary facilities by all personnel at the site.

1.06 TEMPORARY VENTILATION

A. Provide ventilation to prevent accumulation of dust, fumes or gases and to properly cure materials and disperse humidity.

1.07 MEASUREMENT

There shall be no measurement for Temporary Utilities.

1.08 PAYMENT

Payment for Temporary Utilities will be made under “Mobilization and Demobilization”.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

3.01 REMOVAL

A. Completely remove all temporary utilities when their use is no longer required. Clean and repair damage caused by temporary installation.

B. Relocate temporary facilities during construction as required by progress of the Work at no additional cost to the Owner.

END OF SECTION 01 51 00

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SECTION 01 52 13

FIELD OFFICES AND SHEDS

1.0 GENERAL

1.01 RELATED WORK

A. Section 01 77 00 - Project Closeout

B. Section 01 71 13 - Mobilization and Demobilization

1.02 DESCRIPTION

A. During the performance of this contract, Contractor shall maintain a suitable temporary field office at the site of the Work which shall be the headquarters of his representative authorized to receive drawings, instructions or other communications or articles. Any communication given to the said representative or delivered at Contractor's office at the site of the Work in his absence shall be deemed to have been delivered to Contractor.

B. Location of temporary field office shall be subject to Engineer's and Owner's acceptance.

C. Temporary buildings and structures shall conform to all codes applicable to such facilities.

D. Copies of the drawings, specifications and other contract documents shall be kept at Contractor's office at the site of the Work and available for use at all times.

E. Furnish, install and maintain for the duration of the Project, all required scaffolds, tarpaulins, canopies, steps, bridges, platforms, and other temporary construction necessary for proper completion of the Work in compliance with all safety regulations, plans and ordinances.

1.03 OWNER'S REPRESENTATIVE FIELD OFFICE

A. Contractor shall provide a suitable field office with at least 400 square feet of floor space, either adjacent to or partitioned off from his office at the site, for use of the Owner's Project Representative and any inspectors. The office shall be provided with an outside entrance door with a substantial lock, stairs, glazed windows suitable for light and ventilation, adequate heating, air conditioning, sanitary facilities and lighting facilities. Contractor shall pay all electricity and

heating bills. The office shall be furnished with a desk, a four drawer legal size filing cabinet, a work table, chairs, a plan rack, a 4'x8' meeting table, and a locker for storage of surveying instruments. The doors on the storage locker shall be equipped for padlocking. The general arrangement of the office and facilities provided shall be acceptable to Engineer.

1.04 TEMPORARY STORAGE FACILITIES

A. Provide temporary weathertight storage facilities with raised floors as required by storage needs.

B. Location of temporary storage facilities shall be subject to Engineer's and Owner's acceptance.

1.05 MEASUREMENT

There shall be no measurement for field offices and sheds.

1.06 PAYMENT

Payment for field offices and sheds will be made under “Mobilization and Demobilization”.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

A. Completely remove temporary facilities when their use is no longer required. Clean and repair damage caused by temporary installations.

B. Relocate temporary facilities as required by the progress of construction.

END OF SECTION 01 52 13

SECTION 01 60 00

MATERIAL AND EQUIPMENT

1.0 GENERAL

1.01 RELATED WORK

A. Section 01 66 00 - Storage and Protection

1.02 DESCRIPTION

A. Material and equipment incorporated into the Work:

1. Conform to applicable specifications and standards.

2. Comply with size, make, type and quality specified or as specifically approved in writing by the Engineer.

3. Manufactured and Fabricated Products:

a. Design, fabricate and assemble in accordance with the best engineering and shop practices.

b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.

c. Two or more items of the same kind shall be identical, by the same manufacturer.

d. Products shall be suitable for service conditions.

e. Equipment Capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

5. Whenever an article, device or piece of equipment specified herein (or as indicated on the Drawings) is referred to in the singular number, such reference shall apply to as many such articles as are indicated on the Drawings or required to complete the installation within the general intent of the Contract Documents.

B. Contractor shall be fully responsible for all materials and equipment which he has furnished, and shall furnish necessary replacements at any time prior to expiration of the Correction Period.

C. Off-site storage arrangements shall be acceptable to Owner for all materials and equipment not incorporated into the work but included in Applications for Payment. Such off-site storage arrangements shall be presented in writing, and shall afford adequate and satisfactory security and protection. Off-site storage facilities shall be accessible to Engineer.

D. Existing materials and equipment removed, and not reused or suitable for salvage, shall become Contractor's property.

E. Any items damaged in removal, storage or handling through carelessness or improper procedures shall be replaced by Contractor in kind or with new items.

F. Existing materials and equipment removed by Contractor shall not be reused in the Work except where so specified or indicated.

G. All items mentioned in these Contract Documents shall be handled in conformance with this Section, Section 01620, instructions in the related Sections, and manufacturer's literature.

H. The security of Owner furnished equipment shall become the responsibility of the Contractor upon taking delivery of the items at the office of the Owner.

1.03 MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents require that installation of Work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to Engineer.

1. Maintain one set of complete instructions at the job site during installation and until Project completion.

B. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.

2. Do not proceed with such Work without clear instructions.

C. Perform Work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.04 TRANSPORTATION AND HANDLING

A. Arrange deliveries of products in accordance with construction schedules, coordinate to avoid conflicts and delays with Work and conditions at the site.

B. Deliver products in undamaged condition, in manufacturer's original containers or packaging with identifying labels intact and legible. Labels shall indicate manufacturer and product name, description, mixing and application instructions, limitations, cautions and warnings.

C. Immediately upon delivery, inspect shipments to ensure proper material, color, type, quantities, and to assure compliance with the Contract Documents and approved submittals and that the products are undamaged.

D. Provide equipment and personnel to handle products by methods to prevent soiling or damage to the product or packaging.

1.05 PROTECTION AFTER INSTALLATION

A. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove coverings when no longer needed.

1.06 SUBSTRATE CONDITIONS

A. Contractor shall be responsible for verifying and obtaining proper substrate conditions, tolerances and material alignments to receive applied or attached materials and construction.

B. Substrates shall be sound, clean, dry and free of imperfections or conditions which would be detrimental to receipt of applied materials.

C. Align materials to give smooth, uniform surface planes within specified tolerances and straight, level and plumb surfaces.

D. Inspect substrates prior to installation of applied materials. Correct unacceptable conditions prior to proceeding with work.

1.07 FINISHED SURFACES

A. Finished surfaces shall be clean, uniform and free of damages, soiling or defects in material and finish.

B. Finished surfaces shall match color and texture of samples provided or approved by Engineer.

C. Protection:

1. Protect finished surfaces from damage and soiling during application, drying or curing, as applicable.

2. Provide temporary protective coverings or barriers required.

2.0 PRODUCTS

2.01 EVIDENCE OF COMPLIANCE

A. All material and equipment used in the completion of this work shall be accompanied by certificates of compliance with the applicable requirements of the specifications. These certificates shall state date of manufacture, manufacturer, local representative, component sources and other pertinent specified facts of manufacture.

3.0 EXECUTION

NOT USED

END OF SECTION 01 60 00

SECTION 01 66 00

STORAGE AND PROTECTION

1.0 GENERAL

1.01 RELATED WORK

NOT USED

1.02 DESCRIPTION

A. All materials shall be suitably packaged (in manufacturer's original packaging with labels and seals intact) to facilitate handling and protect against damage during storage.

B. Painted or coated surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted or coated surfaces which are damaged prior to acceptance of equipment shall be repaired to the satisfaction of the Engineer. If the Engineer deems the damage to be too extensive for repair, the material will be rejected and disposed of by the Contractor at No Direct Pay.

C. Each item, package, or bundle of material shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall accompany each shipment.

1.03 MEASUREMENT

There shall be no measurement for storage and protection.

1.04 PAYMENT

Payment for storage and protection will be made under “Mobilization and Demobilization”.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

3.01 STORAGE, GENERAL

A. Store products, immediately on delivery, in accordance with manufacturer's instructions. Protect until installed.

B. Arrange storage in a manner to provide access for maintenance of stored items and for inspection.

C. Store and handle paints and products subject to spillage in areas where spills will not deface surfaces.

D. Flammable or hazardous materials:

1. Store minimum quantities in protected areas.

2. Provide appropriate type fire extinguishers near storage areas.

3. Observe manufacturer's precautions and applicable ordinances and regulations.

3.02 EXTERIOR STORAGE

A. Provide substantial platforms, blocking, or skids, to support fabricated products above ground; slope to provide drainage. Protect products from soiling and staining.

B. For products subject to discoloration or deterioration from exposure to the elements, cover with impervious sheet material. Provide ventilation to avoid condensation.

C. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.

D. Provide surface drainage to prevent erosion, pollution by mixing and ponding of water.

E. Prevent mixing of refuse or chemically injurious materials or liquids.

3.03 OFF-SITE STORAGE

A. Off-site storage arrangements for Contractor-furnished equipment and materials shall be acceptable to Owner for all materials and equipment not incorporated into to the work but included in Applications for Payment. Such off-site storage

arrangements shall be presented in writing and shall afford adequate and satisfactory security and protection. Off-site storage facilities shall be accessible to Engineer.

3.04 MAINTENANCE OF STORAGE

A. Periodically inspect stored products on a scheduled basis.

B. Verify that storage facilities comply with manufacturer's product storage requirements.

C. Verify that manufacturer's required environmental conditions are maintained continually.

D. Verify that surfaces of products exposed to the elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents.

END OF SECTION 01 66 00

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SECTION 01 71 13

MOBILIZATION AND DEMOBILIZATION

1.0 GENERAL

1.01 SCOPE

A. The Work shall consist of the preparatory and closeout work of the Contractor's forces and equipment necessary for performing the Work required under the Agreement.

B. It shall include the purchase of contract bonds, insurance, transportation of personnel, equipment, operating supplies, and incidentals to and from the site, establishment and removal of temporary offices, buildings, temporary utilities barricades and enclosures, project signs, security and other necessary facilities at the site; and other preconstruction expenses necessary for the start and closeout of work, excluding the cost of materials.

C. It shall not include mobilization and demobilization for any specific item of work for which payment for mobilization is provided elsewhere in the Agreement.

D. This specification covers mobilization and demobilization for work required by the Agreement at the time of award. If additional mobilization costs are incurred during performance of the Agreement as a result of changed or added items of work for which the Contractor is entitled to an adjustment in contract price, compensation for such costs will be included in the price adjustment for the items of work changed or added.

1.02 RELATED WORK

A. Section 01 51 00 - Temporary Utilities

B. Section01 52 13 - Field Offices and Sheds

1.03 MEASUREMENT

No measurement shall be made for mobilization.

1.04 PAYMENT.

A. Payment will be made monthly as the Work proceeds, after presentation of invoices by the Contractor showing his own mobilization costs and evidence of charges of suppliers, subcontractors, and others for mobilization work performed by them. If the total of such payments is less than the lump sum price for mobilization, the unpaid balance will be included in the final contract payment. Total payment will be the lump sum price for mobilization, regardless of actual cost to the Contractor.

B. Payment will not be made under this item for the purchase costs of materials having a residual value, the purchase costs of materials to be incorporated into the project, or the purchase costs of operating supplies.

C. Payment of the lump sum price for mobilization will constitute full compensation for all labor, materials, equipment, and all other items necessary and incidental to completion of the Work.

D. In the event this Agreement is canceled by the Owner, the Contractor will be paid for the actual costs incurred for mobilization to the time of cancellation, which costs will not exceed the total lump sum price for the pay item "Mobilization".

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 71 13

SECTION 01 73 23

FIELD ENGINEERING AND SURVEYING

1.0 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Contractor shall provide and pay for field engineering services and field surveying required for Project.

1. Survey work required in execution of Project.

2. Civil, structural or other professional engineering services specified, or required to execute Contractor's construction methods.

1.02 RELATED REQUIREMENTS

A. DIVISION 1

B. DIVISION 2

C. DIVISION 31

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEER

A. Registered professional engineer or registered land surveyor of the discipline required for the specific service of the Project, licensed in the State of Louisiana and acceptable to the Owner.

1.04 QUALITY CRITERIA

A. Contractor shall perform the following:

1. Verify existing grades prior to beginning site preparation. If existing grades are at variance with drawings, notify Engineer and receive instructions prior to proceeding.

2. Verify limits of the site preparation and earthwork operations. Locate adjacent buildings and appurtenances.

3. Establish bench marks outside of working limits. Establish two benchmarks, located on the project site, as widely separated as possible.

4. Verify locations and levels of buildings and appurtenances; including structural and facing components. Note variation from the indicated locations and levels.

5. Verify batter boards at building corners.

6. Verify utility locations, including new construction and existing active and inactive utilities encountered during construction activity.

7. Verify outside building lines to ensure correct position of buildings and appurtenances on project site. Make required surveys to fix and verify foundation locations and elevations, column centerlines, piers, walls, pits and trenches.

8. Measure any settlement of adjacent and project building monthly during construction operations.

9. Measure deflection in structural members.

10. Coordinate work of all trades where work is concealed above finish ceilings, below finish floors or within walls, particularly where contract drawings are diagrammatic. Coordinate locations of piping, ductwork, conduit, lighting fixtures and similar items.

B. Notify Engineer, in writing of on-site conditions which are at variance with the Contract Documents. Compare variations in locations, level, plumbness and deflection with allowable tolerances given in the Contract Documents.

1.05 SURVEY REFERENCE POINTS

A. The basic horizontal and vertical control points for the Project should be those designated on Drawings. All additional survey, layout, and measurement Work shall be performed by Contractor as a part of the Work. Contractor shall verify all existing grades prior to beginning work on the site.

B. Contractor shall locate verify and protect control points prior to starting work, and preserve all permanent reference points during construction.

1. Make no changes or relocations without prior written notice to Engineer.

2. Report to Engineer when any reference point is lost or destroyed, or required relocation because of necessary changes in grades or locations.

3. Require surveyor to replace Project control points which may be lost or destroyed.

    a. Establish replacements based on original survey control.

1.06 PROJECT SURVEY REQUIREMENTS

A. Establish temporary bench marks as needed referenced to data established by survey control points. Record locations, with horizontal and vertical data, on Project Record Documents.

B. Establish lines and levels, locate and lay out, by instrumentation and similar appropriate means.

C. From time to time, as directed by the Engineer, verify layouts by same methods.

D. Contractor shall provide an experienced instrument man, competent assistants, and such instruments, tools, stakes, and other materials required to complete the survey, layout and measurement of Work.

E. Contractor shall furnish, without charge, competent men from his force and such tools, stakes, and other materials as Engineer may require in establishing or designating control points, in establishing construction easement boundaries, or in checking survey, layout, and measurement of Work performed by Contractor.

1.07 RECORDS

A. Maintain a complete, accurate log of all control and survey work as it progresses.

B. Contractor shall keep neat and legible notes of measurements and calculations made by him in connection with the layout of the Work. Copies of such data shall be furnished to the Resident Project Representative for use in checking Contractor's layout.

C. All field notes and layout data shall be recorded in bound field books.

1.08 SUBMITTALS

A. Submit name and address of Surveyor and Professional Engineer to Engineer.

B. On request of Engineer, submit documentation to verify accuracy of field engineering work.

C. Submit certificate signed by Registered Engineer or Surveyor certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.

D. All field books, notes, and other data developed by Contractor in performing surveys required as part of the Work shall be available to Engineer for examination throughout the construction period. All such data shall be submitted to Engineer with the other documentation required for final acceptance of the Work.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 71 23

SECTION 01 73 29

CUTTING AND PATCHING

1.0 GENERAL

1.01 DESCRIPTION

A. Contractor shall be responsible for all cutting, fitting and patching, including excavation and backfill, required to complete the Work or to:

1. Make its several parts fit together properly.

2. Uncover portions of the Work to provide for installation of ill-timed work.

3. Remove and replace defective work.

4. Remove and replace work not conforming to requirements of Contract Documents.

5. Remove samples of installed work as specified for testing.

6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

B. Related Requirements are specified in all other DIVISIONS.

1.02 SUBMITTALS

A. The Contractor shall submit a written request to the Owner's Representative well in advance of executing any cutting or alteration which may affect:

1. The work of the Owner or any separate contractor.

2. The structural value or integrity of any element of the Project.

3. The integrity of effectiveness of weather-exposed or moisture-resistant elements or systems.

4. The efficiency, operational life, maintenance or safety of operational elements.

5. The visual qualities of sight-exposed elements.

B. The request shall include:

1. Identification of the Project.

2. Location and description of the affected work.

3. The necessity for cutting, alteration or excavation.

4. The effect on the work of the Owner or any separate contractor, or on the structural or weatherproof integrity of the Project.

5. Description of the proposed work:

a. The scope of cutting, patching, alteration, or excavation.

b. The trades who will execute the work.

c. Products proposed to be used.

d. The extent of refinishing to be done.

6. Alternatives to cutting and patching.

7. Cost proposal, when applicable.

8. Written permission of any separate contractor whose work will be affected.

9. Date and time work will be executed.

C. Should conditions of the work or the schedule indicate a change of products from the original installation, Contractor shall submit a request substitution.

D. Contractor shall not undertake any cutting or demolition which may affect the structural stability of the existing facilities without Engineer's concurrence.

2.0 PRODUCTS

2.01 MATERIALS

A. Comply with specifications and standards for each specific product involved.

3.0 EXECUTION

3.01 INSPECTION

A. The Contractor shall inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, the Contractor shall inspect the conditions affecting the installation of Products, or performance of the work. Beginning of cutting or patching means acceptance of existing conditions.

C. Report unsatisfactory or questionable conditions to the Owner's Representative in writing; do not proceed with the work until the Owner's Representative has provided further instructions.

3.02 PREPARATION

A. The Contractor shall provide adequate temporary support as necessary to assure the structural value or integrity of the affected portion of the Work. Contractor shall provide all shoring, bracing, supports, and protective devices necessary to safeguard all Work during cutting and patching operations.

B. Provide devices and methods to protect other portions of the Project from damage.

C. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.

3.03 PERFORMANCE

A. The Contractor shall execute cutting and demolition by methods which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

B. Provide devices and methods to protect other portions of the Project from damage.

C. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.

D. Execute excavating and backfilling by methods which will prevent settlement or damage to other work.

E. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes.

F. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.

G. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

H. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

1. For continuous surfaces, refinish to nearest intersection.

2. For an assembly, refinish the entire unit.

END OF SECTION 01 73 29

SECTION 01 77 00

CONTRACT CLOSEOUT

1.0 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Comply with requirements stated in the General and Supplementary Conditions of the Contract and in the Specifications for administrative procedures in closing out the Work.

1.02 RELATED WORK

A. General and Supplementary Conditions of the Contract. Fiscal provisions, legal submittals and additional administrative requirements.

B. Section 01 11 00 - Summary of Work.

C. Section 01 29 00 - Applications for Payment.

1.03 CLEANING

A. Before final acceptance, the Contractor shall remove from the site and adjacent property all surplus materials, weeds, bushes, rubbish and temporary structures trailers, tools, equipment, supplies, and unused or waste materials; shall satisfactorily restore by grading, raking, smoothing, and other necessary operations all property which has been worn, rutted or damaged during the work, and shall leave the site in a presentable condition. Upon completion of work in connection with drainage structures, the Contractor shall remove all obstructions to the flow of water from inside all structures, channels, and culverts whether new or old. No direct payment will be made for this work.

B. Clean all interior and exterior building surfaces and make same ready for use before final inspection and after completion of all building construction operations. Wash and rinse floors. Wash fixtures and polish trim. Restore or replace all damaged or defaced surfaces to original condition. Clean all equipment.

C. Remove all temporary labels.

D. Clean site. Sweep paved areas.

E. Remove all waste and surplus material from site.

F. Roads, fences, and other facilities damaged or deteriorated because of Contractor's operations shall be repaired.

G. Contractor shall be responsible for and will clean up at his own expense any streets or roadways which have debris, mud, stone, etc., as a result of construction on this project.

1.04 SUBSTANTIAL COMPLETION

A. When Contractor considers the Work is substantially complete, he shall submit to the Engineer (5 copies each):

1. A written notice that the Work, or designated portion thereof, is substantially complete.

2. A list of items to be completed or corrected.

3. Prepare and file a request for Certificate of Use and Occupancy with the Building Department.

B. Within a reasonable time after receipt of such notice, the Engineer will make an inspection to determine the status of completion.

C. Should the Engineer determine that the Work is not substantially complete:

1. Engineer will promptly notify the Contractor in writing, giving the reasons therefor.

2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Engineer.

3. Engineer will re-inspect the Work.

D. When the Engineer finds that the Work is substantially complete, he may:

1. Prepare and deliver to the Owner a notification of Substantial Completion on an appropriate form with the Contractor's list of items to be completed or corrected as verified and amended by the Engineer before final payment.

2. After consideration of any objections made by the Owner as provided in Conditions of the Contract, and when Engineer considers that the Work is substantially complete, he will countersign and deliver to the Owner and the

contractor a definite notification of Substantial Completion with a revised list of items to be completed or corrected.

1.05 COMPLETION VIDEO

A. The Contractor shall deliver a satisfactory video tape with the preconstruction and post construction information. Final payment (retainage) shall not be paid until receipt of the video.

1.06 FINAL INSPECTION

A. When Contractor considers the Work is complete, he shall submit written notification that (5 copies):

1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.

4. Equipment and systems have been tested in the presence of the Engineer and /or Owner's representative and are operational.

5. Work is completed and ready for final inspection.

6. All items noted from the Substantial Completion inspection have been completed or corrected.

B. Contractor shall also submit (5 copies each):

1. Certificate of Use and Occupancy.

2. Certificate of approved final inspection for all applicable mechanical, electrical, plumbing, equipment, etc. as required by state and local authorities.

C. Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such notification.

D. Should Engineer consider that the Work is incomplete or defective:

1. Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.

2. Contractor shall take immediate steps to remedy the stated deficiencies and send a second written notification to Engineer stating that the Work is complete.

3. Engineer will re-inspect the Work.

E. When the Engineer finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closeout submittals, including Application for Final Payment.

1.07 REINSPECTION FEES

A. Should Engineer perform re-inspection due to failure of the Work to comply with the claims of status of completion made by the Contractor:

1. Owner will compensate Engineer for such additional services.

2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.08 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

A. Project Record Documents.

B. Warranties, Guarantees and Bonds. All warranty periods shall begin on the date of Final Acceptance.

C. Operations & Maintenance Manuals and Data, 3 copies each, bound in labeled stiff back ring binders. Include for all equipment and controls.

D. Executed Service Contracts.

E. Spare parts and Maintenance Materials.

F. Reports of all required tests and demonstrations.

G. Keys to all locks and locksets.

H. Evidence of Payment and Release of Liens: In accordance with requirements of General and Supplementary Conditions.

1.09 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to the Engineer.

B. Statement shall reflect all adjustments to the Contract Sum:

1. The original Contract Sum.

2. Additions and deductions resulting from:

a. Previous Change Orders.

b. Quantity reconciliations.

c. Penalties and Bonuses.

d. Deductions for liquidated damages.

e. Deductions for re-inspection payments.

f. Deductions for overtime inspection payments.

g. Other adjustments.

3. Total Contract Sum, as adjusted.

4. Previous payments.

5. Sum remaining due.

C. Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.10 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the General and Supplementary Conditions of the Contract.

1.11 SUPPLEMENTAL LIQUIDATED DAMAGES

A. After the establishment of a date of Substantial Completion, the Contractor shall have 30 days to complete any outstanding items of Work remaining to be completed or corrected as listed on a final punch list made a part of the Substantial Completion Package. If upon expiration of said 30 days the outstanding items of Work have not been completed, liquidated damages in the amount agreed to in this contract will be reinstated for every day in which the outstanding items of Work have not been completed. Furthermore, the Owner

shall not release monies withheld until all outstanding items of Work have been completed.

2.0 PRODUCTS

NOT USED

3.0 EXECUTION

NOT USED

END OF SECTION 01 77 00

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Sections:
1. Division 01 Section "Site Survey Conditions" for final property survey.
2. Division 01 Section "Contract Closeout" for general closeout procedures.
3. Divisions 02 through 41 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints at each submission.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Intermediate Construction Submittals: Submit one paper copy sets of marked-up record prints and one set of plots from corrected record digital data files at the 30%, 60% and 90%. Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting is acceptable.
b. Final Submittal: Submit one paper copy set of marked-up record prints. Print each Drawing, whether or not changes and additional information were recorded.

3. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

B. Reports: Submit written report weekly indicating items incorporated in Project record documents concurrent with progress of the Work, including modifications, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Engineer determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Engineer for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Engineer.
e. Name of Contractor.

2.2 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

1. Include record Product Data directory organized by specification section number and title, electronically linked to each item of record Product Data.

2.3 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as paper copy.

1. Include miscellaneous record submittals directory organized by specification section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.

B. Submittal: Submit one copy of current record drawings at 30%, 60% and 90% construction intervals to the Engineer.

C. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Engineer's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture.

C. Shop Drawings: For steel reinforcement.

D. Material test reports and certificates.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

D. Pre-installation Conference: Conduct conference at Project site.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615 Grade 60, deformed.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, ASTM A 775/A 775M epoxy coated.

C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, II, or I/II.

B. Normal-Weight Aggregates: ASTM C 33, graded, 1-1/2-inch nominal maximum coarse-aggregate size.

1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.

2.5 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

1. Products: Subject to compliance with requirements, **provide one of the following**:

a. Carlisle Coatings & Waterproofing, Inc.; MiraSTOP.
b. CETCO; Volclay Waterstop-RX.
c. Concrete Sealants Inc.; Conseal CS-231.
d. Greenstreak; Swellstop.
e. Henry Company, Sealants Division; Hydro-Flex.
f. JP Specialties, Inc.; Earth Shield Type 20.
g. Or Approved Equal.

2. At fuel tank containment facility, submit waterproofing that is resistant to diesel fuel.

2.6 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Grouts:

1. Epoxy Grout: Epoxy grout shall be Five Star epoxy grout or approved equal in accordance with ASTM –C 827 minimum compressive strength 16,000 psi. Epoxy grout shall be applied according to the manufacturer's recommendations. Contractor shall submit epoxy grout product data for Engineer's approval.
2. Epoxy Bonding Agent for installing drilled in place concrete reinforcement bars shall be Five Star RS Anchor Gel or Engineer approved equal. Compressive properties in accordance with ASTM D 695 shall be a minimum of 10,800 psi and 14 day bond strength in accordance with ASTM C 882 shall be 3000 psi. Epoxy anchor gel shall be applied according to the manufacturer's recommendations. Contractor shall submit epoxy anchor gel product data for Engineer's approval.

3. Nonshrink, non metallic cement based Five Star High Performance Precision Nonshrink Grout or approved equal in accordance with ASTM- C827 and ASTM C-1107-02 and CRD-C 621-93, with minimum compressive strength 8,000 psi at 28 days. Contractor shall submit grout detail for Engineer's approval.

2.8 CONCRETE MIXTURES

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

B. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.

2. Maximum Water-Cementitious Materials Ratio: 0.48.
3. Slump Limit: 4 inches at point of delivery.
4. Air Content: 4 percent at point of delivery for ¾”-inch nominal maximum aggregate size.

2.9 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice." Field bending by use of heat will not be allowed.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturers recommended tape.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Engineer.

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

C. Waterstops: Install in construction joints and at other joints indicated according to manufacturer's written instructions.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

C. Cold-Weather Placement: Comply with ACI 306.1.

D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch.

3.9 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and

during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect/Engineer. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Contractor will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

4. Testing Services: Tests shall be performed according to ACI 301.

END OF SECTION 03300

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Steel framing and supports for overhead doors, louvers, etc.
2. Steel framing and supports for mechanical and electrical equipment.
3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
4. Shelf angles.
5. Metal ladders.
6. Metal floor plate and supports.
7. Structural-steel door frames.
8. Miscellaneous steel trim including.
9. Metal bollards.
10. Downspout guards.
11. Abrasive metal nosings treads and thresholds.
12. Metal downspout boots.
13. Loose bearing and leveling plates for applications where they are not specified in other Sections.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
2. Division 04 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Division 05 Section "Pipe and Tube Railings."
4. Division 05 Section "Metal Gratings."

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Metal nosings and treads.
   2. Paint products.
   3. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified professional engineer.

B. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

   1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
   2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
   3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves,

concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

C. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

F. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. IKG Industries, a division of Harsco Corporation; Mebac.
    b. SlipNOT Metal Safety Flooring, a W. S. Molnar company; SlipNOT.

G. Steel Tubing: ASTM A 500, cold-formed steel tubing.

H. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

I. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: As indicated.
2. Material: Galvanized steel, ASTM A 653/A 653M,, with G90 (Z275) coating; 0.064-inch (1.6-mm) nominal thickness.
3. Material: Cold-rolled steel, ASTM A 1008/A 1008M,; 0.0966-inch (2.5-mm) minimum thickness; hot-dip galvanized after fabrication.

J. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.3 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

C. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

D. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

E. Bronze Plate, Sheet, Strip, and Bars: ASTM B 36/B 36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper).

F. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).

G. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).

H. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500.

I. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.4 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.
3. Provide stainless-steel fasteners for fastening nickel silver.
4. Provide bronze fasteners for fastening bronze.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy Group 1 (A1).

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Eyebolts: ASTM A 489.

G. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

H. Lag Screws: ASME B18.2.1 (ASME B18.2.3.8M).

I. Wood Screws: Flat head, ASME B18.6.1.

J. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

K. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

L. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

M. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

N. Post-Installed Anchors: chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

G. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.6 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches

(200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with primer specified in Division 09 Section "High-Performance Coatings" where indicated.

2.8 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

2.9 METAL LADDERS

A. General:

1. Comply with ANSI A14.3 unless otherwise indicated.

B. Steel Ladders:

1. Space siderails 16 inches (406 mm) apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch (9.5-by-64-mm) steel flat bars, with eased edges.
3. Rungs: 1-inch- (25-mm-) diameter steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.

5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.

   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

      1) IKG Industries, a division of Harsco Corporation; Mebac.
      2) SlipNOT Metal Safety Flooring, a W. S. Molnar company; SlipNOT.

6. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
7. Galvanize ladders, including brackets and fasteners.

2.10 METAL FLOOR PLATE

A. Fabricate from rolled-aluminum-alloy abrasive-surface floor plate of thickness indicated below:

   1. Thickness: As indicated.

B. Provide grating sections where indicated fabricated from pressure-locked aluminum bar grating. Limit openings in gratings to no more than 1 inch (25 mm) in least dimension.

C. Provide aluminum angle supports as indicated.

D. Include aluminum angle stiffeners, and fixed and removable sections as indicated.

E. Provide flush aluminum bar drop handles for lifting removable sections, one at each end of each section.

2.11 STRUCTURAL-STEEL DOOR FRAMES

A. Fabricate structural-steel door frames from steel shapes, plates, and bars of size and to dimensions indicated, fully welded together, with 5/8-by-1-1/2-inch (16-by-38-mm) steel channel stops, unless otherwise indicated. Plug-weld built-up members and continuously weld exposed joints. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than 10 inches (250 mm) o.c. Reinforce frames and drill and tap as necessary to accept finish hardware.

   1. Provide with integrally welded steel strap anchors for securing door frames into adjoining concrete or masonry.

B. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

C. Galvanize exterior steel frames.

D. Prime exterior steel frames with primer specified in Division 09 Section "High-Performance Coatings."

2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize miscellaneous steel trim.

2.13 METAL BOLLARDS

A. Fabricate metal bollards from Schedule 40 steel pipe.

1. Fill bollards with concrete, round cap at top.

B. Fabricate bollards with 3/8-inch- (9.5-mm-) thick steel baseplates for bolting to concrete slab. Drill baseplates at all four corners for 3/4-inch (19-mm) anchor bolts.

1. Where bollards are to be anchored to sloping concrete slabs, angle baseplates for plumb alignment of bollards.

C. Fabricate sleeves for bollard anchorage from steel pipe with 1/4-inch- (6.4-mm-) thick steel plate welded to bottom of sleeve. Make sleeves not less than 8 inches (200 mm) deep and 3/4 inch (19 mm) larger than OD of bollard.

D. Fabricate internal sleeves for removable bollards from Schedule 40 steel pipe or 1/4-inch (6.4-mm) wall-thickness steel tubing with an OD approximately 1/16 inch (1.5 mm) less than ID of bollards. Match drill sleeve and bollard for 3/4 inch (19 mm) steel machine bolt.

E. Prime bollards with primer specified in Division 09 Section "High-Performance Coatings."

2.14 DOWNSPOUT GUARDS

A. Fabricate downspout guards from as shown on the drawings.

B. Galvanize downspout guards.

C. Prime downspout guards with primer specified in Division 09 Section "High-Performance Coatings."

2.15 ABRASIVE METAL NOSINGS

A. Cast-Metal Units: Cast iron, with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Safety Tread Co., Inc.
b. Balco Inc.
c. Barry Pattern & Foundry Co., Inc.
d. Granite State Casting Co.
e. Safe-T-Metal Company, Inc.
f. Wooster Products Inc.

2. Nosings: Cross-hatched units, 4 inches (100 mm) wide with 1/4-inch (6-mm) lip, for casting into concrete steps.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Apply bituminous paint to concealed surfaces of cast-metal units.

2.16 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

2.17 LOOSE STEEL LINTELS

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

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches (200 mm) unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.18 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.19 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.20 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with primers specified in Division 09 painting Sections unless indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Division 09 Section "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

2.21 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING METAL BOLLARDS

A. Fill metal bollards solidly with concrete.

1. Do not fill removable bollards with concrete.

B. Anchor bollards to existing construction with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each bollard unless otherwise indicated.

1. Embed anchor bolts at least 4 inches (100 mm) in concrete.

C. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. Fill annular space around bollard solidly with nonshrink, nonmetallic grout; mixed and placed to comply with grout manufacturer's written instructions. Slope grout up approximately 1/8 inch (3 mm) toward bollard.

D. Fill bollards solidly with concrete, mounding top surface to shed water.

1. Do not fill removable bollards with concrete.

3.4 INSTALLING PIPE GUARDS

A. Provide pipe guards at exposed vertical pipes in parking garage where not protected by curbs or other barriers. Install by bolting to wall or column with expansion anchors. Provide four 3/4-inch (19-mm) bolts at each pipe guard. Mount pipe guards with top edge 26 inches (660 mm) above driving surface.

3.5 INSTALLING NOSINGS, TREADS, AND THRESHOLDS

A. Center nosings on tread widths unless otherwise indicated.

B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

C. Seal thresholds exposed to exterior with elastomeric sealant complying with Division 07 Section "Joint Sealants" to provide a watertight installation.

3.6 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.7 ADJUSTING AND CLEANING

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

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

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Steel pipe and tube railings.

B. Related Sections include the following:

   1. Division 05 Section "Metal Stairs" for steel tube railings associated with metal stairs.

1.3 PERFORMANCE REQUIREMENTS

A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
   1. Steel: 72 percent of minimum yield strength.

B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   1. Handrails:

      a. Uniform load of 50 lbf/ ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.

   2. Top Rails of Guards:

      a. Uniform load of 50 lbf/ ft. applied in any direction.
      b. Concentrated load of 200 lbf applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.

   3. Infill of Guards:

      a. Concentrated load of 200 lbf applied horizontally on an area of 1 sq. ft.
      b. Uniform load of 25 lbf/sq. ft. applied horizontally.

c. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.

D. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

E. Welding certificates.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel." (latest edition).

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating railings without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 STEEL AND IRON

A. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).

B. Pipe: ASTM A 53, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

1. Provide galvanized finish for exterior installations and where indicated.

C. Plates, Shapes, and Bars: ASTM A 36.

D. Castings: Either gray or malleable iron, unless otherwise indicated.

1. Gray Iron: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.
2. Malleable Iron: ASTM A 47.

2.3 FASTENERS

A. General: Provide the following:
1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:
1. Provide square or hex socket flat-head machine screws for exposed fasteners, unless otherwise indicated.

D. Anchors: Provide chemical or torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

1. Use primer with a VOC content of 3.5 lb/gal. or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Use primer with a VOC content of 3.5 lb/gal. or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, provide one of the following:

    a. Benjamin Moore & Co.; Epoxy Zinc-Rich Primer CM18/19.
    b. Carboline Company; Carbozinc 621.
    c. ICI Devoe Coatings; Catha-Coat 313.
    d. International Coatings Limited; Interzinc 315 Epoxy Zinc-Rich Primer.
    e. PPG Architectural Finishes, Inc.; Aquapon Zinc-Rich Primer 97-670.
    f. Sherwin-Williams Company (The); Corothane I GalvaPac Zinc Primer.
    g. Tnemec Company, Inc.; Tneme-Zinc 90-97.
    h. Or approved equal.

D. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

H. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

I. Existing Aluminum guardrail, posts and accessories that are to be relocated shall not have direct contact with any new or existing steel members or grating. Rubber or plastic gaskets shall be used where all aluminum and steel are come into direct contact with one another.

2.5 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded connections, unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:

1. As detailed.
2. By inserting prefabricated elbow fittings flush-elbow fittings elbow fittings of radius indicated.

K. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of railing members with prefabricated end fittings.

M. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide fillers made from crush-resistant material, or other means to transfer wall loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

P. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

Q. For removable railing posts, fabricate slip-fit sockets from steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.

1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

R. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.7 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize steel and iron railings, including hardware, after fabrication.
2. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.
3. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
4. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.

B. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

D. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic-phosphate process.

F. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:

1. Exterior Railings (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interior Railings (SSPC Zone 1A): SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
3. Interior Railings Indicated to Receive Zinc-Rich Primer (SSPC Zone 1A): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

G. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Do not apply primer to galvanized surfaces.
2. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to 1 side, and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout or anchoring cement, mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch buildup, sloped away from post.

C. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends to concrete and masonry with round flanges connected to railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface.
   1. Use type of bracket with predrilled hole for exposed bolt anchorage.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For hollow masonry anchorage, use toggle bolts.
   3. For steel-framed gypsum board partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.7 ADJUSTING AND CLEANING

A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

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

C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

D. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 52 13

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SECTION 260519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN, XHHW.

C. Multiconductor Cable: Comply with NEMA WC 70 for Type SO with ground wire.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, XHHW, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. Class 1 Control Circuits: Type THHN-THWN, in raceway.

J. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Sections "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

I. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.4 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 26 Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.5 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test conductors for compliance with requirements.

2. All conductors shall pass a continuity and megger insulation test. Use conductor manufacturer recommended voltages for testing each appropriate insulation rating.

3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
4. All test reports shall be submitted to the Engineer for review and be included in final close out documentation.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260523

CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. UTP cabling.
2. RS-232 cabling.
3. RS-485 cabling.
4. Low-voltage control cabling.
5. Control-circuit conductors.
6. Identification products.

1.2 DEFINITIONS

A. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.

B. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of an NRTL.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

B. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.

1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

2.2 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden CDT Inc.; Electronics Division.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Draka USA.
5. Genesis Cable Products; Honeywell International, Inc.
6. KRONE Incorporated.
7. Mohawk; a division of Belden CDT.
8. Nordex/CDT; a subsidiary of Cable Design Technologies.
9. Superior Essex Inc.
10. SYSTIMAX Solutions; a CommScope, Inc. brand.
11. 3M.
12. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. Description: 100-ohm, four-pair UTP.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 5e/ Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Multipurpose: Type MP or Type MPG; or Type MPP or Type MPR.
b. Multipurpose, Riser Rated: Type MPR or Type MPP, complying with UL 1666.

2.3 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Technology Systems Industries, Inc.
2. Dynacom Corporation.
3. Hubbell Premise Wiring.
4. KRONE Incorporated.
5. Leviton Voice & Data Division.
6. Molex Premise Networks; a division of Molex, Inc.
7. Nordex/CDT; a subsidiary of Cable Design Technologies.
8. Panduit Corp.
9. Siemon Co. (The).
10. Tyco Electronics/AMP Netconnect; Tyco International Ltd.

B. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.

C. Connecting Blocks: 110 style for Category 5e. Provide blocks for the number of cables terminated on the block, plus 25 percent spare; integral with connector bodies, including plugs and jacks where indicated.

2.4 RS-232 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.5 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM or Type CMG.

1. Paired, two pairs, twisted, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.6 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

C. Paired Cable: NFPA 70, Type CMG.

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

D. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Plastic jacket.

5. Flame Resistance: NFPA 262, Flame Test.

2.7 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN in raceway, complying with UL 83, UL 44.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, complying with UL 83, UL 44.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or Type TF, complying with UL 83.

2.8 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation.
2. HellermannTyton.
3. Kroy LLC.
4. Panduit Corp.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

B. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.

C. Install manufactured conduit sweeps and long-radius elbows if possible.

D. Pathway Installation in Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed or in the corner of room if multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard if entering room from overhead.
4. Extend conduits 3 inches (75 mm) above finished floor.

5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

E. Backboards: Install backboards with 96-inch (2440-mm) dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
3. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
7. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

C. UTP Cable Installation:

1. Comply with TIA/EIA-568-B.2.
2. Install 110-style IDC termination hardware unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways. Comply with requirements specified in Division 26 Section "Raceway and Boxes for Electrical Systems."

E. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.

2. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches (75 mm).
c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches (150 mm).

3. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches (1200 mm).
4. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches (127 mm).

3.3 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits, No. 14 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits, No 12 AWG.

3.4 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 GROUNDING

A. For data communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.6 IDENTIFICATION

A. Identify system components, wiring, and cabling according to TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Visually inspect UTP cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not after cross connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Grounding systems and equipment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.2 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad, steel; 3/4 inch diameter by 10 feet long (19 mm by 3 m).

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches (600 mm) below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.

3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

B. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch (6.3-by-100-by-300-mm) grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

E. Metal and Wood Poles Supporting Outdoor Lighting Fixtures or equipment: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until in the earth so that only the top 6” of the rod is exposed above final grade. Make all connections to ground rods so they are visible for inspection and maintenance. Locate ground rods within 3” of building walls to prevent tripping hazard or damage from lawn maintenance equipment. Apply oxide inhibitor to all ground rod connections.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches (300 mm) deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

3.4 LABELING

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.

B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.

1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Make tests at ground rods before any conductors are connected.

B. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System: 10 ohms.
2. Power Distribution Units or Panelboards Serving Electronic Equipment: 10 ohm(s).

C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

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SECTION 260529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.3 ACTION SUBMITTALS

A. Product Data: For steel slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Equipment supports.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.; a division of Cooper Industries.
    c. ERICO International Corporation.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut; Tyco International, Ltd.

3. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
4. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
6. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron, hot dipped galvanized, or stainless steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    b. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Hilti Inc.
        3) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        4) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, hot dipped galvanized slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates. All fabrications shall be hot dipped galvanized after fabrication.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits. Secure raceways and cables to these supports with two-bolt conduit clamps.

3.2 SUPPORT INSTALLATION

A. Comply with NFPA 70 (NEC), NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts or Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533

RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits and fittings.
2. Nonmetal conduits and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Boxes, enclosures, and cabinets.
6. Handholes and boxes for exterior underground cabling.

B. Related Requirements:

1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.
2. Division 27 Section "Pathways for Communications Systems" for conduits, wireways, surface pathways, innerduct, boxes, faceplate adapters, enclosures, cabinets, and handholes serving communications systems.
3. Division 28 Section "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

1.2 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

B. Seismic Qualification Certificates: For enclosures, cabinets, and conduit racks and their mounting provisions, including those for internal components, from manufacturer.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, AND FITTINGS

A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. ARC: Comply with ANSI C80.5 and UL 6A.

D. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

E. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

F. Joint Compound for GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. RNC: Type EPC-40-PVC or schedule 80 as indicated, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

C. Fittings for and RNC: Comply with NEMA TC 3; match to conduit type and material.

D. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, 3R or 4 as indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, galvanized ferrous alloy, Type FD, with gasketed cover.

D. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb (23 kg). Outlet boxes designed for attachment of luminaires weighing more than 50 lb (23 kg) shall be listed and marked for the maximum allowable weight.

F. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast steel with neoprene gasketed cover and stainless steel screws.

G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

H. Gangable boxes are prohibited.

I. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1, 3R, 4 as indicated with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Nonmetallic Enclosures: Fiberglass.
3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

J. Cabinets:

1. NEMA 250, Type 1, 3R, 4 as indicated, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.5 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Polymer-Concrete Handholes and Boxes with Polymer-Concrete Cover: Molded of sand and aggregate, bound together with polymer resin, and reinforced with steel, fiberglass, or a combination of the two.

1. Standard: Comply with SCTE 77.
2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC.".
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC (ARC for grounds).
2. Concealed Conduit, Aboveground: GRC.
3. Underground Conduit: RNC, Type EPC-40-PVC, Type EPC-80-PVC, direct buried or concrete encased as indicated.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or 4 as indicated.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: GRC.
2. Exposed, Not Subject to Severe Physical Damage: GRC.
3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.

c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: GRC .
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F (49 deg C).

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for hangers and supports.

D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches (300 mm) of changes in direction.

F. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

G. Support conduit within 12 inches (300 mm) of enclosures to which attached.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot (3-m) intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches (50 mm) of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from RNC to GRC before rising above floor.

I. Stub-ups to Above Recessed Ceilings:

1. Use RMC for raceways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch (35-mm) trade size and insulated throat metal bushings on 1-1/2-inch (41-mm) trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

O. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

P. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

Q. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F (17 deg C) and that has straight-run length that exceeds 25 feet (7.6 m).
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

    a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C temperature change.
    c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
    d. Attics: 135 deg F (75 deg C) temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F (0.06 mm per meter of length of straight run per degree C) of temperature change for PVC conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints. Install expansion fittings in vertical portion of Service Entrance Conduits where they emerge from the ground at the building.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

R. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 18 inches (460 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC in damp or wet locations not subject to severe physical damage.

S. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

T. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

U. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

V. Locate boxes so that cover or plate will not span different building finishes.

W. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

X. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Y. Set metal floor boxes level and flush with finished floor surface.

Z. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Division 31 Section "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
4. Install manufactured duct elbows for stub-up at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete for a minimum of 12 inches (300 mm) on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

6. Underground Warning Tape: Comply with requirements in Division 26 Section "Identification for Electrical Systems."

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.5-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch (25 mm) above finished grade.

D. Install handholes with bottom below frost line.

E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 26 Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

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SECTION 260544

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

B. Related Requirements:

1. Division 07 Section "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.

2. Minimum Metal Thickness:

    a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and with no side larger than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
    b. For sleeve cross-section rectangle perimeter 50 inches (1270 mm) or more and one or more sides larger than 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Advance Products & Systems, Inc.
    b. CALPICO, Inc.
    c. Metraflex Company (The).
    d. Pipeline Seal and Insulator, Inc.
    e. Proco Products, Inc.

2. Sealing Elements: Nitrile (Buna N) rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Presealed Systems.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
2. Sealant shall have VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."

b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

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SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.2 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.

B. Colors for Raceways Carrying Circuits at 600 V or Less:

1. Black letters on an orange field
2. Legend: Indicate voltageand system or service type.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

D. Write-On Tags: Polyester tag, 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.4 FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.5 UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Tag: Type I :

1. Pigmented polyolefin, bright-colored, continuous-printed on one side with the inscription of the utility,compounded for direct-burial service.
2. Thickness: 4 mils (0.1 mm).
3. Weight: 18.5 lb/1000 sq. ft. (9.0 kg/100 sq. m).
4. 3-Inch (75-mm) Tensile According to ASTM D 882: 30 lbf (133.4 N), and 2500 psi (17.2 MPa).

2.6 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 42 INCHES (915 MM)."
3. ARC Flash: Lavel to identify potential electric arc flash hazards in compliance with the requirements of NFPA 70E and ANSI Z535.4.

2.7 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with [black letters on white face].
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.8 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

B. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after completing finish work.

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

G. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30A, and 120V to ground: Install labels at 10-foot (3-m) maximum intervals.

B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.
3. UPS.

C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Dark Blue.

c. Colors for 480/277-V Circuits:

1) Phase A: Brown.
2) Phase B: Orange.
3) Phase C: Yellow.

d. Colors for control circuits
1) General purpose a-c control: Pink
2) General purpose d-c control: Light Blue

e. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

E. Conductors to Be Extended in the Future: Attach write-on tags or marker tape to conductors and list source.

F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

G. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

H. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels, Baked-enamel warning signs, Metal-backed, butyrate warning signs.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

J. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

K. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer, or emergency operations.

L. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
    b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 260553

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.
3. Snap switches and wall-box dimmers.
4. Solid-state fan speed controls.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets.

1.2 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:

1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

1. Products: Subject to compliance with requirements, **available products that may be incorporated into the Work include, but are not limited to, the following**:

a. Cooper; 5351 (single), CR5362 (duplex).
b. Hubbell; HBL5351 (single), HBL5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, **feed**-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.

3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, **available products that may be incorporated into the Work include, but are not limited to, the following**:

a. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; 7590.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, **available products that may be incorporated into the Work include, but are not limited to, the following**:

a. Single Pole:

1) Cooper; AH1221.
2) Hubbell; HBL1221.
3) Leviton; 1221-2.
4) Pass & Seymour; CSB20AC1.

b. Two Pole:

1) Cooper; AH1222.
2) Hubbell; HBL1222.
3) Leviton; 1222-2.
4) Pass & Seymour; CSB20AC2.

c. Three Way:

1) Cooper; AH1223.
2) Hubbell; HBL1223.
3) Leviton; 1223-2.
4) Pass & Seymour; CSB20AC3.

d. Four Way:

1) Cooper; AH1224.
2) Hubbell; HBL1224.
3) Leviton; 1224-2.
4) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, **available products that may be incorporated into the Work include, but are not limited to, the following**:

    a. Cooper; AH1221PL for 120 and 277 V.
    b. Hubbell; HBL1201PL for 120 and 277 V.
    c. Leviton; 1221-LH1.
    d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Stainless steel.
2. Material for Unfinished Spaces: **Galvanized steel**
3. Material for Damp Locations: **Cast aluminum** with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant**, die-cast aluminum** with lockable cover.

2.7 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: **Gray** unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: **Red**.
3. TVSS Devices: Blue.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.

3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:

    a. Cut back and pigtail, or replace all damaged conductors.
    b. Straighten conductors that remain and remove corrosion and foreign matter.
    c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles **up**, and on horizontally mounted receptacles to the **right**.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.

3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

I. Adjust locations of service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.
6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262813

FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches, panelboards, switchboards, enclosed controllers, and motor-control centers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA FU 1 for cartridge fuses.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.
2. Ferraz Shawmut, Inc.
3. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

B. All fuses rated 30 amps and higher shall have a blown fuse indicator window.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

A. Service Entrance: Class RK5, dual element, time delay, 200KAIC.

B. Feeders: Class RK5, dual element, time delay, 200KAIC.

C. Motor Branch Circuits: Class RK5, dual element, time delay, 200KAIC.

D. Other Branch Circuits: Class RK5, dual element, time delay, 200KAIC.

E. Control Circuits: Class CC, fast acting.

3.2 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable and in the upright position. Information shall be legible without removing fuse.

B. Install all fuses using oxidation inhibiting compound on all fuse blades and fuse holders.

3.3 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

END OF SECTION 262813

SECTION 262816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

B. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Suitable for number, size, and conductor material.

2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

E. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

F. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection (where indicated): Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip (where indicated): Trip coil energized from separate circuit, with coil-clearing contact.
6. Auxiliary Contacts (where indicated): One SPDT switch with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
7. Alarm Switch (where indicated) : One NO contact that operates only when circuit breaker has tripped.

2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 12.
2. Outdoor Locations: NEMA 250, Type 4X, stainless steel.
3. Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: Type 4X, stainless steel.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA Type 12.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices. Install fuses using oxide inhibitor compound on fuse blades and fuseholders.

E. Comply with NECA 1.

3.2 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes thermal scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

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SECTION 264313

TRANSIENT-VOLTAGE SUPPRESSION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes field-mounted TVSS for low-voltage (120 to 600 V) power distribution and control equipment.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating weights, electrical characteristics, furnished specialties, and accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Warranties: Sample of special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

B. Comply with IEEE C62.41.2 and test devices according to IEEE C62.45.

C. Comply with NEMA LS 1.

D. Comply with UL 1283 and UL 1449.

E. Comply with NFPA 70.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of surge suppressors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SERVICE ENTRANCE SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Current Technology Inc.; Danaher Power Solutions.
2. Liebert Corporation; a division of Emerson Network Power.
3. Square D; a brand of Schneider Electric.

B. Surge Protection Devices:

1. Non-modular.
2. LED indicator lights for power and protection status.
3. Comply with UL 1449.
4. Fuses, rated at 200-kA interrupting capacity.
5. Fabrication using bolted compression lugs for internal wiring.
6. Integral disconnect switch.
7. Redundant suppression circuits.
8. Arrangement with copper bus bars and for bolted connections to phase buses, neutral bus, and ground bus.
9. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
10. LED indicator lights for power and protection status.

C. Peak Single-Impulse Surge Current Rating: 320 kA per mode/640 kA per phase.

D. Minimum single impulse current ratings, using 8-by-20-mic.sec waveform described in IEEE C62.41.2

1. Line to Neutral: 70,000A.
2. Line to Ground: 70,000A.
3. Neutral to Ground: 50,000A.

E. Protection modes and UL 1449 SVR for grounded wye circuits with 480Y/277 V, 3-phase, 4-wire circuits shall be as follows:

1. Line to Neutral: 800 V for 480Y/277 V
2. Line to Ground: 800 V for 480Y/277 V
3. Neutral to Ground: 800 V for 480Y/277 V

F. Protection modes and UL 1449 SVR for 240/120 V, single-phase, 3-wire circuits shall be as follows:

1. Line to Neutral: 400 V.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

G. Protection modes and UL 1449 SVR for 240/120-V, 3-phase, 4-wire circuits with high leg shall be as follows:

1. Line to Neutral: 400 V, 800 V from high leg.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

H. Protection modes and UL 1449 SVR for 240 V, 480 V, or 600 V, 3-phase, 3-wire, delta circuits shall be as follows:

1. Line to Line: 2000 V for 480 V.
2. Line to Ground: 2000 V for 480 V.

2.2 PANELBOARD SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Current Technology Inc.; Danaher Power Solutions.
2. Liebert Corporation; a division of Emerson Network Power.
3. Square D; a brand of Schneider Electric.

B. Surge Protection Devices:

1. Non-modular.
2. LED indicator lights for power and protection status.
3. Fuses, rated at 200-kA interrupting capacity.
4. Fabrication using bolted compression lugs for internal wiring.
5. Integral disconnect switch.
6. Redundant suppression circuits.
7. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
8. LED indicator lights for power and protection status.

C. Peak Single-Impulse Surge Current Rating: 160 kA per mode/320 kA per phase.

D. Minimum single impulse current ratings, using 8-by-20-mic.sec waveform described in IEEE C62.41.2:

1. Line to Neutral: 70,000A.
2. Line to Ground: 70,000A.
3. Neutral to Ground: 50,000A.

E. Protection modes and UL 1449 SVR for grounded wye circuits with 208Y/120 V, 3-phase, 4-wire circuits shall be as follows:

1. Line to Neutral: 400 V for 208Y/120 V.
2. Line to Ground: 400 V for 208Y/120 V.
3. Neutral to Ground: 400 V for 208Y/120 V.

F. Protection modes and UL 1449 SVR for 240/120-V, single-phase, 3-wire circuits shall be as follows:

1. Line to Neutral: 400 V.
2. Line to Ground: 400 V.
3. Neutral to Ground: 400 V.

G. Protection modes and UL 1449 SVR for 240 V, 480 V, or 600 V, 3-phase, 3-wire, delta circuits shall be as follows:

1. Line to Line: 2000 V for 480 V.
2. Line to Ground: 1500 V for 480 V.

2.3 ENCLOSURES

A. Indoor Enclosures: NEMA 250 Type 12.

B. Outdoor Enclosures: NEMA 250 Type 4X.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install TVSS devices at service entrance on load side, with ground lead bonded to service entrance ground.

B. Install TVSS devices for panelboards and auxiliary panels with conductors or buses between suppressor and points of attachment as short and straight as possible. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

1. Provide multiple, 30A minimum circuit breaker as a dedicated disconnecting means for TVSS unless otherwise indicated or directed by TVSS manufacturer.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS, "Surge Arresters, Low-Voltage Surge Protection Devices" Section. Certify compliance with test parameters.
2. After installing TVSS devices but before electrical circuitry has been energized, test for compliance with requirements.
3. Complete startup checks according to manufacturer's written instructions.

C. TVSS device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Do not energize or connect service entrance equipment or panelboards to their sources until TVSS devices are installed and connected.

B. Do not perform insulation resistance tests of the distribution wiring equipment with the TVSS installed. Disconnect before conducting insulation resistance tests, and reconnect immediately after the testing is over.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to maintain TVSS devices.

END OF SECTION 264313

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SECTION 27 60 00

WIRELESS TELEMETRY SYSTEMS

PART 1 - GENERAL

1.1. GENERAL REQUIREMENTS

A. THE CONTRACTOR shall furnish, install, and place into service a Programmable Logic Controller (PLC), radio system, and all associated hardware and software to perform the specified monitoring, communications, alarm, control, and reporting functions the OWNER's Supervisory Control and Data Acquisition (SCADA) System as described in the summary of work, all in accordance with the requirements of the Contract Documents.

B. CONTRACTOR shall be qualified in designing and installing telemetry systems of the nature described in the Contract Documents.

1.2. RELATED WORK SPECIFIED ELSEWHERE

A. Electrical work specified hereunder shall conform to the requirements of this section and the applicable requirements of Division 26 Electrical Specifications.

B. The drawings and specifications are complementary. Reference the drawings for further information regarding equipment and requirements of the system. Contractor shall provide a complete and functional system.

1.3. REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of these Specifications, all work specified herein shall conform to or exceed the applicable requirements of the referenced documents to the extent that the requirements therein are not in conflict with the provisions of this section; provided, that where such documents have been adopted as a code or ordinance by the public agency having jurisdiction, such code or ordinance shall precedence.

1.4. CONTRACTOR SUBMITTALS

A. All submittals shall be made in accordance with the applicable general requirements of the Specification Section entitled "Submittal Procedures." Where drawings and data are specified to be produced thru CAD, word processing, or other software program, one (1) disk copy (as appropriate) shall be submitted initially, and two (2) copies of the final version shall be furnished with printed copies.

B. Shop Drawings: The CONTRACTOR shall submit to the ENGINEER shop drawings of all equipment before fabrication in accordance with provisions of the Contract Documents. Should an error be found in a shop drawing during installation or start up of equipment, the correction, including any field changes found necessary, shall be noted on the drawing and submitted finally as part of the "Record Drawings" prior to acceptance of the WORK. All drawings provided shall be produced using PC based drawing program. All shop drawings shall be checked by the CONTRACTOR before submittal for review by the ENGINEER. These drawings and data shall be submitted as a complete package at one time (except allowed early submittals on major equipment and long lead delivery items) and shall include:

1. Complete systems diagrams.

2. Drawings shall show definitive wiring interconnection diagrams for each site. These diagrams shall show and identify each component of each system and shall which components require a nominal 115-volt, 60 Hertz power source. These diagrams shall be prepared in accordance with ANSI/ISA-S5.4.

3. Data sheets shall be included for each component together with a technical product brochure or bulletin. These data shall show: The component name as used on project drawings and in these Specifications, manufacturer's model number or other identifying product designation, the project site to which it applies, input and output characteristics, functional and operational descriptions sufficient to show conformance to the specification requirements, requirements for electric power, specifications for ambient operating conditions, and details on materials of construction.

4. Arrangement and construction drawings for control panels and equipment boxes, enclosures, and cabinets shall show dimensions, identification of all components, preparation and finish data, nameplates, and the like.

5. Any and all modifications made to existing measurement and control circuits, equipment, and wiring shall be shown on the SCADA site wiring diagrams including references to appropriate OWNER drawings.

6. Installation, mounting, and anchoring details shall be shown for all components and assembles to be field mounted, including access requirements, conduit connections, or entry details.

7. Complete and detailed bills of material.

C. Technical Manuals: The CONTRACTOR shall furnish a complete set of manuals describing the operations and maintenance requirements of the complete PLC and radio. The operations manuals shall describe each feature and function of the system in a step by step tutorial fashion. The maintenance manuals shall include complete system trouble-shooting guides and explain fully the use and application of diagnostic programs, as well as all relevant manufacture's maintenance and calibration instruction sheets. All manuals written for this contract shall be produced using the word processing program furnished with the system software or Word Version 2007 (or newer). To allow for different levels of use and area of application, separate manuals shall be furnished as follows:

1. Maintenance Manual- PLCs/Interfaces: This manual shall provide complete information for the maintenance, repair, replacement, calibration etc. for all the PLCs and interfaces furnished under this contract. This shall include the final settings and calibration point records developed during the check out complete instructions in the use of diagnostic programs for trouble shooting these units to the circuit card level, as well as instructions in loading application programs, system resets, initialization, etc.

2. Maintenance Manual- Radios: This manual shall provide complete information for the maintenance, repair, replacement, calibration, etc. for all of the radio equipment furnished under this contract. This shall include complete instructions in the use of testing and diagnostic programs for the radio system.

D. Quality Control Test Procedures and Forms: The CONTRACTOR shall submit a complete set of test procedures and forms that will be used in conjunction with the quality assurance program as specified herein.

E. Spare Parts Lists: The recommended spare parts list for the equipment furnished under this section shall be annotated to indicate which items, if any, are furnished as a part of this contract.

1.5. QUALITY ASSURANCE

A. Shop Tests: Prior to installation, the complete system, including peripherals and communication equipment of the PLCs, shall be assembled, connected, and all software loaded for a full functional test of the integrated system. Test procedures shall be developed by the CONTRACTOR to show that the integrated system hardware and software is fully operational and in compliance with the requirements of the Contract Documents. Attention is directed to PART 3 – EXECUTION of this Specification Section for additional requirements relative to this test.

B. Installation Supervision: The CONTRACTOR shall furnish services and technical information as necessary to insure that the equipment furnished by him is installed in a proper and satisfactory manner. These services shall include, but not be limited to, providing the installing contractor with information and direction prior to commencement of the installation work, periodic inspection during the construction period, answering of all questions regarding the installation and hookup, and a complete check of the completed installation and hookup, and a complete check of the completed installation to insure that it is in conformance with the requirements of the equipment and the Contract Documents.

C. Calibration: The CONTRACTOR shall furnish the services of a trained technician to perform a complete system calibration. This shall provide that those components having adjustable features are set for the specific conditions and applications, and that the components and systems are within the specified limits of accuracy. Defective elements which cannot achieve proper calibration or accuracy, either individually or within the system or subsystem, shall be replaced. A complete record of the calibration checks and adjustments shall be made and delivered to the OWNER upon completion of the system calibration.

D. Testing: System shall be exercised through operational tests in the presence of OWNER in order to demonstrate achievement for the specified performance. Attention is directed to PART 3 EXECUTION for additional requirements relating to testing.

1.6. ACCEPTANCE TEST

A. After start-up has been completed, the PLC and radio will be given an acceptance test. The complete system must run continuously for 30 consecutive days. During this period all system functions shall be exercised, and any interruption and accompanying component, subsystem, or program failure shall be logged for cause of failure, as well as time of occurrence and duration of each failure. The CONTRACTOR shall provide a competently trained technician or programmer on call during all normal working days from the start of the acceptance test until final acceptance of the system.

B. Failures shall be classified as either major or minor. A minor failure would be a small and non-critical component failure which can be corrected by operators. This occurrence shall be logged but shall not be reason enough for stopping the test and shall not be grounds for non-acceptance. However, should the same or similar component failure occur repeatedly, this may be considered as grounds for non-acceptance. Failure of one printer, or of one display shall be considered a minor failure providing all functions can be provided by backup equipment (alternate printers and displays) and repairs can be made and equipment returned to service within 3 working days. A major failure shall be considered to have occurred when a component, subsystem, or program fault causes a halt in operation of the system and/or re-initiate operation of the system. A major failure shall cause termination of the acceptance test. When the causes of a major failure have been corrected, a new

acceptance test shall be started.

C. Each time a technician is required to respond to a system malfunction he or she must complete a report which shall include details concerning the nature of the complaint or malfunction. When such a failure or malfunction occurs which clears itself or which the operator on duty is able to work but no report is written, then a major failure shall be considered to have occurred.

1.7. INTERFACE AND USE OF EXISTING EQUIPMENT AND SYSTEMS

A. The installation and operation of the SCADA/Telemetry system incorporates some existing equipment, including instrumentation and control circuits, radio antenna and masts, and a variety of these items without replacement (except for where specifically allowed or directed) and as described below.

B. Instrumentation and Control Circuits: The instrumentation and control circuits that are to be directly connected to the SCADA system will be connected by the OWNER. The CONTRACTOR shall be responsible for providing all interpose relays, isolators, convertors, etc. that are required to make this existing equipment compatible with the SCADA system. Connections between existing station control panels and the telemetry panels will be performed by the OWNER. The CONTRACTOR shall not be responsible for the condition, calibration, or performance of this existing equipment. However, the CONTRACTOR shall make notes of all such conditions, etc. during the check out and startup phases of this contract. CONTRACTOR is responsible for the proper operation of the telemetry system and shall coordinate with the OWNER any discrepancies requiring correction with the OWNER's equipment.

C. PLCs shall be furnished at locations as delineated on the drawings.

D. Radio Antennae and Masts: The remote site antennas directional with gain as determined by the CONTRACTOR, and are approximately located on the Drawings. The CONTRACTOR shall be responsible for any RF cables and/or connectors, as required for a complete and operable system.

E. Miscellaneous items such as cables, connections, etc. are not necessarily shown or specified. All such items needed to provide a complete and operable system shall be furnished under the requirements of this contract.

F. Power Supplies: All equipment shall be designed to operate on 115 VAC utility power. The power will be provided by the OWNER. All power supplies, converters, isolators, etc. necessary for the proper operation of this equipment shall be furnished with the equipment.

G. Racks, Cabinets and Furniture: All equipment shall be mounted in or on appropriate racks, enclosures. Furniture shall include operator station desks and paper handling facilities for alarm printers, for each master operators station and sub-master computers furnished. CONTRACTOR shall furnish required racks and cabinets for head end equipment. OWNER will furnish all furniture, desks, etc.

PART 2 - PRODUCTS

2.1 PROGRAMMABLE LOGIC CONTROLLERS (PLC)

A. The PLC to be installed at each remote station shall be a SIEMENS LOGO! System:

• LOGO PLC 6ED1 052-1FB00-0BA7	Duplex and Quad
• DM16 EXP MOD 6ED1 055-1FB10-OBAO	Quadplex only
• SOFT COMFORT 6ED1 058-0BA02-0YA1	Duplex and Quad
• Comfort Panel HMI 6AV2124 0GC01-0AX0	Duplex and Quad
• TIA Portal Software	Entire system

B. System shall have the capability to accept digital and analog inputs, produce digital and analog outputs, perform local control and data manipulation functions, transmit measured and calculated values and status/alarm signals to the central computer system, receive command signals and configuration data from the central computer, and perform all other functions required to meet the specified performance and functional requirements of the integrated system. Each PLC shall be furnished with all necessary power supplies, processors, memory, process I/O cards, serial communication ports, modems, etc. to meet its specified functions, requirements and environmental conditions. System shall poll and report at 30 second intervals for all stations.

C. Manufacturers: PLC equipment and software shall be as manufactured by SIEMENS as specified in paragraph A above or an approved equal by one of the following manufacturers:
   1. Schneider Electric & SCADA Expert ClearSCADA software (Square D)
   2. Motorola & SystemTool Suite (STS) software
   3. Rockwell Automation & FactoryTalk View software (Allen-Bradley)

D. Each PLC shall be furnished with appropriate communications ports and protocols to communicate with furnished radios.

E. Each PLC shall be furnished with process I/O cards, etc. as necessary to interface to the process equipment and instrumentation. The PLC shall be capable of powering the analog transmitters and the dry contact digital inputs. Dry contact outputs shall be rated at least 1 amp continuously with interposing relays furnished as necessary where higher amperages are required.

F. For sites with sub PLCs the PLC shall communicate failures to Master PLCs.

G. For sites with Master PLCs the PLC shall communicate with Sub-PLCs and transmit diagnostic data to the Main SCADA Server.

H. The PLC and Radio Transceiver shall be designed to operate on 115 VAC 60 Hz primary power. The power supply system shall be suitably sized for the quantity of PLC and radios furnished.

I. The PLCs shall be housed in NEMA 4 fiberglass enclosures of appropriate size as specified or shown on the drawings. Each enclosure shall include a 115 VAC circuit breaker on the incoming line, a duplex GFI outlet. The enclosures shall also house all communication modems, etc., to be furnished at each remote site. The enclosures shall have flanges for wall mounting, hinged front door with neoprene gasket and a plan holder on inside of front door, a hinged deadfront panel, and a removable interior mounting panel for components. The interior of each enclosure including the mounting panel shall be finished with white enamel. Enclosures shall be as manufactured Hoffmann or approved equal.

J. Refer to drawings for further information and details regarding the PLCs and installation and construction of Telemetry Control Panels.

2.2 RADIO COMMUNICATIONS

A. The radio system shall operate on the 2.4 GHz band. The central station transceivers operate through antennas at the water tower.

B. Radio equipment and software shall be as manufactured by ProSoft Technology as specified in paragraph G below or an approved equal by one of the following manufacturers:
   1. Freewave Technologies
   2. ELPRO Technologies (Eaton)
   3. Moore Industries

C. The radio system shall be furnished with internal diagnostic capabilities. Each remote station radio shall have diagnostics module with an interface for a PC or hand-held diagnostic module. This shall include loop back diagnostics of the remote radios.

D. Path Design: The paths between the existing site at the water tower and each of the PLC sites shall be checked by the CONTRACTOR for line-of-sight clearance. Antenna heights shall be selected for the PLC sites which will provide clearance over all local obstructions. Antennae shall be mounted to existing structures at each station where feasible. However, at several sites it may be necessary to add poles to provide the desired path clearance. Refer to the specifications, "Antenna Support Details." It shall be the responsibility of the CONTRACTOR to install the equipment at the sites and obtain satisfactory signal levels by adjusting the antenna orientation and/or height.

E. Path Fade margins shall not exceed 20 dB from the master station site to the most distant PLC site and from the same PLC site back to the master station site. The fade margin shall be calculated based on proposed equipment and modeled system layout and topography. These fade margins are based upon a receiver sensitivity of –110 Dbm based upon a 1x10e–6 BER. It shall be the responsibility of the CONTRACTOR to furnish and install the radio system so that actual measured fade margin on each path is no worse than –3 Db below the calculated margins.

F. The R.F. equipment furnished under these specifications shall meet or exceed all current FCC requirements for point-to-multipoint radio systems and shall also meet or exceed the following minimum specifications. The R.F. equipment shall be capable of operation on the 2.4 GHz spectrum on clear channels without degradation.

G. The radio assembly for each site shall be a ProSoft Radiolinx RLX2-IFH24E with graphical ControlScape software. It shall also include OPC server software to allow monitoring of radio network health with any OPC client based HMI software. These units shall also meet the following requirements:

1. The radios shall be 2.4 GHz band Frequency Hopping Spread Spectrum and utilize all standard IEEE 802.3 protocols with 128 bit AES encryption. They shall accept wired input/output over 10/100 Base-T Ethernet, shielded RF45 port, IEEE 802.3, 8.2.03u and 802.3x protocols, and via Serial port, RS-232 DB-9, RS-422, and RS-485, 300 bps to 230 kbps and support serial to serial tunneling and serial TCP/UDP encapsulation.

    a. Transmitter:

        1. Power Output: 100mW to 1W (FCC-A model- Programmable
        2. Frequency: 2.4 GHz band
        3. Data Rate: 1.1 Mbps or 345 kbps (Programmable)
        4. Duty Cycle: Continuous

b. Receiver:

1. Receiver Sensitivity: 1.1Mbps: -97 dBm @ 10-6 BER,
   345kbps: -104 dBm @ 10-6 BER,
2. Frequency: 2.4 GHz band

2. Each R.F. assembly shall be capable of operation at full performance specifications between –40 and +75 degrees centigrade with a relative humidity of 95%, with no condensation.

3. Each R.F. assembly shall operate from a D.C. power system furnished and installed as a part of the overall PLC installation. Battery tapping of 24 volt power systems to obtain 12 volts will not be permitted.

4. Each R.F. assembly shall be enclosed in a sturdy metal housing suitable for mounting on the back plate of the PLC enclosure with stainless steel hardware in such a manner as to permit easy removal of the radio assembly for service and/or replacement.

5. Each R.F. unit shall be configurable as point-to-point, point-to-multipoint, or store and forward repeater with smart switch packet switching for virtual peer-to-peer communications.

H. The antennas for all sites shall be a Directional Antenna, meeting the following minimum specifications:

- Frequency Range 2.400 to 2.4835 GHz
- Forward Gain 10 Db
- Front-to-Back Ratio 20 Db
- VSWR 1.5 to 1.0 Maximum
- Polarization depend on location
- Impedance Match radio
- Horizontal Beamwidth 60 Degree (half power point)
- Input Power 50 Watts max
- Wind rating 130 MPH Survival (no ice)
- Lightning Protection Direct Ground
- Input Connector As required

1. Mounting brackets shall be steel and shall be hot-dip galvanized after fabrication or stainless steel. All mounting hardware shall be stainless steel. It is important to note that the required hardware will vary by site and available structures. It shall be the responsibility of the CONTRACTOR to furnish stainless steel hardware capable of

mounting the antennas to these structures or poles:

a. Single antennas at sites shall be installed on the station antenna support or pole as shown in details on the drawings, whichever is appropriate.

b. Dual antennas at sites shall be installed one above the other on the station antenna support. Antennas shall be separated vertically by a minimum of 18 inches.

2. Transmission lines at all sites shall be Heliax coaxial cable or approved equal. The coaxial cable shall be encased in a black polythylene outer jacket. Connectors shall be as appropriate for the equipment furnished and suitable for 2.4 GHz low loss. It shall be the responsibility of the CONTRACTOR to determine the exact length of transmission line required at each site.

a. Connection of the transmission line to the antenna and to the radio equipment shall be made through the use of “pigtails” of the appropriate length. Connection of the upper end of the transmission line to the “pigtail” shall be made within a junction box installed on the top of the pole. Connection of the lower end of the transmission line to the “pigtail” shall be made within the PLC enclosure.

b. Installation of transmission lines at sites where existing structures are to be used as antenna supports shall be accomplished in accordance with good installation practices. Transmission lines shall be routed from the PLC enclosure to the antenna in a neat and orderly manner and shall be secured using stainless steel hangers or approved equal. Hangers shall be spaced no more 3’0” apart. Hangers shall be installed using stainless steel banding straps, stainless steel beam clamps, concrete anchors with stainless steel hardware or such other fasteners as may be appropriate.

c. Where transmission lines are routed to a separate pole it shall be routed in conduit and run underground to the pole. Rigid steel conduit shall be used where exposed above grade and schedule 80 PVC underground. Every effort shall be made to keep transmission line runs as short as practical. Transmission line shall be secured using stainless steel hangers or approved equal. Hangers shall be spaced no more than 3’0” apart and shall be installed using stainless steel beam clamps complete with stainless steel hardware.

d. All transmission lines shall be grounded at both the upper and lower ends. Grounding shall be accomplished through the use of Andrew Corporation Type 204989 grounding kits or approved equal.

e. Grounding of the upper end of transmission lines at sites utilizing aluminum antenna support poles shall be done within the junction box installed at the top of the pole. The actual ground connection shall be made to the interior of the junction box using stainless steel hardware.

f. Grounding of the upper end of transmission lines at sites utilizing wooden antenna support poles shall be made just above the point where the transmission line enters the conduit. The actual grounding shall be made to the ground wire. After the grounding kit is installed on the transmission line jacket shall be resealed using a two-part tape system. Each layer of tape shall be sealed by coating with Scotchkote or approved equal.

g. Grounding of the lower end of all transmission lines shall be accomplished within the PLC enclosure. Actual grounding shall be done at a common ground provided within the enclosure.

2.3 HMI TOUCHSCREEN DISPLAY

A. Each PLC/radio system shall be furnished with a HMI (Human Machine Interface) panel capable of displaying parameters from the PLC and allowing control of the PLC via touch screen commands. Panel shall be fully compatible with the PLC furnished and have Ethernet support. Mount panel on the dead front panel of the telemetry enclosure as shown on the drawings. Minimum requirements shall be:

1. Screen size: 7” minimum
2. Type: Color TFT
3. Resolution: 64k colors, 800x800 pixel SVGA
4. Temperature: –40 and +75 degrees centigrade with a relative humidity of 95%, with no condensation.
5. Manufacturers: Siemens Comfort Panel HMI 6AV2124 0GC01-0AX0 or equal by C-More Industrial, Vartech Systems, Schneider, Rockwell Automation, or Motorola.

2.4 INSTRUMENTATION

A. Interposing relays, if required, shall be electro-mechanical relay with octal-type plug termination with the following features: indicator lamp, silver-cadmium oxide contacts rated for 10 amps and UL recognized. Relays shall be Potter & Brumfield KRPA-11AN-120V with No. 27E122 base or equal. Install in new telemetry enclosures.

B. 120 vac signals from existing equipment shall be connected to the PLC or through interposing relays if required. All wiring shall conform to section Division 26 Electrical Specifications.

C. All available existing and new telemetry contacts shall be connected to the PLC as dry contacts whenever possible. Contacts shall be wired to terminal blocks within the Telemetry enclosure. All wiring shall conform to Division 26 Electrical Specifications.

2.5 ETHERNET HUBS/SWICTHES:

A. Furnish where required Ethernet hubs and/or switches. Hubs/switches shall be minimum four port with at least number of spare ports as ports that are utilized (full redundancy). Hubs/switches shall be auto-switching, Ethernet 10/100/1000 Mbps, Base T/Tx, RJ-45, full duplex. Equipment shall be stand alone or rack mounted as required. Furnish Cat 6 patch cables as required. Approved manufacturers: Netgear, Cisco, Dlink, and Linksys.

2.6 SPARE PARTS, SUPPLIES, TOOLS AND TEST EQUIPMENT

A. It is intended that sufficient spare parts and supplies necessary to support one year's operation and all tools and test equipment necessary to troubleshoot and maintain the system shall be furnished with the system.

B. As a minimum, the spare parts listed below shall be furnished. No spare parts for the central, sub-master, and portable computers are required to be furnished under this contract.

1. PLCs: One of each type of circuit boards furnished with the PLCs shall be furnished.
2. I/O Isolators, Converters, etc.: One spare unit shall be furnished for each type signal converter, isolator, interposing relay or the I/O interface device furnished with the system.

2.7 COMPUTER SYSTEM HARDWARE

A. SCOPE: This section covers the furnishing and installation of standard computer system hardware fully configured to work with the software specified in the computer system software section. Principal items of the computer and peripheral hardware to be furnished are specified or are indicated on the control system block diagram on the drawings.

B. CONTRACTOR shall furnish all necessary interconnecting cables, accessories, and appurtenances as well as additional computer or peripheral hardware required for proper operation and to meet the functional requirements indicated on the drawings and specified herein.

C. All equipment shall be capable of tolerating and "riding through" a power interruption of 8 milliseconds or less without interruption of normal operation.

D. SPARE PARTS: The following spare parts and consumables shall be provided.

1. 25 writeable media disks.

E. All consumables and spares shall be supplied by the computer or printer manufacturer or by a vendor expressly recommended by the manufacturer. CONTRACTOR shall replace any consumables or spares that are spent during setup, testing, and commissioning of the system.

F. SYSTEM COMPUTERS: CONTRACTOR shall ensure that all computers are configured to operate properly with all software, input/output devices, and peripherals supplied. Monitor resolution shall be consistent between all monitors furnished.

G. SERVER COMPUTERS:

1. Each Server Computer and backup server computer shall be comprised of the following configuration. This configuration is to be provided as a minimum:

a. Processor type: Dual-Core (Intel Xeon or AMD Opteron)

b. Processor speed: 3.6GHz

c. Monitor Type: Flat Panel LED

d. Monitor size: 21 inch

e. Memory size (RAM): 8GB

f. Number of 10/100/1000 Mbps RJ-45 Ethernet cards: 2

g. Enclosure style: 19” Rack-mount

h. Manufacturer: Dell, or equal by HP or Lenovo

i. Two (2) 500 GB SCSI Wide Ultra 2/3 hard drives with integrated RAID controller.

j. Single CPU (with dual CPU capabilities).

k. 32X DVD-ROM (read/write).

l. Integrated VGA/HDMI compatible video controller.

m. 2 MB Cache.

n. Six hot-pluggable hard drive bays.

o. 2 Serial Ports standard.

p. Redundant power supplies.

q. Scroll Mouse.

r. Standard Windows keyboard.

s. 2 Serial Ports standard.

t. Redundant power supplies.

u. Scroll Mouse.

v. Standard Windows keyboard.

2. Removable Hard Drive: A removable hard drive shall be supplied and shall be capable of storing a minimum of 500 GB of data on a removable cartridge. The drive shall be internally or externally mounted. The drive shall be Iomega Jaz, Castlewood Orb, or equal.

3. CD/DVD-RW Drive: A DVD-RW (read/write) drive shall be supplied and shall be capable of Orange Book standard with a minimum of 32x read and 8x record and of playing DVD disks. DVD drive shall be manufactured by HP, Sony, Panasonic or equal. DVD drives shall be supplied with spare disks.

4. Modem: An internal fax-modem, rated 33.6kBPS or 56kBPS, shall be supplied with the computer. The fax-modem shall support ITU-T V.17, V.29, V.27, ITU Group Ill standards for fax transmissions and ITU-T V.34, V.32bis, Bell 212 and 103 standards for data transmissions. A 56kBPS modem shall also support V.92 standards. The fax-modem shall be US Robotics or equal.

H. WORKSTATION COMPUTERS:

1. Each Workstation Computer shall be comprised of the following configuration. Workstation shall be configured to act as both a Back-up Server as well as Historian; this configuration is to be provided as a minimum:

a. Processor type: Dual-Core (Intel Xeon or AMD Opteron)

b. Processor speed: 3.8 GHz

c. Monitor Type: Flat Panel LED

d. Monitor size: 21 inch

e. Memory size (RAM): 8GB

f. Number of 10/100/1000 Mbps RJ-45 Ethernet cards: 1

g. Enclosure style: Desk top

h. Manufacturer: Dell, or equal by HP or Lenovo

i. Two (2) 500 GB hard drives.

j. Single CPU (with dual CPU capabilities).

k. 32X DVD-ROM (read/write).

l. 256 MB AGP video card

m. 2 MB Cache.

n. 2 Serial Ports standard.

o. Scroll Mouse.

p. Standard Windows keyboard.

q. Sound Card and speakers.

2. CD-RW/DVD Drive: The CD-RW (read/write)/DVD drive shall be supplied and shall be capable of Orange Book standard with a minimum of 32x read and 8x record and of playing DVD disks. CD-RW/DVD drive shall be manufactured by HP, Sony, Panasonic or equal. CD-RW/DVD drives shall be supplied with spare disks.

I. SYSTEM PRINTERS are furnished by OWNER. CONTRACTOR shall interface the Telemetry System with OWNER'S existing printers to allow print out of reports and graphics as needed by the OWNER.

2.8 COMPUTER SYSTEM SOFTWARE

A. SCOPE. This section covers computer system software to be furnished and installed by CONTRACTOR on computer hardware specified in other sections of this specification and on the drawings. All software and the resulting programming of same for this project shall become the property of the OWNER when the system is turned over to OWNER at project completion. All required licenses shall be either in the OWNER's name or transferred to the OWNER at project turn-over.

B. CONTRACTOR shall furnish standard, field proven, fully debugged and

supported software packages for this application with a minimum of additions or changes. Customized or specially written software shall be furnished only if required to meet all functional requirements specified herein.

C. Software is described in functional categories. CONTRACTOR shall furnish a complete software package including the functional requirements specified, along with any additional software required for proper and efficient operation of the system.

D. No attempt has been made to list all software or all characteristics of software required by CONTRACTOR to meet the functional requirements specified, nor to determine the location of the software modules within the system.

E. The computer control software shall meet the design conditions and performance required and specified herein and on drawings.

F. OPERATING SYSTEM SOFTWARE:

1. Operating system software for servers shall be Windows Server 2012, without exception, and shall include a complete and unmodified operating system that provides system level functions. Furnish operating system software that is fully compatible with the process control software being furnished.

2. Operating system software for workstations shall be Windows 8 without exception, and shall include a complete and unmodified operating system that provides system level functions. Furnish operating system software that is fully compatible with the process control software being furnished.

G. PROCESS CONTROL SYSTEM APPLICATION SOFTWARE:

1. Process Control software shall enable the operator to monitor and control field devices connected to PLCs, RTUs, or other input/output hardware. The process control system application software shall meet the minimum requirements specified herein (Paragraph 2.1-C) and on drawings, and shall exceed these requirements where necessary to comply with the functional requirements of the project.

2. Process Control software shall have the capability of accommodating a total of one hundred (100) stations without replacement or reprogramming of the software to allow for future expansion of the system.

H. A license shall be issued for each machine loaded with operating system software and for each machine, PLC, or radio loaded with process control software. This includes computer system software to be furnished and installed by CONTRACTOR on computer hardware specified in other sections of this specification and on the drawings. All software and the resulting programming of same for this project shall become the property of the OWNER when the system is turned over to OWNER at project completion. All required licenses shall be either in the OWNER's name or transferred and placed in the OWNER's name at project turn-over.

I. In addition to collecting and reporting data from the lift stations, the system shall be capable of remote notification of a fault, failure, or other anomaly to offsite personnel. Upon such alarm the system shall automatically place three telephone calls in sequence to numbers to be provided by the OWNER. It shall allow for an acknowledgement of the call from each recipient in sequence, and call the next number in sequence if it is not acknowledged by the first recipient. If the alarm condition is not corrected within one hour of the first call, the system shall place a second series of calls in the same sequence as the first.

PART3—EXECUTION

3.1 INSTALLATION

C. The CONTRACTOR shall employ installers who are skilled and experienced in the installation and connection of all PLC and radio elements, instruments, accessories and assemblies furnished. Electrical work shall be performed as specified in the applicable sections of Division 26.

D. Wire Marking: Each signal and control circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on all shop drawings. These numbers shall marked on all conductors at every terminal using white numbered wire markers which shall be permanently marked heat-shrink plastic.

E. Mounting and Connection: The CONTRACTOR shall install and connect all field-mounted components and assemblies under the criteria imposed by the equipment manufacturer and the CONTRACTOR. The installation personnel shall be provided with a final reviewed copy of the shop drawings and data.

F. Technical Assistance: The CONTRACTOR shall provide a trained technical field representative to instruct installation personnel on any and all equipment installation requirements. Thereafter, the technical field representative shall be readily available to answer questions and supply clarification when needed by installation personnel.

G. Final Checks: After all installation and connection work has been completed, the technical filed representative shall check it all for correctness, verifying polarity of electric power and signal connections, making sure all process connections are free of leaks, and all other similar details. The technical filed representative shall certify in writing to the ENGINEER/OWNER that each loop and system has been checked out and that all discrepancies has been corrected by the installation personnel.

3.2 SCADA RADIO SYSTEM INSTALLATION

A. Installation of all radio equipment which will provide the communication links for the St. John the Baptist Parish SCADA system shall be performed in accordance with manufacturer's recommendations, with good and accepted microwave and radio installation practices and with these specifications. All miscellaneous installation material, tools and test equipment shall be suitable for the tasks to be performed. All work shall be performed by qualified personnel experienced in the trade involved.

B. PLC and Radio Installation: Each PLC and radio shall be installed on the metal back-plate of its associated PLC enclosure using stainless steel hardware. Radios shall be installed so that they may readily be removed for repair or replacement.

C. D.C. Power Wiring: All D.C. power wiring used to connect PLC and radio equipment to the D.C. power source shall be a two-conductor cable with stranded copper AWG #14 conductors. The conductor with red insulation shall be used for the positive supply and conductor with black insulation shall be used for the negative return (ground.)

D. The case of each PLC and radio shall be grounded to the station ground using a bare solid AWG #6 ground connector. Burndy Type KA one-hole copper grounding lugs shall be used to connect the equipment to the ground conductor. Crimp or solder type lugs will not be permitted. Brass or stainless steel bolts, nuts and washers shall be used to connect the lugs to the equipment.

E. Data and control wiring between PLC and radio shall conform to EIA RS-232-C and/or EIA Ethernet specifications.

3.3 ENCLOSURE SIGNAL AND CONTROL CIRCUIT WIRING

A. Calibration: All instruments and systems provided shall be calibrated after installation, in conformance with the component manufacturer's instructions. This shall provide that those components having adjustable features are set carefully for the specific conditions and applications of this installation, and insure that components and/or systems are within the specified limits of accuracy. Defective elements which cannot achieve proper calibration or accuracy, either individually or within a system, shall be replaced. This calibration work shall be accomplished by appropriately experienced he technical field representatives. The CONTRACTOR shall certify in writing to the ENGINEER that, for each loop and system, all calibrations have been made and that all instruments are ready to operate. The contractor shall provide a complete record of all calibrations, adjustments, and settings.

B. Proof of Conformance: The burden of proof of conformance to specified accuracy and performance is on the CONTRACTOR. The CONTRACTOR shall supply necessary test equipment and technical personal if called upon to prove accuracy and/or performance, at no separate additional cost to the OWNER, wherever reasonable doubt or evidence of malfunction or poor performance may appear.

C. Testing: All systems shall be exercised through complete operational tests in the presence of the OWNER in order demonstrate achievement of the specified performance. Operational tests depend upon completion of work specified elsewhere in these Contract Documents. The scheduling of tests shall be coordinated by the CONTRACTOR among all parties involved so that the tests may proceed without delays or disruption by uncompleted work.

D. Start-up: When all equipment and systems have been assessed by the CONTRACTOR to have been successfully carried through complete operational tests with not less than a minimum of simulation, and the ENGINEER concurs in this assessment, switchover and system start-up can follow. Only one site at a time will be taken off line. At each site the existing controls will be disconnected and the new controls will be connected and start-up for that site will be performed. When all control and other functions are made fully operational at that site, work at the next scheduled site may begin.

3.4 SCADA RADIO SYSTEM TESTING

A. General: Prior to installation of the SCADA radio equipment, the CONTRACTOR shall assemble all major items of equipment acquired under these specifications at a single location and test the equipment as an operating system. After all equipment has been installed, placed in operation and optimized, the CONTRACTOR shall conduct final system test. Should, at any time during pre-installation or final system testing, any item of equipment or the equipment operating as a system fail to meet specifications, it shall be the

responsibility of the CONTRACTOR at his sole expense to repair or replace any or all equipment causing said failure.

B. Pre-installation Testing: Prior to installation of the radio equipment at the various sites, the CONTRACTOR shall assemble all equipment at a single site and shall test each radio assembly for proper operation. Upon successful completion of equipment testing, the equipment shall be tested as an operating system.

C. R.F. Equipment Testing: The following measurements shall be made, recorded and compared to normal readings on each R.F. assembly prior to system testing to ensure that all equipment meets published specification:

a. Operating Voltages
b. Transmitter Frequency
c. Transmitter Output Power
d. Transmitter Deviation
e. Receiver Local Oscillator Frequency
f. Receiver Sensitivity (10 to –6 BER)
g. Protection System Operation

D. Additional Requirements: Any power supplies, signal isolators, convertors, interposing relays, etc., that are necessary to make existing signals and equipment compatible with the PLC I/O system, shall be furnished and installed as a part of this Contract.

3.5 DATA BASE CONFIGURATION

A. Listed References: The analog and digital data base inputs and outputs specified above are to be configured for this system. Points specified as future shall be included in the configured data base and blocked out. Demonstrate to OWNER system capability to accommodate a total of one hundred (100) stations, including current stations and future additions to the system.

B. Additional Requirements: Any other data base points that are required to perform specified control, display, or reporting functions shall be included in the configured data base.

END OF SECTION 27 60 00