CONTRACT DOCUMENTS AND SPECIFICATIONS

HALLSDALE POWELL UTILITY DISTRICT
HPUD MELTON HILL RAW WATER INTAKE IMPROVEMENTS

2600-008

JUNE 2023

Prepared By:

FOXPE
ENGINEERING FOR THE WATER ENVIRONMENT

2711 Berrywood Dr
Nashville, Tennessee 37204

Prepared For:

HALLSDALE-POWELL UTILITY DISTRICT

3745 Cunningham Road
Knoxville, Tennessee 37918

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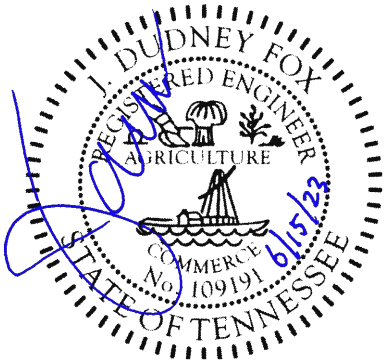

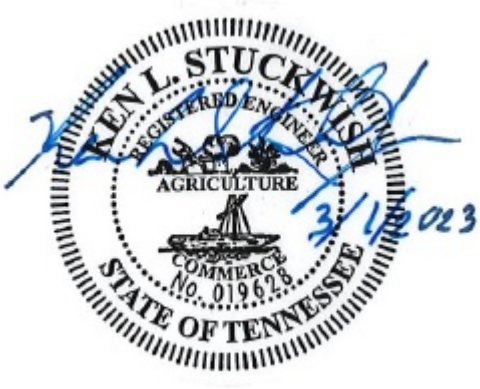

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SECTION 00 1100

ADVERTISEMENT FOR BIDS

HPUD Melton Hill Raw Water Intake Improvements
(Project)

Hallsdale Powell Utility District
(Owner)

Separate sealed Bids for furnishing of all materials, labor, tools, equipment, and appliances necessary for the construction of HPUD Melton Hill Raw Water Intake Improvements will be received by the Owner at 3745 Cunningham Road, Knoxville, TN 37918 until 2:00 p.m. local time, on August 24, 2023, and then at said office publicly opened and read aloud.

The Project consists of the installation of a raw water intake pump and appurtenances, discharge piping, including associated electrical and HVAC improvements for a complete project as shown or specified in the Contract Documents.

A pre-bid meeting will be held at 1:00 p.m. local time, on August 9, 2023, at the Melton Hill WTP, 285 Moore Lane, Powell, TN 37849.

Copies of the Contract Documents and Specifications, including bidding documents and requirements and Contract Drawings may be obtained from the Engineer, FOXPE LLC, Nashville, TN (Address below), upon payment of $250.00 for each set. This payment is not refundable. Copies may be examined at the following locations:

FOXPE LLC, 2711 Berrywood Drive, Nashville, Tennessee 37204, 615.640.0757

Builders Exchange of Tennessee (Nashville Office), 2322 Winford Ave. Nashville, TN 37211

Builders Exchange of Tennessee (Knoxville Office), 300 Clark Street Knoxville, TN 37921

Bidders must be listed on Engineer's list of plan holders who have purchased the Contract Documents, Specifications, and Drawings. No bid may be withdrawn within 90 days after the scheduled time for receipt of bids. Engineer shall be provided with the following information: mailing address for U.S. Postal Service, physical delivery address, telephone number, email address, and name of contact person.

This project is being supported in whole or in part, by Federal award number 21.027 awarded to Knox County by the U.S. Department of the Treasury. All bidders must be licensed General Contractors as required by the Contractor's Licensing Act of 1994 of the General Assembly of the State of Tennessee and qualified for the type of construction being bid upon. Attention of bidders is particularly called to the requirements as to conditions of employment to be observed and minimum wage rates to be paid under the contract.

All qualified applicants will receive consideration for employment without regard to race, color, creed, religion, sex, age, handicap, disability, ancestry, national origin, marital status, or any other basis prohibited by law.

SPECIAL NOTICE TO DISADVANTAGED BUSINESS ENTERPRISES (DBE) FIRMS

All qualified Disadvantaged Business Enterprises (DBE) firms desiring to bid as a General Contractor, sub-contractor, professional service provider, supplier, or equipment vendor are encouraged to contact the Governor's Office of Diversity Business Enterprise (Go-DBE), https://www.tn.gov/generalservices/procurement/central-procurement-office--cpo-/go-dbe.html, to review bidding/contract documents. Qualified Disadvantaged Business Enterprises (DBE) firms may also contact FOXPE at the address listed above, to obtain a list of prospective bidding General Contractors or to obtain copies of bidding/contract documents.

OWNER

Date:_____ Darren Cardwell, CEO

SECTION 00 2100

INFORMATION FOR BIDDERS

1. RECEIPT AND OPENING OF BIDS

The Hallsdale Powell Utility District (herein called the "Owner"), invites Bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the Owner at the location and time noted in the Advertisement for Bids. The envelopes containing the Bids shall be sealed.

The Owner may consider informal any Bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all Bids. Any Bid may be withdrawn prior to the above scheduled time for the opening of Bids or authorized postponement thereof. Any Bid received after the time and date specified shall not be considered. No Bidder may withdraw a Bid within 90 days after the actual date of the opening thereof.

2. PREPARATION OF BID

Each Bid shall be submitted on the Bid forms bound in the Contract Documents. All blank spaces for Bid prices must be filled in, in ink or typewritten, in both words and figures. (In case of discrepancy, the amount shown in words will govern.) All required enclosed certifications must be fully completed and executed when submitted.

Each Bid must be submitted in a sealed envelope, addressed to the Owner. Each sealed envelope containing a Bid must be plainly marked on the outside as HPUD Melton Hill Raw Water Intake Improvements, and include all other information required by the state of Tennessee law.

If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed to the Owner at 3745 Cunningham Road, Knoxville, TN 37918.

Any and all Bids not meeting the aforementioned criteria for Bid submittal, will be declared nonresponsive, will **not** be opened, and will be returned to the Bidder unopened.

3. SUBCONTRACTS

The Bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must be acceptable to the Owner and funding agencies and shall be subject to verification by the state of Tennessee as to eligibility status. **The following electrical contractors are approved for this project:**

1. East Tennessee Technical Services, Inc, Knoxville, TN
2. Energy Electric, Inc, Knoxville, TN
3. Service One, Inc, Knoxville, TN
4. DC Electric, Pikeville, TN

4. FACSIMILE MODIFICATIONS

Any Bidder may modify his Bid by facsimile communication at any time prior to the scheduled closing time for receipt of Bids, provided such facsimile communication is received by the Owner prior to the closing time, and provided further, the Owner is satisfied that a written confirmation of the facsimile modification over the signature of the Bidder was mailed prior to the closing time. The facsimile communication should not reveal the Bid price but should provide the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed Bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the facsimile modification.

5. OVERHEAD, PROFIT, AND REVISION OF QUANTITIES

The unit or lump sum price for each of the items in the proposal of each Bidder shall include its pro rata share of overhead and profit so that the sum of the products obtained by multiplying the quantity shown for each item by the unit price represents the total Bid. Any Bid not conforming to this requirement may be rejected as informal. The special attention of all Bidders is called to this provision, for should conditions make it necessary to revise the quantities, no limit will be fixed for such increased or decreased quantities nor extra compensation allowed, provided the net monetary value of all such addition or subtraction in quantities of such items of work (i.e., difference in cost) shall not increase or decrease the total original contract price by more than 25 percent, except for work not covered in the Drawings and Detailed Specifications as provided for under General Conditions and Supplemental General Conditions.

6. QUALIFICATIONS OF BIDDER

The Owner may make such investigations as 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 properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein. Conditional Bids will not be accepted.

A Bidder must purchase a set of Contract Documents (including Bidding Requirements and Documents), Specifications, and Drawings through the Engineer in order to be considered a qualified bidder. Addenda will only be sent to those who have purchased documents and are on the list of plan holders maintained by FOXPE LLC.

7. BID SECURITY

Each Bid must be accompanied by a cashier's check on a duly authorized bank, certified check of the Bidder, or a bid bond prepared on the form of bid bond attached hereto, duly executed by the Bidder as principal and having as security thereon a surety company listed in the latest issue of U.S. Treasury Circular 570, in the amount of 5 percent of the Bid. Certified checks or cashier's checks shall be made payable to the Owner. Such checks or bid bonds will be returned to all except the three lowest Bidders within three days after the opening of Bids; the remaining 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 90 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.

8. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The successful Bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within 10 days after he has received 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.

9. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

Bidder must agree to commence work on or before a date to be specified in a written Notice to Proceed of the Owner and to fully complete the Project within 600 consecutive calendar days thereafter. Bidder must agree also to pay as liquidated damages the sum of $1,000 for each consecutive calendar day in default as hereinafter provided in the General Conditions and Supplemental General Conditions.

10. CONDITIONS OF WORK

Each Bidder must inform himself fully of the conditions relating to the construction of the Project and the employment of labor thereof. Failure to do so will not relieve a successful Bidder of his obligation to furnish all material and labor necessary to carry out the provision of his Contract. Insofar as possible the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor or the operations of the Owner.

11. ADDENDA AND INTERPRETATIONS

No interpretation of the meaning of the Drawings, Specifications, or other prebid documents will be made to any Bidder orally.

Every request for such interpretation should be in writing addressed to Dudney Fox, P.E.(dudney@foxpe.com); FOXPE LLC, at 2711 Berrywood Dr, Nashville, Tennessee 37204, and to be given consideration must be received at least five 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 transmitted electronically to all prospective Bidders not later than two days prior to the date fixed for the opening of Bids, or in accordance with Tennessee statute. 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 a part of the Contract Documents.

12. SECURITY FOR FAITHFUL PERFORMANCE

Simultaneously with his delivery of the executed Contract, the Contractor 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, as specified in the General Conditions included herein. 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.

13. 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.

14. NOTICE OF SPECIAL CONDITIONS

Attention is particularly called to those parts of the Contract Documents and Specifications which deal with the following:

A. Inspection and testing of materials
B. Insurance requirements
C. Wage rates (if applicable)
D. Surveys, permits, and regulations
E. State Allowances

The federal regulations enclosed or herein referred to supersede all conflicting requirements of the Contract Documents.

15. LAWS AND REGULATIONS

The Bidder's attention is directed to the fact that all applicable state laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the Project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

16. 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 Drawings 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 in respect of his Bid.

17. EXECUTION OF BID DOCUMENTS

The Contractor, in signing his Bid on the whole or any portion of the work, shall conform to the following requirements:

A. Bids which are not signed by individuals making them shall have attached thereto a power of attorney evidencing authority to sign the Bid in the name of the person for whom it is signed.

B. Bids which are signed for a partnership shall be signed by all of the partners or by an attorney-in-fact. If a Bid is signed by an attorney-in-fact, there should be attached to the Bid a power of attorney executed by the partners evidencing authority to sign the Bid.

C. Bids which are signed for a corporation shall have the correct corporate name thereof and the signature of the President or other authorized officer of the corporation manually written below the corporate name following the wording "By _____." Corporation seal shall also be affixed to the Bid.

18. METHOD OF AWARD - LOWEST QUALIFIED BIDDER

The Contract will be awarded to the responsive, responsible Bidder submitting the lowest Bid complying with the conditions of the Information for Bidders. Award will be made on the basis of the prices given in the Base Bid either with or without alternates at the discretion of the Owner. The Bidder to whom the award is made will be notified at the earliest possible date. The Owner reserves the right to reject any and all Bids and to waive any informality in Bids received whenever such rejection or waiver is in its interest.

A responsive Bidder shall be one who submits his Bid in the proper form without qualification or intent other than as called for in the Specifications and on the Contract Drawings and who binds himself on behalf of his Bid to the Owner with the proper bid bond or certified check completed and attached, and who properly completes all forms required to be completed and submitted at the time of the bidding.

A responsible Bidder shall be one who can fulfill the following requirements:

A. The Bidder shall maintain a permanent place of business. This requirement applies to the Bidder where the Bidder is a division of a corporation, or where the Bidder is 50 percent or more owned by a person, corporation, or firm.

B. The Bidder shall demonstrate that he has adequate construction management experience and sufficient equipment resources to properly perform the work under and in conformance with these Contract Documents. This evaluation will be based upon a list of completed and active projects and a list of construction equipment available to the Bidder to perform the work.

C. The Bidder shall demonstrate that he is familiar with the work under these Contact Documents. This evaluation will be based upon a list of major equipment items the Bidder proposes to furnish and a list of subcontractors the Bidder proposes to use in prosecuting the work.

D. The Bidder shall demonstrate that he has financial resources of sufficient strength to meet the obligations incident to the performance of the work covered by these Contract Documents. The Bidder shall complete the Statement of Bidder's Qualifications in the Bid forms. The ability to obtain the required Performance and Payment Bonds will not alone demonstrate adequate financial capability.

E. The Bidder may demonstrate financial capability by submitting a suitable financial statement of an Equity Partner, provided an agreement is executed binding the Bidder and said Equity Partner, jointly and severally, to fulfill all duties, obligations, and responsibilities of the Contractor under these Contract Documents if the Contract is awarded to the Bidder. The agreement shall be submitted with the Bid and shall be satisfactory to the Owner's attorney or the Bid may be declared nonresponsive.

F. The Bidder shall furnish all data required by these Contract Documents. Failure to do so may result in the Bid being declared nonresponsive. Acceptance of the Bidder's documentation and substantiation or contract award by the Owner does not relieve the Bidder of liability for nonperformance as covered in the Contract Documents, nor will the Bidder be exempted from any other legal recourse the Owner may elect to pursue.

19. EMPLOYMENT OF LOCAL LABOR

Preference in employment on the Project shall, insofar as practicable, be given to qualified local labor.

20. BID ENVELOPE

All Bidders must be licensed contractors in the State of Tennessee. In compliance with all the requirements of Chapter No. 135, Public Acts of 1945 of the General Assembly of the State of Tennessee, and House Bill No. 2180 (Public Chapter No. 882) known as the Contractor's Licensing Act of 1976 (and all amendments thereto), the envelope in which the Bid is contained must also bear on the outside the following:

A. Name of Bidder

1. Address of the Bidder;
2. Name of Project for which Bid is submitted;
3. Bidder's License Number;
4. Bidder's License Category or Classification; and
5. Bidder's License Expiration Date.

B. Name of Electrical; Plumbing; Heating, Ventilation and Air Conditioning; or Masonry Sub-Contractors

1. Contractor's License Number;
2. Contractor's License Expiration Date; and
3. License Classification.

Bid envelopes that do not bear the above information will be returned to the Bidder unopened.

A copy of the form found on the last page of this section properly completed to provide the required information as identified above shall be affixed to the front of the envelope containing the Bidder’s proposal.

CONTRACTOR'S IDENTIFICATION

This form shall be attached to the sealed envelope containing the Bid. Failure to provide the following information on the sealed envelope will be considered a non-responsive Bid.

BIDDER:

Name _____

Address _____

_____

_____

Tennessee License No._____

Expiration Date _____

Monetary Limit $_____

Classification _____

_____

_____

Complete the following for all applicable Electrical; Plumbing; Heating, Ventilation and Air-Conditioning; or Masonry Subcontractors:

Subcontractor: _____

_____

Tennessee License No._____

License Expiration Date _____

License Classification _____

Subcontractor: _____

_____

Tennessee License No._____

License Expiration Date _____

License Classification _____

Subcontractor: _____

_____

Tennessee License No._____

License Expiration Date _____

License Classification _____

Subcontractor: _____

_____

Tennessee License No._____

License Expiration Date _____

License Classification _____

SEALED BID PROPOSAL FOR THE CONSTRUCTION OF

HPUD MELTON HILL RAW WATER INTAKE IMPROVEMENTS

FOR HALLSDALE POWELL UTILITY DISTRICT

Bid Date _____ Bid Time _____

SECTION 00 4100

BID

Project Description: HPUD Melton Hill Raw Water Intake Improvements

Proposal of_____

(hereinafter called "Bidder"), doing business as_____
(a corporation, a partnership, an individual)

to Hallsdale Powell Utility District (hereinafter called "Owner").

Gentlemen:

The Bidder, in compliance with your Advertisement for Bids for the construction of this project having examined the Drawings and Specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the price(s) stated below. This price(s) is to cover all expenses including overhead and profit incurred in performing the work required under the Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this contract on or before a date to be specified in written Notice to Proceed of the Owner and to fully complete the project within 600 consecutive calendar days thereafter as stipulated in the Specifications. Bidder further agrees to pay as liquidated damages, the sum of $1,000 for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.

Bidder acknowledges receipt of the following addenda:

_____

_____

_____

Bidder agrees to perform all the construction of the project complete with appurtenant and accessory work described in the Specifications and shown on the plans for the attached price(s).

The attached price(s) shall include all labor, materials, bailing, shoring, removal, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for.

Bidder understands that the Owner reserves the right to reject any or all Bids and to waive any informalities in the bidding.

The Bidder agrees that this Bid shall be good and may not be withdrawn for a period of 90 calendar days after the scheduled closing time for receiving Bids.

Upon receipt of written notice of the acceptance of this Bid, Bidder will execute the formal contract attached within ten days and deliver a surety bond or bonds as required by the General Conditions. The Bid security attached in the sum of 5 percent of the total Bid is to become the property of the Owner in the event the contract and bond are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

Respectfully submitted:

_____

By_____
(Signature)

Title_____

_____

_____
(Business Address)

ATTEST:

_____

Name_____
(Please Type)

Title_____ (SEAL)

Note: Attest for a corporation must be by the corporate secretary; for a partnership by another partner; for an individual by a Notary.

BID SCHEDULE
HPUD MELTON HILL RAW WATER INTAKE IMPROVEMENTS
HALLSDALE POWELL UTILITY DISTRICT

SCHEDULE I - LUMP SUM BASE BID

Item No. 1 - Lump Sum Base Bid

The Lump Sum Base Bid for the furnishing of all labor, materials, and equipment for the construction of the HPUD Melton Hill Raw Water Intake Improvements as required for a complete operating installation as described on the Drawings and in the Contract Documents, including Allowances provided in the schedule below, the lump sum of

_____ Dollars

and_____Cents

Total Amount of Bid: $_____(In figures)

MAJOR EQUIPMENT ITEMS

The Specifications require the inclusion of certain major equipment items by specified manufacturers in the Base Bid. This requirement is not intended to restrict competition but is for the purpose of establishing the desired standard of quality and mechanical features without ruling out comparable competitive equipment.

Where appropriate, provision is made here for the Bidder to offer comparable equipment by other manufacturers for the Owner's consideration.

"a" Items
Equipment listed as "a" items shall be used in the Bidder's Base Bid. These items were used by the Engineer as the basis of design for this project. The Contractor shall circle the "a" item used in his Base Bid.

"b" Items
Named Suppliers and blanks have been provided for "b" items of equipment for which the bidder may submit additive/deductive prices from the base bid for supplying those alternate items.

Adjusted Contract Price
The Owner reserves the right to select any, all, or none of the proposed alternate items of a manufacturer/supplier. If the Owner selects any such items, the Contract Price shall be equal to the total base bid stated above, adjusted by the difference between the sum of all "a" items and the sum of any "b" items selected by the Owner plus any additive alternates selected by the Owner.

The Adjusted Contract Price shall be the basis for determination of the lowest responsive, responsible bidder.

Vertical Turbine Pump, Section 43 2113

a. Peerless

b. Flowserve (deduct) $_____

b. _____ (deduct) $_____

ALLOWANCES			
Section 01 2113	Miscellaneous Allowance	Per Section 01 2113	$100,000.00
Section 01 2113	SCADA Allowance (Programming Only, MR Systems)	Per Section 01 2113	$50,000.00
Section 01 2113	Paving Allowance	Per Section 32 1000	$50,000.00
Section 01 2113	Bypass Flow Control	Per Section 33 0130	$50,000.00

BIDDER		DATE
BY	Signature	TITLE
ADDRESS		
CITY	STATE	ZIP CODE
TELEPHONE NUMBER	E-MAIL	

SECTION 00 4313

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____ _____as Principal, and _____as Surety, are hereby held and firmly bound unto Hallsdale Powell Utility District as Owner in the penal sum of five percent of the total Bid which equals _____ _____for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, our heirs, executors, administrators, successors, and assigns.

The condition of the above obligation is such that whereas the Principal has submitted to Hallsdale Powell Utility District a certain Bid, attached hereto and hereby made a part hereof to enter into a contract in writing for the construction of the HPUD Melton Hill Raw Water Intake Improvements.

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 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 the 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 Surety have executed this bond by causing their respective names to be hereunto subscribed and their seals to be hereunto affixed by their duly authorized officers, on this the _____ day of _____, 20 __.

CONTRACTOR - PRINCIPAL:

_____

By _____

Name_____
(Please Type)

Title_____

ATTEST:

_____

Name _____
(Please Type)

Title _____ (SEAL)

Note: Attest for a Corporation must be by the corporate secretary; for a partnership by another partner; for an individual by a Notary.

SURETY:

_____

By _____

Name _____
(Please Type)

Title _____
(Attach Power of Attorney)

ATTEST:

_____

Name _____
(Please Type)

Title _____ (SEAL)

Note: 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.

SECTION 00 4513

STATEMENT OF BIDDER'S QUALIFICATIONS

All questions must be answered and the data given must be clear and comprehensive. This statement must be notarized. If necessary, questions may be answered on separate attached sheets. The Bidder may submit any additional information he desires. Attach all additional sheets to these Contract Documents.

1. Name of Bidder.

2. Permanent main office address.

3. When organized.

4. If a corporation, where incorporated.

5. How many years have you been engaged in the contracting business under your present firm or trade name?

6. Contracts on hand: (Schedule these, showing amount of each contract and the appropriate anticipated dates of completion.)

7. General character of work performed by your company.

8. Have you ever failed to complete any work awarded to you? If so, where and why?

9. Have you ever defaulted on a contract? If so, where and why?

10. List the most important projects recently completed by your company, stating the approximate cost for each, and the month and year completed.

11. List your major equipment available for this project. (Use form provided in Section 00 4514.)

12. Experience in construction work similar in importance to this project.

13. Background and experience of the principal members of your organization, including officers.

14. Credit available: $ _____

15. Give bank reference.

16. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the Local Public Agency?

The undersigned hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the Local Public Agency in verification of the recitals comprising this Statement of Bidder's Qualifications.

Dated this_____day of _____, 20___.

_____
Name of Bidder

By _____

Title _____

State of _____

County of _____

_____ being duly sworn deposes and says that he is

_____of _____

_____and that the answers to the foregoing

questions and all statements therein contained are true and correct. Subscribed and sworn to

before me this _____ day of _____ , 20 __ .

_____
Notary Public

My Commission Expires:

_____
(Date) (SEAL)

SECTION 00 4514

STATEMENT OF EQUIPMENT

Showing machinery and other equipment available to Contractor for prosecuting the work included in contract. (To be filled in by Contractor and submitted with Bid.)

Available Machinery and Other Equipment Kind-Size-Capacity	Location	Ownership	Date Proposed To be Placed On Work

The above is a true statement of the equipment available to the undersigned Bidder for prosecuting the work included in the contract. Where it is shown that the equipment is not owned by the Bidder, arrangements have been made with the owners to furnish the equipment.

Signed _____

Name _____

Title _____

SECTION 00 4519

NONCOLLUSION AFFIDAVIT OF PRIME BIDDER

State of _____)
)ss.
County of _____)

_____, being first duly sworn, deposes and says that:

1. He is_____ of _____
   (owner, partner, officer, representative, or agent)

   _____ , the Bidder that has submitted the attached Bid;

2. He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;

3. Such Bid is genuine and is not a collusive or sham Bid;

4. Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the _____ (Local Public Agency) or any person interested in the proposed Contract; and

5. The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners, employees, or parties in interest, including this affiant.

(Signed)_____

_____
(Title)

Subscribed and sworn to before me this _____ day of _____ , 20 ___ .

_____

_____
(Title)
My commission expires _____
(Date) (SEAL)

SECTION 00 4544.10

PARTNERSHIP CERTIFICATE

STATE OF_____

COUNTY OF_____

On this _____ day of _____ , 20 _____, before me personally appeared

_____, known to me to be the person who executed the above instrument, who, being by me first duly sworn, did depose and say that he is a general partner in the firm of _____

and that said firm consists of himself and _____

and that he executed the foregoing instrument on behalf of said firm for the uses and purposes stated therein, and that no one except the above named members of the firm have any financial interest whatsoever in said proposed contract.

_____	_____
Partner	Partner
_____	_____
Partner	Partner

Subscribed and sworn to before me, this _____ day of _____ , 20 __ .

_____

Notary Public

My Commission Expires:

(Date) (SEAL)

NOTE: If only one partner signs, a power of attorney executed by all other partners authorizing him to act in the name of the company must be attached; otherwise, all partners must sign.

SECTION 00 4544.20

CORPORATE CERTIFICATE

I, _____, certify that I am the Secretary of the corporation named as Contractor in the foregoing proposal; that _____ _____, who signed said proposal in behalf of the Contractor was then _____ of said corporation; that said proposal was duly signed for and in behalf of said corporation by authority of its Board of Directors, and is within the scope of its corporate powers; that said corporation is organized under the laws of the State of _____.

This _____day of _____, 20 _____.

_____

(SEAL)

SECTION 00 4545

JOINT VENTURE QUESTIONNAIRE

In the event a joint venture bid is submitted, the following questions shall be answered, submitted with the bid and signed by the owner, partner, officer, representative, or agent of each joint venturer.

1. What is the separate bonding capability of each member of the joint venture?

2. What other work is in progress by the total contract dollar amount and percentage of completion for each joint venturer?

3. Are there any particular risks associated with this Contract which contributed to the decision to joint venture, and if so, what?

4. Has consideration been given to utilization of subcontract as opposed to formation of a joint venture, and if so, why was the joint venture format chosen?

5. Has either member of the joint venture been separately awarded a contract by Hallsdale Powell Utility District, and if so, what was the most recent contract awarded to each?

6. What will be the contribution of each participant in the joint venture with respect to personnel, equipment, and other resources of each company allocated to this contract?

7. What will be the specific contribution of each participant of the joint venture for the completion of work to be performed and material to be supplied under this Contract?

8. Will there be separate management for the joint venture? If not, which company will supervise, or how will the contract be supervised?

9. Why will the joint venture be more efficient than the possibility of both companies separately bidding and either company being awarded the contract separately.

10. Does the formation of the joint venture promote competition on this Contract, and if so, how?

11. Has the joint venture, or any participant therein, received any legal advice with respect to the antitrust implications of formation of a joint venture, and if so, from what attorneys?

_____	_____
Name of Joint Venturer	Name of Joint Venturer
By _____	By _____
Title _____	Title_____

State of _____

County of _____

_____being duly sworn deposes and says that he

is _____of_____and

_____being duly sworn deposes and says that he

is _____of_____and

that the answers to the foregoing questions and all statements therein contained are true and correct. Subscribed and sworn to before me this _____ day of _____, 20____.

_____
Notary Public

My Commission Expires:

_____ (SEAL)
(Date)

END OF SECTION

SECTION 00 4550

STATEMENT OF LICENSE CERTIFICATE

Each Contractor bidding shall fill in and sign the following:

This is to certify that _____ has fully complied with all the requirements of Chapter No. 135, Public Acts of 1945 of the General Assembly of the State of Tennessee and House Bill No. 2180 (Public Chapter No. 822), known as the Contractors Licensing Act of 1976. The Contractor's license number, other information outlined in the Instructions for Bidders, expiration date, and that part of classification applying to the Bid shall appear on the envelope containing the Bid, otherwise the Bid will not be considered.

The State Board for Licensing General Contractors issued to _____

_____Certificate No._____

which expires on _____, 20 _____.

Signed _____

Name _____

Title _____

SECTION 00 4560

ILLEGAL IMMIGRANTS

CERTIFICATE OF COMPLIANCE

EACH CONTRACTOR BIDDING SHALL FILL IN AND SIGN THE FOLLOWING:

This is to certify that_____ has fully complied with all the requirements of Chapter No. 878 (House Bill No. 111 and Senate Bill No. 411) which serves to amend Tennessee Code Annotated Title 12, Chapter 4, Part I.

All Bidders for construction services on this project shall be required to submit an affidavit (by executing this compliance document) as part of their bid, that attests that such Bidder shall comply with requirements of Chapter No. 878.

Signature _____

Print or Type Name _____

State of _____)
) ss
County of _____)

Personally appeared before me, _____ the undersigned Notary

Public,_____, the within named bargainer, with whom I am

personally acquainted, and known to me to be the _____of the
(President, Owner, Partner)

_____, and acknowledged to me that he executed the foregoing
(corporation, partnership, sole proprietorship)

document for the purposes recited therein.

Witness my hand, at office, this _____ day of _____ , 20 _____ .

_____
Notary Public

My commission expires _____

SECTION 00 4570

DRUG-FREE WORKPLACE AFFIDAVIT

STATE OF _____

COUNTY OF _____

The undersigned, principal officer of _____ , an employer of five (5) or more employees contracting with _____ government to provide construction services, hereby states under oath as follows:

1. The undersigned is a principal officer of_____ hereinafter referred to as the "Company"), and is duly authorized to execute this Affidavit on behalf of the Company.

2. The Company submits this Affidavit pursuant to T.C.A. §50-9-113, which requires each employer with no less than five (5) employees receiving pay who contracts with the state or any local government to provide construction services to submit an affidavit stating that such employer has a drug-free workplace program that complies with Title 50, Chapter 9, of the Tennessee Code Annotated .

3. The Company is in compliance with T.C.A. §50-9-113.

Further affiant saith not.

_____
Principal Officer

STATE OF _____

COUNTY OF _____

Before me personally appeared _____, with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence), and who acknowledged that such person executed the foregoing affidavit for the purpose therein contain.

Witness my hand and seal at office this _____day of _____, 20_____.

_____
Notary Public

My Commission expires: _____

END OF SECTION

SECTION 00 4580

IRAN DIVESTMENT ACT

In compliance with the Iran Divestment Act (State of Tennessee 2016, Public Chapter No. 817), which became effective on July 1, 2016, certification is required of all bidders on contracts over $1,000.

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party hereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each bidder is not on the list created pursuant to T.C.A. § 12-12-106.

I affirm, under the penalties of perjury, this statement to be true and correct.

Date	Signature of Bidder
	Company

A bid shall not be considered for award nor shall award be made where the foregoing certification has been complied with; provided, however, that if in any case the bidder cannot make the foregoing certification, the bidder shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefor. Hallsdale Powell Utility District may award a bid to a bidder who cannot make the certification, on case-by-case basis, if:

1. The investment activities in Iran were made before July 1, 2016, the investment activities in Iran have not been expanded or reviewed on or after July 1, 2016, and the person has adopted, publicized, and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or

2. Hallsdale Powel Utility District makes a determination that the goods or services are necessary for Hallsdale Powell Utility District to perform its functions and that, absent such an exemption, the political subdivision will be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

This form must be completed and accompany the bid documents.

SECTION 00 5100

NOTICE OF AWARD

To: _____

_____

_____

Project Description: The site of the proposed work is the Melton Hill Raw Water Intake Pump Station in Powell, Tennessee. The project consists of the installation of a raw water intake pump, discharge piping, and appurtenances, including associated electrical and HVAC improvements.

The Owner has considered the Bid submitted by you for the above described work in response to its Advertisement for Bids dated _____ , 20 ___ , and Information for Bidders.

You are hereby notified that your bid has been accepted for items in the amount of

$ _____.

You are required by the Information for Bidders to execute the Contract and furnish the required Contractor's Performance Bond, Payment Bond and certificates of insurance within ten calendar days from the date of this notice to you.

If you fail to execute said Contract and to furnish said bonds within ten days from the date of this notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your bid as abandoned and as a forfeiture of your Bid Bond will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this Notice of Award to the Owner.

Dated this _____ day of _____ , 20 ____ .

By_____

Name_____

Title_____

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby acknowledged by_____

_____, this the _____day of _____, 20___.

By_____

Name_____

Title_____

SECTION 00 5200

CONTRACT

THIS CONTRACT, made this _____ day of _____, 20_____by and between Hallsdale Powell Utility District, hereinafter called "Owner" and _____ _____ doing business as a_____hereinafter called "Contractor"

(Corporation, Individual, or Partnership)

WITNESSETH: That for and in consideration of the payments and agreements hereafter mentioned:

1. The Contractor will commence and complete the HPUD Raw Water Intake Improvements.
2. The Contractor will furnish all of the material, supplies, tools. equipment, labor and other services necessary for the completion of the work described herein.
3. The Contractor will commence the work required by the Contract Documents within 10 calendar days after the contract start date of the written Notice to Proceed and will complete the work within 600 consecutive calendar days unless the periods of completion are extended otherwise by the Contract Documents. The Contractor further agrees to pay as liquidated damages, the sum of $1,000 for each consecutive calendar day in default thereafter as hereinafter provided in the General Conditions.
4. Contractor agrees to perform all of the Work described in the Contract Documents and comply with the terms therein for the sum of $_____or as shown in the Bid Schedule.
5. The term "Contract Documents" means and includes the following:

    a. Advertisements for Bids
    b. Information for Bidders
    c. Bid
    d. Bid Bond
    e. Contract
    f. General Conditions
    g. Supplemental General Conditions
    h. Payment Bond
    i. Performance Bond
    j. Notice of Award

k. Notice to Proceed

l. Change Order(s)

m. Drawings prepared by FOXPE LLC, number G1.0 through M1.1

n. Specifications prepared or issued by FOXPE LLC, dated June 2023

o. Addenda:

No. _____, dated _____, 20_____

No. _____, dated _____, 20_____

No. _____, dated _____, 20_____

6. The Owner will pay to the Contractor in the manner and at such times as set forth in the General Conditions and Supplemental General Conditions such amounts as required by the Contract Documents.

7. This Contract shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Contract in four (4) copies each of which shall be deemed an original on the date first above written.

OWNER:
Hallsdale Powell Utility District

Name _____

Title _____

WITNESS:
_____

Name _____

Title _____
(Please Print or Type)

(SEAL)

CONTRACTOR:

_____

By _____

Name_____

Title_____
(Please Type)

ATTEST:

_____

Name _____

Title _____ (SEAL)
(Please Type)

Note: Attest for a Corporation must be by the corporate secretary; for a partnership by another partner; for an individual by a Notary.

SECTION 00 5500

NOTICE TO PROCEED

To: _____

_____

_____

Project Description: The site of the proposed work is the Melton Hill Raw Water Intake Pump Station in Powell, Tennessee. The project consists of the installation of a raw water intake pump, discharge piping, and appurtenances, including associated electrical and HVAC improvements.

You are hereby notified to commence work in accordance with the Contract dated _____ _____, 20 ___ , on or before _____ _____ , 20 ___ , and you are to complete the work within 600 consecutive calendar days thereafter. The date of completion of all work is therefore _____ _____, 20 __ .

Dated this _____ day of _____, 20 ___.

Hallsdale Powell Utility District

By _____

Name _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above Notice to Proceed is hereby acknowledged by _____

_____, this the _____ day of _____, 20 _____.

By _____

Name _____

Title _____

SECTION 00 6113.13

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that _____

_____
(Name and Address of Contractor)
_____ of the State of _____
(Corporation, Partnership, or Individual)
the "Principal," and _____

_____the "Surety,"
(Name and Address of Surety)

are held and firmly bound unto the Hallsdale Powell Utility District, the "Owner," existing under and by virtue of the laws of the State of Tennessee, in the sum of _____
_____($)
in lawful money of the United States, for the payment of which sum in lawful money of the United States well and truly to be made we do hereby bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally.

The condition of this obligation is such that whereas Principal has entered into a certain Contract with the Owner, dated as of the _____ day of _____ , 20 __ , which is by reference incorporated in and made a part hereof as fully as if copied here verbatim, for the following work: HPUD Melton Hill Raw Water Intake Improvements.

NOW, THEREFORE, if the Principal shall in all respects comply with and perform all the terms and conditions of the Contract (which includes the Drawings, Specifications, and Contract Documents) and such alterations as may be made in said contract as the documents therein provide for, during the original term thereof and any extensions thereof which may be granted by the Owner, with or without notice to Surety, and during the one-year warranty period, and if Principal shall satisfy all claims and demands and shall indemnify and save harmless the Owner against and from all costs, expenses, damages, injury, or conduct, want of care, skill, negligence, or default, including compliance with performance guarantees and patent infringement by the Principal, then this obligation shall be void; otherwise Principal and Surety jointly and severally agree to pay to Owner any difference between the sum to which the Principal would be entitled on completion of the contract and that which the Owner may be obliged to pay for the completion of the work by contract or otherwise, together with any damages, direct or indirect, or consequential, which Owner may sustain on account of such work, or on account of the failure of the Principal to keep and execute all provisions of the Contract.

Principal and Surety further bind themselves, their heirs, executors, administrators, and assigns, jointly and severally, that if the Principal shall keep and perform its agreement to repair or replace defective work or equipment during the warranty period of one (1) year as provided, then this paragraph shall be void; but if default shall be made by Principal in the performance of its contract to so repair or replace said work, then this paragraph shall be in effect and Owner shall have and recover from Principal and its Surety damages for all defective conditions arising by reason of defective materials, work, or labor performed by or on the account of Principal and

it is further understood and agreed that this obligation shall be a continuing one against the Principal and Surety hereon, and that successive recoveries may be had hereon for successive breaches until the full amount shall have been exhausted; and it is further understood that the obligation therein to maintain said work shall continue throughout said maintenance period, and the same shall not be changed, diminished, or in any manner affected from any cause during said time; and to fully save and hold the Owner harmless for any damages it may be caused to pay on account of injury to person, loss of life or damage to property.

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

IN WITNESS WHEREOF, the Principal and Surety have executed this Bond by causing their respective names to be hereunto subscribed and their seals to be hereunto affixed by their duly authorized officers, on this the _____ day of _____ , 20 __ .

CONTRACTOR - PRINCIPAL:

_____

By _____

Name _____
(Please Print or Type)

Title _____

ATTEST:

_____

Name _____
(Please Print or Type)

Title _____ (SEAL)

Note: Attest for a corporation must be by the corporate secretary; for a partnership by another partner; for an individual by a Notary.

SURETY:

_____

By _____

Name _____
(Please Print or Type)

(Attach Power of Attorney)

WITNESS:

_____

Name _____
(Please Print or Type)

Title _____ (SEAL)

Note: 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.

SECTION 00 6113.16

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that_____
(Name and Address of Contractor)

_____

_____of the State of _____
(A Corporation, a partnership, or Individual)
the "Principal," and _____
(Name and Address of Surety)
_____the "Surety,"

are held and firmly bound unto the Hallsdale Powell Utility District, the "Owner," existing under and by virtue of the laws of the State of Tennessee, in the sum of _____

_____ ($ _____)

in lawful money of the United States, for the payment of which sum in lawful money of the United States well and truly to be made we do hereby bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally.

The condition of this obligation is such that whereas Principal has entered into a certain Contract with the Owner, dated as of the _____ day of _____ , 20 __ , which is by reference incorporated in and made a part hereof as fully as if copied here verbatim, for the following work: HPUD Melton Hill Raw Water Intake Improvements.

NOW, THEREFORE, if the Principal shall fully pay for all the labor and materials used by said Principal or any immediate or remote subcontractor or furnisher of labor or materials under him in the performance of the work in lawful money of the United States as the same shall become due, including all amounts due for materials, lubricants, oil, gasoline, electricity, coal and coke, repairs on machinery, equipment, and tools, consumed or used in connection with performance of the work and all insurance premiums and other charges incurred under said contract, then this obligation shall be void; otherwise to remain in full force and effect.

Principal and Surety further bind themselves, their heirs, executors, administrators, and assigns, jointly and severally, that they shall promptly make payments of all taxes, licenses, assessments, contributions, penalties, and interest thereon, when, and if, the same may be lawfully due the State of Tennessee, or any County, Municipality, or political subdivision thereof by reason of and directly connected with the performance of the Contract, or any part thereof.

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

executors, administrators, successors, assignees, subcontractors, and other transferees shall have the same effect as to said Surety as though done or omitted to be done by and in relation to the Principal.

IN WITNESS WHEREOF, the Principal and Surety have executed this Bond by causing their respective names to be hereunto subscribed and their seals to be hereunto affixed by their duly authorized officers, on this the _____ day of _____ , 20 ___ .

CONTRACTOR - PRINCIPAL:

_____

By _____

Name _____
(Please Print or Type)

Title _____

ATTEST:

_____

Name _____
(Please Print or Type)

Title _____ (SEAL)

Note: Attest for a corporation must be by the corporate secretary; for a partnership by another partner; for an individual by a Notary.

SURETY:

_____

By _____

Name _____
(Please Print or Type)

Title _____
(Attach Power or Attorney)

WITNESS:

_____

Name _____

Title_____ (SEAL)

Note: 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.

SECTION 00 6363

CHANGE ORDER

Order No._____

Date: _____

Agreement Date: _____

NAME OF PROJECT: HPUD Melton Hill Raw Water Intake Improvements
OWNER: Hallsdale Powell Utility District (HPUD)
CONTRACTOR: _____

The following changes are hereby made to the Contract Documents:

Change to Contract Price

Original Contract Price $_____
Current Contract Price adjusted by previous Change Order $_____
The Contract Price due to this Change Order will be
increased/decreased by: $ _____
The new Contract Price including this Change Order will be $ _____

Change to Contract Time

The Contract Time will be increased/decreased by _____ calendar days.
The date for completion of all work will be _____ (date).

Justification

_____

_____

Approvals Required

To be effective this Order must be approved by the Federal agency if it changes the scope or objective of the Project, or as may otherwise be required by the Supplemental General Conditions.

Accepted by:_____(CONTRACTOR)
Recommended by:_____FOXPE LLC
Ordered by: _____HPUD

SECTION 00 6516

CERTIFICATE OF SUBSTANTIAL COMPLETION

Project: HPUD Melton Hill Raw Water Intake Improvements

Agreement Date:_____ ____, 20 ___

Contractor: _____

_____

_____

Owner: Hallsdale Powell Utility District
3745 Cunningham Road
Knoxville, TN 37918

Engineer: FOXPE LLC
2711 Berrywood Drive
Nashville, Tennessee 37204

A walk-through inspection of the project was conducted on_____ _____, 20 __ , with representatives of the Contractor, Owner, and Engineer participating. A final Punch List of work remaining to be completed or deficiencies noted was prepared.

ENGINEER: The work performed under this contract has been reviewed and found to the Engineer's best knowledge, information, and belief to be substantially complete as of _____.

By: _____ Title: _____ Date: _____

CONTRACTOR: The Contractor will complete or correct all work noted on the list of remaining work items dated __ , and supplements issued thereto within ___ days of the substantial completion date unless time is extended by Owner. The failure to include any items on the list does not alter the responsibility of the Contractor to complete all work in accordance with the Contract Documents.

By: _____ Title: _____ Date: _____

OWNER: The Owner accepts the work as substantially complete and accepts full possession thereof including the responsibilities for security, maintenance, and insurance.

By: _____ Title: _____ Date: _____

SECTION 00 6519

PROJECT CLOSE OUT FORMS

The following forms must be fully filled out by the Contractor and properly executed prior to release of final payment:

1. Certificate of Property Restoration

2. Affidavit of Payment

3. Affidavit of Release of Liens

4. Consent of Surety for Final Payment

5. Final Waiver of Lien

   (To be executed by each and every subcontractor and supplier of materials.)

SECTION 00 6519.10

CERTIFICATE OF PROPERTY RESTORATION

Date _____

I, _____, easement property owner, agree that the Contractor for this project, _____ _____, has cleaned up and restored to my satisfaction my property at _____ _____ where the property was disturbed during construction.

Signed _____

Witness _____

END OF SECTION

SECTION 00 6519.13

AFFIDAVIT OF PAYMENT

To: _____
(Owner)

WHEREAS, the undersigned has been employed _____ _____ to furnish labor and materials for _____ _____ work, under a contract _____ for the improvement of the property described as _____ in the _____ of _____ , County of _____ _____, State of _____ of which _____ _____ is the Owner.

NOW, THEREFORE, this _____ day of _____, 20 _____. The undersigned, as the Contractor for the above-named Contract pursuant to the Conditions of the Contract hereby certifies that, except as listed below, he has paid in full or has otherwise satisfied all obligations for all materials and equipment furnished, for all work, labor, and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Contract referenced above for which the Owner or his property might in any way be held responsible.

EXCEPTIONS: (If none, write "None." If required by the Owner, the Contractor shall furnish bond satisfactory to the Owner for each exception.)

ATTACHMENTS:

1. Consent of Surety to Final Payment. (Whenever Surety is involved, Consent of Surety is required.)
2. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
3. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers.
4. Contractor's Affidavit of Release of Liens.

_____(SEAL)
CONTRACTOR (Name of sole ownership, corporation or partnership)

_____(SEAL)
(Signature of Authorized Representative)

(Affix corporate seal here)

TITLE:_____

SECTION 00 6519.16

AFFIDAVIT OF RELEASE OF LIENS

To: _____
(Owner)

WHEREAS, the undersigned has been employed by_____to furnish labor and materials for_____

_____work, under a contract _____
for the improvement of the property described as _____

_____ _____in the _____ of _____ County of _____, _____ State of _____ of which _____

_____ is the Owner.

NOW, THEREFORE, this _____day of _____, 20_____.

The undersigned, as the Contractor for the above-named Contract pursuant to the conditions of the Contract hereby certifies that to the best of his knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services, who have or may have liens against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

EXCEPTIONS: (If none, write "None." If required by the Owner, the Contractor shall furnish bond satisfactory to the Owner for each exception.)

ATTACHMENTS:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers.

_____(SEAL)
CONTRACTOR (Name of sole ownership, corporation or partnership)

_____(SEAL)
(Affix corporate seal here) (Signature of Authorized Representative)

TITLE: _____

SECTION 00 6519.19

CONSENT OF SURETY FOR FINAL PAYMENT

Project Name _____

Location _____

Project No. _____ Contract No._____

Type of Contract _____

Amount of Contract _____

In accordance with the provisions of the above-named contract between the Owner and the Contractor, the following named surety:

_____

_____

on the Payment Bond of the following named Contractor:

_____

_____

hereby approves of final payment to the Contractor, and further agrees that said final payment to the Contractor shall not relieve the surety company named herein of any of its obligations to the following named Owner: as set forth in said surety company's bond:

_____

_____

IN WITNESS WHEREOF, the surety company has hereunto set its hand and seal this _____ day of _____, 20_____.

_____
(Name of Surety Company)

_____
(Signature of Authorized Representative)

(Affix corporate seal here)

Title: _____

SECTION 00 6519.27

FINAL WAIVER OF LIEN

To: _____
(Owner)

WHEREAS, the undersigned has been employed by (A) _____

to furnish labor and materials for (B) _____

_____ work,

under a contract (C) _____

for the improvement of the premises described as (D) _____

_____

in the _____ (City-Village) of _____

County of _____, State of _____

of which _____

_____is the Owner.

NOW, THEREFORE, this _____ day of _____ 20____, for and in consideration of the sum of (E) _____

Dollars paid simultaneously herewith, the receipt whereof is hereby acknowledged by the undersigned, the undersigned does hereby waive and release any lien rights to, or claim of lien with respect to and on said above-described premises, and the improvements thereon, and on the monies or other considerations due or to become due from the Owner, or account of labor, services, material, fixtures, apparatus or machinery heretofore or which may hereafter be furnished by the undersigned to or for the above-described premises by virtue of said contract.

(F) _____ (SEAL)
(Name of sole ownership, corporation or partnership)

_____(SEAL)
(Affix corporate seal here) (Signature of Authorized Representative)

TITLE: _____

INSTRUCTIONS FOR FINAL WAIVER

A. Person or firm with whom you agreed to furnish either labor, or services, or materials.
B. Fill in nature and extent of work; strike the word labor or the word materials if not in your contract.
C. If you have more than one contract on the same premises, describe the contract by number if available, date, and extent of work.
D. Furnish an accurate enough description of the improvement and location of the premises so that it can be distinguished from any other property.
E. Amount shown should be the amount actually received and equal to that amount of contract as adjusted.
F. If waiver is for a corporation, corporate name should be used, corporate seal affixed and title of officer signing waiver should be set forth; if waiver is for a partnership, the partnership name should be used, partner should sign and designate himself as partner.

SECTION 00 7200

GENERAL CONDITIONS

1. Definitions
2. Additional Instructions and Detail Drawings
3. Schedules, Reports and Records
4. Drawings and Specifications
5. Shop Drawings
6. Materials, Services and Facilities
7. Inspection and Testing
8. Substitutions and “Or-Equals”
9. Patents
10. Surveys, Permits, Regulations
11. Protection of Work, Property and Persons
12. Supervision by Contractor
13. Changes in the Work
14. Changes in Contract Price
15. Time for Completion and Liquidated Damages
16. Correction of Work
17. Subsurface Conditions
18. Suspension of Work, Termination and Delay
19. Payments to Contractor
20. Acceptance of Final Payment as Release
21. Insurance
22. Contract Security
23. Assignments
24. Indemnification
25. Separate Contracts
26. Subcontracting
27. Engineer's Authority
28. Land and Rights-of-Way
29. Guaranty
30. Disputes
31. Taxes

1. DEFINITIONS

1.1. Wherever used in the **CONTRACT DOCUMENTS**, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural thereof:

1.2. **ADDENDA** - Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the CONTRACT DOCUMENTS, DRAWINGS, AND SPECIFICATIONS by additions, deletions, clarifications or corrections.

1.3. **BID** - The offer or proposal of the BIDDER submitted on the prescribed form setting forth the prices for the Work to be performed.

1.4. **BIDDER** - Any person, firm or corporation submitting a BID for the WORK.

1.5. **BONDS** - Bid, Performance, and Payment Bonds and other instruments of security, furnished by the CONTRACTOR and his surety in accordance with the CONTRACT DOCUMENTS.

1.6. **CHANGE ORDER** - A written order to the CONTRACTOR authorizing an addition, deletion or revision in the WORK within the general scope of the CONTRACT DOCUMENTS, or authorizing an adjustment in the CONTRACT PRICE OR CONTRACT TIME.

1.7. **CONTRACT DOCUMENTS** - The contract, including Advertisement For Bids, Information For Bidders, BID, Bid Bond, Agreement, Payment Bond, Performance Bond, NOTICE OF AWARD, NOTICE TO PROCEED, CHANGE ORDER, DRAWINGS, SPECIFICATIONS, and ADDENDA.

1.8. **CONTRACT PRICE** - The total monies payable to the CONTRACTOR under the terms and conditions of the CONTRACT DOCUMENTS.

1.9. **CONTRACT TIME** - The number of calendar days stated in the CONTRACT DOCUMENTS for the completion of the WORK.

1.10. **CONTRACTOR** - The person, firm, or corporation with whom the OWNER has executed the Agreement.

1.11. **DRAWINGS** - The part of the CONTRACT DOCUMENTS which show the characteristics and scope of the WORK to be performed and which have been prepared or approved by the ENGINEER.

1.12. **ENGINEER** - The person, firm, or corporation named as such in the CONTRACT DOCUMENTS.

1.13. **FIELD ORDER** - A written order effecting a change in the WORK not involving an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME during construction.

1.14. **NOTICE OF AWARD** - The written notice of the acceptance of the BID from the OWNER to the successful BIDDER.

1.15. **NOTICE TO PROCEED** - Written communication issued by the OWNER to the CONTRACTOR authorizing him to proceed with the WORK and establishing the date of commencement of the WORK.

1.16. **OWNER** - A public or quasi-public body or authority, corporation, association, partnership, or individual for whom the WORK is to be performed.

1.17. **PROJECT** - The undertaking to be performed as provided in the CONTRACT DOCUMENTS.

1.18. **RESIDENT PROJECT REPRESENTATIVE** - The authorized representative of the OWNER who is assigned to the PROJECT site or any part thereof.

1.19. **SHOP DRAWINGS** - All drawings, diagrams, illustrations, brochures, schedules, and other data which are prepared by the CONTRACTOR, a SUBCONTRACTOR, manufacturer, SUPPLIER, or distributor, which illustrate how specific portions of the WORK shall be fabricated or installed.

1.20. **SPECIFICATIONS** - A part of the CONTRACT DOCUMENTS consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards, and workmanship.

1.21. **SUBCONTRACTOR** - An individual, firm or corporation having a direct contract with the CONTRACTOR or with any other SUBCONTRACTOR for the performance of a part of the WORK at the site.

1.22. **SUBSTANTIAL COMPLETION** - That date as certified by the ENGINEER when the construction of the PROJECT or a specified part thereof is sufficiently completed, in

accordance with the CONTRACT DOCUMENTS, so that the PROJECT or specified part can be utilized for the purposes for which it is intended.

1.23. **SUPPLEMENTAL GENERAL CONDITIONS** - Modifications to General Conditions required by a Federal agency for participation in the PROJECT and approved by the agency in writing prior to inclusion in the CONTRACT DOCUMENTS, or such requirements that may be imposed by applicable state laws.

1.24. **SUPPLIER** - Any person or organization who supplies materials or equipment for the WORK, including that fabricated to a specific design, but who does not perform labor at the site.

1.25. **WORK** - All labor necessary to produce the construction required by the CONTRACT DOCUMENTS, and all materials and equipment incorporated or to be incorporated in the PROJECT.

1.26. **WRITTEN NOTICE** - Any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address or delivered in person to said party or his authorized representative on the WORK.

2. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

2.1. The CONTRACTOR may be furnished additional instructions and detail drawings, by the ENGINEER, as necessary to carry out the WORK required by the CONTRACT DOCUMENTS.

2.2. The additional drawings and instruction thus supplied will become a part of the CONTRACT DOCUMENTS. The CONTRACTOR shall carry out the WORK in accordance with the additional detail drawings and instructions.

3. SCHEDULES, REPORTS, AND RECORDS

3.1. The CONTRACTOR shall submit to the OWNER such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data where applicable as are required by the CONTRACT DOCUMENTS for the WORK to be performed.

3.2. Prior to the first partial payment estimate the CONTRACTOR shall submit construction progress schedules showing the order in which he proposes to carry on the WORK, including dates at which he will start the various parts of the WORK, estimated date of completion of each part and, as applicable:

3.2.1. The dates at which special detail drawings will be required; and

3.3. Respective dates for submission of SHOP DRAWINGS, the beginning of manufacture, the testing and the installation of materials, supplies and equipment.

4. DRAWINGS AND SPECIFICATIONS

4.1. The intent of the DRAWINGS and SPECIFICATIONS is that the CONTRACTOR shall furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the WORK in accordance with the CONTRACT DOCUMENTS and all incidental work necessary to complete the PROJECT in an acceptable manner, ready for use, occupancy or operation by the OWNER.

4.2. In case of conflict between the DRAWINGS and SPECIFICATIONS, the SPECIFICATIONS shall govern. Figure dimensions on DRAWINGS shall govern over scale dimensions, and detailed DRAWINGS shall govern over general DRAWINGS.

4.3. Any discrepancies found between the DRAWINGS and SPECIFICATIONS and site conditions or any inconsistencies or ambiguities in the DRAWINGS or SPECIFICATIONS shall be immediately reported to the ENGINEER, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. WORK done by the CONTRACTOR after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the CONTRACTOR'S risk.

5. SHOP DRAWINGS

5.1. The CONTRACTOR shall provide SHOP DRAWINGS as may be necessary for the prosecution of the WORK as required by the CONTRACT DOCUMENTS. The ENGINEER shall promptly review all SHOP DRAWINGS. The ENGINEER'S approval of any SHOP DRAWING shall not release the CONTRACTOR from responsibility for deviations from the CONTRACT DOCUMENTS. The approval of any SHOP DRAWING which substantially deviates from the requirement of the CONTRACT DOCUMENTS shall be evidenced by a CHANGE ORDER.

5.2. When submitted for the ENGINEER'S review, SHOP DRAWINGS shall bear the CONTRACTOR'S certification that he has reviewed, checked, and approved the SHOP DRAWINGS and that they are in conformance with the requirements of the CONTRACT DOCUMENTS.

5.3. Portions of the WORK requiring a SHOP DRAWING or sample submission shall not begin until the SHOP DRAWING or submission has been approved by the ENGINEER. A copy of each approved SHOP DRAWING and each approved sample shall be kept in good order by the CONTRACTOR at the site and shall be available to the ENGINEER.

6. MATERIALS, SERVICES AND FACILITIES

6.1. It is understood that, except as otherwise specifically stated in the CONTRACT DOCUMENTS, the CONTRACTOR shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the WORK within the specified time.

6.2. Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the WORK. Stored materials and equipment to be incorporated in the WORK shall be located so as to facilitate prompt inspection.

6.3. Manufactured supplies, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the manufacturer.

6.4. Material, supplies, and equipment shall be in accordance with samples submitted by the CONTRACTOR and approved by the ENGINEER.

6.5. Materials, supplies, or equipment to be incorporated into the WORK shall not be purchased by the CONTRACTOR or the SUBCONTRACTOR subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the seller.

7. INSPECTION AND TESTING

7.1. All materials and equipment used in the construction of the PROJECT shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the CONTRACT DOCUMENTS.

7.2. All materials and equipment used in the construction of the PROJECT shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the CONTRACT DOCUMENTS.

7.3. The CONTRACTOR shall provide at his expense the testing and inspection services required by the CONTRACT DOCUMENTS.

7.4. If the CONTRACT DOCUMENTS, laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction require any WORK to specifically be inspected, tested, or approved by someone other than the CONTRACTOR, the CONTRACTOR will give the ENGINEER timely notice of readiness. The CONTRACTOR will then furnish the ENGINEER the required certificates of inspection, testing, or approval.

7.5. Inspections, tests, or approvals by the ENGINEER or others shall not relieve the CONTRACTOR from his obligations to perform the WORK in accordance with the requirements of the CONTRACT DOCUMENTS.

7.6. The ENGINEER and his representatives will at all times have access to the WORK. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records. The CONTRACTOR will provide proper facilities for such access and observation of the WORK and also for any inspection or testing thereof.

7.7. If any WORK is covered contrary to the written instructions of the ENGINEER it must, if requested by the ENGINEER, be uncovered for his observation and replaced at the CONTRACTOR'S expense.

7.8. If the ENGINEER considers it necessary or advisable that covered WORK be inspected or tested by others, the CONTRACTOR, at the ENGINEER'S request will uncover, expose, or otherwise make available for observation, inspection or testing as the ENGINEER may require, that portion of the WORK in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such WORK is defective, the CONTRACTOR will bear all the expenses of such uncovering, exposure, observation, inspection, and testing and of satisfactory reconstruction. If, however, such WORK is not found to be defective, the CONTRACTOR will be allowed an increase in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction, and an appropriate CHANGE ORDER shall be issued.

8. SUBSTITUTIONS AND "OR-EQUALS"

8.1. Whenever a material, article, or piece of equipment is identified on the DRAWINGS or SPECIFICATIONS by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality, and function may be considered. The CONTRACTOR may recommend the use of an "or-equal" manufacturer or supplier or substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the CONTRACT DOCUMENTS by reference to brand name or catalogue number, and if, in the sole opinion of the ENGINEER, such material, article, or piece of equipment is of equal substance and function to that specified, the ENGINEER may approve its substitution and use by the CONTRACTOR. Factors to be considered, but not limited to, include materials of construction, quality, durability, appearance, strength, design characteristics, reliability, performance, experience, economy of operation, and availability of responsive service.

8.2. Any cost differential shall be deductible from the CONTRACT PRICE and the CONTRACT DOCUMENTS for substitute and "or-equal" items and shall be appropriately modified by a CHANGE ORDER. The CONTRACTOR warrants that if substitutes or "or-equals" are approved, no major changes in the function or general design of the PROJECT will result. Incidental changes or extra component parts required to accommodate the substitute, or "or-equal" item will be made by the CONTRACTOR without a change in the CONTRACT PRICE or CONTRACT TIME. The CONTRACTOR shall be solely responsible for any changes to the design required to accommodate the use of substitute items, including reimbursement of the OWNER for ENGINEERS documented costs. Reimbursement of ENGINEERS cost to evaluate substitute items shall not depend on the final acceptability of substitute items. OWNER may require CONTRACTOR to furnish at CONTRACTORS expense a special performance guarantee or other surety with respect to any substitute. The CONTRACTOR shall provide all data in support of any proposed substitute or "or-equal" item at CONTRACTORS expense.

8.3. The ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to this paragraph. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute or "or-equal" item. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute shall be ordered, installed, or utilized until ENGINEERS review is complete, which

will be evidenced by a CHANGE ORDER in the case of a substitute or an approved Shop Drawing for an “or-equal”. ENGINEER will advise CONTRACTOR in writing of any negative determination.

9. PATENTS

9.1. The CONTRACTOR shall pay all applicable royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and save the OWNER harmless from loss on account thereof. Except that the OWNER shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified, however, if the CONTRACTOR has reason to believe that the design process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the ENGINEER.

10. SURVEYS, PERMITS, REGULATIONS

10.1. The OWNER shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the WORK together with a suitable number of benchmarks adjacent to the WORK as shown in the CONTRACT DOCUMENTS. From the information provided by the OWNER, unless otherwise specified in the CONTRACT DOCUMENTS, the CONTRACTOR shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pile locations and other working points, lines, elevations, and cut sheets.

10.2. The CONTRACTOR shall carefully preserve benchmarks, reference points and stakes and, in case of willful or careless destruction, he shall be charged with the resulting expense and shall be responsible for any mistakes that may be caused by their unnecessary loss or disturbance.

10.3. Permits and licenses of a temporary nature necessary for the prosecution of the WORK shall be secured and paid for by the CONTRACTOR unless otherwise stated in the SUPPLEMENTAL GENERAL CONDITIONS. Permits, licenses, and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the OWNER, unless otherwise specified. The CONTRACTOR shall give all notices and comply with all laws, ordinances, rules, and regulations bearing on the conduct of the WORK as drawn and specified. If the CONTRACTOR observes that the CONTRACT DOCUMENTS are at variance therewith, he shall promptly notify the ENGINEER in writing and any necessary changes shall be adjusted as provided in Section 13. CHANGES IN THE WORK.

11. PROTECTION OF WORK, PROPERTY, AND PERSONS

11.1. The CONTRACTOR will be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the WORK. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the WORK and other persons who may be affected thereby, all the WORK and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways,

structures, and utilities not designated for removal, relocation or replacement in the course of construction.

11.2. The CONTRACTOR will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. He will erect and maintain, as required by the conditions and progress of the WORK, all necessary safeguards for safety and protection. He will notify owners of adjacent utilities when prosecution of the WORK may affect them. The CONTRACTOR will remedy all damage, injury, or loss to any property caused, directly or indirectly, in whole or in part, by the CONTRACTOR, any SUBCONTRACTOR or anyone directly or indirectly employed by any of them or anyone for whose acts any of them be liable, except damage or loss attributable to the fault of the CONTRACT DOCUMENTS or to the acts or omissions of the OWNER or the ENGINEER or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the CONTRACTOR.

11.3. In emergencies affecting the safety of persons or the WORK or property at the site or adjacent thereto, the CONTRACTOR, without special instruction or authorization from the ENGINEER or OWNER, shall act to prevent threatened damage, injury, or loss. He will give the ENGINEER prompt WRITTEN NOTICE of any significant changes in the WORK or deviations from the CONTRACT DOCUMENTS caused thereby, and a CHANGE ORDER shall be issued covering the changes and deviations involved.

12. SUPERVISION BY CONTRACTOR

12.1. The CONTRACTOR will supervise and direct the WORK. He will be solely responsible for the means, methods, techniques, sequences and procedures of construction. The CONTRACTOR will employ and maintain on the WORK a qualified supervisor or superintendent who shall have been designated in writing by the CONTRACTOR as the CONTRACTOR'S representative at the site. The supervisor shall have full authority to act on behalf of the CONTRACTOR and all communications given to the supervisor shall be as binding as if given to the CONTRACTOR. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the WORK.

13. CHANGES IN THE WORK

13.1. The OWNER may at any time, as the need arises, order changes within the scope of the WORK without invalidating the Agreement. If such changes increase or decrease the amount due under the CONTRACT DOCUMENTS, or in the time required for performance of the WORK, an equitable adjustment shall be authorized by CHANGE ORDER.

13.2. The ENGINEER, also, may at any time, by issuing a FIELD ORDER, make changes in the details of the WORK. The CONTRACTOR shall proceed with the performance of any changes in the WORK so ordered by the ENGINEER unless the CONTRACTOR believes that such FIELD ORDER entitles him to a change in CONTRACT PRICE or TIME, or both, in which event he shall give the ENGINEER WRITTEN NOTICE thereof within seven (7) days after the receipt of the ordered

change. Thereafter the CONTRACTOR shall document the basis for the change in CONTRACT PRICE or TIME within thirty (30) days. The CONTRACTOR shall not execute such changes pending the receipt of an executed CHANGE ORDER or further instruction from the OWNER.

14. CHANGES IN CONTRACT PRICE

14.1. The CONTRACT PRICE may be changed only by a CHANGE ORDER. The value of any WORK covered by a CHANGE ORDER or of any claim for increase or decrease in the CONTRACT PRICE shall be determined by one or more of the following methods in the order of precedence listed below:

(a) Unit prices previously approved.

(b) An agreed lump sum.

(c) The actual cost for labor, direct over-head, materials, supplies, equipment, and other services necessary to complete the work. In addition there shall be added an amount to be agreed upon but not to exceed fifteen (15) percent of the actual cost of the WORK to cover the cost of general overhead and profit. In no case shall the value of materials, supplies, equipment, and other services exceed actual cost or as identified in RS Means or equivalent, latest edition.

15. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

15.1. The date of beginning and the time for completion of the WORK are essential conditions of the CONTRACT DOCUMENTS and the WORK embraced shall be commenced on a date specified in the NOTICE TO PROCEED.

15.2. The CONTRACTOR will proceed with the WORK at such rate of progress to insure full completion within the CONTRACT TIME. It is expressly understood and agreed, by and between the CONTRACTOR and the OWNER, that the CONTRACT TIME for the completion of the WORK described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the WORK.

15.3. If the CONTRACTOR shall fail to complete the WORK within the CONTRACT TIME, or extension of time granted by the OWNER, then the CONTRACTOR will pay to the OWNER the amount for liquidated damages as specified in the BID for each calendar day that the CONTRACTOR shall be in default after the time stipulated in the CONTRACT DOCUMENTS.

15.4. The CONTRACTOR shall not be charged with liquidated damages or any excess cost when the delay in completion of the WORK is due to the following, and the CONTRACTOR has promptly given WRITTEN NOTICE of such delay to the OWNER or ENGINEER.

15.4.1. To any preference, priority, or allocation order duly issued by the OWNER.

15.4.2. To unforeseeable causes beyond the control and without the fault or negligence of the CONTRACTOR, including but not restricted to, acts of God or of the public enemy, acts of the OWNER, acts of another CONTRACTOR in the performance of a CONTRACT with the OWNER, fires, floods, epidemics, quarantine, restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and

15.4.3. To any delays of SUBCONTRACTORS occasioned by any of the causes specified in paragraphs 15.4.1 and 15.4.2 of this article.

16. CORRECTION OF WORK

16.1. The CONTRACTOR shall promptly remove from the premises all WORK rejected by the ENGINEER for failure to comply with the CONTRACT DOCUMENTS, whether incorporated in the construction or not and the CONTRACTOR shall promptly replace and re-execute the WORK in accordance with the CONTRACT DOCUMENTS and without expense to the OWNER and shall bear the expense of making good all WORK of other CONTRACTORS destroyed or damaged by such removal or replacement.

16.2. All removal and replacement WORK shall be done at the CONTRACTOR'S expense. If the CONTRACTOR does not take action to remove such rejected WORK within ten (10) days after receipt of WRITTEN NOTICE, the OWNER may remove such WORK and store the materials at the expense of the CONTRACTOR.

17. SUBSURFACE CONDITIONS

17.1. The CONTRACTOR shall promptly, and before such conditions are disturbed, except in the event of an emergency, notify the OWNER by WRITTEN NOTICE of:

17.1.1. Subsurface or latent physical conditions at the site differing materially from those indicated in the CONTRACT DOCUMENTS; or

17.1.2. Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in WORK of the character provided for in the CONTRACT DOCUMENTS.

17.2. The OWNER shall promptly investigate the conditions, and if he finds that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the WORK, an equitable adjustment shall be made and the CONTRACT DOCUMENTS shall be modified by a CHANGE ORDER. Any claim of the CONTRACTOR for adjustment hereunder shall not be allowed unless he has given the required WRITTEN NOTICE, provided that the OWNER may, if he determines the facts so justify, consider and adjust any such claims asserted before the date of final payment.

18. SUSPENSION OF WORK, TERMINATION AND DELAY

18.1. The OWNER may suspend the WORK or any portion thereof for a period of not more than ninety days or such further time as agreed upon by the CONTRACTOR,

by WRITTEN NOTICE to the CONTRACTOR and the ENGINEER which notice shall fix the date on which WORK shall be resumed. The CONTRACTOR will resume that WORK on the date so fixed. The CONTRACTOR will be allowed an increase in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, directly attributable to any suspension.

18.2. If the CONTRACTOR is adjudged a bankrupt or insolvent, or if he makes a general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for the CONTRACTOR or for any of his property, or if he files a petition to take advantage of any debtor's act, or to reorganized under the bankruptcy or applicable laws, or if he repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or if he repeatedly fails to make prompt payments to SUBCONTRACTORS or for labor, materials, or equipment or if he disregards laws, ordinances, rules, regulations, or orders of any public body having jurisdiction of the WORK or if he disregards the authority of the ENGINEER, or if he otherwise violates any provision of the CONTRACT DOCUMENTS, then the OWNER may, without prejudice to any other right or remedy and after giving the CONTRACTOR and his surety a minimum of ten (10) days from delivery of a WRITTEN NOTICE, terminate the services of the CONTRACTOR and take possession of the PROJECT and of all materials, equipment, tools, construction equipment, and machinery thereon owned by the CONTRACTOR, and finish the WORK by whatever method he may deem expedient. In such case the CONTRACTOR shall not be entitled to receive any further payment until the WORK is finished. If the unpaid balance of the CONTRACT PRICE exceeds the direct and indirect costs of completing the PROJECT, including compensation for additional professional services, such excess SHALL BE PAID TO THE CONTRACTOR. If such costs exceed such unpaid balance, the CONTRACTOR will pay the difference to the OWNER. Such costs incurred by the OWNER will be determined by the ENGINEER and incorporated in a CHANGE ORDER.

18.3. Where the CONTRACTOR'S services have been so terminated by the OWNER, said termination shall not affect any right of the OWNER against the CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of monies by the OWNER due the CONTRACTOR will not release the CONTRACTOR from compliance with the CONTRACT DOCUMENTS.

18.4. After ten (10) days from delivery of a WRITTEN NOTICE to the CONTRACTOR and the ENGINEER, the OWNER may without cause and without prejudice to any other right or remedy, elect to abandon the PROJECT and terminate the Contract. In such case, the CONTRACTOR shall be paid for all WORK executed and any expense sustained plus reasonable profit.

18.5. If, through no act or fault of the CONTRACTOR, the WORK is suspended for a period of more than ninety (90) days by the OWNER or under an order of court or other public authority, or the ENGINEER fails to act on any request for payment within thirty (30) days after it is submitted, or the OWNER fails to pay the CONTRACTOR substantially the sum approved by the ENGINEER or awarded by arbitrators within thirty (30) days of its approval and presentation, then the CONTRACTOR may, after ten (10) days from delivery of a WRITTEN NOTICE to the OWNER and the ENGINEER, terminate the CONTRACT and recover from the OWNER payment for all WORK executed and all expenses sustained. In addition,

and in lieu of terminating the CONTRACT, if the ENGINEER has failed to act on a request for payment or if the OWNER has failed to make any payment as aforesaid, the CONTRACTOR may upon then (10) days WRITTEN NOTICE to the OWNER and the ENGINEER stop the WORK until he has been paid all amounts then due, in which event and upon resumption of the WORK, CHANGE ORDERS shall be issued for adjusting the CONTRACT PRICE or extending the CONTRACT TIME or both to compensate for the costs and delays attributable to the stoppage of the WORK.

18.6. If the performance of all or any portion of the WORK is suspended, delayed, or interrupted as a result of a failure of the OWNER or ENGINEER to act within the time specified in the CONTRACT DOCUMENTS, or if no time is specified, within a reasonable time, an adjustment in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, shall be made by CHANGE ORDER to compensate the CONTRACTOR for the costs and delays necessarily caused by the failure of the OWNER or ENGINEER.

19. PAYMENTS TO CONTRACTOR

19.1. At least ten (10) days before each progress payment falls due (but not more often than once a month), the CONTRACTOR will submit to the ENGINEER a partial payment estimate filled out and signed by the CONTRACTOR covering the WORK performed during the period covered by the partial payment estimate and supported by such data as the ENGINEER may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the WORK but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the OWNER, as will establish the OWNER'S title to the material and equipment and protect his interest therein, including applicable insurance. The ENGINEER will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present the partial payment estimate to the OWNER, or return the partial payment estimate to the CONTRACTOR indicating in writing his reasons for refusing to approve payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the partial payment estimate. The OWNER will, within ten (10) days of presentation to him of an approved partial payment estimate, pay the CONTRACTOR a progress payment on the basis of the approved partial payment estimate. The OWNER shall retain an amount not exceeding ten (10) percent of each payment limited to five (5) percent of the total contract amount until final completion and acceptance of all work covered by the CONTRACT DOCUMENTS. On completion and acceptance of a part of the WORK on which the price is stated separately in the CONTRACT DOCUMENTS, payment may be made in full, including retained percentages, less authorized deductions.

19.2. The request for payment may also include an allowance for the cost of such major materials and equipment which are suitably stored either at or near the site.

19.3. Prior to SUBSTANTIAL COMPLETION, the OWNER, with the approval of the ENGINEER and with the concurrence of the CONTRACTOR, may use any completed or substantially completed portions of the WORK. Such use shall not constitute an acceptance of such portions of the WORK.

19.4. The OWNER shall have the right to enter the premises for the purpose of doing work not covered by the CONTRACT DOCUMENTS. This provision shall not be construed as relieving the CONTRACTOR of the sole responsibility for the care and protection of the WORK, or the restoration of any damaged WORK except such as may be caused by agents or employees of the OWNER.

19.5. Upon completion and acceptance of the WORK, the ENGINEER shall issue a certificate attached to the final payment request that the WORK has been accepted by him under the conditions of the CONTRACT DOCUMENTS. The entire balance found to be due the CONTRACTOR, including the retained percentages, but except such sums as may be lawfully retained by the OWNER, shall be paid to the CONTRACTOR within thirty (30) days of completion and acceptance of the WORK.

19.6. The CONTRACTOR will indemnify and save the OWNER or the OWNER'S agents harmless from all claims growing out of the lawful demands of SUBCONTRACTORS, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the WORK. The CONTRACTOR shall, at the OWNER'S request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the CONTRACTOR fails to do so the OWNER may, after having notified the CONTRACTOR, either pay unpaid bills or withhold from the CONTRACTOR'S unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged where upon payment to the CONTRACTOR shall be resumed, in accordance with the terms of the CONTRACT DOCUMENTS, but in no event shall the provisions of this sentence be construed to impose any obligations upon the OWNER to either the CONTRACTOR, his Surety, or any third party. In paying any unpaid bills of the CONTRACTOR, any payment so made by the OWNER shall be considered as a payment made under the CONTRACT DOCUMENTS by the OWNER to the CONTRACTOR and the OWNER shall not be liable to the CONTRACTOR for any such payments made in good faith.

19.7. If the OWNER fails to make payment thirty (30) days after approval by the ENGINEER, in addition to other remedies available to the CONTRACTOR, there shall be added to each such payment interest at the maximum legal rate commencing on the first day after said payment is due and continuing until the payment is received by the CONTRACTOR.

20. ACCEPTANCE OF FINAL PAYMENT AS RELEASE

20.1. The acceptance by the CONTRACTOR of final payment shall be and shall operate as a release to the OWNER of all claims and all liability to the CONTRACTOR other than claims in stated amounts as may be specifically excepted by the CONTRACTOR for all things done or furnished in connection with this WORK and for every act and neglect of the OWNER and others relating to or arising out of this WORK. Any payment, however, final or otherwise, shall not release the CONTRACTOR or his sureties from any obligations under the CONTRACT DOCUMENTS or the Performance BOND and Payment BONDS.

21. INSURANCE

21.1. The CONTRACTOR shall purchase and maintain such insurance as will protect him from claims set forth below which may arise out of or result from the CONTRACTOR'S execution of the WORK, whether such execution be by himself or by any SUBCONTRACTOR or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

21.1.1. Claims under workmen's compensation, disability benefit, and other similar employee benefit acts:

21.1.2. Claims for damages because of bodily injury, occupational sickness or disease, or death of his employees:

21.1.3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees:

21.1.4. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the CONTRACTOR, or (2) by any other person; and

21.1.5. Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

21.2. Certificates of Insurance acceptable to the OWNER shall be filed with the OWNER prior to commencement of the WORK. These Certificates shall contain a provision that coverages afforded under the policies will not be canceled unless at least fifteen (15) days prior WRITTEN NOTICE has been given to the OWNER.

21.3. The CONTRACTOR shall procure and maintain, at his own expense, during the CONTRACT TIME, liability insurance as hereinafter specified:

21.3.1. CONTRACTOR'S General Public Liability and Property Damage Insurance including vehicle coverage issued to the CONTRACTOR and protecting him from all claims for personal injury, including death, and all claims for destruction of or damage to property, arising out of or in connection with any operations under the CONTRACT DOCUMENTS, whether such operations be by himself or by any SUBCONTRACTOR under him, or anyone directly or indirectly employed by the CONTRACTOR or by a SUBCONTRACTOR under him. Insurance shall be written with a limit of liability of not less than $1,000,000 for all damages arising out of bodily injury, including death, at any time resulting therefrom, sustained by any one person in any one accident: and a limit of liability of not less than $1,000,000 aggregate for any such damages sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than $500,000 for all property damage sustained by any one person in any one accident; and a limit of liability of not less than $500,000 aggregate for any such damage sustained by two or more persons in any one accident.

21.3.2. The CONTRACTOR shall acquire and maintain, if applicable, Fire and Extended Coverage insurance upon the PROJECT to the full insurable value thereof for the benefit of the OWNER, the CONTRACTOR, and SUBCONTRACTORS as their interest may appear. This provision shall in no way release the CONTRACTOR or CONTRACTOR'S surety from obligations under the CONTRACT DOCUMENTS to fully complete the PROJECT.

21.4. The CONTRACTOR shall procure and maintain, at his own expense, during the CONTRACT TIME, in accordance with the provisions of the laws of the state in which the work is performed. Workmen's Compensation Insurance, including occupational disease provisions, for all of his employees at the site of the PROJECT and in case any work is sublet, the CONTRACTOR shall require such SUBCONTRACTOR similarly to provide Workmen's Compensation Insurance, including occupational disease provisions for all of the latter's employees unless such employees are covered by the protection afforded by the CONTRACTOR. In case any class of employees engaged in hazardous work under this contract at the site of the PROJECT is not protected under Workmen's Compensation statue, the CONTRACTOR shall provide, and shall cause each SUBCONTRACTOR to provide, adequate and suitable insurance for the protection of his employees not otherwise protected.

21.5. The CONTRACTOR shall secure, if applicable, "All Risk" type Builder's Risk Insurance for WORK to be performed. Unless specifically authorized by the OWNER, the amount of such insurance shall not be less than the CONTRACT PRICE totaled in the BID. The policy shall cover not less than the losses due to fire, explosion, hail, lightning, vandalism, malicious mischief, wind, collapse, riot, aircraft, and smoke during the CONTRACT TIME, and until the WORK is accepted by the OWNER. The policy shall name as the insured the CONTRACTOR, the ENGINEER, and the OWNER.

22. CONTRACT SECURITY

22.1. The CONTRACTOR shall within ten (10) days after the receipt of the NOTICE OF AWARD furnish the OWNER with a Performance Bond and a Payment Bond in penal sums equal to the amount of the CONTRACT PRICE, conditioned upon the performance by the CONTRACTOR of all undertakings, covenants, terms, conditions, and agreements of the CONTRACT DOCUMENTS, and upon the prompt payment by the CONTRACTOR to all persons supplying labor and materials in the prosecution of the WORK provided by the CONTRACT DOCUMENTS. Such BONDS shall be executed by the CONTRACTOR and a corporate bonding company licensed to transact such business in the state in which the WORK is to be performed and named on the current "Department of the Treasury's Listing of Approved Sureties (Department Circular 570)." The expense of these BONDS shall be borne by the CONTRACTOR. If at any time a surety on any such BOND is declared a bankrupt or loses its right to do business in the state in which the WORK is to be performed or is removed from the listing of approved sureties, CONTRACTOR shall within ten (10) days after notice from the OWNER to do so, substitute an acceptable BOND (or BONDS) in such form and sum and signed by such other surety or sureties as may be satisfactory to the OWNER. The premiums on such BOND shall be paid by the CONTRACTOR. No further

payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable BOND to the OWNER.

23. ASSIGNMENTS

23.1. Neither the CONTRACTOR nor the OWNER shall sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or of his right, title, or interest therein, or his obligations thereunder, without written consent of the other party.

24. INDEMNIFICATION

24.1. The CONTRACTOR will indemnify and hold harmless the OWNER and the ENGINEER and their agents and employees from and against all claims, damages, losses, and expenses including attorney's fees arising out of or resulting from the performance of the WORK, provided that any such claims, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom: and is caused in whole or in part by any negligent or willful act or omission of the CONTRACTOR, and SUBCONTRACTOR, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

24.2. In any and all claims against the OWNER or the ENGINEER, or any of their agents or employees, by any employee of the CONTRACTOR, any SUBCONTRACTOR, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way be any limitation on the amount or type of damages, compensation, or benefits payable by or for the CONTRACTOR or any SUBCONTRACTOR under workmen's compensation acts, disability benefit acts or other employee benefits acts.

24.3. The obligation of the CONTRACTOR under this paragraph shall not extend to the liability of the ENGINEER, his agents or employees arising out of the preparation or approval of maps, DRAWINGS, opinions, reports, surveys, CHANGE ORDERS, designs, or SPECIFICATIONS.

25. SEPARATE CONTRACTS

25.1. The OWNER reserves the right to let other contracts in connection with this PROJECT. The CONTRACTOR shall afford other CONTRACTORS reasonable opportunity for the introduction and storage of their materials and the execution of their WORK and shall properly connect and coordinate his WORK with theirs. If the proper execution or results of any part of the CONTRACTOR'S WORK depends upon the WORK of any other CONTRACTOR, the CONTRACTOR shall inspect and promptly report to the ENGINEER any defects in such WORK that render it unsuitable for such proper execution and results.

25.2. The OWNER may perform additional WORK related to the PROJECT by himself, or he may let other contracts containing provisions similar to these. The CONTRACTOR will afford the other CONTRACTORS who are parties to such Contracts (or the OWNER, if he is performing the additional WORK himself), reasonable opportunity for the introduction and storage of materials and equipment

and the execution of WORK, and shall properly connect and coordinate his WORK with theirs.

25.3. If the performance of additional WORK by other CONTRACTORS or the OWNER is not noted in the CONTRACT DOCUMENTS prior to the execution of the CONTRACT, written notice thereof shall be given to the CONTRACTOR prior to starting any such additional WORK. If the CONTRACTOR believes that the performance of such additional WORK by the OWNER or others involves him in additional expense or entitles him to an extension of the CONTRACT TIME, he may make a claim therefor as provided in Sections 14 and 15.

26. SUBCONTRACTING

26.1. The CONTRACTOR may utilize the services of specialty SUBCONTRACTORS on those parts of the WORK which, under normal contracting practices, are performed by specialty SUBCONTRACTORS.

26.2. The CONTRACTOR shall not award WORK to SUBCONTRACTOR(S), in excess of fifty (50%) percent of the CONTRACT PRICE, without prior written approval of the OWNER.

26.3. The CONTRACTOR shall be fully responsible to the OWNER for the acts and omissions of his SUBCONTRACTORS, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

26.4. The CONTRACTOR shall cause appropriate provisions to be inserted in all subcontracts relative to the WORK to bind SUBCONTRACTORS to the CONTRACTOR by the terms of the CONTRACT DOCUMENTS in so far as applicable to the WORK of SUBCONTRACTORS and to give the CONTRACTOR the same power as regards terminating any subcontract that the OWNER may exercise over the CONTRACTOR under any provision of the CONTRACT DOCUMENTS.

26.5. Nothing contained in this CONTRACT shall create any contractual relation between any SUBCONTRACTOR and the OWNER.

27. ENGINEER'S AUTHORITY

27.1. The ENGINEER shall act as the OWNER'S representative during the construction period. He shall decide questions which may arise as to quality and acceptability of materials furnished and WORK performed. He shall interpret the intent of the CONTRACT DOCUMENTS in a fair and unbiased manner. The ENGINEER will make visits to the site and determine if the WORK is proceeding in accordance with the CONTRACT DOCUMENTS.

27.2. The CONTRACTOR will be held strictly to the intent of the CONTRACT DOCUMENTS in regard to the quality of materials, workmanship, and execution of the WORK. Inspections may be made at the factory or fabrication plant of the source of material or equipment supply.

27.3. The ENGINEER will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

27.4. The ENGINEER shall promptly make decisions relative to interpretation of the CONTRACT DOCUMENTS.

28. LAND AND RIGHTS-OF-WAY

28.1. Prior to issuance of NOTICE TO PROCEED, the OWNER shall obtain all land and rights-of-way necessary for carrying out and for the completion of the WORK to be performed pursuant to the CONTRACT DOCUMENTS, unless otherwise mutually agreed.

28.2. The OWNER shall provide to the CONTRACTOR information which delineates and describes the lands owned and rights-of-way acquired.

28.3. The CONTRACTOR shall provide at his own expense and without liability to the OWNER any additional land and access thereto that the CONTRACTOR may desire for temporary construction facilities, or for storage of materials.

29. GUARANTY

29.1. The CONTRACTOR shall guarantee all materials and equipment furnished and WORK performed for a period of one (1) year from the date of SUBSTANTIAL COMPLETION. The CONTRACTOR warrants and guarantees for a period of one (1) year from the date of SUBSTANTIAL COMPLETION of the system that the completed system is free from all defects due to faulty materials or workmanship and the CONTRACTOR shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The OWNER will give notice of observed defects with reasonable promptness. In the event that the CONTRACTOR should fail to make such repairs, adjustments, or other WORK that may be made necessary by such defects, the OWNER may do so and charge the CONTRACTOR the cost thereby incurred. The Performance BOND shall remain in full force and effect through the guarantee period.

30. DISPUTES

30.1. If the parties are unable to resolve a dispute, claim, or controversy relating to this Contract by direct discussions or by voluntary nonbinding mediation, the OWNER and the CONTRACTOR may pursue their respective remedies at law or equity.

31. TAXES

31.1. The CONTRACTOR will pay all sales, consumer, use and other similar taxes required by the law of the place where the WORK is performed.

END OF SECTION

SECTION 00 7300

SUPPLEMENTAL GENERAL CONDITIONS

1. DEFINITIONS

1.1. The following shall be added to the definitions listed in the General Conditions:

(a) APPROVED - shall mean as approved, directed, required or permitted by the Engineer, unless specified otherwise.

(b) CITY, COUNTY, OR AUTHORITY – Hallsdale Powell Utility District.

(c) CONTRACT DOCUMENTS - The Contract Documents shall also include Certificate of Owner's Attorney, General Conditions, Supplemental General Conditions, funding agency requirements, EEO and MBE/WBE requirements, wage rate decisions, and all other certificates, regulations and documents herein bound.

(d) ENGINEER -FOXPE LLC, or its lawfully designated successor.

(e) OWNER – Hallsdale Powell Utility District.

(f) OWNER'S ATTORNEY – Mr. John Valliant.

(g) SUBSTANTIAL COMPLETION - The determination as to whether the project is sufficiently complete so it can be utilized for its intended purposes will be based upon a consideration of completion items and submittals specified in the Specifications.

(h) SUPPLEMENTAL GENERAL CONDITIONS - Also such modifications to the General Conditions as the Owner or Engineer may deem necessary.

(i) The SITE is the location of the proposed WORK as shown on the Drawings.

2. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

2.1. (RESERVED)

3. SCHEDULES, REPORTS, AND RECORDS

3.1. Each such schedule is to be subject to change from time to time in accordance with the progress of the work.

3.2. The Contractor shall also furnish on forms to be supplied by the Owner and/or his Engineer:

(a) a detailed estimate giving a complete breakdown of a lump sum contract price and

(b) periodic itemized estimates of work done for the purpose of making partial payments thereon.

The costs employed in making up any of these schedules will be used only for determining the basis of partial payments and will not be considered as fixing a basis for additions to or deductions from the Contract Price.

4. DRAWINGS AND SPECIFICATIONS

4.1. The Drawings, Specifications and Addenda shall form part of this Contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The table of contents, titles, headings, running headlines and marginal notes contained in the Contract Documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit, or cast light on the interpretation of the provisions to which they refer.

4.2. Upon award of the Contract, the Contractor upon request will be supplied free of charge up to six complete sets of the Drawings and Specifications. If the Contractor requests additional prints or specifications, they will be furnished to him at cost at the Contractor's expense.

4.3. The Contractor shall keep on the job a copy of the Drawings and Specifications and shall at all times give the Owner and Engineer access thereto. Anything mentioned in the Specifications and not shown on the Drawings or shown on the Drawings and not mentioned in the Specifications shall be of like effect as if shown or mentioned in both.

4.4. The Contractor shall not take advantage of any errors or omission which may exist in the Drawings and Specifications but shall immediately call them to the attention of the Engineer whose prompt interpretation or correction thereof shall be conclusive.

5. SHOP DRAWINGS

5.1. After checking and verifying all field measurements, the Contractor shall submit to the Engineer for review one electronic PDF set of all Shop Drawings, which shall have been checked by and stamped with the approval of Contractor and identified as the Engineer may require. The data shown on the Shop Drawings will be complete with respect to dimensions, design criteria, materials of construction and the like to enable the Engineer to review the information as required.

5.2. The Contractor shall also submit for the Engineer's review with such promptness as to cause no delay in work, all samples required by the Contract Documents. All samples will have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.

5.3. At the time of each submission, the Contractor shall in writing call the Engineer's attention to any deviations that the Shop Drawing or sample may have from the requirements of the Contract Documents.

5.4. The Engineer will review with reasonable promptness those Shop Drawings and samples submitted in accordance with the Contractor's approved Submittal Schedule, but his review shall be only for general conformance with the information given in the Contract Documents. The Contractor shall make any corrections required by the Engineer and shall return the required number of corrected copies of Shop Drawings and resubmit new samples. The Contractor shall direct specific attention in writing or on resubmitted Shop Drawings to revisions other than the corrections called for by the Engineer on previous submissions. Contractor's stamp of approval on any Shop Drawing or sample shall constitute a representation to the Owner and the Engineer that the Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, or he assumes full responsibility for doing so, and that he has reviewed or coordinated each Shop Drawing or sample with the requirements of the work and the Contract Documents.

5.5. Engineer's review of Shop Drawings or samples shall not relieve the Contractor from his responsibility for any deviations from the requirements of the Contract Documents unless the Contractor has in writing called the Engineer's attention to such deviation at the time of submission and the Engineer has concurred in writing with the specific deviation, nor shall any review by the Engineer relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

5.6. Once approved, the Contractor shall submit four paper sets of all Shop Drawings.

6. MATERIALS, SERVICES AND FACILITIES

6.1. Any work necessary to be performed after regular working hours, on Sundays or on legal holidays, shall be performed without additional expense to the Owner.

6.2. The Contractor warrants that he has good title to all materials, supplies, and equipment used by him in the work.

6.3. All materials required in the work may be stored on the site upon which the project is to be constructed, subject to approval by the Engineer, but all such materials, tools, and machinery shall be neatly and compactly stored in such a manner as to not interfere with traffic and to cause the least inconvenience to the property owners. All fire hydrants must at all times be kept free and unobstructed, and water and gas shut-off boxes, underground power and telephone line manholes must not be covered by such materials.

6.4. Materials, tools, and machinery shall not be piled or placed against trees unless the trees shall be amply protected against injury therefrom. All materials, tools, machinery, etc., stored upon public thoroughfares must be provided with warning lights at night to warn the traffic of such obstruction.

6.5. The Contractor shall make his own arrangements for delivery and handling of equipment and materials as he may require for the prosecution of the work. The location of all temporary lines, roadways and similar facilities shall be subject to

the approval of the Engineer, and these shall be located and operated so as not to interfere with other work carried on by the Owner or by other contractors.

6.6. It is agreed that any temporary power lines, roadways or other facilities which the Contractor furnishes, installs, maintains, and removes at the completion of the work, may be used by the Owner or any of its contractors at such reasonable time or times as may be directed by the Engineer. Likewise, it is provided that similar facilities of other contracts will become available to the Contractor under similar conditions.

6.7. Adequate sanitary facilities shall be provided by the Contractor. All such sanitary facilities shall conform to the requirements of the respective State and County Departments of Public Health.

6.8. Office space and furnishings for the Resident Project Representative, if required, will be as specified in the Specifications. If required, office space must be provided before the Contractor's first partial payment estimate will be approved. No separate payment shall be made for office space.

6.9. Contractor shall furnish six hard hats which shall be made available to authorized representatives and agents of the Owner and any interested governmental agency while visiting the job site.

7. INSPECTION AND TESTING

7.1. Where testing and inspection of materials or equipment are required by the Contract supplying the applicable materials and equipment, as no separate payment will be made for these services. The laboratory or inspection agency shall be approved by the Owner.

7.2. Where mill tests of materials are required by the Engineer under the Contract Documents, Contractor shall furnish certified copies of such mill tests.

7.3. Where shop equipment performance tests are specified, the Engineer shall be permitted to witness such tests. In the absence of a witnessed test, certified copies of shop tests shall be submitted at the discretion of the Engineer. Cost of Engineer's services and any travel and associated room and board to witness this test will be borne by the Contractor.

7.4. No payment will be made to the Contractor for samples taken for tests such as concrete cylinders, etc., where testing is required by the Contract Documents.

8. SUBSTITUTIONS AND “OR-EQUALS”

8.1. The Owner, through the Engineer, will consider proposals for substitution of materials, equipment, and methods or “or-equal” items only when such proposals are accompanied by full and complete technical data and all other information required to evaluate the proposed substitution.

8.2. The Contractor shall not substitute materials, equipment, or methods unless such substitution or “or-equal” item has been specifically approved for this project by the Engineer.

8.3. The Contract, if awarded, will be on the basis of materials, equipment, and methods defined and specified in the Contract Documents, Specifications, and Drawings, or substitute or “or-equal” materials and equipment as defined in paragraph 8 of the General Conditions approved by the Engineer and identified by Addendum. Request for Engineer’s clarification of materials and equipment considered “or-equal” prior to the Effective Date of the Agreement must be received by the Engineer at least 10 days prior to the date for receipt of bids. Request for Engineer’s clarification of materials and equipment considered as substitutes prior to the Effective Date of the Agreement must be received by the Engineer at least 15 days prior to the date for receipt of bids. Each request must conform to the requirements of the General Conditions and shall be made only by the bidding Contractor. The burden of proof of the merit of the proposed item is upon the Contractor and the Engineer’s decision of approval or disapproval will be final. If Engineer approves any proposed “or-equal” or substitute item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidding Contractors shall not rely upon approvals in any other manner.

8.4. The Contractor shall verify prior to bidding that all specified items will be available in time for installation during orderly and timely progress of the project.

8.5. In the event specified items will not be so available, the Contractor shall notify the Engineer prior to receipt of bids.

8.6. Costs of delays because of non-availability of specified items, when such delays could have been avoided by the Contractor, will be back charged as necessary and shall not be borne by the Owner.

8.7. In cases where experience clauses are used, an alternate bond or cash deposit may be accepted from manufacturers which do not meet the specified experience period. The bond or cash deposit provided by the manufacturer or supplier will guarantee replacement of the equipment or process in the event of failure or unsatisfactory service. The period of time for which the bond or cash deposit is required shall be the same as the experience period of the time specified.

9. PATENTS

9.1. License and/or royalty fees for the use of a process which is authorized by the Owner of the project must be reasonable and paid to the holder of the patent, or his authorized licensee, directly by the Owner and not by or through the Contractor.

10. SURVEYS, PERMITS, REGULATIONS

10.1. The baseline and benchmark, if applicable, are indicated on the Drawings. The Contractor shall be responsible for all surveying required for laying out and constructing the Work.

10.2. The Contractor shall procure all permits and licenses, pay all charges or fees, and give all notices necessary for the completion of the work.

11. PROTECTION OF WORK, PROPERTY AND PERSONS

11.1. In order to protect the lives and health of his employees under the Contract, the Contractor shall comply with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., and shall maintain an accurate record of all cases of death, occupational disease and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under the Contract.

11.2. The Contractor alone shall be responsible for the safety, efficiency, and adequacy of his plant, appliances and methods, and for any damage which may result from their failure or their improper construction, maintenance, or operation.

11.3. The Contractor shall, at his own expense, shore up and protect any buildings, bridges, or other public or private structures which may be encountered or endangered in the prosecution of the work, and that may not be otherwise provided for, and he shall repair and make good any damages to such property by reason of his operations. All existing fences which were removed by the Contractor due to prosecution of the work shall be replaced by the Contractor. No extra payment will be made for said work or materials.

11.4. Contractor shall repair or replace at his own expense any existing water pipes, power and communication lines, or other public utilities, roads, drainpipes, sewers, drainage ditches and all plantings (including grass) that are damaged during construction. The site shall be left in its present condition after all cleanup work has been done. Any damage to drainage or water pipes, local sewers, or plantings (including grass, utilities, roads, parking space, or other structures) shall be repaired and replaced immediately in the condition found. Such repairs and replacement shall be at the expense of the Contractor.

11.5. Contractor shall preserve all governmental markers (e.g. U.S.G.S., T.V.A., etc.), and none such will be removed or disturbed without prior approval of the Engineer. Any removal and replacement of such markers shall be at the expense of the Contractor.

11.6. The Contractor shall employ watchmen on the work as necessary to protect the work from damage, vandalism, etc., and shall, when necessary, erect and maintain such strong and suitable barriers and such lights as will effectually prevent the happening of any accident to health, limb or property. Lights shall be maintained between the hours of one-half hour before sunset and one-half hour after sunrise.

11.7. Contractor will be required, at his own expense, to do everything necessary to support, protect and sustain all sewer, water or gas pipe; service pipes; electric lights; power, telephone, or telegraph poles; conduits; and other fixtures laid across or along the site of the work. The Engineer, as well as the company or

the corporation owning said poles, pipes or conduits, must be notified by the Contractor before any such fixtures are removed or molested. In case any of the said sewer, gas, or water pipes; service pipes; electric lights; power, telephone or telegraph poles; conduits; or other fixtures are damaged, they shall be repaired by the authorities having control of the same, and the expense of said repairs shall be deducted from the monies due or to become due the Contractor under this Contract.

11.8. Should it become necessary to temporarily change the position or remove any poles, electric conduits, water pipes, gas pipes, or other pipes or wires, the Contractor shall notify the Engineer and company or the corporation owning said poles, pipes or conduits of the location and circumstances, and shall cease work if necessary, until satisfactory arrangements have been made by the owners of the said poles, pipes, conduits, or wires to properly care for the same. No claims for damages will be allowed on account of any delay occasioned thereby. The entire cost of such temporary changes or removal must be included in the unit or lump sum prices bid for the various items of work under this Contract.

11.9. In the event of temporary suspension of work, or during inclement weather, or whenever the Engineer shall direct, the Contractor will, and will cause his subcontractors to protect carefully his and their work and materials against damage or injury from the weather. If, in the opinion of the Engineer, any work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of his subcontractors to so protect the work, such materials shall be removed and replaced at the expense of the Contractor.

11.10. Before, during, and after installation, the Contractor shall furnish and maintain satisfactory protection to all equipment against injury by weather, flood or breakage, thereby permitting the work to be left in a perfect condition at the completion of the contract. No extra payment will be made for this work but the entire cost of the same shall be included in the price bid for the construction of the work done under this contract.

11.11. All chemicals used during project construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, must show approval of either EPA or USDA. Use of all such chemicals and disposal of residues shall strictly conform with the manufacturer's instructions.

11.12. Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing.

12. SUPERVISION BY CONTRACTOR

12.1. It is understood that the Contractor's representative shall be one who can be continued in that capacity for the particular job involved unless he ceases to be

on the Contractor's payroll. Changes in supervision must be approved by the Engineer.

13. CHANGES IN THE WORK

13.1. All Change Orders, including a change in technical design or an increase in cost, must be approved by the Owner, the Engineer and those governmental agencies whose approval is required.

13.2. Before executing any Change Order involving adjustment of the contract price, where necessary and desirable, the Contractor shall first obtain the consent of his surety.

13.3. No claim for extra work or cost shall be allowed unless the same was done in pursuance of a written order of the Engineer approved by the Owner. When the work is performed under the terms of the General Conditions, the Contractor shall furnish satisfactory bills, payrolls, and vouchers covering all items of cost and when requested by the Owner, give the Owner access to accounts relating thereto.

13.4. The location of utility lines, pavements, and other appurtenant construction shown on the Drawings may be raised or lowered, may be moved from one location to another, or may be lengthened or shortened by the Owner because of clearances needed, easement changes, design changes, or any other reason. In such case, the Contractor shall be entitled to payment for the work based on the unit prices shown in the Bid Schedule. No additional payment will be allowed because of such changes unless the Contractor notifies the Owner in writing prior to commencing that portion of the work and an appropriate change order is prepared.

13.5. If additional time is requested on account of a change in the work, the documentation of the basis for the requested time shall include a detailed justification and calculation relating the time extension to the project schedule and critical path. Any time extensions claimed for abnormal weather must be supported by historical weather records for the period in question. Generally, for changes that do not directly affect work elements on the critical path of the project, additional time will be granted only in proportion to the cost of the change over the original contract price.

13.6. Failure to submit the written notice or failure to document the basis for the change in contract price or time within the times specified shall bar the Contractor from all future claims for a change in contract price or an extension of time on account of the change.

13.7. Changes in contract price will not be granted in connection with so-called “Acts of God” or nature (i.e., floods, storms, earthquakes, etc.).

14. CHANGES IN CONTRACT PRICE

14.1. For any change in contract price, the Contractor shall submit a detailed price breakdown sufficient to permit analysis of all material, labor, equipment,

subcontract, and overhead costs, as well as profit, regardless of whether the change is an increase or a decrease in price. Any amounts claimed by subcontractors must be supported by a similar price breakdown.

14.2. The change in contract price shall be deemed to cover all costs, overhead, and profit attributable to the change, including any delays or impacts related thereto. There will be no reservation of rights for future or further increases in contract price in connection with a particular change.

15. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

15.1. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain, and said amount shall be retained from time to time by the Owner from current periodic estimates.

15.2. The Owner will suffer financial loss if the project is not Substantially Completed on the date set forth in the Contract Documents. The Contractor and his Surety shall be liable for and shall pay to the Owner the sums stipulated in the Bid or Contract as fixed, agreed, and liquidated damages for each calendar day of delay until the project is Substantially Completed.

16. CORRECTION OF WORK

16.1. If, in the opinion of the Engineer, it is undesirable to replace any defective or damaged materials or to reconstruct or correct any portion of the work injured or not performed in accordance with the Contract Documents, the compensation to be paid to the Contractor hereunder shall be reduced by such amount as, in the judgment of the Engineer, shall be equitable.

17. SUBSURFACE CONDITIONS

17.1. Owner and Engineer make no representations or guarantee, either expressed or implied, about any subsurface conditions that may be encountered within the scope of the project. The Contractor should satisfy himself/herself by on-site inspections, core-drillings or other methods of the subsurface conditions that may be encountered. The risk of encountering and correcting such subsurface conditions shall be borne solely by the Contractor, and the Contract price shall include the cost of performing the work complete-in-place.

17.2. The Engineer may have made certain subsurface explorations in the vicinity of the work to be constructed under this Contract. These borings were made only for the Engineer's information in designing the project. Copies of these logs of borings and their locations will be provided to prospective Bidders upon request. These logs of borings are furnished only as information to Bidders for whatever interpretation and use they desire to make of conditions found when the borings were made. The Owner and Engineer do not warrant that the same conditions exist between borings and the Bidder shall satisfy himself as to the nature of the subsurface conditions throughout the project. If the Bidder wishes to make

borings at any location, he shall be afforded the opportunity to do so. Cost of such borings shall be at the Bidder's expense.

18. SUSPENSION OF WORK, TERMINATION, AND DELAY

18.1. In the event a portion of the work is delayed or interrupted, the Contractor shall continue to prosecute those portions of the work unaffected by the delay or interruption.

18.2. In the event of a delay or interruption in the work, the Contractor shall make reasonable and appropriate adjustments in his job site resources (manpower and equipment) to minimize the overall cost impact of the delay or interruption.

18.3. In the event of a delay or interruption in the work due to the failure of the Owner or Engineer to act within the time specified in the Contract Documents, or if no time is specified, within a reasonable time, the Contractor shall so notify the Engineer in writing immediately upon becoming aware of the delay. The Contractor shall submit a detailed justification for any claim for adjustment in contract price or extension in contract time on account of the delay or interruption as soon as the price or time impact can be quantified, but in no case later than 30 days following the end of the delay or interruption. Failure to submit the written notification or the justification within the time specified shall bar the Contractor from all future claims for adjustment in contract price or time on account of the delay.

19. PAYMENTS TO CONTRACTOR

19.1. No separate payment will be made for any items specified in the General Conditions or Supplemental General Conditions. Payments for such items shall be included in the unit price and lump sum prices bid by the Contractor for items listed in the Bid Schedule.

20. ACCEPTANCE OF FINAL PAYMENT AS RELEASE

20.1. (RESERVED)

21. INSURANCE

21.1. Each insurance policy shall be renewed at least 30 days before the expiration date thereof.

21.2. Insurance must be carried by a recognized insurance company licensed to do business in the state in which the project is constructed and approved by the Owner's Attorney.

21.3. The Contractor's and his Subcontractor's Public Liability and Property Damage Insurance shall provide protection in the amounts specified in Paragraph 21.3.1 of the General Conditions and as further specified in the Special Conditions (if included) against the following special hazards:

(a) Blasting damage

(b) Damage to existing structures

(c) Damage to private driveways, walks, shrubbery, plantings, etc.

(d) Damage to public utilities, electric, water, telephone, gas, sewerage, etc.

(e) Damage to U.S. Government markers.

21.4. The Contractor shall not commence work under this Contract until he has obtained all the insurance required and such insurance has been approved by the Owner, nor shall the Contractor allow any subcontractor to commence work on his subcontract until the insurance required of the subcontractor has been so obtained and approved.

21.5. In the event any insurance coverage should be canceled or allowed to lapse, Contractor will not be permitted to work until adequate and satisfactory insurance is in effect. Failure to keep insurance policies in effect WILL NOT be cause for any claims for extension of time under this Contract.

21.6. Limits of liability for general public liability and property damage insurance shall not be less than:

(a)	Bodily Injury	$1,000,000 each person $1,000,000 each occurrence
(b)	Property Damage	$500,000 each occurrence $500,000 aggregate

21.7. Limits of liability for comprehensive motor vehicle liability and property damage insurance.

(a)	Bodily Injury	$1,000,000 each person $1,000,000 each occurrence
(b)	Property Damage	$250,000 each occurrence

21.8. The Contractor shall provide builder's risk insurance to protect the Contractor and the Owner against risks of damage to buildings, structures, materials, and equipment not otherwise covered under installation floater insurance, from the perils of fire and lightning, the perils included in the standard extended coverage endorsement, and the perils of vandalism and malicious mischief. The amount of such insurance shall be not less than the insurable value of the work at completion less the value of the materials and equipment insured under installation floater insurance. If the work does not include the construction of building structures, builder's risk insurance may be omitted providing the installation floater insurance fully covers the work.

21.9. The Contractor shall provide installation floater insurance to protect the Contractor and the Owner from all insurable risks of physical loss or damage to materials, products and equipment not otherwise covered under builder's risk insurance while in warehouses or storage areas, during installation, during testing, and after the work is completed. Equipment such as pumps, motors, engine-generators, compressors, process equipment, switchgear, transformers, panel boards, control equipment, and other similar equipment shall be insured

under installation floater insurance when the aggregate value of the equipment exceeds $10,000.

21.10. If the work does not include the construction of building structures or installation of equipment, the builder's risk insurance and installation floater insurance may be omitted.

22. CONTRACT SECURITY

22.1. A Payment Bond in the amount of 100 percent of the contract price and a Performance Bond in the amount of 100 percent of the contract price shall be required in the form set forth in the Contract Documents.

23. ASSIGNMENTS

23.1. In case the Contractor assigns all or any part of any monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for the performance of the work called for in this contract.

24. INDEMNIFICATION

24.1. (RESERVED)

25. SEPARATE CONTRACTS

25.1. (RESERVED)

26. SUBCONTRACTING

26.1. The Contractor shall not award any work to any Subcontractor without prior written approval of the Owner, which approval will not be given until the Contractor submits to the Owner a written statement concerning the proposed award to the Subcontractor, which statement shall contain such information as the Owner may require.

27. ENGINEER'S AUTHORITY

27.1. The Engineer may appoint such resident project representatives as he may desire. Scope of the resident project representative's authority will extend to all parts of the work and to the preparation and manufacture of the materials to be used. A resident project representative is placed on the work to keep the Engineer and Owner informed as to the progress of construction and the manner in which it is being done and also to call to the attention of the Contractor any deviation from the Drawings and Specifications.

27.2. The resident project representatives have the authority to reject defective material or work that is being improperly done subject to the final decision of the Engineer. The resident project representatives are not authorized to revoke,

alter, enlarge, or relax the provisions of these conditions, nor are they authorized to approve or accept any portion of the completed work, or to issue instructions contrary to the Drawings and Specifications.

27.3. The Contractor may request written instructions from the Engineer upon any important items which lie within the resident project representative's jurisdiction.

28. LAND AND RIGHTS-OF-WAY

28.1. In the event all land and rights-of-way have not been obtained as herein contemplated before construction begins, the Contractor shall begin the work upon such land and rights-of-way as the Owner may have previously acquired, and no claim for damages whatsoever will be allowed by reason of the delay in obtaining the remaining land and rights-of-way. Should the Owner be prevented or enjoined from proceeding with the work, or from authorizing its prosecution, either before or after the commencement, by reason of any litigation, or by reason of its inability to procure any lands or rights-of-way for the work, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay, or to withdraw from the Contract except by consent of the Owner; but time for completion of the work will be extended to such time as the Owner determines will compensate for the time lost by such delay such determination to be set forth in writing.

29. GUARANTY

29.1. (RESERVED)

30. DISPUTES

30.1. (RESERVED)

31. TAXES

31.1. (RESERVED)

32. CONFLICTING CONDITIONS

32.1. Any provision in any of the Contract Documents which may be in conflict or inconsistent with any of the paragraphs in the General Conditions or the Federal Regulations shall be void to the extent of such conflict or inconsistency except if when and as clarified by the Supplemental General Conditions. Interpretations of any conflicts not clarified may be requested by the Contractor in writing to the Engineer. In the event of conflicts between funding agency documents, the more restrictive will apply.

32.2. In case of unresolved conflict between items of the Contract Documents, the following order of precedence shall govern, with the higher item taking precedence over a lower item:

(a) Contract (including Supplemental Agreements and Change Orders thereto)

(b) Addenda

(c) Bid Proposal

(d) Supplemental General Conditions

(e) General Conditions

(f) Specifications

(g) Governing Standard Specifications

(h) Schedules on Drawings

(i) Notes on Drawings

(j) Details on Drawings

(k) Large Scale Drawings

(l) Small Scale Drawings

(m) Dimensions Given in Figures

(n) Scaled Dimensions

32.3. In the event of any discrepancy between any drawing and the figure written thereon, the figures, unless obviously incorrect, shall be taken as correct.

33. REQUIRED PROVISIONS DEEMED INSERTED

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

34. PROHIBITED INTEREST

34.1. No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this Contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Contract if made with a corporation for its general benefit.

34.2. No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the Project, shall become directly or indirectly interested personally in this Contract or in any part hereof. No officer, employee, architect, attorney, engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the Project, shall become directly or indirectly interested personally in this contract or in any part thereof, any material, supply contract, subcontract, insurance contract, or any other contract pertaining to the Project.

35. USE OF PREMISES AND REMOVAL OF DEBRIS

35.1. The Contractor expressly undertakes at his own expense:

(a) To take every precaution against injuries to persons or damage to property;

(b) To store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the work as will not unduly interfere with the progress of his work or the work of any other contractors;

(c) To place upon the Work or any part thereof only such loads as are consistent with the safety of that portion of the Work;

(d) To clean up frequently all refuse, rubbish, scrap materials and debris caused by these operations, to the end that at all times the site of the Work shall present a neat, orderly and workmanlike appearance;

(e) Before final payment to remove all surplus material, false work, temporary structures, including foundations thereof, plant of any description and debris of every nature resulting from his operations, and to put the site in a neat, orderly condition;

(f) To effect all cutting, fitting or patching of his work required to make the same to conform to the Drawings and Specifications and, except with the consent of the Engineer, not to cut or otherwise alter the work of any other contractor.

36. ESTIMATE OF QUANTITIES

36.1. Wherever the estimated quantities of work to be done and materials to be furnished under this Contract are shown in any of the Contract Documents including the proposal, they are given for use in comparing Bids, and the right is especially reserved except as herein otherwise specifically limited, to increase or diminish them as may be deemed reasonably necessary or desirable by the Owner to complete the Work contemplated by this Contract, and such increase or decrease shall in no way nullify this Contract, nor shall any such increase or decrease give cause for claims or liability for damages.

37. CONTRACTOR'S OBLIGATIONS

37.1. The Contractor shall in good workmanlike manner perform all work and furnish all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete the Work required by this Contract, within the time herein specified, in accordance with the provisions of this Contract and said Specifications and in accordance with the Drawings covered by this Contract and all supplemental drawings, and in accordance with the directions of the Engineer as given from time to time during the progress of the Work. He shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required. The Contractor shall observe, comply with and be subject to all terms,

conditions, requirements, and limitations of the Contract and Specifications and shall do, carry on, and complete the entire work to the satisfaction of the Engineer and the Owner.

37.2. The Contractor shall restore disturbed areas to original or better condition.

37.3. When work performed under this Contract is in areas where easements and working agreements have been obtained by the Owner on private properties, it shall be the responsibility of the Contractor to protect trees, shrubs, gardens, etc., insomuch as is possible and to restore said properties to the satisfaction of the property owners, said protection and restoration shall include but not be limited to the fencing off of trees and shrubs, transplanting of trees and shrubs, etc., replacing topsoil removed with topsoil of equal or better quality, re-grassing, and replacing fences. All expenses for said protection and restoration shall be borne by the Contractor, and no separate payment shall be made for this work.

37.4. When work is done on private property in easements and working agreements obtained by the Owner, the Contractor shall furnish affidavits from the property owners attesting to the fact that their property has been satisfactorily restored before that portion of the work will be considered for final payment.

38. PAYMENTS BY CONTRACTOR

38.1. The Contractor shall pay (a) for all transportation and utility services not later than the 20th day of the calendar month following that in which services are rendered, (b) for all materials, tools, and other expendable equipment to the extent of 90 percent of the cost thereof, not later than the 20th day of the calendar month following that in which such materials, tools, and equipment are delivered at the site of the Project, and the balance of the cost thereof not later than the 30th day following the completion of that part of the Work in or on which such materials, tools, and equipment are incorporated or used, and (c) to each of his subcontractors, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by his subcontractors to the extent of each subcontractor's interest therein.

39. INFORMATION TO BE FURNISHED

39.1. Contractor shall fill out all questionnaire forms completely in preparing his Bid and after award shall supply to the Engineer all pertinent information required.

40. WAIVER

40.1. It is expressly understood and agreed that any waiver granted by the Engineer or the Owner of any term, provision or covenant of this Contract shall not constitute a precedent nor breach of the same or any other terms, provisions or covenants of this Contract.

40.2. Neither the acceptance of the Work by the Owner nor the payment of all or any part of the sum due the Contractor hereunder shall constitute a waiver by the

Owner of any claim which the Owner may have against the Contractor or surety under this Contract or otherwise.

41. CONNECTING OF EXISTING WORK

41.1. Contractor shall remove such existing masonry and piping as is necessary in order to make the proper connections to these structures at the locations shown. Also, he shall make the necessary pipeline, roadway, and other connections at the several points in order that on completion of the Contract, all required flows may flow through the several pipelines and structures. No extra payment shall be made for this work, but the entire cost of the same shall be included in the price bid for the various items of the Work to be done under this Contract.

42. PROGRAM AND METHOD OF CONSTRUCTION

42.1. The order or sequence of execution of the Work and the general arrangements of the construction plant to be installed shall at all times be subject to the review of the Engineer. If at any time before the commencement or during the progress of the Work, or any part of it, such features, and appliances used or to be used appear to the Engineer as insufficient, or improper, he may order the Contractor to improve their character, and the Contractor shall conform to such orders, but the failure of the Engineer to demand any increase of safety, efficiency, adequacy, or any improvement shall not release the Contractor from his obligation to secure the safe conduct and quality of the Work specified.

43. BUILDINGS AND SHANTIES

43.1. No shanties, camps, or buildings for the housing of men employed on the Work shall be erected on land owned or leased by the Owner unless a permit, in writing, is secured from the Owner allowing their construction. Should permission be asked and granted, the Contractor must comply with all regulations regarding the construction and maintenance of such buildings.

44. CONSTRUCTION METHODS AND PROTECTION OF PROPERTIES

44.1. Cooperation with Utilities - The Contractor shall be cooperative at all times with all utilities, or their duly authorized agent or contractor, installing or connecting new services and shall coordinate all phases of the work with said utilities to avoid unnecessary delays or complications.

44.2. Damage to Property

(a) The Contractor is warned to prevent excessive dust or air pollution that may disfigure or soil any public or private facilities. The use of water sprinklers or other approved devices to reduce dust will be necessary if such is the case. Additionally, in cases of heavy rains or storms, every effort shall be made to prevent mud or water which may result due to the construction from accumulating on or damaging any property or any private owner.

(b) Contractor shall use special care in working in areas where the right-of-way crosses private property. Contractor shall also replace, at his/her own expense, any existing water pipes, power lines, communication lines, or other public utilities, roads, drainpipes, sewers, drainage ditches, and all plantings including grass and/or sod on private property. The site shall be left in its present condition after all cleanup work has been done. Any damage to drainage pipes, water pipes, local sewers, plantings (including grass and/or sod), utilities, roads, parking space, or other structures shall be repaired and replaced immediately in the condition found. Such repairs and replacement shall be at the expense of the Contractor.

44.3. Existing Sanitary, Combined and/or Storm Sewers

(a) Whenever existing sewers are broken or damaged as a result of traffic or excavation by the Contractor, the maintenance, replacement, and/or repairs to the damaged existing sanitary, combined, and/or storm sewer shall be the Contractor's responsibility, except as otherwise provided for on the Drawings and in the Contract Documents, or as authorized by the Engineer, and the expense of maintaining, repairing, replacing, or connecting to existing sewers shall be borne by the Contractor.

(b) No separate payment will be made for handling sewage from existing sewers or interrupted connections, since it shall be the responsibility of the Contractor to maintain services until such time as the proposed or relocated sewers can be constructed. If the Contractor should damage any existing sewer, such that it affects the public interest, health, or general welfare, the Contractor shall replace or repair that sewer at his/her own expense as directed by the Engineer.

(c) Contractor shall make all connections to existing sewerage facilities as shown on the Drawings.

45. SEWAGE, SURFACE, AND FLOOD FLOWS

45.1. The Contractor shall furnish all the necessary equipment, shall take all necessary precautions and shall assume the entire cost of handling any sewage, seepage, storm, surface, and flood flows which may be encountered at any time during the construction of the Work. The manner of providing for these flows shall meet the approval of the Engineer, and the entire cost of said work shall be included in prices bid for the various items of the Work to be done under this Contract.

45.2. The Contractor will minimize siltation and bank erosion during construction.

45.3. During the period of construction, the Contractor shall cooperate with the Owner's employees in maintaining all existing collection, pumping, and treatment facilities in operation. The cost of any temporary conveyances or bypass pumping shall be included in the price bid for other items of work under this Contract, as no separate payment will be made.

45.4. The Contractor shall not discharge or allow discharge of pollutants, as defined in the Clean Water Act, including fill and sediment, into waters of the State or

United States, including wetlands, unless authorized by an appropriate State or Federal permit. This prohibition specifically applies to silt and sediment in storm water runoff and in water pumped from trenches and excavations.

45.5. In the event that pollutants are discharged or otherwise released to the environment as the result of the Contractor's negligence or unlawful conduct, it is understood and agreed that the Contractor shall bear all risks associated with such release(s), shall indemnify the Owner and the Engineer from any liabilities resulting from the release(s), and shall not make any claim for additional compensation for delays or damage resulting from such release(s).

46. OBSTRUCTIONS ENCOUNTERED

46.1. In addition to showing the structures to be built under this Contract, the Drawings show certain information obtained by the Owner regarding the pipelines and other structures which exist along the site of the Work, both at and below the surface of the ground. The Owner expressly disclaims any responsibility for the accuracy or completeness of the information given on the Drawings with regard to existing structures and pipelines, and the Contractor will not be entitled to any extra compensation on account of inaccuracy or incompleteness of such information, said structures and pipelines being shown only for the convenience of the Contractor who must verify the information to his own satisfaction. The giving of this information upon the Drawings will not relieve the Contractor of his obligations to support and protect all pipelines and other structures which may be encountered during the construction of the work and to make good all damages done to such pipelines and structures as provided in these Supplemental General Conditions.

47. USE OF STREETS

47.1. During the progress of the Work, the Contractor shall make ample provision for both vehicular and foot traffic on any public road and shall indemnify and save harmless the Owner from any expense whatsoever due to his operations over said roadways. The Contractor shall also provide free access to all fire hydrants, water and gas valves located along the line of his work. Gutters and waterways must be kept open or other provisions made for the removal of storm water. Street intersections may be blocked only one-half at a time, and the Contractor shall lay and maintain temporary driveways, bridges and crossings such as in the opinion of the Engineer are necessary to reasonably accommodate the public and to provide access to needed private driveways. In the event of the Contractor's failure to comply with these provisions, the Owner may cause the same to be done and will deduct the cost of such work from any monies due or to become due the Contractor under this Contract, but the performance of such work by the Owner or at its insistence shall serve in no way to release the Contractor from his general or particular liability for the safety of the public or the Work.

47.2. Required line crossings of all streets and roads shall be done in accordance with the applicable state Department of Transportation procedures.

47.3. Contractor will be permitted to close a street when necessary for the proper prosecution of the work. The Contractor shall keep the Police and Fire Department continuously informed as to his intentions to close streets and give the Police Department sufficient notice in order that "No Parking" signs may be placed at the proper time to clear the street for construction.

47.4. The Contractor shall maintain property barricades and flagmen to detour traffic.

47.5. At all times the Contractor is responsible for damage to city and county streets as a result of their use in this project. The streets must be kept clear of all dirt, stone, or other debris. All debris, dirt, etc., whether caused by rains, storms, spillage from trucks or otherwise, shall be kept out of sewers. The Contractor is responsible for and may not plead ignorance of city and county ordinances and amendments thereto that may affect this use of streets or sewers.

48. CONSULTING AND RESIDENT OBSERVATION SERVICES DURING CONSTRUCTION

48.1. In providing the Owner with consulting services and resident project representation during construction, the Engineers and their employees do not assume any duty to supervise construction means or methods and safety procedures followed by any contractor, subcontractor and/or their respective employees or to any other person; nor for any public liability or for property damage caused through acts of the Contractor, subcontractor and/or their respective employees or any other person.

49. SAFETY AND HEALTH REGULATIONS

49.1. The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54).

49.2. Contractor shall allow free access to any Department of Labor Representative for inspection purposes.

50. ACCESS BY REPRESENTATIVES OF GOVERNMENTAL AGENCIES

50.1. The authorized representatives and agents of all governmental agencies involved in this project shall have access to the work at all times and shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records. Contractor shall provide proper facilities for the access and inspection of the work by such persons.

51. LOCAL AND STATE LAWS

51.1. The Contractor shall abide by all local and State laws or ordinances to the extent that such requirements do not conflict with Federal laws or regulations.

52. NEW JOB OPPORTUNITIES (WHERE REQUIRED BY FUNDING AGENCY ONLY)

52.1. The Contractor shall:

(a) To the maximum extent practicable, follow hiring and employment practices which will assure that performance of the Work results in new job opportunities for the unemployed and the underemployed; and

(b) Insert or cause to be inserted the same or similar provisions in each construction subcontract.

53. CONSTRUCTION RESTRICTIONS

53.1. Heavy construction machinery shall not be used within 500 feet of residential areas between the hours of 06:30 pm and 6:30 am except as otherwise provided herein.

53.2. No blasting or drilling shall be performed within 500 feet of residential areas between the hours of 06:30 pm. and 6:30 am.

54. LEAD BASE PAINT AND JOINT SEALERS

54.1. No lead-based paints, protective coatings or joint sealers may be used on this project.

55. ASPHALT

55.1. Pursuant to the conditions as set out in the Specifications for hot asphaltic concrete binder and surface courses with particular reference to the limitations or temperature and weather conditions, the Owner may at its option and upon written notice, suspend the Contract over the winter and bad weather months. The Contract may then be resumed when weather conditions will permit the application of the above pavement, at the discretion of the Engineer. The notice to resume said contract shall be in writing. The suspended period will in no way be counted against the Contractor's allotted time to do the entire work.

55.2. This provision does not relieve the Contractor of the responsibility to maintain existing work already completed or any other responsibilities of the Contract; nor shall the Contractor, upon the basis of this fair notice herein; be eligible to make claim for or receive any damages for loss of overhead, plant expense, or anticipated profits, nor any other expenses incurred due to delay.

56. ABANDONMENT OR TERMINATION OF CONTRACT

56.1. For contracts over $10,000, the Owner reserves the right to abandon the Contract if it will be in the Owner's best interest. The Contractor will be paid a fair payment, as negotiated with the Owner, for the work completed to date.

57. EVIDENCE OF PAYMENT

57.1. Contractor may be asked to present acceptable evidence from time to time that all bills have been paid for labor, materials, and equipment for which payment on account has been made in monthly estimates. Before final payment is made, Contractor shall, if required by the Owner, present sworn affidavit that all labor,

materials, equipment, and service engaged for the work have been paid in full and that there are no outstanding debts or liens on any portions of the work.

58. ACCESSIBILITY OF RECORDS (PROJECTS WITH FEDERAL FUNDS ONLY)

58.1. The Owner, representatives of applicable federal agencies, the Comptroller General of the United States, or any of their duly authorized representatives, for a period of three years beyond completion of the Contract, shall have access to any books, documents, papers, and records of the Contractor which are directly pertinent to this Project for the purpose of making audit, examination, excerpts, and transcriptions of contracts in excess of $10,000.

59. WORK WEEK, OVERTIME PAY, SHOW-UP PAY, AND ON-CALL PAY

59.1. All work performed under this Contract shall be performed on a 40-hour work week basis and shall include not only the prime Contractor but any and all subcontractors. The 40-hour work week shall be established by the Contractor at the Pre-construction Conference. Any deviation from the established work week will be approved in advance in writing by the Owner. Any additional cost incurred by the Owner due to deviations from the established work week will be borne by the Contractor. The Contractor shall provide written acknowledgment that he will pay any overtime cost incurred by the Owner at the time of requesting an increase in the 40-hour work week.

59.2. The Contractor will be assessed for each hour of overtime incurred by the Engineer's field representative(s) as a result of extended work hours (i.e., a total of more than 40 hours per calendar week) by the Contractor or his subcontractors.

59.3. If the Contractor advises the Engineer's field representative(s) that he will work on a particular day and subsequently decides not to work and does not so advise the representative(s) before he departs for the job site, the Contractor will be assessed an amount equal to 2 hours of the representative's time for "show-up" pay plus round-trip travel time and mileage. Show-up pay will not be assessed in the event of inability to work due to unanticipated inclement weather.

59.4. If the Contractor requests that the Engineer's field representative(s) be available to work on a weekend or a holiday but does not actually commit to work, the Contractor will be assessed an amount equal to 8 hours of the representative's time for "on-call" pay for each day that the Contractor so requests.

59.5. The above assessments for field representative's overtime pay, show-up pay, and on-call pay will be deducted as a separate line item on the Contractor's next progress payment request. Unless otherwise stated, the Engineer's field representative's time will be assessed at $90.00 per hour for regular time and $135.00 per hour for overtime.

59.6. Available working times are Monday through Friday, 6:30 am to 6:30 pm except as otherwise provided herein. Work outside these times shall only be performed with the Owners permission.

END OF SECTION

SECTION 00 7373

SUPPLEMENTAL GENERAL CONDITIONS FOR TENNESSEE

A. LOCAL AND STATE LAWS

Senate Bill No. 1726 (Public Acts 1978 [Chapter 692]), known as the Underground Utility Damage Prevention Act (and all amendments thereto), enacted by the General Assembly of the State of Tennessee, is in its entirety to be considered a part of these documents.

B. TENNESSEE WATER QUALITY CONTROL ACT OF 1977

Tennessee Code Annotated (TCA) 69-3-108, Rule 1200-4-10-.05 (General NPDES Permit for Storm Water Discharges Associated with Construction Activity) requirements, in their entirety, shall be considered a part of these documents.

C. CONTRACTORS LICENSING ACT OF 1976

House Bill No. 2180 (Public Chapter No. 882) known as the Contractors Licensing Act of 1976 (and all amendments thereto), enacted by the General Assembly of the State of Tennessee, is in its entirety to be considered a part of these Specifications.

D. BLASTING - T.C.A. §68-105-103

Persons who conduct blasting operations must notify Department of Commerce and Insurance at least 72 hours prior to the commencement of the operation. Civil penalties may be imposed for failure to comply.

E. ESCROW ACCOUNT OF CONTRACTOR RETAINAGE (Contracts over $500,000)

1. Tennessee Code Annotated (TCA) 66-34-104 as amended (Public Chapter No. 340) House Bill No. 966 and Senate Bill No. 388. If applicable, the Owner will set up separate escrow account for deposit of retainage due Contractor in accordance with TCA 66-34-104 and amendments. These requirements shall be a part of these Specifications in their entirety.

2. TCA 66-34-104. Retention of Portion of Contract Price in Escrow — Applicability — Mandatory Compliance

   (a) Whenever, in any contract for the improvement of real property, a certain amount or percentage of the contract price is retained, that retained amount shall be deposited in a separate, interest bearing, escrow account with a third party which must be established upon the withholding of any retainage.

   (b) As of the time of the deposit of the retained funds, the funds shall become the sole and separate property of the prime contractor or remote contractor to whom they are owed, subject to the rights of the person withholding the retainage in the event the prime contractor or remote contractor otherwise entitled to the funds defaults on or does not complete its contract.

(c) In the event that the party withholding the retained funds fails to deposit the funds into an escrow account as provided herein, such party shall be responsible for paying the owner of the retained funds an additional three-hundred-dollar ($300) penalty per day for each and every day that such retained funds are not deposited into such escrow account.

(d) The party with the responsibility for depositing the retained amount in a separate, interest-bearing, escrow account with a third party shall have the affirmative duty to provide written notice that it has complied with the requirements of this section to any prime contractor upon withholding the amount of retained funds from each and every application for payment, including:

1. Identification of the name of the financial institution with whom the escrow account has been established;

2. Account number; and

3. Amount of retained funds that are deposited in the escrow account with the third party.

(e) Upon satisfactory completion of the contract, to be evidenced by a written release by the owner or prime contractor owing the retainage, all funds accumulated in the escrow account together with all interest on the account shall be paid immediately to the prime contractor or remote contractor to whom the funds and interest are owed.

(f) In the event the owner or prime contractor, as applicable, fails or refuses to execute the release provided for in subsection (c), then the prime contractor or remote contractor, as applicable, may seek any remedy in a court of proper jurisdiction and the person holding the fund as escrow agent shall bear no liability for the nonpayment of the fund to the prime contractor or remote contractor; provided, however, that all claims, demands, disputes, controversies, and differences that may arise between the owner, prime contractor or prime contractors, and remote contractor or remote contractors regarding the funds may be, upon written agreement of all parties concerned, settled by arbitration conducted pursuant to the Tennessee Uniform Arbitration Act, compiled in title 4, chapter 5, part 3, or the Federal Arbitration Act, 9 U.S.C. § 1, et seq., as may be applicable.

(g) In contracts to which the state or any department, board or agency of the state, including the University of Tennessee, is a party, interest shall be paid on the retained amounts at the same rate interest is paid on the funds of local governments participating in the local government investment pool established pursuant to § 9-4-704, for the contract period.

(h) The provisions of this section shall be applicable to the state, any department, board or agency of the state, including the University of Tennessee, and all counties and municipalities and all departments,

boards or agencies of the counties and municipalities, including all school and education boards, and any other subdivision of the state.

(i) This section shall be applicable to all prime contracts and all subcontracts thereunder for the improvement of real property when the contract amount of such prime contract is five hundred thousand dollars ($500,000) or greater, notwithstanding the amount of such subcontracts.

(j) Compliance with this section shall be mandatory and may not be waived by contract.

(k) Failure to deposit the retained funds into an escrow account as provided herein, within seven (7) days' receipt of written notice regarding such failure, is a class A misdemeanor.

[Acts 1975, ch. 345, §§ 1-4; TCA, §§ 64-1148—64-1151; Acts 1985, ch. 340, §§ 1, 2; 1986, ch. 551, § 9; 2007, ch. 189, § 43; 2007, ch. 201, §§ 1, 2; TCA § 66-11-144; Acts 2008, ch. 804, §§ 1, 2; 2010, ch. 875, § § 1, 2; 2012, ch. 609, § § 2-5.]

3. TCA 66-34-203. Withholding of Payment or Retainage by Owner

Nothing in this chapter shall prevent the owner from reasonably withholding payment or a portion of a payment to the contractor; provided, that such withholding is in accordance with the provisions of the written contract between the owner and the contractor. The owner may also withhold a reasonable amount of retainage as specified in the written contract between the owner and the contractor; provided, however, that the retainage amount may not exceed five percent (5%) of the amount of the contract.

[Acts 1991, ch. 45, § 1; 2007, ch. 201, § 4.]

4. TCA 66-34-103. Withholding of Retainage — Violations — Penalties

(a) All construction contracts on any project in this state, both public and private, may provide for the withholding of retainage; provided, however, that the retainage amount may not exceed five percent (5%) of the amount of the contract.

(b) The owner, whether public or private, shall release and pay all retainages for work completed pursuant to the terms of any contract to the prime contractor within ninety (90) days after completion of the work or within ninety (90) days after substantial completion of the project for work completed, whichever occurs first. As used in this subsection (b), work completed shall be construed to mean the completion of the scope of the work and all terms and conditions covered by the contract under which the retainage is being held. The prime contractor shall pay all retainages due any subcontractor within ten (10) days after receipt of the retainages from the owner. Any subcontractor receiving the retainage from the prime contractor shall pay to any subcontractor or material supplier all retainages due the subcontractor or material supplier within ten (10) days after receipt of the retainages.

(c) Any default in the making of the payments shall be subject to those remedies provided in this part.

(d) In the event that an owner or prime contractor withholds retainage that is for the use and benefit of the prime contractor or its subcontractors pursuant to § 66-34-104(a) and (b), neither the prime contractor nor any of its subcontractors shall be required to deposit additional retained funds into an escrow account in accordance with § 66-34-104(a) and (b).

(e) (1) It is an offense for a person, firm, or corporation to fail to comply with subsection (a) or (b) or § 66-34-104(a).

(2) (A) A violation of this subsection (e) is a Class A misdemeanor, subject to a fine only of three thousand dollars ($3,000).

(B) Each day a person, firm or corporation fails to comply with subsection (a) or (b) or § 66-34-104(a) is a separate violation of this subsection (e).

(C) Until the violation of this subsection (e) is remediated by compliance, the punishment for each violation shall be consecutive to all other such violations.

(3) In addition to the fine imposed pursuant to subdivisions (e)(2)(A) and (B), the court shall order restitution be made to the owner of the retained funds. In determining the appropriate amount of restitution, the formula stated in § 40-35-304 shall be used.

[Acts 2007, ch. 201, § 3; 2008, ch. 804, § 3; 2012, ch. 609, § 1.]

F. CONFLICTS BETWEEN DOCUMENTS

In the event of conflicts between funding agency documents, the more restrictive shall apply.

GENERAL CONDITIONS

CONTRACT AND CONTRACT DOCUMENTS

The project to be constructed and pursuant to this contract will be financed with assistance from Coronavirus State and Local Fiscal Recovery Fund (SLFRF) and American Rescue Plan Act (ARPA) and is subject to all applicable Federal laws and regulations.

The Plans, Specifications and Addenda, and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The table of contents, titles, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light on the interpretation of the provisions to which they refer.

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GENERAL CONDITIONS

ARTICLE 1--DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

Addenda – Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the bidding documents or the Contract Documents.

Agreement – The written agreement between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

Application for Payment – The form accepted by ENGINEER which is to be used by CONTRACTOR in requesting progress or final payments and which is to include such supporting documentation as is required by the Contract Documents.

Bid – The offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bonds – Bid, performance and payment bonds and other instruments of security.

Change Order – A document recommended by ENGINEER, which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time, issued on or after the Effective Date of the Agreement.

Contract Documents – The Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post-Bid documentation submitted prior to the Notice of Award) when attached as an exhibit to the Agreement, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all amendments, modifications and supplements issued pursuant to paragraphs 3.4 and 3.5 on or after the Effective Date of the Agreement.

Contract Price – The moneys payable by OWNER to CONTRACTOR under the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.9.1 in the case of Unit Price Work).

Contract Time – The number of days (computed as provided in paragraph 17.2) or the date stated in the Agreement for the completion of the Work.

CONTRACTOR – The person, firm or corporation with whom OWNER has entered into the Agreement.

Defective – An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, or does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.8 or 14.10).

Drawings – The drawings which show the character and scope of the Work to be performed and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents.

Effective Date of the Agreement – The date indicated in the Agreement on which it becomes effective, but if no such date is indicated it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

ENGINEER – The person, firm or corporation named as such in the Agreement.

Field Order – A written order issued by ENGINEER which orders minor changes in the Work in accordance with paragraph 9.5 but which does not involve a change in the Contract Price or the Contract Time.

General Requirements – Sections of Division 1 of the Specifications.

Laws and Regulations; Laws or Regulations – Laws, rules, regulations, ordinances, codes and/or orders.

Notice of Award – The written notice by OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the Agreement.

Notice to Proceed – A written notice given by OWNER to CONTRACTOR (with a copy to ENGINEER) fixing the date on which the Contract Time will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR's obligations under the Contract Documents.

OWNER – The public body or authority, corporation, association, firm or person with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be provided.

Partial Utilization – Placing a portion of the Work in service for the purpose for which it is intended (or a related purpose) before reaching Substantial Completion for all the Work.

Project – The total construction of which the Work to be provided under the Contract Documents may be the whole, or a part as indicated elsewhere in the Contract Documents.

Resident Project Representative – The authorized representative of ENGINEER who is assigned to the site or any part thereof.

Shop Drawings – All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for CONTRACTOR to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, diagrams and other information prepared by a Supplier and submitted by CONTRACTOR to illustrate material or equipment for some portion of the Work.

Specifications – Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

Subcontractor – An individual, firm or corporation having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the site.

Substantial Completion – The Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER as evidenced by ENGINEER's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents so that the Work (or specified part) can be utilized for the purpose for which it is intended; or if there be no such certificate issued, when final payment is due in accordance with paragraph 14.13. The terms "substantially complete" and "substantially completed" as applied to any Work refer to Substantial Completion thereof.

Supplementary Conditions – The part of the Contract Documents which amends or supplements these General Conditions.

Supplier – A manufacturer, fabricator, supplier, distributor, materialman or vendor.

Underground Facilities – All pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels or other such facilities or attachments, and any encasements containing such facilities which have been installed underground to furnish any of the following services or materials: electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, sewage and drainage removal, traffic or other control systems or water.

Unit Price Work – Work to be paid for on the basis of unit prices.

Work – The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work is the result of performing services, furnishing labor and furnishing and incorporating materials and equipment into the construction, all as required by the Contract Documents.

Work Directive Change – A written directive to CONTRACTOR, issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in paragraph 4.2 or 4.3 or to emergencies under paragraph 6.22. A Work Directive Change may not change the Contract Price or the Contract Time, but is evidence that the parties expect that the change directed or documented by a Work Directive Change will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Time as provided in paragraph 10.2.

Written Amendment – A written amendment of the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly Work-related aspects of the Contract Documents.

ARTICLE 2 – PRELIMINARY MATTERS

Delivery of Bonds:

2.1. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish in accordance with paragraph 5.1.

***Copies of Documents*:**

2.2. OWNER shall furnish to CONTRACTOR up to ten copies (unless otherwise specified in the Supplementary Conditions) of the Contract Documents as are reasonably necessary for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

Commencement of Contract Time; Notice to Proceed:

2.3. The Contract Time will commence to run on the thirtieth day after the Effective Date of the Agreement, of, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within thirty days after the Effective Date of the Agreement. In no event will the Contract Time commence to run later than the seventy-fifth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

Starting the Project:

2.4 CONTRACTOR shall start to perform the Work on the date when the Contract Time commences to run, but no Work shall be done at the site prior to the date on which the Contract Time commences to run.

Before Starting Construction:

2.5. Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error or discrepancy in the Contract Documents, unless CONTRACTOR had actual knowledge thereof or should reasonably have known thereof.

2.6. Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for review:

2.6.1. an estimated progress schedule indicating the starting and completion dates of the various stages of the Work;

2.6.2. a preliminary schedule of Shop Drawing submissions; and

2.6.3. a preliminary schedule of values for all of the Work which will include quantities and prices of items aggregating the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during construction. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work which will be confirmed in writing by CONTRACTOR at the time of submission.

2.7 Before any Work at the site is started, CONTRACTOR shall deliver to OWNER, with a copy to ENGINEER, certificates (and other evidence of insurance requested by OWNER) which

CONTRACTOR is required to purchase and maintain in accordance with paragraphs 5.3 and 5.4, and OWNER shall deliver to CONTRACTOR certificates (and other evidence of insurance requested by CONTRACTOR) which OWNER is required to purchase and maintain in accordance with paragraphs 5.6 and 5.7.

Preconstruction Conference:

2.8. Within twenty days after the Effective Date of the Agreement, but before CONTRACTOR starts the Work at the site, a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to discuss the schedules referred to in paragraph 2.6, to discuss procedures for handling Shop Drawings and other submittals and for processing Applications for Payment, and to establish a working understanding among the parties as to the Work.

Finalizing Schedules:

2.9. At least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to finalize the schedules submitted in accordance with paragraph 2.6. The finalized progress schedule will be acceptable to ENGINEER as providing an orderly progression of the Work to completion within the Contract Time, but such acceptance will neither impose on ENGINEER responsibility for the progress or scheduling of the Work nor relieve CONTRACTOR from full responsibility thereof. The finalized schedule of Shop Drawing submissions will be acceptable to ENGINEER as providing a workable arrangement for processing the submissions. The finalized schedule of values will be acceptable to ENGINEER as to form and substance.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

Intent:

3.1. The Contract Documents comprise the entire agreement between OWNER and CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the place of the Project.

3.2. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result will be supplied whether or not specifically called for. When words which have a well-known technical or trade meaning are used to describe Work, materials or equipment such word shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code or Laws or Regulations in effect at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated. However, no provision of any referenced standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR or ENGINEER, or any of their consultants, agents or employees from those set forth in the Contract Documents, nor shall it be effective to assign to ENGINEER, or any of ENGINEER's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provision of paragraph 9.15 or 9.16. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in paragraph 9.4.

3.3. If, during the performance of the Work, CONTRACTOR finds a conflict, error or discrepancy in the Contract Documents, CONTRACTOR shall so report to ENGINEER in writing at once and before proceeding with the Work affected thereby shall obtain a written interpretation or clarification from ENGINEER; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error or discrepancy in the Contract Documents unless CONTRACTOR had actual knowledge thereof or should reasonably have known thereof.

Amending and Supplementing Contract Documents:

3.4. The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

3.4.1. a formal Written Amendment,

3.4.2. a Change Order (pursuant to paragraph 10.4), or

3.4.3. a Work Directive Change (pursuant to paragraph 10.1).

As indicated in paragraphs 11.2 and 12.1, Contract Price and Contract Time may only be changed by a Change Order or a Written Amendment.

3.5. In addition, the requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, in one or more of the following ways:

3.5.1. a Field Order (pursuant to paragraph 9.5),

3.5.2. ENGINEER's approval of a Shop Drawing or sample (pursuant to paragraphs 6.26 and 6.27), or

3.5.3. ENGINEER's written interpretation or clarification (pursuant to paragraph 9.4).

Reuse of Documents:

3.6. Neither CONTRACTOR nor any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with OWNER shall have or acquire any title to or ownership rights in any of the Drawings, Specifications or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER; and they shall not reuse any of them on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaptation by ENGINEER.

ARTICLE 4—AVAILABILITY OF LANDS; PHYSICAL CONDITIONS; REFERENCE POINTS

Availability of Lands:

4.1. OWNER shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by OWNER, unless otherwise provided in the Contract Documents. If CONTRACTOR believes that any delay in OWNER's furnishing these lands, rights-of–way or easements entitles CONTRACTOR to an extension of the Contract Time, CONTRACTOR may make a claim therefor as provided in Article 12. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

Physical Conditions:

4.2.1. *Explorations and Reports*: Reference is made to the Supplementary Conditions for identification of those reports of explorations and tests of subsurface conditions at the site that have been utilized by ENGINEER in preparation of the Contract Documents. CONTRACTOR may rely upon the accuracy of the technical data contained in such reports, but not upon nontechnical data, interpretations or opinions contained therein or for the completeness thereof for CONTRACTOR's purposes. Except as indicated in the immediately preceding sentence and in paragraph 4.2.6, CONTRACTOR shall have full responsibility with respect to subsurface conditions at the site.

4.2.2. *Existing Structures*: Reference is made to the Supplementary Conditions for identification of those drawings of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilities referred to in paragraph 4.3) which are at or contiguous to the site that have been utilized by ENGINEER in preparation of the Contract Documents. CONTRACTOR may rely upon the accuracy of the technical data contained in such drawings, but not for the completeness thereof for CONTRACTOR's purposes. Except as indicated in the immediately preceding sentence and in paragraph 4.2.6, CONTRACTOR shall have full responsibility with respect to physical conditions in or relating to such structures.

4.2.3. *Report of Differing Conditions*: If CONTRACTOR believes that:

4.2.3.1. any technical data on which CONTRACTOR is entitled to rely as provided in paragraphs 4.2.1 and 4.2.2 is inaccurate, or

4.2.3.2. any physical condition uncovered or revealed at the site differs materially from that indicated, reflected or referred to in the Contract Documents,

CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.22), notify OWNER and ENGINEER in writing about the inaccuracy or difference.

4.2.4. *ENGINEER's Review*: ENGINEER will promptly review the pertinent conditions, determine the necessity of obtaining additional explorations or tests with respect thereto and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

4.2.5. *Possible Document Change*: If ENGINEER concludes that there is a material error in the Contract Documents or that because of newly discovered conditions a change in the Contract Documents is required, a Work Directive Change or a Change Order will be issued as provided in Article 10 to reflect and document the consequences of the inaccuracy or difference.

4.2.6. *Possible Price and Time Adjustments*: In each such case, an increase or decrease in the Contract Price or an extension or shortening of the Contract Time, or any combination thereof, will be allowable to the extent that they are attributable to any such inaccuracy or difference. If OWNER and CONTRACTOR are unable to agree as to the amount or length thereof, a claim may be made therefor as provided in Articles 11 and 12.

Physical Conditions – Underground Facilities:

4.3.1. *Shown of Indicated*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

4.3.1.1. OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and,

4.3.1.2. CONTRACTOR shall have full responsibility for reviewing and checking all such information and data, for locating all Underground Facilities shown or indicated in the Contract Documents, for coordination of the Work with the owners of such Underground Facilities during construction, for the safety and protection thereof as provided in paragraph 6.20 and repairing any damage thereto resulting from the Work, the cost of all of which will be considered as having been included in the Contract Price.

4.3.2. *Not Shown or Indicated*. If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents and which CONTRACTOR could not reasonably have been expected to be aware of, CONTRACTOR shall, promptly after becoming aware thereof and before performing any Work affected thereby (except in an emergency as permitted by paragraph 6.22), identify the owner of such Underground Facility and give written notice thereof to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility to determine the extent to which the Contract Documents should be modified to reflect and document the consequences of the existence of the Underground Facility, and the Contract Documents will be amended or supplemented to the extent necessary. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 6.20. CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, to the extent that they are attributable to the existence of any Underground Facility that was not shown or indicated in the Contract Documents and which CONTRACTOR could not reasonably have been expected to be aware of. If the parties are unable to agree as to the amount or length thereof, CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

Reference Points:

4.4. OWNER shall provide engineering surveys to establish reference points for construction which in ENGINEER's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work (unless otherwise specified in the General Requirements),

shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

ARTICLE 5—BONDS AND INSURANCE

Performance and Other Bonds:

5.1. CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as otherwise provided by Law or Regulation or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary Conditions. All Bonds shall be in the forms prescribed by Law or Regulation or by the Contract Documents and be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of the authority to act.

5.2. If the surety on any Bond furnished by CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.1, CONTRACTOR shall within five days thereafter substitute another Bond and Surety, both of which must be acceptable to OWNER.

Contractor's Liability Insurance:

5.3. CONTRACTOR shall purchase and maintain such comprehensive general liability and other insurance as is appropriate for the Work being performed and furnished and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance and furnishing of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed or furnished by CONTRACTOR, by any Subcontractor, by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for those acts any of them may be liable:

5.3.1. Claims under workers' or workmen's compensation, disability benefits and other similar employee benefit acts;

5.3.2. Claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;

5.3.3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;

5.3.4. Claims for damages insured by personal injury liability coverage which are substained (a) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (b) by any other person for any other reason;

5.3.5. Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom;

5.3.6. Claims arising out of operation of Laws or Regulations for damages because of bodily injury or death of any person or for damage to property; and

5.3.7. Claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

The insurance required by this paragraph 5.3 shall include the specific coverages and be written for not less than the limits of liability and coverages provided in the Supplementary Conditions, or required by law, whichever is greater. The comprehensive general liability insurance shall include completed operations insurance. All of the policies of insurance so required to be purchased and maintained (or the certificates or other evidence thereof) shall contain a provision or endorsement that the coverage afforded will not be cancelled, materially changed or renewal refused until at least thirty days' prior written notice has been given to OWNER and ENGINEER by certified mail. All such insurance shall remain in effect until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing *defective* Work in accordance with paragraph 13.12. In addition, CONTRACTOR shall maintain such completed operations insurance for at least two years after final payment and furnish OWNER with evidence of continuation of such insurance at final payment and one year thereafter.

Constructual Liability Insurance:

5.4. The comprehensive general liability insurance required by paragraph 5.3 will include contractual liability insurance applicable to CONTRACTOR's obligations under paragraphs 6.30 and 6.31.

Owner's Liability Insurance:

5.5. OWNER shall be responsible for purchasing and maintaining OWNER's own liability insurance and, at OWNER's option, may purchase and maintain such insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

Property Insurance:

5.6. Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property insurance upon the Work at the site to the full insurable value thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER and ENGINEER's consultants in the Work, all of whom shall be listed as insureds or additional insured parties, shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss and damage including theft, vandalism and malicious mischief, collapse and water damage, and such other perils as may be provided in the Supplementary Conditions, and shall include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other

professionals). If not covered under the "all risk" insurance or otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain similar property insurance on portions of the Work stored on and off the site or in transit when such portions of the Work are to be included in an Application for Payment.

5.7. OWNER shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER and ENGINEER's consultants in the Work, all of whom shall be listed as insured or additional insured parties.

5.8. All the policies of insurance (or the certificates or other evidence thereof) required to be purchased and maintained by OWNER in accordance with paragraphs 5.6 and 5.7 will contain a provision or endorsement that the coverage afforded will not be cancelled or materially changed or renewal refused until at least thirty days' prior written notice has been given to CONTRACTOR by certified mail and will contain waiver provisions in accordance with paragraph 5.11.2.

5.9. OWNER shall not be responsible for purchasing and maintaining any property insurance to protect the interests of CONTRACTOR, Subcontractors or others in the Work to the extent of any deductible amounts that are provided in the Supplementary Conditions. The risk of loss within the deductible amount, will be borne by CONTRACTOR, Subcontractor or others suffering any such loss and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.10. If CONTRACTOR requests in writing that other special insurance be included in the property insurance policy, OWNER shall, if possible, include such insurance, and the cost thereof will be charged to CONTRACTOR by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the site, OWNER shall in writing advise CONTRACTOR whether or not such other insurance has been procured by OWNER.

Waiver of Rights:

5.11.1. OWNER and CONTRACTOR waive all rights against each other for all losses and damages caused by any of the perils covered by the policies of insurance provided in response to paragraphs 5.6 and 5.7 and any other property insurance applicable to the Work, and also waive all such rights against the Subcontractors, ENGINEER, ENGINEER's consultants and all other parties named as insureds in such policies for losses and damages so caused. As required in paragraph 6.11, each subcontract between CONTRACTOR and a Subcontractor will contain similar waiver provisions by the Subcontractor in favor of OWNER, CONTRACTOR, ENGINEER, ENGINEER's consultants and all other parties named as insureds. None of the above waivers shall extend to the rights that any of the insured parties may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

5.11.2. OWNER and CONTRACTOR intend that any policies provided in response to paragraphs 5.6 and 5.7 shall protect all of the parties insured and provide primary coverage for all losses and damages caused by the perils covered thereby. Accordingly, all such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any of the parties named as insureds or additional insureds, and if the insurers require separate waiver forms to be signed by ENGINEER or ENGINEER's consultant OWNER will obtain the same, and if such waiver forms are required of any Subcontractor, CONTRACTOR will obtain the same.

Receipt and Application of Proceeds:

5.12. Any insured loss under the policies of insurance required by paragraphs 5.6 and 5.7 will be adjusted with OWNER and made payable to OWNER as trustee for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 5.13. OWNER shall deposit in a separate account any money so received, and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

5.13. OWNER as trustee shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within fifteen days after the occurrence of loss to OWNER's exercise of this power. If such objection is made, OWNER as trustee shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If required in writing by any party in interest, OWNER as trustee shall, upon the occurrence of an insured loss, give bond for the proper performance of such duties.

Acceptance of Insurance:

5.14. If OWNER has any objection to the coverage afforded by or other provisions of the insurance required to be purchased and maintained by CONTRACTOR in accordance with paragraphs 5.3 and 5.4 on the basis of its not complying with the Contract Documents, OWNER shall notify CONTRACTOR in writing thereof within ten days of the date of delivery of such certificates to OWNER in accordance with paragraph 2.7. If CONTRACTOR has any objection to the coverage afforded by or other provisions of the policies of insurance required to be purchased and maintained by OWNER in accordance with paragraphs 5.6 and 5.7 on the basis of their not complying with the Contract Documents, CONTRACTOR shall notify OWNER in writing thereof within ten days of the date of delivery of such certificates to CONTRACTOR in accordance with paragraph 2.7. OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided by each as the other may reasonably request. Failure by OWNER or CONTRACTOR to give any such notice of objection within the time provided shall constitute acceptance of such insurance purchased by the other as complying with the Contract Documents.

Partial Utilization – Property Insurance:

5.15. If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with paragraph 14.10; provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected the changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be cancelled or lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence:

6.1. CONTRACTOR shall supervise and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of others in the design or selection of a specific means, method, technique, sequence or procedure of construction which is indicated in and required by the Contract Documents. CONTRACTOR shall be responsible to see that the finished Work complies accurately with the Contract Documents.

6.2. CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the site and shall have authority to act on behalf of CONTRACTOR. All communications given to the superintendent shall be as binding as if given to CONTRACTOR.

Labor, Materials and Equipment:

6.3. CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the site. Except in connection with the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all work at the site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without OWNER's written consent given after prior written notice to ENGINEER.

6.4. Unless otherwise specified in the General Requirements, CONTRACTOR shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

6.5. All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instruction of the applicable Supplier except as otherwise provided in the Contract Documents; but no provision of any such instructions will be effective as assign to ENGINEER, or any of ENGINEER's consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.15 or 9.16.

Adjusting Progress Schedule:

6.6. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.9) adjustments in the progress schedule to reflect the impact thereon of new developments; these will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

Substitutes or "Or-Equal" Items:

6.7.1. Whenever materials or equipment are specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier the naming of the item is intended to establish the type, function and quality required. Unless the name is followed by words indicating that no substitution is permitted, materials or equipment of other Suppliers may be accepted by ENGINEER if sufficient information is submitted by CONTRACTOR to allow ENGINEER to determine that the material or equipment proposed is equivalent or equal to that named. The procedure for review by ENGINEER will include the following as supplemented in the General Requirements. Requests for review of substitute items of material and equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall make written application to ENGINEER for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar and of equal substance to that specified and be suited to the same use as that specified. The application will state that the evaluation and acceptance of the proposed substitution will not prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which shall be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish at CONTRACTOR's expense additional data about the proposed substitute.

6.7.2. If a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, sequence, technique or procedure of construction acceptable to ENGINEER, if CONTRACTOR submits sufficient information to allow ENGINEER to determine that the substitute proposed is equivalent to that indicated or required by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in paragraph 6.7.1 as applied by ENGINEER and as may be supplemented in the General Requirements.

6.7.3. ENGINEER will be allowed a reasonable time within which to evaluate each proposed substitute. ENGINEER will be the sole judge of acceptability, and no substitute will be ordered, installed or utilized without ENGINEER's prior written acceptance which will be evidenced by either a Change Order or an approved Shop

Drawing. OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute. ENGINEER will record time required by ENGINEER and ENGINEER's consultants in evaluating substitutions proposed by CONTRACTOR and in making changes in the Contract Documents occasioned thereby. Whether or not ENGINEER accepts a proposed substitute, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's consultants for evaluating each proposed substitute.

Concerning Subcontractors, Suppliers and Others:

6.8.1. CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization (including those acceptable to OWNER and ENGINEER as indicated in paragraph 6.8.2), whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

6.8.2. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials and equipment) to be submitted to OWNER in advance of the specified date prior to the Effective Date of the Agreement for acceptance by OWNER and ENGINEER and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's or ENGINEER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the bidding documents or the Contract Documents) of any such Subcontractor, Supplier or other person or organization so identified may be revoked on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable substitute, the Contract Price will be increased by the difference in the cost occasioned by such substitution and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER or ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER or ENGINEER to reject *defective* Work.

6.9. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create any contractual relationship between OWNER or ENGINEER any such Subcontractor, Supplier or other person or organization, not shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws and Regulations.

6.10. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

6.11. All Work performed for CONTRACTOR by a Subcontractor will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor which specifically binds the Subcontractor to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER and contains waiver provisions as required by paragraph 5.11. CONTRACTOR shall pay each Subcontractor a just share of any insurance moneys received by CONTRACTOR on account of losses under policies issued pursuant to paragraphs 5.6 and 5.7.

Patent Fees and Royalties:

6.12. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. CONTRACTOR shall indemnify and hold harmless OWNER and ENGINEER and anyone directly or indirectly employed by either of them from and against all claims, damages, losses and expenses (including attorney's fees and court and arbitration costs) arising out of any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any inventions, design, process, product or device not specified in the Contract Documents, and shall defend all such claims in connection with any alleged infringement of such rights.

Permits:

6.13. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or if there are no Bids on the Effective Date of the Agreement, CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto such as plant investment fees.

Laws and Regulations:

6.14.1. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to furnishing and performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

6.14.2. If CONTRACTOR observes that the Specifications or Drawings are at variance with any Laws or Regulations, CONTRACTOR shall give ENGINEER prompt written notice thereof, and any necessary changes will be authorized by one of the methods indicated in paragraph 3.4. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to such Laws or Regulations, and without such notice to ENGINEER, CONTRACTOR shall bear all costs arising therefrom; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with such Laws and Regulations.

Taxes:

6.15. CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

Use of Premises:

6.16. CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the Project site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by Laws and Regulations, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereto or of any land or areas contiguous thereto, resulting from the performance of the Work. Should any claim be made against OWNER or ENGINEER by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly attempt to settle with such other party by agreement or otherwise resolve the claim by arbitration or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold OWNER and ENGINEER harmless from and against all claims, damages, losses and expenses (including, but not limited to, fees of engineers, architects, attorneys and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any such other party against OWNER or ENGINEER to the extent based on a claim arising out of CONTRACTOR's performance of the Work.

6.17. During the progress of the Work, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery, and surplus materials, and shall leave the site clean and ready for occupancy by OWNER. CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

6.18. CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

Record Documents:

6.19. CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Directive Changes, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and annotated to show all changes made during construction. These record documents together with all approved samples and a counterpart of all approved Shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, samples and Shop Drawings will be delivered to ENGINEER for OWNER.

Safety and Protection:

6.20. CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.20.1. all employees on the Work and other persons and organizations who may be affected thereby:

6.20.2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the site; and

6.20.3. other property at the site or adjacent thereto, including trees, shrubs, laws, walks, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of construction.

CONTRACTOR shall comply with all applicable Laws and Regulations of any public body having jurisdiction for the safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in paragraph 6.20.2 or 6.20.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR). CONTRACTOR's duties and responsibilities for the safety and protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.13 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.21. CONTRACTOR shall designate a responsible representative at the site whose duty shall be the prevention of accidents. This person shall be CONTRACTOR's superintendent unless otherwise designated in writing by CONTRACTOR to OWNER.

Emergencies:

6.22. In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, CONTRACTOR, without special instruction or authorization from ENGINEER or OWNER, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Contract Documents is required because of the action taken in response to an emergency, a Work Directive Change or Change Order will be issued to document the consequences of the changes or variations.

Shop Drawings and Samples:

6.23. After checking and verifying all field measurements and after complying with applicable procedures specified in the General Requirements, CONTRACTOR shall submit to ENGINEER for review and approval in accordance with the accepted schedule of Shop Drawing submissions (see paragraph 2.9), or for other appropriate action if so indicated in the Supplementary Conditions, five copies (unless otherwise specified in the General Requirements) of all Shop Drawings, which will bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission. All submissions will be identified as ENGINEER may require. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to enable ENGINEER to review the information as required.

6.24. CONTRACTOR shall also submit to ENGINEER for review and approval with such promptness as to cause no delay in Work, all samples required by the Contract Documents. All samples will have been checked by and accompanied by a specific written indication that CONTRACTOR has satisfied CONTRACTOR's responsibilities under the Contract Documents with respect to the review of the submission and will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended.

6.25.1. Before submission of each Shop Drawing or sample CONTRACTOR shall have determined and verified all quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar data with respect thereto and reviewed or coordinated each Shop Drawing or sample with other Shop Drawings and samples and with the requirements of the Work and the Contract Documents.

6.25.2. At the time of each submission, CONTRACTOR shall give ENGINEER specific written notice of each variation that the Shop Drawings or samples may have from the requirements of the Contract Documents, and, in addition, shall cause a specific notation to be made on each Shop Drawing submitted to ENGINEER for review and approval of each such variation.

6.26. ENGINEER will review and approve with reasonable promptness Shop Drawings and samples, but ENGINEER's review and approval will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is indicated in or required by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. CONTRACTOR shall make corrections required by ENGINEER, and shall return the required number of corrected copies of Shop Drawings and submit as required new samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.27. ENGINEER's review and approval of Shop Drawings or samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of submission as required by paragraph 6.25.2 and ENGINEER has given written

approval of each such variation by a specific written notation thereof incorporated in or accompanying the Shop Drawing or sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the provisions of paragraph 6.25.1.

6.28. Where a Shop Drawing or sample is required by the Specifications, any related Work performed prior to ENGINEER's review and approval of the pertinent submission will be the sole expense and responsibility of CONTRACTOR.

Continuing the Work:

6.29. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.5 or as CONTRACTOR and OWNER may otherwise agree in writing.

Indemnification:

6.30. To the fullest extent permitted by Laws and Regulations CONTRACTOR shall indemnify and hold harmless OWNER and ENGINEER and their consultants, agents and employees from and against all claims, damages, losses and expenses, direct, indirect or consequential (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs) arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom and (b) is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder or arises by or is imposed by Law and Regulations regardless of the negligence of any such party.

6.31. In any and all claims against OWNER or ENGINEER or any of their consultants, agents or employees by any employee of CONTRACTOR, any Subcontractor, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.30 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR or any such Subcontractor or other person or organization under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

6.32. The obligations of CONTRACTOR under paragraph 6.30 shall not extend to the liability of ENGINEER, ENGINEER's consultants, agents or employees arising out of the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications.

ARTICLE 7 – OTHER WORK

Related Work at Site:

7.1. OWNER may perform other work related to the Project at the site by OWNER's own forces, have other work performed by utility owners or let other direct contracts therefor which shall contain General Conditions similar to these. If the fact that such other work is to be performed was not noted in the Contract Documents, written notice thereof will be given to CONTRACTOR prior to starting any such other work; and, if CONTRACTOR believes that such performance will involve additional expense to CONTRACTOR or requires additional time and the parties are unable to agree as to the extent thereof, CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

7.2. CONTRACTOR shall afford each utility owner and other contractor who is a party to such a direct contract (or OWNER, if OWNER is performing the additional work with OWNER's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such work, and shall properly connect and coordinate the Work with theirs, CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

7.3. If any part of CONTRACTOR's Work depends for proper execution or results upon the work of any such other contractor or utility owner (or OWNER), CONTRACTOR shall inspect and promptly report to ENGINEER in writing any delays, defects or deficiencies in such work that render it unavailable or unsuitable for such proper execution and results. CONTRACTOR's failure so to report will constitute an acceptance of the other work as fit and proper for integration with CONTRACTOR's Work except for latent or non-apparent defects and deficiencies in the other work.

Coordination:

7.4. If OWNER contracts with others for the performance of other work on the Project at the site, the person or organization who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified in the Supplementary Conditions, and the specific matters to be covered by such authority and responsibility will be itemized, and the extent of such authority and responsibilities will be provided, in the Supplementary Conditions. Unless otherwise provided in the Supplementary Conditions, neither OWNER nor ENGINEER shall have any authority or responsibility in respect of such coordination.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.1. OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.2. In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer against whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER. Any dispute in connection with such appointment shall be subject to arbitration.

8.3. OWNER shall furnish the data required of OWNER under the Contract Documents promptly and shall make payments to CONTRACTOR promptly after they are due as provided in paragraphs 14.4 and 14.13.

8.4. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.4. Paragraph 4.2 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the site and in existing structures which have been utilized by ENGINEER in preparing the Drawings and Specifications.

8.5. OWNER's responsibilities in respect of purchasing and maintaining liability and property insurance are set forth in paragraph 5.5 through 5.8.

8.6. OWNER is obligated to execute Change Orders as indicated in paragraph 10.4.

8.7. OWNER's responsibility in respect of certain inspections, tests and approvals is set forth in paragraph 13.4.

8.8. In connection with OWNER's right to stop Work or suspend Work, see paragraphs 13.10 and 15.1. Paragraph 15.2 deals with OWNER's right to terminate services of CONTRACTOR under certain circumstances.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

Owner's Representative:

9.1. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and shall not be extended without written consent of OWNER and ENGINEER.

Visits to Site:

9.2. ENGINEER will make visits to the site at intervals appropriate to the various stages of construction to observe the progress and quality of the executed Work and to determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform to the Contract Documents. On the basis of such visits and on-site observations as an experienced and qualified design professional, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defects and deficiencies in the Work.

Project Representative:

9.3. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in observing the performance of the Work. The duties, responsibilities and limitations of authority of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions. If OWNER designates another agent to represent OWNER at the site who is not ENGINEER's agent or employee, the duties, responsibilities and limitations of authority of such other person will be as provided in the Supplementary Conditions.

Clarifications and Interpretations:

9.4. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of drawings or otherwise) as ENGINEER may determine necessary, which shall be consistent with or reasonably inferable from the overall intent of the Contract Documents. If CONTRACTOR believes that a written clarification or interpretation justifies an increase in the Contract Price or an extension of the Contract Time and the parties are unable to agree to the amount or extent thereof, CONTRACTOR may make a claim therefor as provided in Article 11 or Article 12.

Authorized Variations in Work:

9.5. ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time and are consistent with the overall intent of the Contract Documents. These may be accomplished by a Field Order and will be binding an OWNER, and also on CONTRACTOR who shall perform the Work involved promptly. If CONTRACTOR believes that a Field Order justifies an increase in the Contract Price or an extension of the Contract Time and the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a claim therefor as provided in Article 11 or 12.

Rejecting Defective Work:

9.6. ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be *defective*, and will also have authority to require special inspection or testing of the Work as provided in paragraph 13.9, whether or not the Work is fabricated, installed or completed.

Shop Drawings, Change Orders and Payments:

9.7. In connection with ENGINEER's responsibility for Shop Drawings and samples, see paragraphs 6.23 through 6.29 inclusive.

9.8. In connection with ENGINEER's responsibilities as to Change Orders, see Articles 10, 11 and 12.

9.9. In connection with ENGINEER's responsibilities in respect of Applications for Payment, etc., see Article 14.

Determination for Unit Price:

9.10. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR ENGINEER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decisions thereon will be final and binding upon OWNER and CONTRACTOR, unless, within ten days after the date of any such decision, either OWNER or CONTRACTOR delivers to the other party to the Agreement and to ENGINEER written notice of intention to appeal from such a decision.

Decisions on Disputes:

9.11. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work and claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Time will be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph, which ENGINEER will render in writing within a reasonable time. Written notice of each such claim, dispute and other matter will be delivered by the claimant to ENGINEER and the other party to the Agreement promptly (but in no event later than thirty days) after the occurrence of the event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other party within sixty days after such occurrence unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim.

9.12. When functioning as interpreter and judge under paragraphs 9.10 and 9.11, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to paragraphs 9.10 and 9.11 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.16) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such claim, dispute or other matter.

Limitations on ENGINEER's Responsibilities:

9.13. Neither ENGINEER's authority to act under this Article 9 or elsewhere in the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority shall give rise to any duty or responsibility of ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization performing any of the Work, or to any surety for any of them.

9.14. Wherever in the Contract Documents the terms "as ordered", "as directed", "as required", "as allowed", "as approved", or terms of like effect or import are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of ENGINEER as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.15 or 9.16.

9.15. ENGINEER will not be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, and ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

9.16. ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

ARTICLE 10 – CHANGES IN THE WORK

10.1. Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work; these will be authorized by a Written Amendment, a Change Order, or a Work Directive Change. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

10.2. If OWNER and CONTRACTOR are unable to agree as to the extent, if any, of an increase or decrease in the Contract Price or an extension or shortening of the Contract Time that should be allowed as a result of a Work Directive Change, a claim may be made therefor as provided in Article 11 or Article 12.

10.3. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraphs 3.4. and 3.5, except in the case of an emergency as provided in paragraph 6.22 and except in the case of uncovering Work as provided in paragraph 13.9.

10.4. OWNER and CONTRACTOR shall execute appropriate Change Orders (or Written Amendments) covering:

10.4.1. changes in the Work which are ordered by OWNER pursuant to paragraph 10.1, are required because of acceptance of *defective* Work under paragraph 13.13 or correcting *defective* Work under paragraph 13.14, or are agreed to by the parties;

10.4.2. changes in the Contract Price or Contract Time which are agreed to by the parties; and

10.4.3. changes in the Contract Price or Contract Time which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 9.11;

provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal. CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.29.

10.5. If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Time) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility, and the amount of each applicable Bond will be adjusted accordingly.

ARTICLE 11 – CHANGE OF CONTRACT PRICE

11.1. The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at his expense without change in the Contract Price.

11.2. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any claim for an increase or decrease in the Contract Price shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than thirty days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within sixty days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by claimant's written statement that the amount claimed covers all known amounts (direct, indirect and consequential) to which the claimant is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Price shall be determined by ENGINEER in accordance with paragraph 9.11 if OWNER and CONTRACTOR cannot otherwise agree on the amount involved. No claim for an adjustment in the Contract Price will be valid if not submitted in accordance with this paragraph 11.2.

11.3. The value of any Work covered by a Change Order or of any claim for an increase or decrease in the Contract Price shall be determined in one of the following ways:

11.3.1. Where the Work involved is covered by unit prices contained in the Contract Documents, by application of unit prices to the quantities of the items involved (subject to the provisions of paragraphs 11.9.1 through 11.9.3, inclusive).

11.3.2. By mutual acceptance of a lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 11.6.2.1).

11.3.3. On the basis of the Cost of the Work (determined as provided in paragraphs 11.4 and 11.5) plus a CONTRACTOR's Fee for overhead and profit (determined as provided in paragraphs 11.6 and 11.7).

Cost of the Work:

11.4. The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in paragraph 11.5:

11.4.1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' or workmen's compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. Such employees shall include superintendents and foremen at the site. The expenses of performing Work after regular working hours, on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by OWNER.

11.4.2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and all returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

11.4.3. Payments made by CONTRACTOR to the Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to CONTRACTOR and shall deliver such bids to OWNER who will then determine, with the advice of ENGINEER, which bids will be accepted. If a subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a Fee, the Subcontractor's Cost of the Work shall be determined in the same manner as CONTRACTOR's Cost of the Work. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

11.4.4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work.

11.4.5. Supplemental costs including the following:

11.4.5.1. The proportion of necessary transportation, travel and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

11.4.5.2. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office and temporary facilities at the site and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost less market value of such items used but not consumed which remain the property of CONTRACTOR.

11.4.5.3. Rentals of all construction equipment and machinery and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, installation, dismantling and removal thereof-all in accordance with terms of said rental agreements. The rental of any such equipment, machinery or parts shall cease when the use thereof is no longer necessary for the Work.

11.4.5.4. Sales, consumer, use or similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

11.4.5.5. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or

for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

11.4.5.6. Losses and damages (and related expenses), not compensated by insurance or otherwise, to the Work or otherwise sustained by CONTRACTOR in connection with the performance and furnishing of the Work (except losses and damages within the deductible amounts of property insurance established by OWNER in accordance with paragraph 5.9), provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's Fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraph 11.6.2.

11.4.5.7. The cost of utilities, fuel and sanitary facilities at the site.

11.4.5.8. Minor expenses such as telegrams, long distance telephone calls, telephone service at the site, expressage and similar petty cash items in connection with the Work.

11.4.5.9. Cost of premiums for additional Bonds and insurance required because of changes in the Work and premiums for property insurance coverage within the limits of the deductible amounts established by OWNER in accordance with paragraph 5.9.

11.5. The term Cost of the Work shall not include any of the following:

11.5.1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in CONTRACTOR's principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.4.1 or specifically covered by paragraph 11.4.4-all of which are to be considered administrative costs covered by the CONTRACTOR's Fee.

11.5.2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the site.

11.5.3. Any of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

11.5.4. Cost of premiums for all Bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same (except for the cost of premiums covered by sub-paragraph 11.4.5.9 above).

11.5.5. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of *defective* Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

11.5.6. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 11.4.

Contractor's Fee:

11.6. The CONTRACTOR's Fee allowed to CONTRACTOR for overhead and profit shall be determined as follows:

11.6.1. a mutually acceptable fixed fee; or if none can be agreed upon.

(This space was left blank intentionally).

11.7. Whenever the cost of any Work is to be determined pursuant to paragraph 11.4 or 11.5, CONTRACTOR will submit in form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

Cash Allowances:

11.8. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be done by such Subcontractors or Suppliers and for such sums within the limit of the allowances as may be acceptable to ENGINEER, CONTRACTOR agrees that:

11.8.1. The allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the site, and all applicable taxes; and

11.8.2. CONTRACTOR's costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances. No demand for additional payment on account of any thereof will be valid.

Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

Unit Price Work:

11.9.1. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit prices for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER in accordance with Paragraph 9.10.

11.9.2. Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

11.9.3. Where the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement and there is no corresponding adjustment with respect to any other item of Work and if CONTRACTOR believes that CONTRACTOR has incurred additional expense as a result thereof, CONTRACTOR may make a claim for an increase in the Contract Price in accordance with Article 11 if the parties are unable to agree as to the amount of any such increase.

ARTICLE 12 – CHANGE OF CONTRACT TIME

12.1. The Contract Time may only be changed by a Change Order or a Written Amendment. Any claim for an extension or shortening of the Contract Time shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than thirty days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within sixty days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Time shall be determined by ENGINEER in accordance with paragraph 9.11 if OWNER and CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Time will be valid if not submitted in accordance with the requirements of this paragraph 12.1.

12.2. The Contract Time will be extended in an amount equal to time lost due to delays beyond the control of CONTRACTOR if a claim is made therefor as provided in paragraph 12.1. Such delays shall include, but not be limited to, acts or neglect by OWNER or others performing additional work as contemplated by Article 7, or to fires, floods, labor disputes, epidemics, abnormal weather conditions or acts of God.

12.3. All time limits stated in the Contract Documents are of the essence of the Agreement. The provisions of this Article 12 shall not exclude recovery for damages (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs) for delay by either party.

ARTICLE 13 – WARRANTY AND GUARANTEE; TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

Warranty and Guarantee:

13.1. CONTRACTOR warrants and guarantees to OWNER and ENGINEER that all Work will be in accordance with the Contract Documents and will not be *defective*. Prompt notice of all defects shall be given to CONTRACTOR. All *defective* Work, whether or not in place, may be rejected, corrected or accepted as provided in this Article 13.

Access to Work:

13.2. ENGINEER and ENGINEER's representatives, other representatives of OWNER, testing agencies and governmental agencies with jurisdictional interests will have access to the Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide proper and safe conditions for such access.

Tests and Inspections:

13.3. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests or approvals.

13.4. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) to specifically be inspected, tested or approved. CONTRACTOR shall assume full responsibility therefor, pay all costs in connection therewith and furnish ENGINEER the required certificates of inspection, testing or approval. CONTRACTOR shall also be responsible for and shall pay all costs in connection with any inspection or testing required in connection with OWNER's or ENGINEER's acceptance of a Supplier of materials or equipment proposed to be incorporated in the Work, or of materials or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. The cost of all inspections, tests and approvals in addition to the above which are required by the Contract Documents shall be paid by OWNER (unless otherwise specified).

13.5. All inspections, tests or approvals other than those required by Laws or Regulations of any public body having jurisdiction shall be performed by organizations acceptable to OWNER and CONTRACTOR (or by ENGINEER if so specified).

13.6. If any Work (including the work of others) that is to be inspected, tested or approved is covered without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation. Such uncovering shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

13.7. Neither observations by ENGINEER nor inspections, tests or approvals by other shall relieve CONTRACTOR from CONTRACTOR's obligations to perform the Work in accordance with the Contract Documents.

Uncovering Work:

13.8. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

13.9. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose or otherwise make available for observation, inspection or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is *defective*, CONTRACTOR shall bear all direct, indirect and consequential costs of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, (including but not limited to fees and charges of engineers, architects, attorneys and other professionals), and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, may make a claim therefor as provided in Article 11. If, however, such Work is not found to be *defective*, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a claim therefor as provided in Articles 11 and 12.

Owner May Stop the Work:

13.10. If the Work is *defective*, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any other party.

Correction or Removal of Defective Work:

13.11. If required by ENGINEER, CONTRACTOR shall promptly, as directed, either correct all *defective* Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by ENGINEER, remove it from the site and replace it with *nondefective* Work. CONTRACTOR shall bear all direct, indirect and consequential costs of such correction or removal (including but not limited to fees and charges of engineers, architects, attorneys and other professionals) made necessary thereby.

One Year Correction Period:

13.12. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be *defective*, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions, either correct such *defective* Work, or, if it has been rejected by OWNER, remove it from the site and replace it with *nondefective* Work. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the *defective* Work corrected or the rejected Work removed and replaced, and all direct, indirect and consequential costs of such removal and replacement (including but not limited to fees and charges of engineer, architects, attorneys and other professionals) will be paid by CONTRACTOR. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendments.

Acceptance of Defective Work:

13.13. If, instead of requiring correction or removal and replacement of *defective* Work, OWNER (and, prior to ENGINEER's recommendation of final payment, also ENGINEER) prefers to accept it, OWNER may do so, CONTRACTOR shall bear all direct, indirect and consequential costs attributable to OWNER's evaluation of and determination to accept such *defective* Work (such costs to be approved by ENGINEER as to reasonableness and to include but not be limited to fees and charges of engineers, architects, attorneys and other professionals). If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefor as provided in Article 11. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

OWNER May Correct Defective Work:

13.14. If CONTRACTOR fails within a reasonable time after written notice of ENGINEER to proceed to correct and to correct *defective* Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.11, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, of if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days' written notice to CONTRACTOR, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph OWNER shall proceed expeditiously. To the extent necessary to complete corrective and remedial action, OWNER may include CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees such access to the site as may be necessary to enable OWNER to exercise the rights and remedies under this paragraph. All direct, indirect and consequential costs of OWNER in exercising such rights and remedies will be charged against CONTRACTOR in an amount approved as to reasonableness by ENGINEER, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefor as provided in Article 11. Such direct, indirect and consequential costs will include but not be limited to fees and charges of engineers, architects, attorneys and other professionals, all court and arbitration costs and all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR's *defective* Work, CONTRACTOR shall not be allowed an extension of the Contract Time because of any delay in performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies hereunder.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

Schedule of Values:

14.1. The schedule of values established as provided in paragraph 2.9 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

Application for Progress Payment:

14.2. At least twenty days before each progress payment is scheduled (but not often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that OWNER has received the materials and equipment free and clear of all liens, charges, security interests and encumbrances (which are hereinafter in these General Conditions referred to as "Liens") and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect OWNER's interest therein, all of which will be satisfactory to OWNER. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

CONTRACTOR's Warranty of Title:

14.3. CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

Review of Applications for Progress Payment:

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14.5. ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's on-site observations of the Work in progress as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules that the Work has progressed to the point indicated; that, to the best of ENGINEER's knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.10, and to any other qualifications stated in the recommendation); and that CONTRACTOR is entitled to payment of the amount recommended. However, by recommending any such payment ENGINEER will not thereby be deemed to have represented that exhaustive or continuous on-site inspections have been made to

check the quality or the quantity of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents or that there may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or OWNER to withhold payment to CONTRACTOR.

14.6. ENGINEER's recommendation of final payment will constitute an additional representation by ENGINEER to OWNER that the conditions precedent to CONTRACTOR's being entitled to final payment as set forth in paragraph 14.13 have been fulfilled.

14.7. ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make such representations to OWNER. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

14.7.1. the Work is *defective*, or completed Work has been damaged requiring correction or replacement,

14.7.2. the Contract Price has been reduced by Written Amendment or Change Order;

14.7.3. OWNER has been required to correct *defective* Work or complete Work in accordance with paragraph 13.14, or

14.7.4. of ENGINEER's actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.9 inclusive.

OWNER may refuse to make payment of the full amount recommended by ENGINEER because claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work or Liens have been filed in connection with the Work or there are other items entitling OWNER to a set-off against the amount recommended, but OWNER must give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action.

Substantial Completion:

14.8. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, CONTRACTOR and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within fourteen days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said fourteen days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

14.9. OWNER shall have the right to exclude CONTRACTOR from the Work after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

Partial Utilization:

14.10. Use by OWNER of any finished part of the Work, which has specifically been identified in the Contract Documents, or which OWNER, ENGINEER and CONTRACTOR agree constitutes a separately functioning and useable part of the Work that can be used by OWNER without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following:

14.10.1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees, CONTRACTOR will certify to OWNER and ENGINEER that said part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraphs 14.8 and 14.9 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

14.10.2. OWNER may at any time request CONTRACTOR in writing to permit OWNER to take over operation of any such part of the Work although it is not substantially complete. A copy of such request will be sent to ENGINEER and within a reasonable time thereafter OWNER, CONTRACTOR and ENGINEER shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If CONTRACTOR does not object in writing to OWNER and ENGINEER that

such part of the Work is not ready for separate operation by OWNER, ENGINEER will finalize the list of items to be completed or corrected and will deliver such list to OWNER and CONTRACTOR together with a written recommendation as to the division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, utilities, insurance, warranties and guarantees for that part of the Work which will become binding upon OWNER and CONTRACTOR at the time when OWNER takes over such operation (unless they shall have otherwise agreed in writing and so informed ENGINEER). During such operation and prior to Substantial Completion of such part of the Work, OWNER shall allow CONTRACTOR reasonable access to complete or correct items on said list and to complete other related Work.

14.10.3. No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of paragraph 5.15 in respect of property insurance.

Final Inspection:

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

Final Application for Payment:

14.12. After CONTRACTOR has completed all such corrections to the satisfaction of ENGINEER and delivered all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, marked-up record documents (as provided in paragraph 6.19) and other documents-all as required by the Contract Documents, and after ENGINEER has indicated that the Work is acceptable (subject to the provisions of paragraph 14.16), CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied by all documentation called for in the Contract Documents, together with complete and legally effective releases or waivers (satisfactory to OWNER) of all Liens arising out of or filed in connection with the Work. In lieu thereof and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full; an affidavit of CONTRACTOR that the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and that all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible, have been paid or otherwise satisfied; and consent of the surety, if any, to final payment.

Final Payment and Acceptance:

14.13. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation – all as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application to OWNER for payment. Thereupon ENGINEER will give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.16. Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application. Thirty days after presentation to OWNER of the Application and accompanying documentation, in appropriate form and substance, and with ENGINEER's recommendation and notice of acceptability, the amount recommended by ENGINEER will become due and will be paid by OWNER to CONTRACTOR.

14.14. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

Contractor's Continuing Obligation:

14.15. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by ENGINEER, nor the issuance of a certificate of Substantial Completion, nor any payment by OWNER to CONTRACTOR under the Contract Documents, nor any use or occupancy of the Work or any part thereof by OWNER, nor any act of acceptance by OWNER nor any failure to do so, nor any review and approval of a Shop Drawing or sample submission, nor the issuance of a notice of acceptability by ENGINEER pursuant to paragraph 14.13, nor any correction of *defective* Work by OWNER will constitute an acceptance of Work not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents (except as provided in paragraph 14.16).

Waiver of Claims:

14.16. The making and acceptance of final payment will constitute:

14.16.1. a waiver of all claims by OWNER against CONTRACTOR, except claims arising from unsettled Liens, from *defective* Work appearing after final inspection pursuant to paragraph 14.11 or from failure to comply with the Contract Documents or the terms of any special guarantees specified therein; however, it will not constitute a waiver by OWNER of any rights in respect of CONTRACTOR's continuing obligations under the Contract Documents; and

14.16.2. a waiver of all claims by CONTRACTOR against OWNER other than those previously made in writing and still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

Owner May Suspend Work:

15.1. OWNER may, at any time and without cause, suspend the Work or any portion thereof for a period of not more than ninety days by notice in writing to CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension if CONTRACTOR makes an approved claim therefor as provided in Articles 11 and 12.

Owner May Terminate:

15.2. Upon the occurrence of any one or more of the following events:

15.2.1. if CONTRACTOR commences a voluntary case under any chapter of the Bankruptcy Code (Title 11, United States Code), as now or hereafter in effect, or if CONTRACTOR takes any equivalent or similar action by filing a petition or otherwise under any other federal or state law in effect at such time relating to the bankruptcy or insolvency;

15.2.2. if a petition is filed against CONTRACTOR under any chapter of the Bankruptcy Code as now or hereafter in effect at the time of filing, or if a petition is filed seeking any such equivalent or similar relief against CONTRACTOR under any other federal or state law in effect at the time relating to bankruptcy or insolvency;

15.2.3. if CONTRACTOR makes a general assignment for the benefit of creditors;

15.2.4. if a trustee, receiver, custodian or agent of CONTRACTOR is appointed under applicable law or under contract, whose appointment or authority to take charge of property of CONTRACTOR is for the purpose of enforcing a Lien against such property or for the purpose of general administration of such property for the benefit of CONTRACTOR's creditors;

15.2.5. if CONTRACTOR admits in writing an inability to pay its debts generally as they become due;

15.2.6. if CONTRACTOR persistently fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.9 as revised from time to time);

15.2.7. if CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;

15.2.8. if CONTRACTOR disregards the authority of ENGINEER; or

15.2.9. if CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents;

OWNER may, after giving CONTRACTOR (and the surety, if there be one) seven days' written notice and to the extent permitted by Laws and Regulations, terminate the services of CONTRACTOR, exclude CONTRACTOR from the site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the direct, indirect and consequential costs of completing the Work (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs) such excess will be paid to CONTRACTOR. If such costs exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such costs incurred by OWNER will be approved as to reasonableness by ENGINEER and incorporated in a Change Order, but when exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

15.3. Where CONTRACTOR's services have been so terminated by OWNER, the termination will not affect any rights or remedies of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

15.4. Upon seven days' written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy, elect to abandon the Work and terminate the Agreement. In such case, CONTRACTOR shall be paid for all Work executed and any expense sustained plus reasonable termination expenses, which will include, but not be limited to, direct indirect and consequential costs (including, but not limited to, fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs).

Contractor May Stop Work or Terminate:

15.5. If, through no act or fault of CONTRACTOR, the Work is suspended for a period of more than ninety days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within thirty days after it is submitted, or OWNER fails for thirty days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days' written to OWNER and ENGINEER, terminate the Agreement and recover from OWNER payment for all Work executed and any expense sustained plus reasonable termination expenses. In addition and in lieu of terminating the Agreement, if ENGINEER has failed to act on an Application for Payment or OWNER has failed to make any payment as aforesaid. CONTRACTOR may upon seven days' written notice to OWNER and ENGINEER stop the Work until payment of all amounts then due. The provisions of this paragraph shall not relieve CONTRACTOR of the obligations under paragraph 6.29 to carry on the Work in accordance with the progress schedule and without delay during disputes and disagreements with OWNER.

ARTICLE 16 – ARBITRATION

16.1. All claims, disputes and other matters in question between OWNER and CONTRACTOR arising out of, or relating to the Contract Documents or the breach thereof (except for claims which have been waived by the making or acceptance of final payment as provided by paragraph 14.16) will be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association then obtaining subject to the limitations of this Article 16. This agreement so to

arbitrate and any other agreement or consent to arbitrate entered into in accordance herewith as provided in this Article 16 will be specifically enforceable under the prevailing law of any court having jurisdiction.

16.2. No demand for arbitration of any claim, dispute or other matter that is required to be referred to ENGINEER initially for decision in accordance with paragraph 9.11 will be made until the earlier of (a) the date on which ENGINEER has rendered a decision or (b) the tenth day after the parties have presented their evidence to ENGINEER if a written decision has not been rendered by ENGINEER before that date. No demand for arbitration of any such claim, dispute or other matter will be made later than thirty days after the date on which ENGINEER has rendered a written decision in respect thereof in accordance with paragraph 9.11; and the failure to demand arbitration within said thirty days' period shall result in ENGINEER's decision being final and binding upon OWNER and CONTRACTOR. If ENGINEER renders a decision after arbitration proceeding have been initiated, such decision may be entered as evidence but will not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned. No demand for arbitration of any written decision of ENGINEER rendered in accordance with paragraph 9.10 will be made later than ten days after the party making such demand has delivered written notice of intention to appeal as provided in paragraph 9.10.

16.3. Notice of the demand for arbitration will be filed in writing with the other party to the Agreement and with the American Arbitration Association, and a copy will be sent to ENGINEER for information. The demand for arbitration will be made within the thirty-day or ten-day period specified in paragraph 16.2 as applicable, and in all other cases within a reasonable time after the claim, dispute or other matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such claim, dispute or other matter in question would be barred by the applicable statute of limitations.

16.4. No arbitration arising out of or relating to the Contract Documents shall include by consolidation, joinder or in any other manner any other person or entity (including ENGINEER, ENGINEER's agents, employees or consultants) who is not a party to this contract unless:

16.4.1. the inclusion of such other person or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration,

16.4.2. such other person or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings, and

16.4.3. the written consent of the other person or entity sought to be included and of OWNER and CONTRACTOR has been obtained for such inclusion, which consent shall make specific reference to this paragraph; but no such consent shall constitute consent to arbitration of any dispute not specifically described in such consent or to arbitration with any party not specifically identified in such consent.

16.5. The award rendered by the arbitrators will be final, judgment may be entered upon it in any court having jurisdiction thereof, and will not be subject to modification or appeal except to the extent permitted by Sections 10 and 11 of the Federal Arbitration Act (9 U.S.C. §§ 10,11).

ARTICLE 17 – MISCELLANEOUS

Giving Notice:

17.1. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

Computation of Time:

17.2.1. When any period of tiem is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.2.2. A calendar day of twenty-four hours measured from midnight to the next midnight shall constitute a day.

General:

17.3. Should OWNER or CONTRACTOR suffer injury or damage to person or property because of any error, omission or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, claim will be made in writing to the other party within a reasonable time of the first observance of such injury or damage. The provisions of this paragraph 17.3 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

17.4. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR by paragraphs 6.30, 13.1, 13.12, 13.14, 14.3 and 15.2 and all of the rights and remedies available to OWNER and

ENGINEER thereunder, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply. All representatives, warranties and guarantees made in the Contract Documents will survive final payment and termination or completion of the Agreement.

ACKNOWLEDGEMENT REGARDING BIDDER SAM REGISTRATION

Contractors procured directly by grantees, sub-grantees, and/or sub-recipients of Coronavirus State and Local Fiscal Recovery Fund (SLFRF) and American Rescue Plan Act (ARPA) funds, are required to have an active registration in the System of Award Management (SAM). This document shall be completed and submitted as part of the bid proposal.

1. By submitting this proposal, the prospective bidder certifies that it has an active registration is SAM that is not set to expire within the next 90 days.

2. By submitting this proposal, the prospective bidder certifies neither it, its principals nor affiliates, is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

3. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that an erroneous certification was rendered, in addition to other remedies available to the Federal Government, the Department or agency with which this transaction originated may pursue available remedies.

4. Further, the prospective bidder shall provide immediate written notice to the person to which this proposal is submitted if at any time the Participant learns that this certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

5. By submitting this proposal, it is agreed that should the proposed covered transaction be entered into, the prospective bidder will not knowingly enter into any lower-tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction unless authorized by the agency with which this transaction originated.

6. It is further agreed that by submitting this proposal, the prospective bidder will include Certification of Subcontractor Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion without modification, in all lower-tier covered transactions and in all solicitations for lower-tier covered transactions.

Provide the following information as detailed in the prospective bidder's SAM registration:

Entity Name _____ _____

Address _____ _____

City: _____ State: _____ Zip: _____

SAM Entity ID: _____ Expiration Date: _____

Active Exclusions: ☐ Yes ☐ No

CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY

This certification is required pursuant to Executive Order 11246 (30 F. R. 12319-25). The implementing rules and regulations provide that any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicates that the bidder has not filed a compliance report due under applicable instructions, such bidder shall be required to submit a compliance report within seven calendar days after bid opening. No contract shall be awarded unless such report is submitted.

Certification by Bidder

Bidder/Firm: _____

Address: _____

City: _____ State _____ Zip _____

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause. ☐ Yes ☐ No
2. Compliance reports were required to be filed in connection with such contract or subcontract. ☐ Yes ☐ No
3. Bidder has filed all compliance reports due under applicable instructions, including SF-100. ☐ Yes ☐ No ☐ None Req.
   .
4. Have you ever been or are you being considered for sanction due to violation of Executive Order 11246, as amended? ☐ Yes ☐ No

Bidder Name:_____ Title: _____

Signature:_____ Date: _____

CERTIFICATION OF BIDDER REGARDING USE OF FEMALE/MINORITY SUBCONTRACTORS

This certification is required for the contractor to demonstrate that when subcontractors are to be used on this project, an attempt will be made to utilize female/minority owned firms.

Documentation must be on file to show who has been contacted.

Certification by Bidder

Bidder/Firm:_____

Address: _____

City: _____ State _____ Zip _____

I,_____, certify that every attempt was made to utilize female/minority contractors on this project.

Bidder Name:_____ Title: _____

Signature:_____ Date: _____

CERTIFICATION OF SUBCONTRACTOR REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND EXCLUSION

Subcontractors for projects that are funded in whole or in part by Coronavirus State and Local Fiscal Recovery Fund (SLFRF) and American Rescue Plan Ace (ARPA) funds must provide information concerning the entity's debarment, suspension, ineligibility or exclusion status. This document shall be completed and provided to the prime contractor.

1. By signing and submitting this proposal, the prospective lower-tier participant certifies that neither it, its principals nor affiliates, is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. Further, the Participant provides the certification set out below:

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that an erroneous certification was rendered, in addition to other remedies available to the Federal Government, the Department or agency with which this transaction originated may pursue available remedies.

3. Further, the Participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the Participant learns that this certification was erroneous when submitted or has become erroneously reason of changed circumstances.

4. By submitting this document, it is agreed that should the proposed covered transaction be entered into, the Participant will not knowingly enter into any lower-tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction unless authorized by the agency with which this transaction originated.

The subcontracting entity may satisfy the requirement of this document via one of the two options below:

Option 1: SAM.gov Active Registration

Entity Name _____ _____

Address _____ _____

City: _____ State: _____ Zip: _____

SAM Entity ID: _____ Expiration Date: _____

Active Exclusions: ☐ Yes ☐ No

Option 2: Signed Certification

Entity Name _____ _____

Address _____ _____

City: _____ State: _____ Zip: _____

Entity Representative:_____ Title:_____

Signature _____ _____

DRUG-FREE WORKPLACE AFFIDAVIT

STATE OF _____

COUNTY OF _____

The undersigned, principal officer of_____, an employer of five (5) or more employees contracting with _____ government to provide construction services, hereby states under oath as follows:

1. The undersigned is a principal officer of_____(hereinafter referred to as the "Company"), and is duly authorized to execute this Affidavit on behalf of the Company.

2. The Company submits this Affidavit pursuant to T.C.A. § 50-9-113, which requires each employer with no less than five (5) employees receiving pay who contracts with the state or any local government to provide construction services to submit an affidavit stating that such employer has a drug-free workplace program that complies with Title 50, Chapter 9, of the Tennessee Code Annotated.

3. The Company is in compliance with T.C.A. § 50-9-113.

Further affiant saith not.

_____
Principal Officer

STATE OF _____

COUNTY OF _____

Before me personally appeared_____, with whom I am personally acquainted (or proved to me on the basis of satisfactory evidence), and who acknowledged that such person executed the foregoing affidavit for the purposes therein contained.

Witness my hand and seal at office this_____day of_____, 20___.

_____
Notary Public

My commission expires: _____

CERTIFICATION BY PROPOSED SUBCONTRACTOR REGARDING EQUAL EMPLOYMENT OPPORTUNITY

NAME OF PRIME CONTRACTOR: _____

PROJECT NUMBER: _____

This certification is required pursuant to Executive Order 11246 (30 F. R. 12319-25). The implementing rules and regulations provide that any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicates that the subcontractor has not filed a compliance report due under applicable instructions, such subcontractor shall be required to submit a compliance report before the owner approves the subcontract or permits work to begin under the subcontract.

SUBCONTRACTOR'S CERTIFICATION

Subcontractor Name: _____

Address: _____

City: _____ State _____ Zip _____

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause. ☐ Yes ☐ No
2. Compliance reports were required to be filed in connection with such contract or subcontract. ☐ Yes ☐ No
3. Bidder has filed all compliance reports due under applicable instructions, including SF-100. ☐ Yes ☐ No ☐ None Req.
   .
4. Have you ever been or are you being considered for sanction due to violation of Executive Order 11246, as amended? ☐ Yes ☐ No

Name:_____ Title: _____

Signature:_____ Date: _____

AFFIDAVIT REGARDING NON-BOYCOTT OF ISRAEL

In compliance with the Contractor Affidavit Regarding Non-Boycott of Israel (State of Tennessee 2022, Public Chapter No. 775, the Act), which became effective on July 1, 2022, certification is required of all bidders on contracts over $250,000 or greater or when the contractor has 10 or more employees.

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party hereto certifies that it is not currently engaged in, and covenants that it will not, for the duration of the Contract, engage in a Boycott of Israel as that term is defined in Tenn. Code Ann §12-4-127.

I affirm, under the penalties of perjury, this statement to be true and correct.

Date	Signature of Bidder
	Company

Davis-Bacon Wage Rate Certification

Project Name_____

Project No. _____

While it is not required, the use of Davis-Bacon Wage Rates (DB), is strongly recommended. Please check one below, sign and date.

☐ will be using DB on this project. Therefore, the following DB Wage Rates and DOL Memo 213, will apply.

☐ will not be using DB on this project. Therefore, the following DB Wage Rates and DOL Memo 213, do not apply.

_____
Contractor

_____
Date

WAGE RATE DETERMINATION

If applicable, appropriate Wage Rates shall be inserted here.

"General Decision Number: TN20230182 01/06/2023

Superseded General Decision Number: TN20220182

State: Tennessee

Construction Type: Building
BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories)

County: Knox County in Tennessee.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $16.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2023.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $12.15 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2023.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number Publication Date
0 01/06/2023

ASBE0086-002 03/01/2022

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR	$ 33.25	17.22

ELEC0270-002 06/01/2021

	Rates	Fringes
ELECTRICIAN (Low Voltage Wiring Only)	$ 32.96	11%+8.10

ELEC0760-001 06/01/2022

	Rates	Fringes
ELECTRICIAN (Excludes Low Voltage Wiring)	$ 27.25	13.98

ENGI0917-004 05/01/2017

	Rates	Fringes
POWER EQUIPMENT OPERATOR (Crane)	$ 28.26	10.10

IRON0492-001 05/01/2022

	Rates	Fringes
IRONWORKER, ORNAMENTAL	$ 31.15	15.66
IRONWORKER, REINFORCING	$ 31.15	15.66

LABO0818-005 05/01/2021

	Rates	Fringes
LABORER (Pipelayer)	$ 21.45	8.06

PLUM0102-001 05/01/2020

	Rates	Fringes
PIPEFITTER	$ 30.77	14.40

SHEE0005-002 05/01/2021

	Rates	Fringes
SHEET METAL WORKER (SIDING (METAL/ALUMINUM/VINYL))	$ 32.29	12.62

SHEE0005-003 05/01/2021

	Rates	Fringes
SHEET METAL WORKER (HVAC Duct Installation Only)	$ 32.29	12.62

TEAM0519-001 05/01/2021

	Rates	Fringes
TRUCK DRIVER (Dump Truck).....	$ 24.81	8.10

UAVG-TN-0001 04/16/2021

	Rates	Fringes
SHEET METAL WORKER (HVAC Unit Installation Only).....	$ 29.60	12.48

SUTN2017-035 04/16/2021

	Rates	Fringes
BRICKLAYER.....	$ 20.00	0.00
CARPENTER.....	$ 20.09	0.00
CEMENT MASON/CONCRETE FINISHER...	$ 22.67	4.11
IRONWORKER, STRUCTURAL.....	$ 18.30	0.00
LABORER DEMOLITION.....	$ 16.74	0.00
LABORER GRADE CHECKER.....	$ 13.01 **	0.00
LABORER: Common or General.....	$ 12.73 **	1.77
LABORER: Mason Tender - Brick...	$ 13.54 **	0.00
LABORER: Mason Tender - Cement/Concrete.....	$ 13.00 **	0.00
OPERATOR: Backhoe/Excavator/Trackhoe.....	$ 27.77	9.75
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	$ 16.84	0.00
OPERATOR: Bulldozer.....	$ 28.52	9.75
OPERATOR: Drill.....	$ 26.50	4.76
OPERATOR: Forklift.....	$ 15.00 **	0.00
OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....	$ 14.70 **	0.00
OPERATOR: Roller.....	$ 14.35 **	0.00
PAINTER (Brush and Roller).....	$ 19.31	10.15
PLUMBER.....	$ 21.63	7.16
ROOFER.....	$ 16.29	0.00
SHEET METAL WORKER, Excludes HVAC Duct and Unit Installation.....	$ 24.19	7.52
TILE FINISHER.....	$ 14.00 **	0.00
TILE SETTER.....	$ 19.65	0.00

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($16.20) or 13658 ($12.15). Please see the Note at the top of the wage determination for more information.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of ""identifiers"" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the

Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISIO"

U.S. Department of Labor

Wage and Hour Division
Washington, D.C. 20210

MAR 22 2013

MEMORANDUM NO. 213

TO: ALL CONTRACTING AGENCIES OF THE FEDERAL GOVERNMENT AND THE DISTRICT OF COLUMBIA

FROM: MARY BETH MAXWELL
Acting Deputy Administrator

SUBJECT: Application of the Davis-Bacon and Related Acts requirement that wage rates for additional classifications, when "conformed" to an existing wage determination, bear a "reasonable relationship" to the wage rates in that wage determination

This Memorandum is notification from the Department of Labor's Wage and Hour Division (WHD) of the proper application of the Davis-Bacon and Related Acts (DBRA) requirements for wage rates for additional classifications that are "conformed" to an existing wage determination by agency contracting officers. The regulations at 29 C.F.R. § 5.5(a)(1)(ii)(A) provide that contracting officers shall approve an additional classification and its proposed wage rate in conformance with an existing wage determination only when the work to be performed by the proposed classification is not performed by a classification in the wage determination and the proposed wage rate bears a "reasonable relationship" to the wages rates in the wage determination. Although this Memorandum primarily focuses on the "reasonable relationship" requirement, it is essential at the threshold to reiterate that a conformance is not appropriate when the work of the proposed classification is already performed by a classification on the wage determination. The conformance process is narrow in scope and has the limited purpose of establishing a new classification when it is necessary to do so because work needed to perform the contract is not performed by an existing classification. *See Cambridge Plaza*, ARB Case No. 07-102 (ARB Oct. 29, 2009). Accordingly, the WHD will not add a new classification through a conformance action unless the first criterion for issuance of a conformance is satisfied, i.e., the proposed work in question is not performed by any classification in the existing wage determination. 29 C.F.R. § 5.5(a)(1)(ii)(A)(1).

In those circumstances in which the duties of the proposed classification are not performed by any classification in the existing wage determination, the WHD will consider whether the proposed wage rate bears a "reasonable relationship" to the wage rates in the wage determination. In the past, WHD has generally approved proposed wage rates for a conformed skilled craft and a power equipment operator when such rates were not less than the rate for the lowest classification in the respective category on the contract wage determination. The practice of using the lowest rate in the relevant category as a benchmark also occurred on occasion with laborers and truck drivers. In keeping with the remedial purpose of the DBRA and the governing

regulations, the wage rate of the lowest skilled craft, laborer, power equipment operator, or truck driver classification on the contract wage determination has no longer been an automatic benchmark when reviewing conformance requests. WHD's approach of not using the lowest wage rate as a benchmark has been progressively implemented over the last year.

The Conformance Process

In accordance with 29 C.F.R. § 5.5(a)(1)(ii)(A), the contracting officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and a wage rate (including fringe benefits) for the classification only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(2) The classification is utilized in the area by the construction industry; and
(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

Further, if the contractor, the laborers or mechanics (if known) to be employed in the classification or their representatives, and the contracting agency agree on the classification and wage rate proposed, a report of the action taken is sent by the contracting officer to the Administrator of WHD for approval, denial, or modification. The Administrator (or an authorized representative) shall respond within 30 days of receipt, or the contracting officer will be notified that more time is necessary. *See* 29 C.F.R. § 5.5(a)(1)(ii)(B). In the event that the contractor, the laborers or mechanics (if known) to be employed in the classification or their representatives, and the contracting agency do not agree on the classification and wage rate proposed, the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator of WHD for determination. The Administrator (or an authorized representative) shall issue a determination within 30 days of receipt and so advise the contracting officer, or the contracting officer will be notified that more time is necessary. *See* 29 C.F.R. § 5.5(a)(1)(ii)(C).

"Reasonable Relationship"

WHD previously typically approved conformance requests from contracting officers for wage rates (including fringe benefits) for skilled classifications and power equipment operators by automatically using as a benchmark the lowest rate for a skilled classification or power equipment operator, respectively, in the applicable wage determination. The practice of using the lowest rate in the relevant category as a benchmark also occurred on occasion with laborers and truck drivers. WHD has concluded, however, that it better reflects the regulatory requirement that "the proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination" to consider the entirety of the rates within the relevant category on the wage determination and to not generally use as a benchmark the lowest rate within that category. The regulation at 29 C.F.R. §

5.5(a)(1)(ii)(A)(3) requires that the proposed wage rate bear a reasonable relationship to the "wage rates" on the wage determination and not to a particular rate or the lowest rate.

The category in which the requested additional classification falls is relevant to the reasonable relationship analysis. As background, classifications in wage determinations fall into four general categories: skilled crafts, laborers, power equipment operators, and truck drivers. To determine a "reasonable relationship," the requested additional classification is compared to the classifications on the applicable wage determination within the same category. A proposed skilled craft classification is compared to skilled classifications in the wage determination; a proposed laborer classification is compared to existing laborer classifications; a proposed power equipment operator classification is compared to existing power equipment operator classifications; and a proposed truck driver classification is compared to existing truck driver classifications. *See Mistick Construction*, ARB Case No. 02-004 (June 24, 2003); *Tower Construction*, WAB Case No. 94-17 (Feb. 28, 1995).[1] Thus, when considering a conformance request for a skilled classification, WHD generally considers the entirety of the rates for the skilled classifications on the applicable wage determination and looks to where the proposed wage rate falls within the rates listed on the wage determination. Occasionally, however, a wage determination may contain some wage rates for laborer classifications that are higher than some wage rates for the skilled classifications or power equipment operators (likely because the laborers' rates reflect union prevailing rates and the skilled crafts' or power equipment operators' rates reflect weighted average prevailing rates). On such occasions, the contracting officer should look to those skilled classifications whose rates are higher than the laborer classifications' rates. *See M.Z. Contractors Co.,* WAB Case No. 92-06 (Aug. 25, 1992). If, however, most of the skilled classifications' or power equipment operators' rates are lower than the laborer classifications' rates, then it may be reasonable to propose a rate that reflects the skilled classifications' rates even if they are lower than the laborer classifications' rates.

Additionally, whether the wage rates in the applicable category (skilled craft, laborer, power equipment operator, truck driver) in the wage determination are predominantly union prevailing wage rates or predominantly weighted average prevailing wage rates should be considered when proposing rates for an additional classification. For example, if a wage determination contains predominantly union prevailing wage rates for skilled classifications, it typically would be appropriate to look to the union sector skilled classifications in the wage determination and the rates for those classifications when proposing a wage rate for the additional classification. Conversely, if a wage determination contains predominantly weighted average prevailing wage rates for skilled classifications, it typically would be appropriate to look to the weighted average/ non-union sector skilled classifications in the wage determination and the rates for those classifications when proposing a wage rate for the additional classification. If the wage rates in the applicable category are roughly half union prevailing rates and half weighted average prevailing rates, it would typically be appropriate to look to the lowest union rate and the highest weighted average rate (assuming the union rates are higher than the weighted average rates) when proposing a wage rate.

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[1] Copies of Administrative Review Board (ARB) and Wage Appeals Board (WAB) decisions can be obtained from: www.oalj.dol.gov/libdba.htm.

While the majority of conformance requests are within the skilled classification category, the governing regulations and the principles outlined in this Memorandum apply to the other categories of workers – laborers, power equipment operators, and truck drivers. To meet the "reasonable relationship" test for a conformed power equipment operator or truck driver classification, the proposed wage rate should bear a reasonable relationship to the entirety of rates within the respective classification, and in particular to the union or weighted average rates in the classification (assuming union or weighted average rates prevail for the classification). When a conformance for a laborer classification is requested, WHD generally continues to use the common laborer rate already existing in the wage determination as a benchmark for the proposed rate.

Each conformance request and corresponding wage determination involves particular circumstances and therefore should be evaluated as such. The full range of wage rates on the wage determination for the appropriate category should be reviewed in the manner discussed above. When seeking conformed classifications and wage rates, the contractor and the contracting officer should not rely on a wage determination or conformance granted to another party regardless of the similarity of the work in question. *See, e.g.*, *Inland Waters Pollution Control, Inc.*, WAB Case No. 94-12 (Sept. 30, 1994). Moreover, the contractor and the contracting officer should not prospectively rely on WHD's prior approval of rates for application to a contract performed at the same location. *See E&M Sales, Inc.*, WAB Case No. 91-17 (Oct. 4, 1991). Although atypical, use of the "lowest skilled" rate may of course be appropriate when that rate in fact bears a reasonable relationship to the wage rates contained in the wage determination for the appropriate category. *See, e.g., Tower Construction*, WAB Case No. 94-17 (Feb. 28, 1995) (conformed wage rate, which equaled lowest skilled rate on wage determination, was reasonable).

In sum, contracting agencies should take the following steps when proposing a wage rate for a classification to be conformed to an existing wage determination:

- First, the contracting agency should determine the category (skilled crafts, laborers, power equipment operators, or truck drivers) of the classification which is being conformed.

- Second, the contracting agency should determine for that category whether union or weighted average/non-union sector rates prevail in the existing wage determination.

- Third, after reviewing the entirety of the rates within the appropriate sector in the applicable category, the contracting agency should determine a rate that bears a reasonable relationship to those rates on the wage determination.

- Fourth, the contracting agency should determine whether any of the considerations identified in this Memorandum apply (or whether any other relevant considerations apply). For example, if the classification being conformed is a skilled classification and some of the wage rates for skilled classifications in the wage determination are lower than the rates for laborer classifications, then the contracting agency should use those existing skilled classification rates that are higher than the laborer rates to determine the

proposed rate. And if the classification which is being conformed is a laborer classification, the proposed wage rate should generally use the existing common laborer wage rate as a benchmark.

Conclusion

The WHD Administrator has historically maintained broad discretion under the regulations to make determinations regarding proposed wage rates for additional classifications that are conformed to existing wage determinations. This broad discretion has been confirmed by the ARB and its predecessors, as illustrated by the decisions cited in this Memorandum, among others. In exercising that discretion, WHD ensures that wage rates (including fringe benefits) for the classification to be conformed bear a reasonable relationship to the range of rates for the classifications in the wage determination in the same category (skilled classifications, power equipment operators, laborers, and truck drivers), and not automatically to the lowest rate in the applicable category. Consistent with the governing regulations, contracting agencies should ensure that they request wage rates (including fringe benefits) for additional classifications in accordance with the principles set forth in this Memorandum. By following the guidance in this AAM, contracting agencies and contractors will benefit by receiving approvals from WHD that ensure consistency in conformed wage rates and increase efficiencies in government.

In conjunction with the guidance provided in this AAM, WHD has posted on www.dol.gov/whd/govcontracts/dbra.htm a series of frequently asked questions that include examples which will provide additional guidance regarding the reasonable relationship requirement in the conformance process. WHD also is updating its Prevailing Wage Resource Book and will provide compliance assistance on DBRA conformances at future Prevailing Wage Conferences. In addition, WHD's Branch of Construction Wage Determinations is available to assist with any questions.

Appendix II to Part 200 - Contract Provisions for Non-Federal Entity Contracts Under Federal Awards

In addition to other provisions required by the Federal agency or non-Federal entity, all contracts made by the non-Federal entity under the Federal award must contain provisions covering the following, as applicable.

(A) Contracts for more than the simplified acquisition threshold, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.

(B) All contracts in excess of $10,000 must address termination for cause and for convenience by the non-Federal entity including the manner by which it will be effected and the basis for settlement.

(C) Equal Employment Opportunity. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of "federally assisted construction contract" in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, "Equal Employment Opportunity" (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, "Amending Executive Order 11246 Relating to Equal Employment Opportunity," and implementing regulations at 41 CFR part 60, "Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor."

(D) Davis-Bacon Act, as amended (40 U.S.C. 3141-3148). When required by Federal program legislation, all prime construction contracts in excess of $2,000 awarded by non-Federal entities must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, "Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction"). In accordance with the statute, contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week. The non-Federal entity must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contracts must also include a provision for compliance with the Copeland "Anti-Kickback" Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, "Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States"). The Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.

(E) Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708). Where applicable, all contracts awarded by the non-Federal entity in excess of $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

(F) Rights to Inventions Made Under a Contract or Agreement. If the Federal award meets the definition of "funding agreement" under 37 CFR § 401.2 (a) and the recipient or subrecipient wishes to enter into a

contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that "funding agreement," the recipient or subrecipient must comply with the requirements of 37 CFR Part 401, "Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements," and any implementing regulations issued by the awarding agency.

(G) Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended - Contracts and subgrants of amounts in excess of $150,000 must contain a provision that requires the non-Federal award to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

(H) Debarment and Suspension (Executive Orders 12549 and 12689) - A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), "Debarment and Suspension." SAM Exclusions contains the names of parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

(I) Byrd Anti-Lobbying Amendment (31 U.S.C. 1352) - Contractors that apply or bid for an award exceeding $100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

(J) See § 200.323.

(K) See § 200.216.

(L) See § 200.322.

[78 FR 78608, Dec. 26, 2013, as amended at 79 FR 75888, Dec. 19, 2014; 85 FR 49577, Aug. 13, 2020]

ATTACHMENT
AMERICAN RESCUE PLAN ACT (ARPA)
CONTRACT TERMS AND CONDITIONS

1. Compliance with the requirements of Title VI of the Civil Rights Act of 1964, as amended, and the Rehabilitation Act of 1973, P.L. 93-112, as amended, and any relevant program-specific regulations, and shall not discriminate against any employee for employment because of race, national origin, creed, color, sex, religion, age, disability, or handicap condition (including AIDS and AIDS- related conditions).
2. Compliance with the Fair Housing Act, Title VIII of the Civil Rights Act of 1968 (42 U.S.C 3601 et. seq), which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status, or disability.
3. Compliance with Section 504 for the Rehabilitation Act of 1973, as amended (29 U.S.C 794), which prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance.
4. Compliance with the Age Discrimination Act of 1975, as amended (42 U.S.C. 6101 et. seq.), and Treasury's implementing regulations at 31 CFR Part 23, which prohibit discrimination on the basis of age in programs or activities receiving federal financial assistance.
5. Compliance with Title II of the Americans with Disabilities Act of 1990 (P.L. 101-136), 42 U.S.C. 12101, as amended, and regulations adopted thereunder contained in 28 CFR 26.101-36.999 inclusive, and any relevant program-specific regulations.
6. Compliance with Equal Opportunity in accordance with 41 CFR Chapter 60. During the performance of this contract, the contractor agrees as follows:
    A. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:
        i. Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
    B. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
    C. The contractor will not discharge or in any other manner discriminate against

any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

D. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

E. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

F. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

G. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

H. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance.

7. Compliance with Title 2 of the Code of Federal Regulations (CFR) and any guidance in effect from the Office of Management and Budget (OMB) related (but not limited to) audit requirements for grantees that expend $750,000 or more in Federal awards during the grantee's fiscal year must have an annual audit prepared by an independent auditor in accordance with the terms and requirements of the appropriate circular.
8. Certifications that the Contractor/Vendor is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. This certification is made pursuant to regulations implementing Executive Order 12549, Department and Suspension, 28 C.F.R. pt. 67 §67.510, as published as pt. VII of May 26, 1988, Federal Register (pp. 19150-19211).
9. Contractors must maintain an active registration in the System for Award Management (SAM).
10. Compliance with 31 CFR Part 21 in regards to new restrictions on lobbying and assurance that no funding associated with this award will be used for lobbying. Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352- Contractor certifies that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Contractor shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award.
11. Compliance with the Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended is applicable to contracts and subcontracts amounts in excess of $150,000. Contractors agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).
12. Disclosure of any existing or potential conflicts of interest relative to the performance of services resulting from this award.
13. Provision has been made for compliance with Governmentwide Requirements for Drug-Free Workplace, 31 CFR Part 20.
14. The Contractor will immediately inform the City if additional easements or right-of-way will be required. Any easements or right-of-way to be obtained for the project activities must be acquired with adherence to Uniform Relocation Assistance and Real Property Acquisitions Act of 1970 (42 U.S.C. §§ 4601-4655) and implementing regulations.
15. Compliance with the Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708) is applicable on contracts awarded in excess of $100,000 that involve mechanics or laborers. Under 40 U.S.C. 3702 of the Act, each contractor is required

to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

16. Audits and Inspection/Access to Records/Record Retention: The Contractor shall make records with respect to the project available to the Owner, U.S Department of Treasury, and authorized representatives for examination. The Contractor shall retain all documents, papers, and records which are directly pertinent to this Contract for a period of five (5) years following completion of the contracted work and expiration of the Contract.
17. There is domestic preference for certain procurements using federal funds. Contractor should, to the greatest extent practicable under a Federal award, purchase, acquire, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). For purposes of this section: 1. Produced in the United States" means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. 2. "Manufactured products" means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.
18. When practicable, the Contractor should make effort to procure recovered or recycled materials for items that exceed $10,000 such as those included in 40 CFR Part 247.
19. Any and all applicable permits will be obtained prior to any construction activity.
20. Any publications produced with funds from this award must display the following language:
    A. "This project is being supported, in whole or in part, by federal funds awarded to the Hallsdale Powell UD by the U.S. Department of the Treasury."
21. The Hallsdale Powell UD proposed uses of the funds provided as payment under ARPA will be used only to cover those costs that:
    A. Are necessary investments in sewer infrastructure.
22. The Hallsdale Powell UD understands that any funds provided pursuant to this certification cannot be used for depositing funds into any pension fund.
23. Protections for Whistleblowers are in place in accordance with 41 U.S.C 4712.

24. Pursuant to Executive Order 13043, 62 FR 19217 (Apr. 18, 1997), the City of Goodlettsville encourages contractors to adopt and enforce on-the-job seat belt policies and programs for their employees when operating company owned, rented, or personally owned vehicles.
25. Pursuant to Executive Order 13513,74 FR 51225 (Oct. 6, 2009), the City of Goodlettsville encourages all employees, subrecipients, and contractors to adopt policies that ban text messaging while driving and discourage distracted driving.
26. Termination of Contract for Cause. If, through any cause, the contracted party shall fail to fulfill in timely and proper manner, his obligations under this Contract, or violate any of the covenants, agreements, or stipulations of this Contract, the Owner shall thereupon have the right to terminate this Contract by giving written notice to the Contracted Party of such termination and specifying the effective date of such termination. In such event, all finished or unfinished documents, data, studies, and reports prepared by the Contracted Party shall entitle the Contracted Party's receipt of just and equitable compensation for any satisfactory work completed on such documents.

    Notwithstanding the above, the Contracted Party shall not be relieved of liability to the Owner for damages sustained or the Subgrantee by virtue of any breach of the Contract by the contracted party. The Owner may withhold any payments to the contracted party for the exact amount of damages due the Owner from the Contractor.
27. Termination for Contract for Convenience. The Owner may terminate this Contract any time by a notice in writing to the Contractor. If the Agreement is terminated by the Owner pursuant to the terms hereof, the contracted party will be paid an amount, which bears the same ratio to the total compensation as the services actually performed. Bear to the total services of the contracted tarty covered by this Contract, less payments of compensation previously made upon the effective date of such termination. The contracted party may be reimbursed (in addition to the above payment) for that portion of actual out-of-pocket expenses (not otherwise reimbursed under this Contract) incurred by the contracted party during the contract period, which are directly attributable to the incomplete portion of the services covered by this Contract.

STATE OF TENNESSEE

BYRD ANTI-LOBBYING AMENDMENT CERTIFICATION

Contractors who apply or bid for an award of $100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352.

Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the awarding agency.

APPENDIX A, 44 C.F.R. PART 18 – CERTIFICATION REGARDING LOBBYING – REQUIRED FOR CONTRACTS OVER $100,000 *Certification for Contracts, Grants, Loans, and Cooperative Agreements*

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

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

☐ If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

☐ The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

The Contractor certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

Signature of Authorized Representative	**Date**
Printed Name and Title	**Phone Number / Email Address**

STATE OF TENNESSEE

CERTIFICATION REGARDING DEBARMENT, SUSPENSION AND OTHER RESPONSBILITY MATTERS

The prospective participant certifies to the best of its knowledge and belief that it and its principals:

☐ Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

☐ Have not within a three-year period preceding this proposal been convicted of or had a civil judgement rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statues or
commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

☐ Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (b) of this certification; and

☐ Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both.

Signature of Authorized Representative	**Date**
Printed Name	**Phone Number / Email Address**

☐ I am unable to certify to the above statements. Explanation is attached.

STATE OF TENNESSEE

IRAN DIVESTMENT ACT CERTIFICATION

SUBJECT CONTRACT NUMBER(S):	
CONTRACTOR LEGAL ENTITY NAME:	
EDISON SUPPLIER IDENTIFICATION NUMBER:	

The Iran Divestment Act, Tenn. Code Ann. § 12-12-101 et. seq. requires a person that attempts to contract with the state, including a contract renewal or assumption, to certify at the time the bid is submitted or the contract is entered into, renewed, or assigned, that the person or the assignee is not identified on a list created pursuant to § 12-12-106.

Currently, the list is available online at the following website: https://www.tn.gov/generalservices/procurement/central-procurement-office--cpo-/library-/public-information-library.html

The Contractor, identified above, certifies by signature below that it is not included on the list of persons created pursuant to Tenn. Code Ann. § 12-12-106 of the Iran Divestment Act.

CONTRACTOR SIGNATURE

NOTICE: This certification MUST be signed by an individual with legal capacity to contractually bind the Contractor.

PRINTED NAME AND TITLE OF SIGNATORY

DATE

STATE OF TENNESSEE

NON-BOYCOTT OF ISRAEL CERTIFICATION

The Bidder certifies that it is not currently engaged in, and will not for the duration of the contract engage in, a boycott of Israel as defined by Tenn. Code Ann. § 12-4-119. This provision shall not apply to contracts with a total value of less than two hundred fifty thousand dollars ($250,000) or to contractors with less than ten (10) employees.

According to the law, a boycott of Israel means engaging in refusals to deal, terminating business activities, or other commercial actions that are intended to limit commercial relations with Israel, or companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel to do business, or persons or entities doing business in Israel, when such actions are taken:

1) In compliance with, or adherence to, calls for a boycott of Israel, or

2) In a manner that discriminates on the basis of nationality, national origin, religion, or other unreasonable basis, and is not based on a valid business reason. Tenn. Code Ann. § 12-4-119.

Signature of Authorized Representative	**Date**
Printed Name	**Phone Number / Email Address**

TN Department of Environment & Conservation

Required and Recommended State and Local Fiscal Recovery Funds (SLRF) Supplemental Conditions for Contracts

Below is a listing of required and recommended supplemental conditions for contracts, along with sample language. This is not an exhaustive list. It is recommended Grantees use this list to supplement typical contract provisions and notify potential bidders of these conditions in the advertisement for bids.

Required Clauses

Legal/contractual/administrative remedies for breach of contract

Contracts for more than the simplified acquisition threshold, currently set at $250,000, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.

Termination for cause or convenience

All contracts in excess of $10,000 must address termination for cause and for convenience by the non-Federal entity, including the manner by which it will be affected and the basis for settlement.

Equal Employment Opportunity

Any contract that uses federal funds to pay for construction work is a "federally assisted construction contract" and must include the equal opportunity clause found in 2 C.F.R. Part 200, unless otherwise stated in 41 C.F.R. Part 60. This contract provision is required for all procurements that meet the definition of a "federally assisted construction contract."

Required Language. The regulation at 41 C.F.R. Part 60-1.4(b) requires the insertion of the following contract clause.

During the performance of this contract, the contractor agrees as follows:

(1) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(2) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(3) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(4) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(5) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(6) In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law. (8) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through

(7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, That if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable

to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

Davis-Bacon Act

U.S. Treasury exercised its federal authority outlining the requirements for water infrastructure projects executed using ARP funds. Therefore, the requirements for prevailing wages and rates slightly differs from the standards of Davis-Bacon. Individual projects less than $10 million dollars are not required to provide certification that prevailing wages and rates were followed. Individual projects of $10 million dollars or more require certification similar to Davis-Bacon and are outlined below. Please note that any project using other funding sources, like Community Development Block Grants or SRF loans, are subject to requirements for those programs. When combining funding sources on a single and complete project or phase, other funding program requirements may trump the requirements for the use of ARP funds. We recommend Grantees and Project Owners discuss project requirements with TDEC when leveraging ARP funds with other funding programs to ensure all applicable rules and regulations are followed.

Individual Water Infrastructure Projects of $10 million dollars or more

(1) A recipient may provide a certification that, for the relevant project, all laborers and mechanics employed by contractors and subcontractors in the performance of such project are paid wages at rates not less than those prevailing, as determined by the U.S. Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code (commonly known as the “Davis-Bacon Act”), for the corresponding classes of laborers and mechanics employed on projects of a character similar to the contract work in the civil subdivision of the State (or the District of Columbia) in which the work is to be performed, or by the appropriate State entity pursuant to a corollary State prevailing-wage-in-construction law (commonly known as “baby Davis-Bacon Acts”). If such certification is not provided, a recipient must provide a project employment and local impact report detailing:
    a. The number of employees of contractors and sub-contractors working on the project;
    b. The number of employees on the project hired directly and hired through a third party;
    c. The wages and benefits of workers on the project by classification; and
    d. Whether those wages are at rates less than those prevailing. 19 Recipients must maintain sufficient records to substantiate this information upon request.

(2) A recipient may provide a certification that a project includes a project labor agreement, meaning a pre-hire collective bargaining agreement consistent with section 8(f) of the National Labor Relations Act (29 U.S.C. 158(f)). If the recipient does not provide such certification, the recipient must provide a project workforce continuity plan, detailing:

a. How the recipient will ensure the project has ready access to a sufficient supply of appropriately skilled and unskilled labor to ensure high-quality construction throughout the life of the project, including a description of any required professional certifications and/or in-house training;
b. How the recipient will minimize risks of labor disputes and disruptions that would jeopardize timeliness and cost-effectiveness of the project;
c. How the recipient will provide a safe and healthy workplace that avoids delays and costs associated with workplace illnesses, injuries, and fatalities, including descriptions of safety training, certification, and/or licensure requirements for all relevant workers (e.g., OSHA 10, OSHA 30);
d. Whether workers on the project will receive wages and benefits that will secure an appropriately skilled workforce in the context of the local or regional labor market; and
e. Whether the project has completed a project labor agreement.

(3) Whether the project prioritizes local hires.

(4) Whether the project has a Community Benefit Agreement, with a description of any such agreement.

Suggested Language, if applicable. The following provides a sample contract clause:

a. All transactions regarding this contract shall be done in compliance with the Davis-Bacon Act (40 U.S.C. 3141- 3144, and 3146-3148) and the requirements of 29C.F.R. pt. 5 as may be applicable. The contractor shall comply with 40 U.S.C. 3141-3144, and 3146-3148 and the requirements of 29 C.F.R. pt. 5 as applicable.
b. b. Contractors are required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor.
c. c. Additionally, contractors are required to pay wages not less than once a week.

Copeland Anti-Kickback Act

The Copeland "Anti-Kickback" Act prohibits workers on construction contracts from giving up wages that they are owed. This requirement applies to all contracts for construction or repair work above $2,000 in situations where the Davis-Bacon Act also applies.

Suggested Language, if applicable. The following provides a sample contract clause:

a. a. Contractor. The contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract.
b. b. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clause above and a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.
c. c. Breach. A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12."

Contract Work Hours and Safety Standards Act

Where applicable, all contracts awarded by the non-Federal entity in excess of $100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. §§ 3702 and 3704, as supplemented by Department of Labor regulations at 29 C.F.R. Part 5. See 2 C.F.R. Part 200, Appendix II(E). Each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours.

Required Language. The following provides a sample contract clause:

Compliance with the Contract Work Hours and Safety Standards Act.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the t $27 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The (write in the name of the Federal agency or the loan or grant recipient) shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

Clean Air Act and Federal Water Pollution Control Act

For contracts over $150,000, contracts must contain a provision requiring contractors to comply with the Clean Air Act and the Federal Water Pollution Control Act. If applicable, contracts must contain a provision that requires the contractor to agree to comply with all applicable standards, orders, or regulations issued pursuant

to the Clean Air Act (42 U.S.C. §§ 7401-7671q.) and the Federal Water Pollution Control Act as amended (33 U.S.C. §§ 1251-1387).

Suggested Language. The following provides a sample contract clause.

Clean Air Act

(1) The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq

(2) The contractor agrees to report each violation to the (name of subrecipient entering into the contract) and understands and agrees that the (name of the subrecipient entering into the contract) will, in turn, report each violation as required to assure notification to Treasury, and the appropriate Environmental Protection Agency Regional Office.

(3) The contractor agrees to include these requirements in each subcontract exceeding $150,000

Federal Water Pollution Control Act

(1) The contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 ets eq.

(2) The contractor agrees to report each violation to the (name of the subrecipient entering into the contract) and understands and agrees that the (name of the subrecipient entering into the contract) will, in turn, report each violation as required to assure notification to the Treasury, and the appropriate Environmental Protection Agency Regional Office.

(3) The contractor agrees to include these requirements in each subcontract exceeding $150,000

Debarment and Suspension

Non-federal entities, contractors and subcontractors are subject to debarment and suspension regulations. These regulations restrict awards, subawards, and contracts with certain parties that are debarred, suspended, or otherwise excluded from or ineligible for participation in Federal assistance programs and activities. In general, an "excluded" party cannot receive a Federal grant award or a contract within the meaning of a "covered transaction," to include subawards and subcontracts. The debarment and suspension clause is required for all contracts and subcontracts for $25,000 or more, all contracts that require the consent of an official of a federal agency, and all contracts for federally required audit services.

Suggested Language. The following provides a debarment and suspension clause. It incorporates an optional method of verifying that contractors are not excluded or disqualified.

Suspension and Debarment

(1) This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such, the contractor is required to verify that none of the contractor's principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).
(2) The contractor must comply with 2 C.F.R. pt. 180, subpart C and2 C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

(3) This certification is a material representation of fact relied upon by (insert name of recipient/subrecipient/applicant). If it is later determined that the contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to (insert name of recipient/subrecipient/applicant), the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

(4) The bidder or proposer agrees to comply with the requirements of2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

Byrd Anti-Lobbying Amendment

Contractors that apply or bid for a contract of $100,000 or more under a federal grant must file the required certification. This is also applicable to subcontractors of more than $100,000, must include a contract provision prohibiting the use of federal appropriated funds to influence officers or employees of the federal government. Contractors that apply or bid for a contract for more than $100,000 must also file the required certification regarding lobbying.

Suggested Language. The following provides a sample contract clause:

Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352

Contractors who apply or bid for an award of $100,000 or more shall file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the awarding agency.

Procurement of Recovered Materials

A non-Federal entity that is a state agency or agency of a political subdivision of a state and its contractors must comply with section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act. The requirements of Section 6002 include procuring only items designated in guidelines of the Environmental Protection Agency (EPA) at 40 CFR part 247 that contain the highest percentage of recovered materials practicable, consistent with maintaining a satisfactory level of competition, where the purchase price of the item exceeds $10,000 or the value of the quantity acquired during the preceding fiscal year exceeded $10,000; procuring solid waste management services in a manner that maximizes energy and resource recovery; and establishing an affirmative procurement program for procurement of recovered materials identified in the EPA guidelines.

Suggested Language. The following provides a sample contract clause:

"In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired competitively within a timeframe providing for compliance with the contract performance schedule; meeting contract performance requirements; or at a reasonable price.

Information about this requirement, along with the list of EPA-designated items, is available at EPA's Comprehensive Procurement Guidelines webpage.

The Contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act."

Domestic Preference for Procurement

As appropriate, and to the extent consistent with law, NFEs should, to the greatest extent practicable under a federal award, provide a preference for the purchase, acquisition, or use of goods, products or materials produced in the United States. This includes, but is not limited to, iron, aluminum, steel, cement, and other manufactured products.

Suggested Language. The following provides a sample contract clause:

"Domestic Preference for Procurements

As appropriate, and to the extent consistent with law, the contractor should, to the greatest extent practicable, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States. This includes, but is not limited to iron, aluminum, steel, cement, and other manufactured products.

For purposes of this clause:

Produced in the United States means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States. Manufactured products mean items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber."

Recommended Clauses

Access to Records

NFEs and their contractors and subcontractors must give the Department of Treasury and other authorized representatives access to records associated with their awards during the federally required record retention period and as long as the records are retained.

Suggested Language. The following provides a sample contract clause:

The following access to records requirements apply to this contract:

(1) The Contractor agrees to provide (insert name of state agency or local or Indian tribal government), (insert name of recipient), Treasury, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, and transcriptions.

(2) The Contractor agrees to permit any of the foregoing parties to reproduce by any means whatsoever or to copy excerpts and transcriptions as reasonably needed.

(3) The Contractor agrees to provide the Treasury or authorized representatives access to construction or other work sites pertaining to the work being completed under the contract.

Contract Changes or Modifications

To be eligible for ARP SLFRF assistance under the non-Federal entity's Treasury grant or cooperative agreement, the cost of the change, modification, change order, or constructive change must be allowable, allocable, within the scope of its grant or cooperative agreement, and reasonable for the completion of project scope.

Compliance with Federal Law, Regulations and Executive Orders

The recipient and its contractors are required to comply with all Federal laws, regulations, and executive orders.

Suggested Language. The following provides a sample contract clause:

> "This is an acknowledgement that Treasury ARP SLFRF financial assistance will be used to fund all or a portion of the contract. The contractor will comply with all applicable Federal law, regulations, executive orders, Treasury policies, procedures, and directives."

Program Fraud and False or Fraudulent Statements or Related Acts

Recipients must comply with the requirements of The False Claims Act (31 U.S.C. §§ 3729-3733) which prohibits the submission of false or fraudulent claims for payment to the federal government. It is that the non-Federal entity include a provision in its contract that the contractor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to its actions pertaining to the contract.

Suggested Language. The following provides a sample contract clause:

> "The Contractor acknowledges that 31 U.S.C. Chap. 38 (Administrative Remedies for False Claims and Statements) applies to the Contractor's actions pertaining to this contract."

KNOX COUNTY
TENNESSEE

CORONAVIRUS STATE AND LOCAL FISCAL RECOVERY FUNDS (SLFRF) GUIDANCE ON SUBRECIPIENT PROCUREMENT AND COMPLIANCE RESPONSIBILITIES

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REQUIRED DOCUMENTS

In the following overview table are a list of documents that subrecipients of Coronavirus State and Local Fiscal Recovery Funds (SLFRF) should maintain and provide to Knox County Grants and Community Development (KCGCD) for documentation of procurement procedures.

DOCUMENTS THAT SUBRECIPIENTS SHOULD PREPARE TO UPLOAD AND MAINTAIN FOR MONITORING EVENTS	
EXISTING PROCUREMENT POLICIES	EVALUATION AND SCORING RECORDS
REQUEST FOR PROPOSAL/REQUEST FOR BID (RFP/RFQ) PACKAGE ISSUED	RECOMMENDATION TO AWARD MEMO
DOCUMENTATION REGARDING THE POSTING OF THE RFP/RFQ	CONTRACT WITH PRICING INFORMATION
INDEPENDENT COST ESTIMATE	ADDENDA/EXTENSIONS ISSUED AND SUPPORTING COST ESTIMATES
EVALUATION CRITERIA	COPIES OF CORRESPONDENCE WITH BIDDER
COPIES OF RESPONSES TO RFP/RFQ	OTHER SUPPORTING DOCUMENTATION AS APPLICABLE
ASSET MANAGEMENT PLAN (AMP) AND CAPITAL IMPROVEMENT PLAN (CIP)	FINAL TENNESSEE INFRASTRUCTURE SCORECARD

SLFRF funds may be used to cover eligible costs incurred during the period that begins on March 3, 2021, and ends on December 31, 2024, as long as the award funds for the obligations incurred by December 31, 2024, are expended by September 30, 2026. Project expenses shall be paid on a reimbursement basis only and solely for grant-related expenses that have been paid. Proof of payment is verified by provided cancelled checks. Requests for payment must be submitted on agency letterhead with adequate and proper documentation of eligible costs incurred in compliance with 2 CFR Part 200. Costs for projects incurred by the subrecipient prior to March 3, 2021are not eligible, as provided for in Treasury's Final Rule.

Note: Before costs associated with the project may be reimbursed, the procurement of services/construction ***must*** be approved.

EXISTING PROCUREMENT POLICIES

Procurement Standards (2 CFR Subpart D) can be broken down into the following categories:

- Procurement by states (2 CFR Part 200.317)
- General procurement standards (2 CFR Part 200.318)

- The Uniform Guidance (2 CFR 200.319) that all procurement transactions for property or services must be conducted in a manner providing full and open competition, consistent with standards outlined in 2 CFR 200.320, which allows for non-competitive procurements only in certain circumstances.
- Contracting with diversity, small and minority businesses, women's business enterprises (DBE/SBE/WBE), and area labor surplus firms (2 CFR Part 200.321)
- Domestic Preferences for Procurement (2 CFR Part 200.322)
- Procurement of Recovered Materials (2 CFR Part 200.323)
- Contract Cost and Price (2 CFR Part 200.324)
- Federal Awarding Agency or Pass-Through Entity Review (2 CFR Part 200.325)
- Bonding Requirements (2 CFR Part 200.326)
- Contract Provisions (2 CFR Part 200.327 Appendix II)

A subrecipient of SLFRF funds must have and use documented procurement procedures, including:

1. **Written policies and procedures** – Have a written code of conduct with standards prohibiting those involved in procurement from soliciting or accepting gifts.
2. **Written standards of conduct** – Have a formal statement of mission, values, principles, and professional standards, including conduct/ethics of subcontractor, including requirements for a drug-free workplace.
3. **Record maintenance and retention** – Maintain sufficient records of the procurement details (rationale for the method used, selection of the contract type, contractor selection or rejection, and basis for contract price). Maintain financial and performance oversight of contractors.
   Note: All records are required to be available for auditing purposes for period of five (5) years from the date of submission of KCGCD's final expenditure report.
4. **SAM.gov Requirements** - All eligible recipients are required to have an active registration with the System for Award Management ("SAM") (https://www.sam.gov) pursuant to 2 CFR Part 25.

COMPETITION (2 CFR PART 200.319)

The Uniform Guidance establishes in 2 CFR 200.319 that all procurement transactions for property or services must be conducted in a manner providing full and open competition, consistent with standards outlined in 2 CFR 200.320, which allows for non-competitive procurements only in certain circumstances. Recipients must have and use documented procurement procedures that are consistent with the standards outlined in 2 CFR 200.317 through 2 CFR 200.320. The Uniform Guidance, pursuant to 2 CFR 180, requires an infrastructure for competitive bidding and contractor oversight, including maintaining written standards of conduct

and prohibitions on dealing with suspended or debarred parties. Subrecipients must ensure adherence to all applicable local, state, and federal procurement laws and regulations as detailed below.

- Provide full and open competition.
- Must have documented selection procedures.
- Subcontractors that develop or draft specifications, requirements, statements of work, RFB's, or RFP's for subrecipients *are not* allowed to compete for and be awarded the subsequent contract for that work.
- Don't approve non-competitive contracts to consultants on retainer contracts.
- Don't require unnecessary experience and excessive bonding or place unreasonable requirements on firms for them to qualify to do business. (2 CFR Part 200.326)
- Do require a bid guarantee from each bidder (5% of the bid price).
- Do require a performance and payment bond for 100% of contract price.
- Must follow bonding requirements for construction or facility improvement projects beneath the Simplified Acquisition Threshold (i.e. subrecipients receiving over $250,000 in federal funding must provide bid guarantee of 5%).
- Don't allow non-competitive pricing practices between firms or between affiliated companies.
- Don't use state, local, or tribal geographical preferences in the evaluation of bids or proposals.
- Don't specify a "brand name" product rather than allowing an equal product to be offered.
- Do ensure all pre-qualified vendor lists are current and include enough qualified resources.

Note: If subrecipients have a single source available for a specific material/supply needed for a grant-funded portion of the project, written justification is ***required*** prior to entering into a contract with the supplier. Contact KCGCD for guidance on Non-Competitive/Sole Source Procurement.

Contractor/Subcontractor Ability to Work on Federally-Funded Project

Subrecipients are responsible for checking each contractor and subcontractor's status in SAM.GOV to ensure that they are not debarred or suspended. Additionally, subrecipients *must* ensure that all contractors and subcontractors are able in good status with the State of Tennessee's Business Registration.

- State of TN Registration - https://tnbear.tn.gov/Ecommerce/FilingSearch.aspx
- SAM.GOV - https://sam.gov/search/

Note: Subrecipients ***must*** submit to KCGCD a screenshot of the contractor/subcontractor search results prior to contracting with them for the project. It is the responsibility of the subrecipient to verify ongoing status annually for the entirety of the time they work on the project.

KNOX COUNTY PROCUREMENT THRESHOLDS

There are three (3) price thresholds per Knox County's procurement policy that are detailed in the table below.

KNOX COUNTY PROCUREMENT THRESHOLDS		
SMALL PURCHASE	INFORMAL BIDDING	COMPETITIVE SEALED BIDS
<$25,000	$25,000 - $50,000	>$50,000
STATE LAW DOES NOT REQUIRE COMPETITIVE BIDDING	THREE WRITTEN QUOTES	PUBLIC NOTICE IS REQUIRED

CONTRACTING WITH DBE/SBE/WBE (2CFR PART 200.321)

To ensure consistent compliance with this requirement, subrecipients that have not released the competitive bid public notice will post project opportunities on the State's Governor's Office of Diversity Business Enterprise (Go-DBE) website. Request for Proposal/Request for Bid opportunities must be posted to the State's Go-DBE website following the instructions below:

1. Visit: Governor's Office of Diversity Business Enterprise (Go-DBE)
2. Follow the link to the Grant Website Posting Form
https://www.tn.gov/content/tn/generalservices/procurement/central-procurement-office--cpo-/go-dbe/current-procurement-opportunities/grant-website-posting-form.html
3. Complete the form, selecting ARP as the type of grant
4. Attach all relevant solicitation documents
    - Grant information will post within 24-48 hours of receipt, except for State approved holidays and weekends.
    - The minimum time frame to leave opportunities posted is 2 weeks (10 business days), but it is preferrable to have the solicitation open for 30 days

Note: A screenshot of the Go-DBE website is ***required*** to be submitted as part of the procurement package. The solicitation will display at the following weblink:
https://www.tn.gov/content/tn/generalservices/procurement/central-procurement-office--cpo-/go-dbe/current-procurement-opportunities/go-dbe-events1.html

DOMESTIC PREFERENCES FOR PROCUREMENT (2CFR PART 200.322)

As appropriate and to the extent consistent with law, the subrecipient should, to the greatest extent practicable under a federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including, but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all subawards including in all contracts and purchase orders for work or products under this award.

CONTRACT COST AND PRICE ANALYSIS (2 CFR PART 200.324)

The subrecipient must perform a cost or price analysis in connection with every procurement action, including contract modifications as detailed below. A *cost analysis* generally means evaluating the separate cost elements that make up the total price, while a *price analysis* means evaluating the total price, without looking at the individual cost elements. Prior procurements, current price data and institutional knowledge may be leveraged during a cost or price analysis.

The method and degree of analysis is dependent on the facts surrounding the particular procurement situation, but as a starting point, the subrecipient must gather an independent estimate prior to receiving bids or proposals.

- Price/cost analysis for each procurement above the small purchase threshold.
- Must use project cost estimates for evaluating bids or proposals prepared prior to receiving bids in order to assess the reasonableness of the proposals received.
- Must negotiate profit as a separate element of the contract.
- Time and materials contracts must contain a cap/threshold.
- Cost-plus-percentage-of-cost (CPPC) or cost-plus-percentage-of-construction-cost *are not* allowed.

Costs or prices based on estimated costs for contracts under the federal award are allowable *only* to the extent that costs incurred, or cost estimates included in negotiated prices would be allowable under Cost Principles of the Uniform Guidance 2 CFR 200 Subpart E.

Cost-Plus-Percentage-Of-Cost (CPPC)

It is important to distinguish between using ("negotiating") projected/estimated costs vs. actual costs in arriving at the profit or fee dollars. If the subrecipient is using the contractor's projected/estimated (proposed) costs as the basis to negotiate fee, then this is not a CPPC situation. If, however, the subrecipient uses actual costs (i.e., after the costs are incurred) as the basis to establish fee, then this would have a "de facto" illegal CPPC situation. Additionally, it would not be legal to establish terms in a contract that promised to pay the contractor for actual costs incurred plus a predetermined rate of profit on those costs. This too would be a CPPC

contract. The fee payable must always be expressed and fixed in the contract in "$" terms, not "%" terms, so that if the contractor overruns the estimated costs in completing the statement of work, there must be no additional fee paid on those cost overrun "$". The fee to be paid for completing the scope of work must be fixed and payable regardless of how much it actually costs the contractor to finish the work.

The table below depicts when it is appropriate to use a cost or price analysis. The scope of the work to be performed should determine whether to use a cost or price analysis. Bids or proposals costs within 15% of the estimate are considered cost reasonable and may move forward to award.

SCOPE OF WORK	COST ANALYSIS	VS	PRICE ANALYSIS
ITEMS PURCHASED	PROFESSIONAL SERVICES LABOR & MATERIALS		SUPPLIES EQUIPMENT & CONSTRUCTION
PROCUREMENT TYPE	RFP/RFB NON-COMPETITIVE		SMALL PURCHASE INFORMAL BIDDING COMPETITIVE SEALED BID
STANDARD FOR ESTIMATES	PRIOR PROPOSALS/BIDS PRIOR PURCHASES ESTIMATING SOFTWARE FEDERAL RATES		PUBLISHED PRICES PRICE SET BY LAW FEDERAL RATE PRIOR PROPOSALS/PURCHASES
EVALUATION	LINE ITEMS ARE REVIEWED AGAINST ESTIMATES, MARKET RATE, & OTHER PROVIDED QUOTES		TOTAL QUOTE PRICE COMPARED TO ESTIMATE, MARKET RATE, & OTHER QUOTES

Contracts will be normally competitively bid unless:

- The item is available only from a single source;
- After solicitation of a number of sources, competition is determined inadequate; *or*
- Meets the requirements of simplified acquisition.

Written authorization from Knox County is required if competitive bids are not adhered to for any of the aforementioned reasons.

BONDING REQUIREMENTS (2 CFR PART 200.326)

Construction or facility improvement projects that are above the Simplified Acquisition Threshold bonding requirements must adhere to the following:

- A bid guarantee from each bidder equivalent to 5% of the bid price.

- A performance and payment bond on the part of the contractor for 100% of the contract price.
- Must follow bonding requirements for construction or facility improvement projects beneath the Simplified Acquisition Threshold.

DOCUMENTATION REGARDING THE POSTING OF THE RFP/RFQ/RFB

Procurement package documentation (*see Procurement Package Documentation Checklist on page 15)* is to be submitted to KCGCD for review and approval prior to contracting with the selected company.

CONTRACT PROVISIONS (2 CFR PART 200.327 APPENDIX II)

Subrecipients must include the following language in all contracts for project-related work:

Contractor agrees to comply with all requirements of Sections 602 and 603 of Social Security Act ("the Act"), regulations adopted by Treasury pursuant to Sections 602(f) and 603(f) of the Act, and guidance issued by Treasury regarding the foregoing. Contractor also agrees to comply with all other applicable federal statues, regulations, and executive orders, and Contractor shall provide for such compliance by other parties in any agreements it enters into with other parties relating to this award. Federal regulations applicable to this award include, without limitation the following:

1. Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200, other than such provisions as Treasury may determine are inapplicable to this Award and subject to such exceptions as may be otherwise provided by Treasury. Subpart F – Audit Requirements of the Uniform Guidance, implementing the Single Audit Act, shall apply to this award.

2. Universal Identifier and System for Award Management (SAM), 2 C.F.R. Part 25 and pursuant to which the award term set forth in Appendix A to 2 C.F.R. Part 25 is hereby incorporated by reference.

3. Reporting Subaward and Executive Compensation information, 2 C.F.R. Part 170, pursuant to which the award term set forth in Appendix A to 2 C.F.R. Part 170 is hereby incorporated by reference.

4. OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement), 2 C.F.R. Part 180 (including the requirement to include a term or condition in all lower tier covered transactions (contracts and subcontracts described in 2

C.F.R. Part 180, subpart B) that the award is subject to 2 C.F.R. Part 180 and Treasury's implementing regulation at 31 C.F.R. Part 19.

5. Recipient Integrity and Performance Matters, pursuant to which the award term set forth in 2 C.F.R. Part 200, Appendix XII to Part 200 is hereby incorporated by reference.

6. Governmentwide Requirements for Drug-Free Workplace, 31 C.F.R. Part 20.

7. New Restrictions on Lobbying, 31 C.F.R. Part 21.

8. Uniform Relocation Assistance and Real Property Acquisitions Act of 1970 (24 §§ 4601-4655) and implementing regulation.

9. Generally applicable federal environmental laws and regulations.

10. Statues and regulations prohibiting discrimination applicable to this award, include without limitation, the following:
    a. Title VI of the Civil Rights Act of 1964 (42 U.S.C. §§ 2000d et seq.) and Treasury's implementing regulations at 31 C.F.R. Part 22, which prohibit discrimination on the grounds of race, color, or national origin under programs or activities receiving federal financial assistance;
    b. The Fair Housing Act, Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§ 3601 et seq.), which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status, or disability;
    c. Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794), which prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance;
    d. The Age Discrimination Act of 1975, as amended (42 U.S.C. §§ 6101 et seq.) and Treasury's implementing regulations at 31 C.F.R. Part 23, which prohibit discrimination on the basis of age in programs or activities receiving federal financial assistance; and
    e. The Americans with Disabilities Act of 1990, as amended (42 U.S.C. §§ 12101 et seq.), which prohibits discrimination on the basis of disability under programs, activities, and services provided or made available by state and local governments or instrumentalities or agencies thereto.

11. In accordance with 41 U.S.C. § 4712, Contractor may not discharge, demote, or otherwise discriminate against an employee as a reprisal for disclosing information to any of the list of persons or entities provided below, information that the employee reasonably believes is evidence of gross mismanagement of a federal contract or grant, a gross waste of federal funds, an abuse of authority relating to a federal contract or grant, a substantial and specific danger to public health or safety, or a violation of law, rule, or regulation related to a federal contract (including the competition for or negotiation of a contract) or grant.

a. A member of Congress or a representative of a committee of Congress;
b. An Inspector General;
c. The Government Accountability Office;
d. A Treasury employee responsible for contract or grant oversight or management;
e. An authorized official of the Department of Justice or other law enforcement agency;
f. A court or grand jury; and/or
g. A management official or other employee of the County, contractor, or subcontractor who has the responsibility to investigate, discover, or address misconduct.

Contractor shall inform its employees in writing of the rights and remedies provided under this section, in the predominant native language of the workforce.

12. Pursuant to Executive Order 13043, 62 FR 19217 (April 8, 1997), Contractor should and should encourage its employees to adopt and enforce on-the-job seat belt policies and programs for their employees when operating company-owned, rented or personally owned vehicles.

13. Pursuant to Executive Order 13513, 74 FR 51225 (October 6, 2009), Contractor should encourage its employees, subrecipients, and contractors to adopt and enforce policies that ban text messaging while driving, and Contractor should establish workplace safety policies to decrease accidents caused by distracted drivers.

Contractor shall not discriminate against any employee or applicant for employment because of race, color, creed, religion, sex, age, handicap, disability, ancestry, national origin, marital status, familial status, or any other basis prohibited by applicable law. Contractor shall take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to their race, color, creed, religion, sex, age, handicap, disability, ancestry, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training including apprenticeship. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

Contractor will, in all solicitations or advertisements for employees placed by or on behalf of Contractor; state that all qualified applicants will receive consideration for employment without regard to race, color, creed, religion, sex, age, handicap, disability, ancestry, national origin, marital status, or any other basis prohibited by applicable law.

In the event of Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or order, this contract may be cancelled, terminated, or suspended in whole or in part and Contractor may be declared ineligible for further government contracts or federally assisted construction contracts.

14. Contractor is prohibited from using funds provided herein or personnel employed in the administration of the program for: political activities; inherently religious activities; lobbying; political patronage; and nepotism activities.

15. **TRAFFICKING**
Contractor will comply with the requirements of Section 106(g) of the Trafficking Victims Protection Act (TVPA) of 2000, as amended (22 U.S.C. 7104), which prohibits grant award recipients or a subrecipient from (1) engaging in severe forms of trafficking in persons during the period of time that the award is in effect (2) Procuring a commercial sex act during the period of time that the award is in effect or (3) Using forced labor in the performance of the award or subawards under the award.

16. **FEDERAL FUNDING ACCOUNTABILITY AND TRANSPARENCY ACT**
The Federal Funding Accountability and Transparency Act (FFATA) of 2006 requires information on Federal awards be made public using the FFATA Subaward Reporting System (FSRS) reporting tool. The County will report subcontracts under Federally-awarded contracts greater than or equal to $30,000.

17. **PROVISIONS OF THE HATCH ACT**
Contractor agrees to comply with the provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

18. **CONFLICT OF INTEREST**
Contractor understands and agrees it must maintain a conflict-of-interest policy consistent with 2 C.F.R. § 200.318(c) and that such conflict-of-interest policy is applicable to each activity funded under this award. Contractor and subrecipients must disclose in writing to County any potential conflict of interest affecting the awarded funds in accordance with 2 C.F.R. § 200.112; which includes (but is not limited to) the following:

    1. Contractor shall maintain a written code or standards of conduct that shall govern the performance of its officers, employees, family members, or consultants engaged in the award and administration of contracts supported by Federal funds.
    2. No employee, officer or agent of the Contractor shall participate in the selection, or in the award, or administration of, a contract supported by Federal funds if a conflict of interest, real or apparent, would be involved.
    3. No covered persons who exercise or have exercised any functions or responsibilities with respect to Treasury assisted activities, or who are in a position to participate in a decision-making process or gain inside information with regard to such activities, may obtain a financial interest in any contract, or have a financial interest in any contract, subcontract, or Agreement with respect to the assisted activity, either for themselves or those with whom they have business or immediate family ties, during their tenure or for a period of

one (1) year thereafter. For purposes of this paragraph, a "covered" person includes any person who is an employee, agent, immediate family member, consultant, officer, or elected or appointed official of the County, Contractor, or any designated public agency.

The County agrees to incorporate, or cause to be incorporated, like language prohibiting such interest in all contracts and subcontracts hereunder.

19. **LOBBYING RESTRICTIONS**

Contractor certifies that, to the best of its knowledge and belief:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of it, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan or cooperative agreement.
b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, loan, grant or cooperative agreement, it will complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions; and
c. It will require that the language of this paragraph be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, United States Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

20. **COMPLIANCE**

Contractor agrees to comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

21. **SPECIAL TERMS AND CONDITIONS**

Any publications produced with funds from this award must display the following language: "This project [is being] [was] supported in whole or in part, by federal award number 21.027 awarded to Knox County by the U.S. Department of the Treasury".

22. **BOYCOTT OF ISRAEL**
    Contractor certifies that it is not currently engaged in and will not for the duration of the contract engage in, a boycott of Israel as defined by Tenn. Code Ann. § 12-4-119. This provision shall not apply to contracts with a total value of less than two hundred fifty thousand dollars ($250,000) or to contractors with less than ten (10) employees.

23. **IRAN DIVESTMENT ACT**
    Contractor certifies that it is not currently engaged in and will not for the duration of the contract engage in investment activities in Iran. The Contractor certifies that it is not on the list of persons engaging in investment activities in Iran, pursuant to Tenn. Code Ann. § 12-12-105, located at: https://ogs.ny.gov/system/files/documents/2022/12/iran-divestment-act-list-of-entities-12-5-22.pdf .

RECOMMENDATION TO AWARD MEMO

Once the contractor/subcontractor selection is made, the subrecipient sends a Recommendation to Award memo to the contractor to carry out the proposed action. This memo should be kept in file documentation.

The Tennessee Department of Environment and Conservation (TDEC) requires the submission of an authority-to-award (ATA) bid package from grant recipients *prior* to commencing construction. Upon TDEC approval of the ATA bid package, the subrecipient is authorized to award construction contracts. Subrecipients should schedule pre-construction conferences (PCC) prior to issuing a notice to proceed (NTP) with selected contractors/subcontractors. TDEC will require a two-week notification prior to the PCC that should be submitted by KCGCD. Once the PCC is held, an NTP can be issued. Construction start dates in the NTP must be within 120 days of the approval of the ATA bid package.

OTHER SUPPORTING DOCUMENTATION

- Maintain documentation details that outline complete and accurate history of the procurement to support method, contractor, the basis of award, and price reasonableness for period of five (5) years from the date of submission of the final expenditure report.
- Insurance certificates are required as part of the procurement file.
- Contract amendments, extensions, and change orders affecting prices or price ceilings must have an updated cost estimate performed.

PROCUREMENT PACKAGE DOCUMENTATION CHECKLIST

Before costs associated with the project may be reimbursed, the procurement of services/construction ***must*** be approved.

☐Existing procurement policy

☐RFP/RFB/RFQ package issued

☐Documentation related to RFP/RFB/RFQ posting

☐Screenshot of RFP/RFB/RFQ posting on Go-DBE website

☐Independent Cost Estimate *(RFP/RFB only)*

☐Cost/Price Analysis *(RFP/RFB only)*

☐Evaluation Criteria

☐Evaluation and scoring records

☐Contractor SAM.GOV registration and debarment status screenshot

☐Contractor TN Business Registration status screenshot

☐Copies of all responses to the RFB/RFP/RFQ

☐Contract with pricing information

☐Addenda/extensions issued

☐Copies of correspondence with all bidders

☐Recommendation to award memo

☐Other applicable supporting documentation

REIMBURSEMENT REQUEST DOCUMENTATION CHECKLIST

All relevant documentation is required with reimbursement requests, ***regardless*** of grant funding source. All costs ***must*** be separated by project, even if the source for the services / materials / supplies is the same for multiple projects.

☐Reimbursement Invoice Form

☐Purchase Orders

☐Change Orders

☐Contractor Invoices and support documentation

☐Proof of payment such as cancelled check

☐Payroll documentation *(if requesting reimbursement for personnel and fringe benefits)*

SECTION 01 1100

SUMMARY OF WORK

1. GENERAL

1.1. SCOPE

A. The work described in these Contract Documents consists of furnishing, delivering, and installing all materials, equipment, and products for the construction of the HPUD Melton Hill Raw Water Intake Improvements, such that the furnished product is fully functional and operational as intended in the Contract Drawings and Specifications.

B. Furnish all materials, power, equipment, tools, labor, transportation, and other items necessary or convenient to the Contractor for the installation of the equipment, materials, and products specified or described in these Contract Documents and for the completion of all work to be performed by the Contractor as specified herein.

C. The work includes, but is not limited to, the following major work elements:

1. Install a new raw water intake pump.
2. Install pump discharge piping and appurtenances, including air release, check, butterfly, and surge valves; flow meter; bypass connection; and connection to existing raw water transmission piping.
3. Install supporting electrical equipment and HVAC upgrades.
4. Painting.
5. Bypass pumping.

1.2. PROJECT COORDINATION

A. The Contractor shall be responsible for project coordination, which includes but is not limited to the following:

1. Work of employees and subcontractors under contract to him. Conduct work to ensure compliance with schedules.
2. Submission of all invoices, progress schedules, progress reports, progress estimates, and other data needed in support of requests for payment.
3. Product and equipment deliveries adequate to maintain the schedule of construction. Report noncompliance to Owner with a recommendation for remedy.
4. Obtaining and use of all temporary structures, offices, storage sheds, and utilities.
5. Obtaining any required building permits, special permits, and approvals from all authorities having jurisdiction.
6. Testing laboratory activities associated with Contractor's scope of work.
7. Check-out of systems and equipment and start-up operations.
8. Work and operations between the Contractor and all trades in such a manner that no union labor dispute of jurisdiction arises regarding unloading,

handling, installations, and connections to utilities and otherwise of the various items in the various trades.

B. Coordination with Ongoing Operations

1. Existing utilities shall be protected at all times during construction. If any utility is damaged, the Contractor shall notify the Utility and the Owner immediately. Damaged utilities shall be repaired immediately.
2. At no time shall construction operations result in an unscheduled or unapproved interruption of ongoing raw water pump station operations.
3. If construction activities require a temporary shutdown of the pump station, the activities that require the shutdown shall be clearly shown on the Contractor's Progress Schedule. The Contractor shall furnish the Engineer with a written description of the work to be accomplished during the proposed shutdown, a written work plan, and an estimate of the duration of the shutdown at least ten (10) working days prior to the scheduled shutdown.
4. Contractor shall order and obtain all equipment, parts, and materials needed for the work prior to any shutdown.
5. The installation of the new raw water pump shall be approved by a factory representative prior to initial start-up. The representative shall be present to witness the initial start-up of the pump.
6. The maximum duration of a shutdown is limited to 10 hours.

1.3. SUBSTANTIAL COMPLETION

A. The work will not be considered to be fully functional and usable by the Owner for its intended purposes and will not be considered substantially complete until the following items are submitted:

1. Copies of final Operation and Maintenance Manuals in conformance with Section 01 7823, Operating and Maintenance Data.
2. Copies of Equipment Start-up Report and Certification Report forms signed by authorized factory representatives on items of process, mechanical, and control equipment in conformance with Section 01 3200, Schedules and Reports.
3. Delivery of specified spare parts and copies of signed Spare Parts Inventory Report forms in accordance with Section 01 3200, Schedules and Reports.
4. Training of Owner's operators and maintenance personnel as specified in the appropriate specification sections.
5. Delivery of specified keys for all permanent locks.
6. Copies of specified inspection and test reports and certifications on materials.
7. Copies of written warranties on equipment and products in accordance with Section 01 7836, Warranties and Bonds.

B. In addition to the above submissions, the work will not be considered to be fully functional and useful by the Owner for its intended purposes and will not be accepted as substantially complete until all of the following components and/or items have been completed:

1. Foundations and structures, including railings and gratings.
2. Process and mechanical equipment pumping systems.

3. Process and mechanical piping and valving, including pressure and leak testing.
4. Alarm, control systems, telemetry, and instrumentation.
5. Electrical panels and equipment.
6. Electrical and control wiring and conduits.
7. Check-out and start-up of equipment and controls, including telemetry, communication, and alarm systems, if provided.
8. Fencing. (Where damaged)
9. Roadways, parking areas, and stone surfaces.
10. Slope protection and riprap.
11. Signage and identification.
12. The following items, unless waived in writing by the Owner due to inclement weather:
    a. Finish grading.
    b. Seeding and mulching.
    c. Pavements. (Where damaged.)
    d. Sidewalks. (Where damaged.)

1.4. FINAL COMPLETION

A. The work under these Contract Documents will not be considered for final acceptance as complete until all of the following items have been completed or submitted:

1. Any items not completed at the time of substantial completion, including all remaining punch list items.
2. Final cleanup.
3. Restoration of all disturbed or damaged properties.
4. Executed project close-out documents included with the Contract Documents.
5. Record drawings.
6. As-built surveys, if required by the Specifications.

1.5. ACCEPTANCE AND START-UP OF OPERABLE COMPONENTS

A. Because of the need to maintain operation during construction, it may be necessary to accept as substantially complete and start-up operable components of the project at various times prior to the completion and acceptance of the entire project.

B. An "operable component" of the project, as used herein, shall mean a complete process subsystem capable of independent operation and shall include all associated structures, equipment, piping, controls, etc.

C. Acceptance and start-up of operable components shall not relieve the Contractor of his obligation to substantially complete the project within the Contract Time.

1.6. OWNER’S CONTINUED OCCUPANCY OF EXISTING FACILITIES

A. The Contractor shall perform his obligations as set forth in these Contract Documents in a manner that will not unduly hinder or jeopardize the continued

operation or reliability of the Owner's raw water pump station, conveyance, or treatment system in any way.

B. Construction activities or operations for which there is no alternative to a temporary shutdown or hindrance to the operation of the raw water treatment system and pump station shall be carefully coordinated in advance with the operations superintendent through or in cooperation with the Engineer.

1.7. TEMPORARY SHUTDOWNS

A. The costs of temporary dewatering, pumping, piping, etc. shall be included in the lump sum price bid for the work. No separate payment will be made.

B. All construction activities requiring a temporary shutdown of system shall be clearly shown on the Contractor's Progress Schedule. The Contractor shall furnish the Engineer with a written description of the work to be accomplished during the proposed shutdown, a written work plan, and an estimate of the duration of the shutdown at least ten (10) working days prior to the scheduled shutdown.

C. Construction activities shall be planned and executed as required to minimize the duration of any temporary shutdowns.

D. Procurement. Contractor shall order and obtain all equipment, parts, valves, and materials needed for the work prior to any temporary shutdown.

1.8. VIDEO

A. Prior to construction, Contractor shall color video record the entire project site including the route of any linear construction, all easements and right-of-way, and the route of all service lines where included in the construction. The Contractor shall identify the line designation and station number or mileage, all natural landmarks, the street address of the area in view if available, and any other areas, structures, fences, trees, landscaping, etc., subject to potential disturbance. The Contractor shall provide the Owner with one (1) copy of the video on DVD with audio comments.

END OF SECTION

SECTION 01 2113

ALLOWANCES

1. GENERAL

1.1. ALLOWANCES IN CONTRACT SUM

A. Include allowances stated in the Contract Documents in the Contract Sum.

B. Use of the allowances shall be authorized in writing by the Engineer and approved by the Owner.

1.2. ADMINISTRATION OF ALLOWANCES

A. Contractor's duties in selection of products or provision of services under allowances.

1. Assist the Engineer and Owner in determining qualified suppliers or installers.

2. Obtain bids from suppliers and installers when requested by the Engineer.

3. Make appropriate recommendations for consideration by the Engineer.

B. Adjustment of Costs

1. Should the net cost be more or less than the specified amount of the allowance, the Contract Sum will be adjusted accordingly by Change Order.

2. At Contract Close Out, reflect approved changes to the Contract Sum in the final application for payment.

3. The Contractor will be limited to a maximum mark-up for overhead and profit of 15 percent on allowance items.

1.3. SPECIFIED ALLOWANCES

A. Furnish and install the equipment or systems identified in the Bid Schedule, Section 00 4143, under Allowances and as specified herein and shown on the Drawings that have been pre-selected by the Owner. Detailed scope of supply and pricing information for the Suppliers identified are provided in the Appendix to these documents. This equipment cost allowances only cover the equipment and items specified and included in the scope. Equipment handling, installation, startup, overhead and profit, terms and conditions, taxes and any other items required for a complete and functional installation shall be provided by the Contractor under the lump sum base bid for the project.

1. Include lump sum allowance of $50,000.00 for SCADA programming, MR Systems.

2. Include lump sum allowance of $50,000.00 for paving restoration. Paving restoration shall be in accordance with the standards of Anderson County, Tennessee.

3. Include lump sum allowance of $50,000.00 for bypass flow control.

B. Owner specified miscellaneous items not covered in contract documents.

1. Include lump sum allowance of $100,000.00.

2. This allowance is provided to cover the cost of unspecified and necessary repairs to existing equipment and appurtenances discovered during the work, including Owner or Engineer requested improvements not specified herein.

3. Such work shall be directed and approved by a field order.

END OF SECTION

SECTION 01 2200

MEASUREMENT AND PAYMENT

1. GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.2. LUMP SUM PRICES

A. Lump sum prices shall include all items of work shown on the Drawings, specified, or otherwise required or necessary for complete, working systems including work, services, fees, equipment or material not specifically listed, overhead, profit, and applicable taxes.

B. A “Schedule of Values” is required to facilitate payment for partial completion of lump sum items as the project progresses.

1.3. UNIT PRICES

A. This section specifies administrative and procedural requirements for unit prices.

1. A unit price is an amount proposed by Bidders and stated in the Bid Schedule as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of work required by the Contract Documents are increased or decreased.

2. Payment will be made only for those items listed in the Bid Schedule. All other items not specifically listed shall be deemed incidental and cost of same shall be included in other items of work.

3. Unit prices include all necessary material, overhead, profit and applicable taxes.

4. Refer to individual specification sections for construction activities requiring the establishment of unit prices. Methods of measurement and payment for unit prices are specified in Part 3 of this section.

B. Specification sections referenced in the Bid Schedule contain requirements for materials and methods described under each unit price.

2. PARTIAL PAYMENT

A. Partial payment may be made for stored material on site, providing:

1. The material meets the specifications outlined elsewhere in these documents.

2. The material is stored according to the recommendations of the Engineer and/or manufacturer.

3. The Contractor submits copies of all shipping invoices for the stored materials delivered to the site.

3. MEASUREMENT AND PAYMENT

3.1. MEASUREMENT AND PAYMENT - LUMP SUM

A. Measurement and payment for all items of work shown on the Drawings, specified, or otherwise required or necessary for complete, working systems shall be made at the lump sum prices listed in the Bid Schedule. No separate payment shall be made for items of work, services, fees, or equipment not specifically listed, but payment for those items shall be included in the payment for items listed.

END OF SECTION

SECTION 01 2976

APPLICATIONS FOR PAYMENT

1. GENERAL

1.1. REQUIREMENTS INCLUDED

A. Submit Applications for Payment to the Engineer.

1.2. RELATED DOCUMENTS

A. Contract between Owner and Contractor.

B. General Conditions: Progress Payments, Retainages and Final Payment.

C. Section 01 7800, Project Closeout.

1.3. FORMAT AND INFORMATION REQUIRED

A. Review preliminary application with resident project representative.

B. Submit applications typed on forms acceptable to the Owner.

C. Provide itemized data on application:

1. Format, schedules, line items, unit prices, units completed by month and project-to-date, and values.

2. Documentation of employee wages, as requested.

1.4. PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Form

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

2. Fill in summary of dollar values to agree with respective totals indicated.

3. Fill in summary of dollar values to agree with respective totals indicated.

B. Continuation Sheets

1. Fill in total list of all scheduled component items of work, with item number and scheduled dollar value for each item.

2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored. Round off values to nearest dollar, or as specified for the Bid Schedule.

3. List each Change Order executed prior to date of submission. List by Change Order number and description, as for an original component item of work.

4. To receive approval for payment on component material stored on site, submit copies of the original paid invoices with the application for payment along with the material location report (see Section 01 3200, Schedules and Reports).

1.5. SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. Substantiating Data. When the Owner or the Engineer requires substantiating data, submit suitable information, with a cover letter identifying:

1. Project.

2. Application number and date.

3. Detailed list of enclosures.

4. For stored products:

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.

1.6. PREPARATION OF APPLICATION FOR FINAL PAYMENT

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

1.7. SUBMITTAL PROCEDURE

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

B. Number: Six copies of each application.

1.8. PROCESSING OF PERIODIC APPLICATIONS FOR PAYMENT

A. No applications for payment for work under this Contract will be processed until the Contractor's Preliminary Construction Schedule, Submittal Tabulation, and Schedule of Values are submitted in accordance with the requirements of Section 01 3200, Schedules and Reports.

B. No further applications for payment will be processed after the due date of the Contractor's Construction Schedule and Submittal Schedule until both schedules are submitted in conformance with the requirements of Section 01 3200, Schedules and Reports.

C. No applications will be processed for stored materials unless the application is accompanied with copies of original paid invoices and the Material Location Report specified in Section 01 3200, Schedules and Reports.

D. No applications for more than 80 percent of the Contract Price will be approved until copies of draft Operation and Maintenance Manuals are submitted in conformance with Section 01 7823, Operating and Maintenance Data.

E. No further applications for payment will be processed after the expiration of the Contract Time, including approved extensions thereof, until the date of Substantial Completion as described in these Contract Documents.

2. PRODUCTS (Not Used)

3. EXECUTION (Not Used)

END OF SECTION

SECTION 01 3119

PROJECT MEETINGS

1. GENERAL

1.1. SCOPE

A. This section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Preconstruction Conference.

2. Pre-Installation Conferences.

3. Coordination Meetings.

4. Progress Meetings.

B. Construction schedules are specified in another Division 1 section.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3. PRECONSTRUCTION CONFERENCE

A. Attend and participate in a preconstruction conference and organizational meeting at the project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees. The Owner, Engineer and their consultants, the contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda. Discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of shop drawings, product data and samples.

8. Preparation of record documents.
9. Use of the premises.
10. Office, work and storage areas.
11. Equipment deliveries and priorities.
12. Safety procedures.
13. First aid.
14. Security.
15. Housekeeping.
16. Working hours.

1.4. PRE-INSTALLATION CONFERENCES

A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Engineer of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:

a. Contract documents.
b. Options.
c. Related change orders.
d. Purchases.
e. Deliveries.
f. Shop drawings, product data and quality control samples.
g. Possible conflicts.
h. Compatibility problems.
i. Time schedules.
j. Weather limitations.
k. Manufacturer's recommendations.
l. Compatibility of materials.
m. Acceptability of substrates.
n. Temporary facilities.
o. Space and access limitations.
p. Governing regulations.
q. Safety.
r. Inspection and testing requirements.
s. Required performance results.
t. Recording requirements.
u. Protection.

2. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Engineer.

3. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the conference at the earliest feasible date.

1.5. COORDINATION MEETINGS

A. Conduct project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6. PROGRESS MEETINGS

A. Conduct progress meetings at the project site at regularly scheduled intervals but not less than monthly. Notify the Owner and Engineer of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees. In addition to representatives of the Owner and Engineer, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Agenda. Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.

2. Contractor's Submittal Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Submittal Schedule, whether on time or ahead or behind schedule. Determine how submittals behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to

ensure that current and subsequent activities will be completed within the contract time.

3. Review the present and future needs of each entity present, including such items as:

   a. Interface requirements.
   b. Time.
   c. Sequences.
   d. Deliveries.
   e. Off-site fabrication problems.
   f. Access.
   g. Site utilization.
   h. Temporary facilities and services.
   i. Hours of work.
   j. Hazards and risks.
   k. Housekeeping.
   l. Quality and work standards.
   m. Change Orders.
   n. Documentation of information for payment requests.

D. Reporting. No later than 5 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

   1. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

2. PRODUCTS (Not Applicable)

3. EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 3200

SCHEDULES AND REPORTS

1. GENERAL

1.1. SUMMARY

A. General. This section specifies administrative and procedural requirements for schedules and reports required for proper performance of the work.

B. Coordination. Each prime Contractor shall closely coordinate scheduling and reporting with the scheduling and reporting of other prime Contractors.

C. Schedules required include:

1. Preliminary Construction Schedule, including Submittals Tabulation.
2. Contractor's Construction Schedule.
3. Submittal Schedule.
4. Schedule of Values.

D. Reports required include:

1. Daily Construction Reports.
2. Material Location Reports.
3. Field Correction Reports.
4. Spare Parts Inventory Reports.
5. Equipment Start-up Report and Certifications.

E. Project meeting minutes are included in Section 01 3119, Project Meetings.

F. Inspection and test reports are included in Section 01 4500, Quality Control Services.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3. PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar Chart Schedule. Submit a preliminary horizontal bar chart type construction schedule within 7 days of the date established for commencement of the work.

B. Bar Chart Schedule. The Contractor for General Construction shall submit a preliminary horizontal bar chart type construction schedule, with a copy to each prime Contractor, within 7 days of the date established for commencement of the work. Within 5 working days of this submittal, each other prime Contractor shall

submit a matching preliminary horizontal bar chart schedule showing their construction operations sequenced and coordinated with general construction.

1. Provide a separate time bar for each significant construction activity. Coordinate each element on the schedule with other construction activities. Schedule each construction activity in proper sequence. Provide a continuous vertical line to identify the first working day of each week.

2. Indicate completion of the work in advance of the date established for substantial completion.

3. If adjustments are necessary for sequencing and coordination of the work, the Contractor for general construction shall arrange a meeting with the other prime Contractors at the earliest possible date. At this meeting each prime Contractor shall negotiate reasonable adjustments to their schedules.

C. Submittal Tabulation. With the submittal of the preliminary construction schedule, include a tabulation by date of submittals required during the first 90 days of construction. List those submittals required to maintain orderly progress of the work, and those required early because of long lead time for manufacture or fabrication.

1. At the Contractor's option, submittal dates may be shown on the schedule, in lieu of being tabulated separately.

1.4. CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar Chart Schedule. Prepare a comprehensive, fully developed, horizontal bar chart type Contractor's construction schedule based on the preliminary construction schedule and on whatever updating and feedback was received since the start of the project.

B. Bar Chart Schedule. The Contractor for general construction shall secure time commitments for performing critical construction activities from each of the other prime Contractors and shall prepare a combined construction schedule for the entire project. The Schedule shall be a comprehensive, multi-sheet, integrated, fully developed horizontal bar chart type schedule based on the preliminary construction schedules and reflecting updating and feedback received since the start of the project.

1. Submit the schedule within 30 calendar days of the date established for commencement of the work, unless a longer time has been requested and approved.

2. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week.

a. If practical, use the same breakdown of units of the work as indicated in the "Schedule of Values."

3. For significant construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within the time bar. As work progresses, place a contrasting mark in each bar to indicate actual completion percentage.

4. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data clearly for the entire construction period.

    a. Show the activities of each prime contract on a separate sheet.

    b. Prepare a simplified summary sheet indicating the combined construction activities of the prime contracts.

5. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on the schedule with other portions of the work; include minor elements involved in the overall sequence of the work. Show each construction activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the work. Show critical path activities or elements.

6. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other required schedules and reports.

7. Indicate completion of the work in advance of the date established for substantial completion. Indicate substantial completion on the schedule to allow ample time for the Engineer's administrative procedures necessary for certification of substantial completion.

C. Work Stages. Use crosshatched bars to indicate important stages of construction for each major portion of the work.

D. Such stages include, but are not necessarily limited to:

1. Subcontract awards.
2. Purchases.
3. Mockups.
4. Fabrication.
5. Sample testing.
6. Deliveries.
7. Installation.
8. Testing.
9. Adjusting.
10. Curing.
11. Start-up and placement into final use and operation.

E. Distribution. Following the Engineer's response to initial submittal of the Contractor's construction schedule, print and distribute copies to the Engineer,

Owner, separate contractors, subcontractors, suppliers, fabricators, and other parties required to comply with scheduled dates.

1. Post copies of the schedule in the project meeting room and temporary field office.

2. When revisions are made, distribute the updated schedule to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the work and are no longer involved in performance of construction activities.

F. Schedule Updating. Revise the schedule immediately after each meeting or other activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.5. SUBMITTAL SCHEDULE

A. Prepare a complete submittal schedule concurrent with the development of the Contractor's construction schedule. Submit the schedule within 30 calendar days of the date established for commencement of the work, unless a longer period has been requested and approved.

1. Coordinate submittal schedule with the list of subcontracts, Schedule of Values, and the list of products specified in Section 01 6000, Materials and Equipment, as well as the Contractor's construction schedule.

2. Prepare the schedule in chronological order; include submittals listed on the tabulation of submittals required during the first 90 days of construction. Provide the following information on the schedule:

   a. Schedule date for the first submittal.
   b. Related section number.
   c. Submittal category.
   d. Name of subcontractor.
   e. Description of the part of the work covered.
   f. Scheduled date of the Engineer's final release or approval.

3. Scheduled submittal dates shall be staggered.

4. Items of a critical nature shall be prioritized and so noted.

5. Scheduled final release or approval dates shall be coordinated with construction schedule.

B. Distribution. Following the Engineer's response to initial submittal, print and distribute the schedule to the Engineer, Owner, separate Contractors, subcontractors, suppliers, fabricators, and other parties required to comply with submittal dates indicated.

1. Post copies in the project meeting room and temporary field office.

2. When revisions are made, distribute the updated schedule to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned part of the work and are no longer involved in the performance of construction activities.

C. Schedule Updating. Revise the schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.6. SCHEDULE OF VALUES

A. Prepare and submit a schedule of values established in the Agreement within 15 days of the date established for commencement of the work.

1. Refer to Section 01 2200, Measurement and Payment, for a listing of categories of work where unit prices are required.

2. Refer to individual specification sections for portions of the work where the establishment of unit prices is required. Methods of measurement and pricing are specified in these sections.

B. Prepare the schedule in tabular form, including the following items:

1. Name of the part of the work.
2. Related specification section.
3. Name of subcontractor assigned.
4. Unit of measurement.
5. Price per unit.

C. Distribution. Distribute to the Owner, Engineer, and each party involved in performance of the portion of the work, where established unit prices could come into force and effect.

D. Following review by the Owner and Engineer, revise the schedule of values to correct any elements which the Owner and Engineer find unacceptable. After revision, the schedule of values shall be submitted for further review.

1.7. REPORTS

A. Daily Construction Reports. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Engineer at weekly intervals:

1. List of subcontractors at the site.
2. List of separate contractors at the site.
3. Approximate count of personnel at the site.
4. High and low temperature, general weather conditions.
5. Accidents (refer to accident reports).
6. Meetings and significant decisions.
7. Unusual events (refer to special reports).

8. Stoppages, delays, shortages, losses.
9. Meter readings and similar recordings.
10. Emergency procedures.
11. Orders and requests of governing authorities.
12. Change Orders received, implemented.
13. Services connected, disconnected.
14. Equipment or system tests and start-ups.
15. Partial completions, occupancies.
16. Substantial completions authorized.

B. Material Location Reports. At monthly intervals prepare a comprehensive list of materials delivered to and stored at the site. The list shall be cumulative, showing materials previously reported plus items recently delivered. Include with the list a statement of progress on and delivery dates for all materials or items of equipment being fabricated or stored away from the building site. Submit copies of the list to the Engineer at monthly intervals.

C. Field Correction Report. When the need to take corrective action that requires a departure from the Contract Documents arises, prepare a detailed report including a statement describing the problem and recommended changes. Indicate reasons the Contract Documents cannot be followed. Submit a copy to the Engineer immediately.

D. Spare Parts Inventory Report. Document in writing on forms provided by the Engineer delivery to the Owner of specified spare parts. Include the manufacturer's name, part name, number, and quantity delivered. Reports shall be signed by representatives of the Contractor, Owner, and Engineer. Reports are due prior to substantial completion.

1.8. LOGS

A. RFI Log. Maintain a tabular log of all Requests for Information (RFI). Number RFIs in a sequential manner. Note date of request and date of response for each. Update the RFI log monthly and distribute at the monthly progress meeting.

B. Shop Drawing and Product Data Submittal Log. Maintain a tabular log of all shop drawing and product data submittals. Number submittals in a sequential manner. Note dates of initial submittal, first return, resubmittal, second or final return along with Engineer’s action noted for each submittal. Update the shop drawing submittal log monthly and distribute at the monthly progress meeting.

C. Change Order Request/Proposal Log. Maintain a tabular log of all change order requests/proposals. Number change order requests/proposals in a sequential manner. Note date of submittal, brief description of covered work, proposed price, requested number of days (if applicable), and status (denied/approved/pending). For those that are approved, indicate in which change order they are included. Update the log monthly and distribute at the monthly progress meeting.

D. O & M Manual Log. Maintain a tabular log of all O & M Manual submittals. Number submittals in a sequential manner. Note dates of initial submittal, first return, resubmittal, second or final return along with Engineer's action noted for each submittal. Update the O & M Manual submittal log monthly and distribute at the monthly progress meeting.

1.9. EQUIPMENT START-UP REPORT AND CERTIFICATION

A. An experienced, authorized service representative of the manufacturer of each item of equipment shall visit the site of the work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the equipment manufacturer's representative shall be present when the equipment is placed in operation and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of the Engineer.

B. Each equipment manufacturer's representative shall furnish to the Owner, through the Engineer, a written report certifying that the equipment (1) has been properly installed and lubricated; (2) is in accurate alignment; (3) is free from any undue stress imposed by connecting piping or anchor bolts; and (4) has been operated under full load conditions and that it operated satisfactorily. Work will not be accepted as substantially complete until executed Equipment Start-up Report and certification forms have been submitted in accordance with the requirements of this section.

C. Properly coordinate the visits by the manufacturer's representatives, particularly where the operation of an item of equipment is dependent on the operation of other equipment. Prior to calling the manufacturer's representative, ensure that all necessary related equipment, structures, piping, and electrical work is complete. Pay for any revisits to the site by the manufacturer's representative made necessary due to the Contractor's failure to properly coordinate the visits.

D. Secure the services of the manufacturer's representative at the site of the work for as long as is necessary to check the installation and place the equipment in satisfactory operation.

2. PRODUCTS (Not Applicable)

3. EXECUTION

3.1. PAYMENT

A. No requests for payment for work under this Contract will be processed until the Contractor's Preliminary Construction Schedule, Submittals Tabulation, and Schedule of Values are submitted and found acceptable by the Owner and Engineer in conformance with the requirements of this section.

B. No further requests for payment will be processed after the due date of the Contractor's Construction Schedule and Submittal Schedule until both schedules are submitted in conformance with the requirements of this section.

C. If payment is being requested for stored materials, the material location report must be included with the request for payment.

END OF SECTION

SECTION 01 3233

CONSTRUCTION PHOTOGRAPHS

1. GENERAL

1.1. SUMMARY

A. General. This section specifies administrative and procedural requirements for construction photographs.

B. Costs. Costs for photographs and associated items shall be included in the lump sum bid price or unit prices contained for other items of work. No separate payment shall be allowed, with the exception of additional photographs, which is addressed elsewhere in this section.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions or General Provisions and other Division 1 specification sections, apply to this section.

1.3. SUBMITTALS

A. Digitally Stored Photographs. Contractor shall provide digital photographs created and stored in a standard format. Transmittal may be electronic and shall occur no less frequently than monthly. Photographs must be received by the Engineer before partial payment requests can be processed.

1.4. QUALITY ASSURANCE

A. Engage a qualified, experienced photographer to take photographs during construction.

B. Associated Services. Cooperate with the photographer's work. Provide reasonable auxiliary services as requested, including access to and use of temporary facilities including temporary lighting.

2. PRODUCTS

2.1. PHOTOGRAPHIC COPIES

A. The photographs shall be taken with a digital camera capable of being programmed to show the date the photo was taken on the front of the photograph.

B. Identification. Provide date on front of the photo per the previous paragraph. The following information shall be provided with each photograph:

1. Name of the Project.
2. Name and address of the photographer.

3. Name of the Engineer.
4. Name of the Contractor.
5. Provide notation of vantage point marked for location and direction of shot on a key plan of the site.

3. EXECUTION

3.1. PHOTOGRAPHIC REQUIREMENTS

A. Take at least 4 color photographs in accordance with requirements indicated, to best show the status of construction and progress since taking the previous photographs.

1. Frequency: Take photographs daily as the work progresses. Submit to Engineer monthly coinciding with the cutoff date associated with each Application for Payment.

2. Vantage Points: The photographer shall select the vantage points for each shot each month to best show the status of construction and progress since the last photographs were taken.

3. Description: A description of each photograph shall be noted.

B. Additional Photographs. From time to time the Engineer may issue requests for additional photographs, in addition to periodic photographs specified. Additional photographs will be paid for by the Owner or Engineer, and are not included in the contract sum or an allowance.

END OF SECTION

SECTION 01 3323

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

1. GENERAL

1.1. SUMMARY

A. This section specifies administrative and procedural requirements for submittal of shop drawings, product data, and samples to verify that products, materials, and systems proposed for use comply with provisions of the Contract Documents.

B. Shop drawings are required for all materials, products, and equipment furnished on this project, unless otherwise specified.

C. Standard information prepared without specific reference to the project is not considered to be shop drawings. Where multiple products are included, specific notation to that model or product being proposed for this project shall be clearly noted. Products not being provided shall similarly be marked out.

D. Coordination drawings are a special type of shop drawing that show the relationship and integration of different construction elements that require close and careful coordination during fabrication or during installation to fit in the restricted space provided or to function as intended.

E. Product data include, but are not limited to, the following:

1. Manufacturer's product specifications.
2. Manufacturer's installation instructions.
3. Standard color charts.
4. Catalog cuts.
5. Roughing-in diagrams and templates.
6. Standard wiring diagrams.
7. Printed performance curves.
8. Operational range diagrams.
9. Mill reports.
10. Standard product operating and maintenance manuals.

F. Samples include, but are not limited to, the following:

1. Partial sections of manufactured or fabricated components.
2. Small cuts or containers of materials.
3. Complete units of repetitively used materials.
4. Swatches showing color, texture, and pattern.
5. Color range sets.
6. Components used for independent inspection and testing.

G. Administrative Submittals. Refer to other Division 1 sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits.
2. Applications for payment.
3. Performance and payment bonds.
4. Insurance certificates.
5. Listing of subcontractors.

H. Inspection and Test Reports. Submittal of inspection and test reports is included under Section 01 4500, Quality Control Services.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3. CONTRACTOR'S RESPONSIBILITY

A. It is the duty of the Contractor to check all drawings, data, and samples prepared by or for him before submitting them to the Engineer for review. Each and every copy of the Drawings and data shall bear Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement. Shop drawings shall indicate any deviations in the submittal from requirements of the Contract Documents.

B. The Contractor shall determine and verify:

1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Conformance with Specifications.
5. Coordination with related project elements, including verification of all dimensions to provide a complete system

C. Do not begin any of the work covered by a drawing, data, or a sample returned for correction until a revision or correction thereof has been reviewed and accepted by the Engineer.

D. Submit to the Engineer all drawings and schedules sufficiently in advance of construction requirements to provide no less than 21 calendar days for checking and appropriate action from the time the Engineer receives them.

E. Stagger shop drawing submittals and indicate priority for critical delivery items on the shop drawing submittal schedule.

F. Initial submittals shall be made in PDF format with delivery to the Engineer to be made electronically wherever possible. Submit four, final approved copies for the Engineer plus the number of copies the Contractor requires of descriptive or product data submittals to complement shop drawings (up to a maximum of eight copies). The Engineer will retain four sets.

G. Contractor shall be responsible for and bear all cost of damages which may result from the ordering of any material or from proceeding with any part of the work prior to the review by Engineer of the necessary shop drawings.

1.4. ENGINEER'S REVIEW OF SHOP DRAWINGS

A. The Engineer's review of drawings, data, and samples submitted by the Contractor is for general conformance with the design concept of the project and for general compliance with the information given in the Contract Documents. The Engineer's review and exception, if any, will not constitute an approval of dimensions, quantities, and details of the material, equipment, device, or item shown.

B. The review of drawings and schedules shall not be construed:

1. As permitting any departure from the Contract requirements;

2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;

3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.

C. If the drawings or schedules as submitted describe variations and show a departure from the Contract requirements which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in contract price or time for performance, the Engineer may return the reviewed drawings without noting an exception.

D. When reviewed by the Engineer, each of the shop drawings will be identified as having received such review, being so stamped and dated. Shop drawings stamped "REVISE AND RESUBMIT" and with required corrections shown will be returned to the Contractor for correction and resubmittal.

E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing or on resubmitted shop drawings, to revisions other than the corrections requested by the Engineer on previous submissions. Make any corrections required by the Engineer.

F. If the Contractor considers any correction indicated on the Drawings to constitute a change to the Contract Drawings or Specifications, the Contractor shall give written notice thereof to the Engineer.

G. The Engineer will review a submittal/resubmittal a maximum of 3 times, after which the cost of review will be borne by the Contractor. The cost of engineering will be equal to the Engineer's charges to the Owner under the terms of the Engineer's agreement with the Owner.

H. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

I. No partial submittals will be reviewed. Submittals not complete will be returned to the Contractor and will be considered "Rejected" until resubmitted.

1.5. SUBMITTAL PROCEDURES

A. Coordination. Coordinate preparation and processing of submittals with performance of the work. Transmit each submittal to the Engineer sufficiently in advance of scheduled performance of related construction activities to avoid delay.

1. Coordinate each submittal with other submittals and related activities that require sequential activity including:

   a. Testing.
   b. Purchasing.
   c. Fabrication.
   d. Delivery.

2. Coordinate transmittal of different types of submittals for the same element of the work and different elements of related parts of the work so that processing will not be delayed by the Engineer's need to review submittals concurrently for coordination.

   a. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are forthcoming.

   b. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Engineer sufficiently in advance of the work to permit processing.

B. Submittal Preparation. Prepare and submit shop drawings in accordance with the following:

1. Attach a submittal cover sheet to each copy of a shop drawing. The submittal cover sheet shall contain the following information:

   a. Project name and Owner’s name.
   b. Contractor’s name and address.
   c. Engineer’s name and address.
   d. Specification section and title.

e. Drawing reference number.
f. Submittal number.
g. Space to indicate the results of the Contractor's review.
h. Space to indicate any deviations from the Contract Documents or comments by the Contractor.
i. Space approximately 8 inches wide and 4 inches high for the Engineer to indicate the results of his review and any comments.

2. Each shop drawing submittal shall be assigned a sequential number, beginning with the number 1. Resubmittals shall be identified by a number suffix (i.e., 1.1, 1.2, etc.).

C. Submittal Transmittal. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Engineer, and to other destinations, as indicated, by use of a transmittal form. Submittals received from sources other than the Contractor will be returned to the sender without action. A separate transmittal shall be used for each shop drawing submittal.

1.6. SHOP DRAWINGS

A. The term "shop drawings," when used in the Contract Documents, shall be considered to mean Contractor's plans for material and equipment which become an integral part of the Project. These drawings shall be complete and detailed. Shop drawings shall consist of fabrication, erection and setting drawings and schedule drawings, manufacturer's scale drawings, and wiring and control diagrams. Cuts, catalogs, pamphlets, descriptive literature, and performance and test data shall be considered only as support to required shop drawings as defined above.

B. Drawings and schedules shall be checked and coordinated with the work of all trades involved before they are submitted for review by the Engineer. Contractor shall indicate whether the shop drawing complies with or deviates from the requirement of the Contract Documents.

C. If drawings show deviations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall clearly mark and describe such deviation in his letter of transmittal. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such drawings have been reviewed.

D. Data on materials and equipment include, without limitation, materials and equipment lists, catalog data sheets, cuts, performance curves, diagrams, materials of construction and similar descriptive material. Materials and equipment lists shall give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.

E. Installation List. When requested by the Engineer, manufacturers or equipment suppliers who propose to furnish equipment or products shall submit an installation list to the Engineer along with the required shop drawings. The installation list shall include at least five installations where identical equipment

has been installed for similar purposes and similar applications and ownership and has been in operation for a period of at least 1 year.

F. Color. Only the Engineer will utilize the color "red" in marking shop drawing submittals.

G. Before final payment is made, the Contractor shall furnish to Engineer five sets of record drawings, all clearly revised, complete and up-to-date showing the permanent construction as actually made for all reinforcing and structural steel, miscellaneous metals, process and mechanical equipment, yard piping, electrical system and instrument system.

1.7. SAMPLES

A. Furnish, for the approval of the Engineer, samples required by the Contract Documents or requested by the Engineer. Samples shall be delivered to the Engineer as specified or directed. The Contractor shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in work until approved by the Engineer.

1.8. SPECIFIC SUBMITTAL REQUIREMENTS

A. Submit coordination drawings where required for integration of different construction elements. Show construction sequences and relationships of separate components where necessary to avoid conflicts in utilization of the space available.

B. Highlight, encircle, or otherwise indicate deviations from the Contract Documents on the shop drawings.

C. Do not permit shop drawing copies without an appropriate final stamp or other marking indicating the action taken by the Engineer to be used in connection with construction.

D. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit shop drawings on sheets at least 8½ by 11 inches but no larger than 30 by 40 inches.

1.9. PRODUCT DATA

A. Collect product data into a single submittal for each element of construction or system. Mark each copy to show which choices and options are applicable to the Project.

B. Where product data have been printed to include information on several similar products, some of which are not required for use on the project, or are not included in this submittal, mark copies to clearly indicate which information is applicable.

C. Where product data must be specially prepared for required products, materials, or systems, because standard printed data are not suitable for use, submit as "shop drawings," not "product data."

D. Include the following information in product data:
   1. Manufacturer's printed recommendations.
   2. Compliance with recognized trade association standards.
   3. Compliance with recognized testing agency standards.
   4. Application of testing agency labels and seals.
   5. Notation of dimensions verified by field measurement.
   6. Notation of coordination requirements.

E. Submittals. Submit two copies of each required product data submittal; submit two additional copies where copies are required for maintenance manuals. The Engineer will retain one copy and will return the other marked with the action taken and corrections or modifications required. Initial submittals shall be made in PDF format and delivered electronically.

F. Distribution. Furnish copies of final product data submittal to manufacturers, subcontractors, suppliers, fabricators, installers, governing authorities and others as required for performance of the construction activities. Show distribution on transmittal forms.

   1. Do not proceed with installation of materials, products and systems until a copy of product data applicable to the installation is in the installer's possession.

   2. Do not permit use of unmarked copies of project data in connection with construction.

1.10. ENGINEER'S ACTION

A. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

   1. Final Unrestricted Release: Where submittals are marked "REVIEWED," that part of the work covered by the submittal may proceed, provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

   2. Final-But-Restricted Release: When submittals are marked "REVIEWED EXCEPTIONS AS NOTED," that part of the work covered by the submittal may proceed, provided it complies with both the Engineer's notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

   3. Returned for Resubmittal: When submittal is marked "REVISE AND RESUBMIT," do not proceed with that part of the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise

or prepare a new submittal in accordance with the Engineer's notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

a. Do not permit submittals marked "REVISE AND RESUBMIT" to be used at the project site, or elsewhere where construction is in progress.

4. Rejected: When submittal is marked "REJECTED," the materials, equipment, and/or methods identified in the submittal do not comply with the Contract requirements and shall not be incorporated into the work. No resubmittal of the same materials, equipment, and/or methods shall be made.

5. Other Action: Where a submittal is primarily for information or record purposes, for special processing or other Contractor activity, the submittal will be returned, marked "Action Not Required."

2. PRODUCTS (Not Applicable)

3. EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 4213

ABBREVIATIONS

1. GENERAL

1.1. GENERAL

A. Wherever in these Specifications and Contract Documents the abbreviations, or pronouns in place of them are used, the intent and meaning shall be interpreted as specified herein.

1.2. ABBREVIATIONS

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies
AFBMA	Anti-Friction Bearing Manufacturers Association
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALSC	American Lumber Standard Committee
ANSI	American National Standards Institute
AMCA	Air Moving and Conditioning Association
APA	American Plywood Association
APHA	American Public Health Association
API	American Petroleum Institute
APWA	American Public Works Association
ARC	Appalachian Regional Commission
AREA	American Railroad Engineering Association
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers’ Association

AWS	American Welding Society
AWWA	American Water Works Association
BIA	Brick Institute of America
CFR	Code of Federal Regulations
CRSI	Concrete Reinforcing Steel Institute
CTI	Cooling Tower Institute
DIPRA	Ductile Iron Pipe Research Association
EIA	Electronic Industries Association
EPA	Environmental Protection Agency
EPD	Georgia Environmental Protection Division
FM	Factory Mutual
FmHA	Farmers Home Administration
FS	Federal Specifications
HEI	Heat Exchange Institute
IBC	International Building Code
IEEE	Institute of Electronic and Electrical Engineers
IES	Illuminating Engineering Society
IPCEA	Insulated Power Cable Engineers Association
IPC	Institute of Printed Circuits
ISA	Instrument Society of America
MBMA	Metal Building Manufacturers Association
MSS	Manufacturers Standardization Society of the Valve and Fitting Industry
MUTCD	Manual on Uniform Traffic Control Devices
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NAPF	National Association of Piping Fabricators
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NRMA	National Ready-Mix Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
SBC	Southern Building Code Congress International, Inc.
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSCRB	Standard Specification Construction of Roads and Bridges, Department of Transportation, State of Georgia
SSPC	SSPC: The Society for Protective Coatings

SSRBC	Standard Specifications for Road and Bridge Construction, Tennessee Department of Transportation
SSRS	Standard Specifications for Roads and Structures, latest edition, North Carolina Department of Transportation, Division of Highways
TCA	Tile Council of America
TDEC	Tennessee Department of Environment and Conservation
TEMA	Tubular Exchangers Manufacturers Association
UBC	Uniform Building Code
UL	Underwriters Laboratories
USDC	United States Department of Commerce
WEF	Water Environment Federation

END OF SECTION

SECTION 01 4219

APPLICABLE CODES AND STANDARDS

1. GENERAL

1.1. GENERAL

A. All materials, equipment, fabrication, and installation practices shall comply with the following applicable codes and standards, unless the Contractor's quality standards establish more stringent quality requirements or as required in drawings and specifications, as determined by the Engineer.

1. Pressure Piping and Tubing

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
DIPRA	Ductile Iron Pipe Research Association
NAPF	National Association of Piping Fabricators
NSF	NSF International
PPI	Plastic Pipe Institute
Unibell	PVC Pipe Association

2. Materials

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials

3. Painting and Surface Preparation

NACE	National Association of Corrosion Engineers
SSPC	SSPC: The Society for Protective Coatings

4. Gear Reducers and Bearings

AFBMA	Anti-Friction Bearing Manufacturers Association
AGMA	American Gear Manufacturers Association

5. Ventilating Fans

AMCA	Air Moving and Conditioning Association
PFMA	Power Fan Manufacturers Association

6. Electrical and Instrumentation

EIA	Electronic Industries Association
IEEE	Institute of Electrical and Electronic Engineers
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriter's Laboratories

7. Aluminum Structures

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturers Association

8. Steel Structures

AISC	American Institute of Steel Construction
API	American Petroleum Institute
AWWA	American Water Works Association
SJI	Steel Joist Institute

9. Concrete Structures

ACI	American Concrete Institute

10. Welding

ASME	American Society of Mechanical Engineers
AWS	American Welding Society

11. Safety

OSHA	Occupational Safety and Health Act

12. General Building Construction

FM	Factory Mutual Fire Insurance Corporation
IBC Code	International Building Code by the International Council
NFPA	National Fire Protection Association

13. Subgrades and Pavement

SSCRB	Standard Specification Construction of Roads and Bridges, Department of Transportation, State of Georgia, 1993 Edition, and Supplemental Specifications
SSRBC	Standard Specifications for Road and Bridge Construction, Tennessee Department of Transportation

SSRS Standard Specifications for Roads and Structures, latest edition, North Carolina Department of Transportation, Division of Highways.

14. Ductwork and Sheet Metal Work

SMACNA	Sheet Metal and Air Conditioning Contractors National Association

15. Plumbing

AGA	American Gas Association
NSF	NSF International
PDI	Plumbing Drainage Institute
SPC	SBCC Standard Plumbing Code

16. Refrigeration, Heating, and Air Conditioning

ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers

17. Pressure Vessels

ASME	American Society of Mechanical Engineers

18. Wood

AF&PA	American Forest & Paper Association
AWPA	American Wood Preservers' Association

19. Pumps & Pumping Stations

HI	Hydraulic Institute

20. Railroads

AREMA	American Railway Engineering and Maintenance-of-Way Association

21. Miscellaneous

NASSCO	National Association of Sewer Service Companies

In addition, all work shall comply with the applicable requirements of local codes, utilities, and other authorities having jurisdiction.

B. All material and equipment, for which a UL Standard, an AGA approval, or an ASME requirement is established, shall be so approved and labeled or stamped. Label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.

END OF SECTION

SECTION 01 4500

QUALITY CONTROL SERVICES

1. GENERAL

1.1. SCOPE OF WORK

A. This section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include contract enforcement activities performed by the Engineer.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

1. Specific quality control requirements for individual construction activities are specified in the sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.

2. Inspections, tests, and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

3. Requirements for the Contractor to provide quality control services required by the authorities having jurisdiction are not limited by provisions of this section.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3. RESPONSIBILITIES

A. Contractor Responsibilities. Provide inspections, tests, and similar quality control services, specified in individual specification sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity; these services include those specified to be performed by an independent agency and not by the Contractor. Costs for these services shall be included in the contract sum.

1. Employ and pay an independent agency to perform specified quality control services.

2. The Owner will engage and pay for the services of an independent agency to perform inspections and tests specified as the Owner's responsibility.

3. Retesting: The Contractor is responsible for retesting where results of required inspections, tests, or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

   a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

4. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

   a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

   b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

   c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

   d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

   e. Security and protection of samples and test equipment at the project site.

B. Owner Responsibilities. The Owner will employ and pay for the services of an independent agency, testing laboratory, or other qualified firm to perform services which are the Owner's responsibility.

C. Duties of the Testing Agency. The independent testing agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual specification sections shall cooperate with the Engineer and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests. The testing agency shall be acceptable to and approved by the Engineer.

   1. The agency shall notify the Engineer and Contractor promptly of irregularities or deficiencies observed in the work during performance of its services.

   2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents, or approve or accept any portion of the work.

   3. The agency shall not perform any duties of the Contractor.

D. Coordination. The Contractor and each agency engaged to perform inspections, tests, and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.4. SUBMITTALS

A. The independent testing agency shall submit to the Engineer, in duplicate, a certified written report of each inspection, test, or similar service.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. Report Data: Written reports of each inspection, test, or similar service shall include, but not be limited to:

a. Date of issue.
b. Project title and number.
c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the work and test method.
g. Identification of product and specification section.
h. Complete inspection or test data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample-taking and testing.
k. Comments or professional opinion as to whether inspected or tested work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

1.5. QUALITY ASSURANCE

A. Qualification for Service Agencies. Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state in which the project is located.

2. PRODUCTS (Not Applicable)

3. EXECUTION

3.1. REPAIR AND PROTECTION

A. General. Upon completion of inspection, testing, sample-taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

1. GENERAL

1.1. DESCRIPTION OF REQUIREMENTS

A. General Contractor shall provide temporary services and facilities for use by all Prime Contractors and the Engineer except as otherwise herein specified. Do not remove temporary facilities until authorized use of permanent facilities.

1.2. USE CHARGES

A. Usage charges for temporary services or facilities shall be paid by the General Contractor.

1.3. WATER FOR TESTING

A. As an exception to the above, necessary amounts of water for initial flushing and testing piping systems will be furnished by the Owner at no cost to the Contractor, subject to requirements which the Owner may impose.

1.4. REGULATIONS AND LIMITATIONS

A. Comply with requirements of local laws and regulations governing construction and local industry standards, in the installation and maintenance of temporary services and facilities.

B. The Contractor shall be limited to work within the property limits of the site and shall be responsible for and take necessary precautions to avoid damage to all adjacent property.

1.5. TEMPORARY UTILITY INSTALLATION

A. Engage the local utility company to install temporary services. As early as possible change to use of permanent service, to enable removal of the temporary utility and eliminate possible interference with completion of the work.

B. Water Service. Provide temporary potable water supply at the plant site for construction purposes. Use of Owner's hydrants is prohibited for this purpose.

C. Electrical Power Service. Provide weather-tight, grounded temporary electrical service entrance and distribution system, with ground-fault circuit interrupters and ground-fault interrupter features of proper types, sizes, electrical ratings and characteristics to fulfill project requirements. Comply with applicable requirements of NEMA, NECA and UL standards and governing regulations. Install temporary lighting of adequate illumination levels to perform the work specified. Temporary electric service for construction purposes shall be for use by all prime contractors.

D. Temporary Heat. Provide temporary heat where needed for performance of work, for curing or drying of recently installed work or for protection of work in place from adverse effects of low temperatures or high humidity. Provide UL or FM tested and labeled heating units known to be safe and without adverse effect upon work in place or being installed. Maintain a minimum temperature of 45°F (7°C) in permanently enclosed portions of the building and areas where finished work has been installed.

Except where use of the permanent heating system is available and authorized, provide properly vented self-contained LP gas or fuel oil heaters with individual space thermostatic control for temporary heat. Do not use open burning or salamander type heating units.

1.6. STAGING AREAS

A. Space available on site for trailers, materials storage, and staging is limited. The staging area may be shown on the plans and will not be expanded.

B. If additional space is required, the Contractors are responsible for leasing or otherwise securing the necessary space, off-site.

1.7. TEMPORARY ROADS AND PAVING

A. Provide temporary graveled roads and graveled parking facilities during the course of the work. Locate in the same locations as permanent facilities.

B. Coordinate temporary drives with grading and compaction of the sub-grade, installation and stabilization of sub-base, and installation of base and finish courses of permanent paving.

C. Construct and maintain temporary roads to support loading and to withstand exposure to traffic. Provide a graded and well compacted, well drained sub-grade, and a gravel paving course of a well graded sub-base material not less than 3 inches thick, roller compacted to a level, smooth surface.

D. Delay installation of the final course of permanent paving in areas exposed to temporary use, until immediately before substantial completion.

E. Completely remove temporary roadways in areas not to receive permanent paving, prior to seeding.

1.8. SANITARY FACILITIES

A. Sanitary facilities include temporary toilets for construction personnel of all prime contractors.

1. Supply toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each facility. Provide appropriate covered waste containers for used materials.

2. Toilets: Install single occupant self-contained toilet units of the chemical, aerated recirculation or combustion type, properly vented and fully enclosed with glass fiber reinforced polyester shell. Use of pit-type privies will not be permitted.

3. Provide separate toilet facilities for male and female construction personnel at ground level. Use of plant facilities is prohibited.

D. Drinking Water. Provide tap-dispenser bottled-water type drinking water units for personnel of all prime contractors and subcontractors.

1.9. SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Maintain site in a safe, lawful and publicly acceptable manner. Each prime contractor shall be responsible for security of their own office and storage facilities.

1.10. BARRICADES, WARNING SIGNS, AND LIGHTS

A. Comply with recognized standards and code requirements for erection of substantial barricades, where needed to prevent accidents. Paint with appropriate colors, graphics, and warning signs to inform personnel at the site and the public, of the hazard being protected against. Provide lighting where needed, including flashing red lights were appropriate.

1.11. MAINTENANCE

A. Operate and maintain temporary services and facilities in good operating condition and in a safe and efficient manner until removal is authorized. Do not overload services or facilities. Protect from damage by freezing temperatures and similar elements. Do not allow unsanitary conditions, public nuisances or hazardous conditions to develop or persist on the site.

1.12. TERMINATION AND REMOVAL

A. Remove each temporary service and facility promptly when need has ended, or when replaced by use of a permanent facility, but no later than substantial completion. Complete, or, if necessary, restore permanent work delayed because of interference with the temporary service or facility. Repair damaged work, clean exposed surfaces, and replace work which cannot be repaired.

B. At substantial completion, clean and renovate permanent services and facilities that have been used to provide temporary services and facilities during the construction period.

1.13. SAFETY MEASURES

A. In addition to complying with safety requirements set forth in the General Conditions, the Contractor shall:

1. Inform himself of and fully comply with all applicable requirements of OSHA in the performance of work required under this contract.

2. The Contractor shall adhere to the rules, regulations, and interpretations of the Secretary of the Department of Labor relating to safety and health for construction which are hereby incorporated into these requirements.

END OF SECTION

SECTION 01 6000

MATERIALS AND EQUIPMENT

1. GENERAL

1.1. SUMMARY

A. This section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the project.

1. Multiple Prime Contracts: Provisions of this section apply to the construction activities of each prime Contractor.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section 01 3200, Schedules and Reports.

C. Standards. Refer to Section 01 4219, Applicable Codes and Standards, for applicability of industry standards to products specified.

1.2. RELATED DOCUMENTS

A. Drawings and general provision of the Contract, including General and Supplemental Conditions or General Provisions and other Division 1 Specification sections, apply to this section.

1.3. DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "system," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the work, whether purchased for the project or taken from previously purchased stock. In all cases, products shall be new and unused. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

   a. "Named products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form a part of the work.

3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.4. QUALITY ASSURANCE

A. Source Limitations. To the fullest extent possible, provide products of the same kind, from a single source.

B. Compatibility of Options. When the Contractor is given the option of selecting between two or more products for use on the project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each prime Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other prime or separate Contractors.

2. Equipment Nameplates: Provide a permanent nameplate of each item of service-connected or power-operated equipment. Locate on an easily accessible surface. The nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer.
b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

1.5. PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.

5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

6. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.

7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

2. PRODUCTS

2.1. PRODUCT SELECTION

A. General Product Requirements. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and for the intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures. Product selection is governed by the Contract Documents and governing regulations. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.

2. Semi-proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.

a. Where products or manufacturers are specified by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" and “or-equals” to obtain approval for use of an unnamed product.

3. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" and “or-equals” to obtain approval for use of an unnamed product.

4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.

    a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.

6. Compliance with Standards, Codes, and Regulations: Where the Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.

7. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer to comply with other specified requirements. The Engineer will select the color, pattern, and texture from the product line selected.

2.2. SHOP PRIMING AND PAINTING

A. Shop prime and/or shop finish all shop fabricated equipment prior to shipping.

B. Surface preparation, primers, finishes, number of coats, and film thicknesses shall comply with applicable provisions of Section 09 9100, Painting (if included), unless alternative procedures and materials are accepted by the Engineer during shop drawing and product data review.

C. Prepare and finish electrical and mechanical equipment prior to final assembly. Do not sandblast or paint assembled equipment or machined interior surfaces of equipment.

D. Coat interior, inaccessible surfaces of equipment with an epoxy system suitable for the lifetime of the equipment at anticipated operating conditions and temperatures, unless otherwise specified or accepted.

E. Coat exterior and accessible interior surfaces with an appropriate epoxy system, unless otherwise specified or accepted.

3. EXECUTION

3.1. INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

SECTION 01 6010

GENERAL EQUIPMENT STIPULATIONS

PART - 1 GENERAL

1.1 SCOPE

A. These General Equipment Stipulations apply, in general, to all equipment and piping. They supplement the detailed equipment specifications, but in case of conflict, the detailed equipment specifications shall govern.

1.2 COORDINATION

A. The Contractor shall assume full responsibility for the coordination of the installation of all equipment, materials, and products furnished under these Contract Documents. The Contractor shall be completely responsible for verification that all structures, piping, and equipment components furnished by him and/or his Subcontractors and Suppliers are compatible. The Contractor shall start up each equipment system and shall make all necessary adjustments to place each system in proper operating condition.

1.3 ADAPTATION AND LOCATION OF EQUIPMENT

A. Equipment shall be readily adaptable for installation and operation in the structures to be constructed under other Contracts. No responsibility for alteration of a planned structure to accommodate other types of equipment will be assumed by the Owner. Equipment which requires alteration of the structures will be considered only if the Contractor assumes all responsibility for making and coordinating all necessary alterations. All such alterations shall be made at the Contractor's expense.

B. The Contractor shall install the work in such manner that the equipment, piping, vents, conduit, panels, and ductwork, etc., will be as neatly installed and out-of-the-way as physically possible. All equipment, piping, ductwork, and conduit, etc., shall be installed to provide needed maintenance and passage space.

1.4 PATENT ROYALTIES

A. All patent royalties and fees for patents covering materials, articles, apparatus, devices, or equipment shall be included in prices bid by the Contractor. Attention is directed to the requirements of the Supplemental General Conditions concerning patents.

1.5 EQUIPMENT GUARANTEE

A. The Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective materials, breakage or other failure. The Contractor shall guarantee all equipment against improper assembly or erection, defective workmanship or other failure. The guarantee period shall be defined in Section 01 7836, Warranties and Bonds.

1.6 WORKMANSHIP AND MATERIALS

A. All equipment shall be designed, fabricated, and assembled in accordance with the best engineering and shop practices. Individual parts shall be manufactured to standard sizes and gauges so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall be new and shall not have been in service at any time prior to delivery, except as required by tests. All bolts, nuts, fastenings, pipe, and fittings shall be manufactured in conformance with the United States system of measurement.

B. Materials shall be suitable for service conditions. Iron castings shall be tough, close grained, gray or ductile iron free from blowholes, flaws, or excessive shrinkage and shall conform to ASTM A 48, Class 30 minimum. Plugging of defective castings shall not be permitted. Castings shall be annealed to remove internal stresses prior to machining and shall have the mark number and heat number cast on them.

C. Structural and miscellaneous fabricated steel used in items of equipment shall conform to the standards of the American Institute of Steel Construction, except where otherwise specified. All structural members shall be considered as subject to shock or vibratory loads.

D. All replaceable or expendable elements such as filters, screens, drive belts, fuses, and indicator lamps, etc., shall be easily accessible and replaceable without need of dismantling equipment or piping. All such items shall be of a standard type that is readily available from multiple suppliers.

E. Threaded openings for drains or vents in pump volutes, compressor or fan scrolls, air receivers, and heat exchangers which are plugged during normal operation shall be provided with stainless steel plugs.

1.7 LUBRICATION

A. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.

B. Provide lubricants of the type recommended by the equipment manufacturer in sufficient quantity to fill all lubricant reservoirs and to replace all lubricants consumed during testing, startup, and initial operation. Provide sufficient quantities of lubricants

to lubricate all equipment for one year of normal service before final acceptance of the equipment will be made by the Owner.

C. Where special run-in oil or storage lubricants are used, they shall be flushed out and replaced with the required service lubricant by the Contractor.

D. Tag each piece of equipment with cloth tag showing proper type lubricant, period between lubrications, date of lubrication, and worker's initials. Have space for ten lubrication notations.

1.8 ELECTRIC MOTORS

A. Motors furnished with equipment shall comply with the following, unless otherwise required by the detailed equipment specifications
   1. Motors shall be designed and applied in compliance with NEMA, ANSI, IEEE, and AFBMA standards and the NEC for the specific duty imposed by the driven equipment.
   2. Where frequent starting occurs, motors shall be designed for frequent starting duty equivalent to the duty service required by the driven equipment.
   3. Unless recognized and defined by the standards and codes for intermittent duty as a standard industry practice, all motors shall be rated for continuous duty at 40°C ambient. Motor temperature rise above 40°C ambient on continuous operation at nameplate horsepower shall not exceed the NEMA limit for 1.0 service factor and Class B insulation, or Class A insulation if used.
   4. Motors shall be designed for full voltage starting. Motors shall operate under a ±10 percent voltage variation and ±5 percent frequency variation.
   5. Motor-bearing life shall be based upon the actual operating load conditions imposed by the driven equipment.
   6. Motors shall be sized for the altitude at the location where the equipment is to be installed.
   7. Motors shall be sized so that, under maximum continuous load imposed by the driven equipment, the motor nameplate horsepower for continuous operation in 40°C ambient is at least 15 percent more than the driven load. Continuous equipment load shall not exceed 87 percent of motor nameplate horsepower, whether motor service factor is 1.0 or higher.
   8. Where the detailed specifications call for encapsulated motor windings, the motor shall have a sealed insulation system designed for a more severe environment than usual varnish treatments can withstand. The insulation system shall be General Electric "Polyseal," Allis-Chalmers "Poxeal," U.S. Motors "Everseal," or equal. Motors in this case may be single voltage rated.
   9. Motors shall have a clamp-type grounding terminal inside the motor conduit box. Motors with external conduit boxes shall have oversized conduit boxes.
   10. Motors in occupied areas shall be quiet rated and so marked.

B. It is the intent of this general specification to allow the manufacturer's standard motor on integrally constructed, motor-driven equipment such as appliances, hand tools, etc., that is specified by model number in which a redesign of the complete unit would be required for a motor with other features as may be specified herein.

C. Motors within the horsepower ranges indicated below shall be rated and constructed as follows, unless otherwise required by the detailed equipment specifications.
   1. Below ½ horsepower:
      a. 115-volt, 60-hertz, single phase.
      b. Totally enclosed, fan-cooled.
      c. Permanently lubricated, sealed bearings.
      d. Built-in manual-reset thermal protector; or furnished with integrally mounted stainless steel enclosed manual motor-overload switch.
   2. ½ to 1 horsepower:
      a. 230/460-volt, 60-hertz, 3-phase.
      b. Totally enclosed, fan-cooled.
      c. Specially insulated for use in damp locations below 20°C.
      d. Grease-lubricated, anti-friction bearings.
   3. 1½ horsepower and above:
      a. 230/460-volt, 60-hertz, 3-phase.
      b. Totally enclosed, fan-cooled.
      c. Specially insulated for use in damp locations below 20°C.
      d. Grease-lubricated anti-friction bearings or oil-lubricated sleeve bearings.
      e. Vertical motors shall have 15-year average-life thrust bearings.

1.9 DRIVE UNITS

A. Except when specified otherwise in the detailed equipment specifications, 87 percent of the nameplate horsepower rating of each drive motor shall be at least equal to the theoretical brake horsepower required to drive the equipment under full load, including all losses in speed reducers and power transmission.

B. The nominal input horsepower rating of each gear or speed reducer shall be at least equal to the nameplate horsepower of the drive motor.

C. Drive units shall be designed for 24-hour continuous service and shall be constructed so that oil leakage around shafts is precluded.

D. Gear Motors. Gear motors shall be rated AGMA Class II and shall bear an AGMA nameplate.

E. Gear Reducers. Each gear reducer shall be totally enclosed, oil lubricated, with anti-friction bearings throughout. Worm gear reducers shall have a service factor of at least 1.25. Shaft-mounted gear reducers shall be rated AGMA Class II. Other helical, spiral bevel, and combination bevel-helical gear reducers shall have a service factor of at least 1.40. Each gear reducer shall bear an AGMA nameplate or the manufacturer shall certify that the gear reducer is designed and rated in accordance with AGMA standards.

F. Chain Drives. Chain drives shall utilize roller chain having an ultimate strength of not less than 10 times the maximum working load.

G. V-Belt Drives. Each V-belt drive shall include a sliding base or other suitable tension adjustment. Fixed ratio V-belt drives shall have a service factor of at least 1.5 based on motor nameplate horsepower.

H. Couplings. Couplings between motors and drives or between drives and the driven equipment shall have a service factor of not less than 1.25 based on motor nameplate horsepower. Couplings between drives and the driven equipment shall have a service factor not less than that of the drive based on motor nameplate horsepower. All couplings rotating at speeds less than 900 rpm shall be of all steel construction. In general, couplings shall be of the tapered grid steel spring type or the crowned gear type.

I. Overtorque Protection. All low speed, high torque drives for equipment such as mechanical screens, conveyors, and clarifier and thickener mechanisms shall be protected against excessive torque by means of a suitable overtorque protection device. Acceptable devices shall include torque switches, shear pins, shear keys, and full-release torque couplings. Torque limiting couplings using sliding surfaces or friction to limit torque shall not be used.

1.10 SAFETY GUARDS

A. All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gauge or heavier galvanized or aluminum-clad sheet steel or ½-inch mesh galvanized expanded metal. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water. All safety guards shall comply with OSHA General Industry Standards, Part 1910, Subpart O, “Machinery and Machine Guarding.” Provide tachometer access on shaft ends.

1.11 ANCHOR BOLTS

A. Equipment suppliers shall furnish suitable anchor bolts for each item of equipment unless otherwise noted. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed. Two nuts and two washers shall be furnished for each bolt. Anchor bolts to be embedded in concrete shall be provided with sufficient threads to permit a nut and washer to be installed on the concrete side of the concrete form or supporting template, but in no case shall bolts be threaded less than 2 inches. Anchor bolts used in anchoring rotating or vibrating equipment shall be provided with suitable lock washers.

B. Anchor bolts for items of equipment mounted on baseplates shall be long enough to permit a minimum of one inch of grout beneath the baseplate and to provide adequate anchorage into structural concrete, unless otherwise shown or specified. Individual, embedded anchor bolts for heavy equipment shall be centered in a steel pipe sleeve having an inside diameter approximately two times the bolt diameter and an embedded length approximately eight times the bolt diameter.

C. Bolts specified to be bent shall be bent cold. Bend radius shall not be less than twice the bolt diameter. Unless otherwise shown or specified, anchor bolts shall be

embedded in concrete a minimum distance of 15 times the bolt diameter. Unless otherwise shown or specified, all anchor bolts shall be at least ½ inch in diameter.

D. All embedded anchor bolts or anchor bolt materials shall be ASTM A 193, Grade B8, ASTM A 276, Type 304, or IFI-104, Grade 304 stainless steel threaded per ANSI B1.1. Nuts shall be heavy hex nuts, ANSI B18.2, semifinished pattern, and shall be ASTM A 194, Grade 8 or IFI-104, Grade 304 stainless steel. Flat washers shall be 18-8 stainless steel and shall conform to ANSI B27.2.

E. Chemical anchors shall be used to anchor equipment to existing concrete, EPCON C6, and conform to manufacturers recommendations. Expansion anchors may be used to anchor equipment to existing concrete, Engineer approval required. Expansion anchors shall be stainless steel, Type 304 and shall be of the wedge type for use in bottomless holes. Expansion anchors shall conform to the applicable requirements of Federal Specification FF-S-325. Installation methods shall be in conformance with the manufacturer's recommendations for maximum pullout and shear strength, but in no case shall the depth of the hole be less than 8 bolt diameters or 3 inches, whichever is greater. The minimum distance between the center of any expansion anchor and an edge or exterior corner of concrete shall not be less than five times the diameter of the hole in which it is installed. The minimum distance between adjacent anchors shall not be less than 10 times the diameter of the hole in which it is installed. Expansion anchors shall be "Phillips Red Head" by Phillips Drill Company, "Kwik-Bolt" by Hilti Fastening Systems, "Trubolt" by Ramset Fastening Systems, or equal.

1.12 EQUIPMENT BASES

A. Equipment shall be installed on a raised reinforced concrete base. The base shall be a minimum of 4 inches in height and shall extend beyond the equipment baseplate approximately 3 inches on all sides.

B. The electrical contractor shall be instructed concerning electrical conduit locations prior to pouring the concrete base. Base mounted electrical enclosures require a minimum 2-inch base that extends beyond the enclosure 3 inches on all sides.

C. Provide a cast iron or welded steel baseplate for each pump, compressor, and any other item of equipment which is to be installed on a concrete base, unless otherwise specified. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components and adequate grout holes. Baseplates for pumps shall have a raised lip all around and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with epoxy or non-shrink grout as specified in the grouting section.

D. On direct coupled equipment, motor and driven equipment shall be doweled to a common base with a minimum of two dowels each.

1.13 ALIGNMENT OF MOTORS AND EQUIPMENT

A. In every case where a drive motor is connected to a driven piece of equipment by a flexible coupling, the coupling halves shall be disconnected and the alignment between the motor and the equipment checked and corrected. Machinery shall first be properly aligned and leveled by means of steel wedges and shims or jacking screws near anchor bolts. Anchor bolts shall be tightened against the shims on wedges or jacking screws and the equipment shall again be checked for level and alignment before placing grout. Wedges shall not be placed between machined surfaces.

B. In general, checking and correcting the alignment shall follow the procedures set up in the Standards of the Hydraulic Institute, “Instructions for Installation, Operation, and Maintenance of Centrifugal Pumps.” Equipment shall be properly leveled and brought into angular and parallel alignment.

C. Equipment shall be installed in such a way that no strain is transmitted to the equipment by piping systems or adjacent equipment.

1.14 LUBRICATION FITTINGS

A. Except for rotating shaft couplings, all lubrication fittings shall be brought to the outside of all equipment so that they are readily accessible from the outside without the necessity of removing covers, plates, housings, or guards. Fittings shall be accessible from safe, permanent platforms or walk areas. Fittings shall be of the bullneck, check type for use with a portable high pressure grease gun. Connection from a remote fitting to the point of use shall be with minimum 3/16 -inch stainless steel tubing, securely mounted parallel to equipment lines and protected where exposed to damage.

1.15 GROUTING

A. A special epoxy, non-shrink, or sand-cement grout shall be used in the placement of all pump, motor, and equipment baseplates or bedplates, column baseplates, other miscellaneous baseplates, and other grouting applications as shown on the Drawings.

1.16 WELDING AND BRAZING

A. All welds shall be sound and free from embedded scale and slag. All butt welds shall be continuous and where exposed to view shall be ground smooth. All continuous welds shall be gas and liquid-tight. Welds in piping shall have full penetration and shall be smooth on the inside of the pipe. Intermittent welds shall have an effective length of at least 2 inches and shall be spaced not more than 6 inches apart.

B. All welding of steel and aluminum, including materials, welding techniques, general safety practices, appearance and quality of welds, and methods of correcting defective work, shall conform to the latest requirements of AWS Specifications. Structural steel welding shall conform to the requirements of the AWS “Structural Welding Code.” The

general recommendations and requirements of the AWS “Structural Welding Code” shall also apply to welded aluminum structures. The welding process and welding operators shall meet qualification tests and welding performance tests in accordance with the latest provisions of ASME Boiler and Pressure Vessel Code, Section IX, “Welding and Brazing Qualifications.” Welding process and qualification procedures for welding of pipe shall conform to the latest requirements of ANSI B31.1, Section 327, “Welding,” and Section 328, “Brazing and Soldering.” All welding qualification tests shall be witnessed by the Engineer, except as provided herein. All costs associated with the qualification or testing of welders and welding operators shall be borne by the Contractor.

C. Actual welding procedures to be used in field assembly and installation of equipment furnished under this Contract shall be submitted to the Engineer for approval prior to beginning the work. Reports certifying that the welding procedures, welders, and welding operators that the Contractor intends to use are qualified as specified above shall also be submitted to the Engineer prior to beginning the work. In the case of welder qualifications for shop welding and for carbon steel field welding, welders presenting certified qualification papers validated within the preceding 6-month period and acceptable to the Engineer will not be required to take the qualification tests. In the case of field welding of stainless steel or aluminum, all welders shall be required to take the qualification tests regardless of past experience or availability of certified qualification papers.

D. Field welding practices shall conform to OSHA Construction Standards, Part 1926, Subpart J, “Welding and Cutting.” Shop welding practices shall conform to OSHA General Industry Standards, Part 1910, Subpart Q, “Welding, Cutting, and Brazing.”

E. Welding electrodes for structural steel shall conform to the standard recommendations of the AISC. Welding electrodes for stainless steel shall conform to applicable AWS specifications and shall be as recommended by “Welded Austenitic Chromium-Nickel Stainless Steels, Techniques and Properties,” published by the International Nickel Company, New York, New York. Welding electrodes for aluminum shall conform to applicable AWS specifications.

F. Each welder and welding operator must identify his welds with his assigned symbol.

G. Welders performing unsatisfactory work shall be removed from the welding process.

H. The Owner may inspect any weld by radiographic or other means. Welds not in accordance with the requirements specified herein shall be repaired or replaced at the Contractor’s expense. Excessive porosity, nonmetallic inclusions, lack of fusion, incomplete penetration, and cracking shall constitute grounds for rejection of welds.

1.17 ERECTION AND SETTING

A. In the erection and setting of all fabricated equipment, the Contractor shall exercise care to ensure that each item of equipment is adequately supported so as not to bend or distort under its own weight until adequate foundation support and anchorage are provided. Where lifting lugs or clips are provided, they shall be used in erecting and setting the equipment. Erection and setting of equipment and structural steel shall

conform to the requirements of OSHA Construction Standards, Part 1926, Subpart R, “Steel Erection,” Subpart H, “Material Handling, Storage, Use, and Disposal,” and Subpart N, “Cranes, Derricks, Hoists, and Conveyors.” Erection of structural steel shall conform to the latest requirements of the AISC “Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.”

B. During placement and prior to any grouting or connection of adjacent piping the equipment shall be leveled and aligned true to level, plumb, alignment, and grade with all parts bearing or fitting the structure or equipment accurately and securely. It shall not be permitted to cock out of alignment, re-drill, re-shape, or force fit any fabricated items.

C. The Contractor shall take all measurements necessary to properly fit his work in the field, and he shall be governed by and responsible for these measurements and the proper working out of all details. The Contractor shall be responsible for the correct fitting of all work in the field and the accurate placement of all anchor bolts installed by him.

D. The Contractor shall bring all parts to be erected or assembled into close contact. Before assembly, all surfaces to be in contact with each other shall be thoroughly cleaned. Drift pins may be used only for bringing members into position, never to enlarge or distort holes. Torching or burning of holes or cutting of fabricated items to correct misalignment or shop errors shall not be permitted. Enlargement of holes necessary to make field connections shall be done only with the Engineer’s approval by reaming with twist drills and in a manner acceptable to the Engineer.

E. All equipment shall be furnished with suitable eyebolt lifting lugs or lifting angles to facilitate handling.

1.18 SPECIAL TOOLS AND ACCESSORIES

A. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Special tools and accessories shall include those tools and accessories not normally available in an industrial hardware or mill supply house. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

1.19 SHOP PRIMING AND PAINTING

A. All iron and carbon steel surfaces of shop fabricated equipment and all ferrous and nonferrous surfaces specified to be shop primed or painted shall be painted in the shop with one or more coats of primer. The provisions of Section 09 9100, Painting, shall govern.

B. All surfaces to be primed in the shop shall have all rust, mill scale, grease, oils, mud, dirt, welding flux, slag, weld spatter, and other foreign material removed after fabrication and prior to application of primer. Welds shall be scraped, chipped, and brushed as necessary to remove all embedded slag or weld spatter. Sharp edges of cut or sheared edges shall be dulled by at least one pass of a power grinder to improve

paint adherence. Surface preparation prior to shop priming shall conform to that specified in the detailed equipment specifications. Where surface preparation prior to shop priming is not otherwise specified, iron and carbon steel surfaces shall be given a commercial blast cleaning in accordance with Steel Structures Painting Council Specification SP-6, galvanized or aluminum surfaces shall be given a solvent cleaning, copper surfaces shall be cleaned with a mild solution of phosphoric acid and buffed or polished to a bright finish, and stainless steel shall be given a solvent cleaning followed by sanding or light blast cleaning to provide a roughened surface. Cleaned surfaces shall be primed immediately after cleaning. Sandblasting shall not be permitted on electrical or mechanical equipment after assembly. Sandblasting shall achieve an anchor pattern or blast profile of between 30 and 40 percent of the dry film thickness of the first applied coat of primer.

C. Primers shall be applied with suitable brushes, rollers, or spray equipment at a rate of application not to exceed the manufacturer's recommended rate for the surface being painted. Primer shall not be applied in areas where there is an excessive amount of dust present in the air. Primer shall be mixed, stored, and applied in strict adherence to the manufacturer's recommendations. Primed surfaces shall be smooth and free of brush marks, streaks, laps, runs, or skipped or missed areas. Special care shall be taken to ensure that all cracks, corners, and crevices are filled with primer. Shop primed materials shall not be handled or assembled until the shop coating is dry and hard.

D. Primers, number of coats, and minimum dry film thicknesses shall conform to the shop painting systems specified in the detailed equipment specifications. Where shop primers are not otherwise specified, iron and carbon steel surfaces shall be coated with one (1) coat of alkyd system ferrous metal primer to a minimum dry film thickness of 2.0 mils, and galvanized, stainless steel, copper, and aluminum surfaces shall be coated with one (1) coat of galvanized metal wash primer to a minimum dry film thickness of 0.5 mils. Alkyd system ferrous metal primer shall be Glidden "Glid-Guard Tank and Structural Primer No. 585," TNEMEC "37-77 Chem-Prime," Indurall "G-1221 Primer," or equal. Galvanized metal wash primer shall be Glidden "Glid-Guard Metal Conditioning Primer No. 5290," TNEMEC "32-1210 TNEME-Grip," Indurall "H4-1109 Wash Coat Primer," or equal.

E. Miscellaneous iron castings shall be given a commercial blast cleaning and coated in the shop with one (1) coat of bituminous paint applied to a minimum dry film thickness of 10.0 mils, unless otherwise specified. Bituminous paint shall be Glidden "Glid-Guard Top Service Thick Black," TNEMEC "46-449 Heavy Duty Black," Indurall "J-1135 Coal Tar Coating," or equal.

F. Anodizing of aluminum shall be conducted in accordance with Aluminum Association Designation (A41), published by Aluminum Association, Inc., New York, New York. Unless otherwise shown or specified, the process shall provide a clear anodized finish having a minimum thickness of 0.4 mils. Anodizing shall be conducted after the aluminum item is fabricated.

G. Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with a rust preventive compound, Dearborn Chemical "No-Ox-Id 2W," Houghton "Rust Veto 344," Rust Oleum "R-9," or equal.

H. All surfaces which will be inaccessible after assembly or installation shall be protected by two or more coats of shop applied paint suitable for the life of the equipment.

I. All non-machined and nonbearing ferrous surfaces of electric motors, compressors, lubricating oil systems, pumps, blowers, speed reducers, and increasers, motor control centers, transformers, valves, valve operators, controls, and other self-contained, purchased equipment shall be shop cleaned and shop finished with the manufacturer's high-grade, oil-resistant alkyd enamel or epoxy coating system. Non-machined ferrous surfaces on the interior of gear reducer or increaser cases shall be shop finished with a rust inhibiting alkyd enamel specially designed for gear case or transmission service applied to a minimum dry film thickness of 1.5 mils. Where equipment is specified to be field painted as well, shop primer and finishes shall be compatible with the specified field applied finish.

1.20 FIELD PRIMING

A. All iron and carbon steel surfaces not specified to be galvanized or shop primed and all ferrous or nonferrous surfaces specified to be field primed and painted shall be coated in the field with one or more coats of primer in accordance with the requirements of Section 09 9100, Painting.

1.21 FIELD PAINTING

A. All ferrous and nonferrous surfaces of equipment which have received one or more coats of shop or field applied primer shall be field painted after installation in accordance with the requirements of Section 09 9100, Painting, except for interior surfaces of vessels and enclosed equipment not specified to be field painted

1.22 GALVANIZING

A. All galvanizing shall be done by the hot-dip process after fabrication in conformity with requirements of ASTM A 123, A 153, A 384, and A 385. Articles to be galvanized shall be pickled before galvanizing.

B. Where galvanized bolts are specified or required by the Drawings, cadmium or zinc plated bolts will be acceptable provided cadmium plating conforms to ASTM A 165, Type NS, and zinc plating conforms to ASTM A 164, Type GS.

C. Areas of galvanizing damaged by welding or burning or otherwise damaged shall be thoroughly stripped and cleared and recoated with zinc to the required thickness by the hot-dip process.

D. Galvanized articles shall be free from uncoated spots, blisters, flux, black spots, dross, projections, and other defects not consistent with acceptable galvanizing practice.

E. Zinc and cadmium plating shall be subject to visual examination to determine uniformity of coating. The Engineer may require that the coating uniformity be tested in accordance with ASTM A 239.

1.23 PROTECTION AND STORAGE

A. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept thoroughly dry at all times. Compressors, blowers, pumps, motors, valves, control panels, instrumentation, electrical equipment, and other equipment having anti-friction or sleeve bearings shall be stored in weathertight warehouses which are maintained at a temperature of at least 60°F. Other equipment may be stored outside under cover. All equipment shall be stored above ground level and adequately supported on wood blocking or other approved support material. Printed storage instructions of the manufacturers shall be strictly adhered to.

B. Painted, anodized, or otherwise coated surfaces shall be protected against impact, abrasion, discoloration, and other damage. All coated surfaces which are damaged prior to acceptance of equipment shall be cleaned and coated or painted to the satisfaction of the Engineer with the same or equivalent coating used in the original application.

C. Electrical equipment, motors, controls, and insulation shall be protected against moisture or water damage. All space heaters provided in the equipment shall be kept connected and operating at all times until equipment is placed in service. Electrical equipment stored without space heaters shall be provided with desiccants to protect against moisture damage. Desiccant shall be silica gel in porous bags at not less than one ounce per cubic foot of volume. Desiccant shall be replaced periodically.

D. Electrical equipment and instrumentation shall be stored in a location that is free from excessive or injurious amounts of vibration.

E. Rotating equipment such as pumps, motors, fans, and compressors shall be rotated periodically. In the absence of specific exercising instructions by the equipment manufacturer, each item of rotating equipment shall be rotated a minimum of 10 revolutions at intervals not to exceed 30 days. When shafts are too difficult to rotate by hand, nonmetallic grips shall be used to turn the shafts.

F. Vehicles such as trucks, forklifts, tractors, lawn mowers, and other engine-powered equipment shall be started up and operated at intervals not to exceed 15 days. Equipment shall be run until engine temperatures and pressures are in normal operating ranges. All lifting, lowering, tilting, loading, and unloading accessories shall be operated at least once during the exercise period. Equipment shall be moved under power from the parked position and run a sufficient distance so as to ensure proper lubrication of drive train and suspension components. All operators employed to exercise the vehicles shall be qualified and thoroughly familiar with the proper operation of the equipment. Forklifts, tractors, lawn mowers, and other small engine-powered equipment shall be stored indoors in garages or other suitable structures. Trucks stored outdoors shall be washed using approved materials at intervals not to exceed 15 days. All exercising and storage of vehicular equipment shall be conducted in a manner acceptable to the Engineer.

G. Interiors of gear and bearing cases housing oil-lubricated gears and bearings shall be filled with a rust inhibiting oil prior to storage or, if extended storage is anticipated, coated periodically with a rust inhibiting oil mist at intervals of time acceptable to the

Engineer. Interiors of large pumps and compressors shall be protected using vapor phase inhibitor paper or porous bags of rust inhibiting, vapor emitting crystals. Exposed shafts shall be coated with rust preventative compound when wrapped with oil-impregnated paper and polyethylene film and sealed with waterproof tape.

H. Individually packaged, unpainted steel parts shall be protected by a wrapping of vapor phase inhibiting or oil-impregnated paper and polyethylene film.

I. Parts and equipment not requiring periodic inspection or maintenance shall be stored unopened in their original packaging until used.

J. Parts, instruments, controls, and small items of equipment shall be stored above ground or floor level on suitable shelves or racks in a heated, watertight warehouse.

K. Flanged openings on equipment shall be covered with suitable solid wooden or metal blanks securely bolted to the flange using a minimum of four bolts and a suitable rubber gasket. Ends of threaded pipe and fittings shall be sealed watertight with metal or plastic caps. Threaded openings shall be sealed watertight with metal or plastic plugs. Other openings shall be sealed with two layers of 6-mil polyethylene securely taped in place with waterproof tape.

L. A maintenance log on each item of mechanical and electrical equipment requiring periodic attention in storage shall be maintained by the Contractor. Oil and grease changes, exercising, desiccant replacement, nitrogen purge checks, heater checks, insulation checks, and other periodic maintenance shall be entered in the log. The maintenance log shall be made available to the Engineer on request.

M. A resistance test shall be performed on all motor windings and heater elements following storage and prior to installation as a check for insulation deterioration or moisture damage during storage. Insulation tests shall be performed in accordance with the requirements of Section 26 0500, Basic Electrical Requirements.

N. Immediately prior to installation, equipment shall be cleaned of any protective coatings used during storage and any rust, dirt, grit, or other foreign material shall be removed.

O. All grease-lubricated joints, shaft couplings, and bearings shall be flushed out and re-greased after installation and prior to start-up. All oil reservoirs and sumps shall be completely drained and flushed and refilled with the proper lubricant. Screens and filters shall be checked for contamination and replaced if necessary. The equipment shall then be tagged, signed, and dated, indicating that the equipment has been properly lubricated for start-up.

P. After storage, rubber parts such as valve seats, diaphragms, expansion joints, gaskets, hoses, and shaft couplings shall be checked for hardening or cracking. Deteriorated parts shall be replaced prior to start-up by the Contractor at his own expense.

1.24 VIBRATION TESTING

A. Each pump, blower, compressor, motor, or similar item of stationary rotating equipment having a rated power in excess of 20 hp shall be tested in the field for acceptable

vibration levels, unless specified otherwise in the detailed equipment specifications. Vibration testing shall be performed by an experienced, factory-trained and authorized vibration analysis expert (not a sales representative) retained by the Contractor for this work. Each unit or pump system shall be tested separately without duplicate equipment running. All field testing shall be done in the presence of the Engineer. The Engineer shall be furnished with four (4) certified copies of vibration test data for each test performed.

B. Equipment which is assembled and tested on the manufacturer's floor shall also be checked triaxially for vibration by the manufacturer where specified in the detailed equipment specifications. The results of these tests, along with location of vibration check points, shall be submitted to the Engineer. All readings shall be made on an X-Y recorder with appropriate scales indicated and an explanation thereon of any recordings exceeding specified limits. The field tests shall include substantiation of the manufacturer's test data.

C. Tests shall be conducted at various speeds between maximum and minimum for systems with variable speed drives. For systems with two-speed drives, tests shall be conducted at both speeds. For systems with constant-speed drives, tests shall be conducted under various loading conditions as determined by the Engineer.

D. Rotating equipment shall be tested for vibration in the field after installation by the following method. Equipment, complete with drive systems, in place at the job site, shall not vibrate more than the values allowed herein, unless otherwise specified in the detailed equipment specifications. All field tests shall be running tests with the equipment operating on the product for which it is intended, or a substitute acceptable to the Engineer. The term displacement, as used herein, shall mean total peak-to-peak movement of vibrating equipment, in mils; velocity shall mean the peak velocity or speed of the vibrating equipment, in inches per second (in/sec); acceleration shall mean the maximum acceleration which occurs during a vibration cycle, measured in G's. Displacement and velocity shall be measured by an IRD Mechanalysis Vibration Meter Model 306, Bently Nevada Model TK-8, or equal. Acceleration shall be measured by suitable IRD Mechanalysis, Bently-Nevada, or equal, equipment, subject to approval of the Engineer. Frequency of vibration, in cycles per minute (cpm), shall be determined when vibration exceeds specified levels or as otherwise necessary. Vibration shall be measured on the bearing housing, unless other locations are deemed necessary by the vibration analysis expert and Engineer.

E. Vibration shall be checked in the radial and axial directions for all equipment tested. For pumps, axial vibration shall not exceed 0.1 in/sec; and radial vibration shall not exceed that permitted by the Hydraulic Institute Standards except that, at vibration frequencies in excess of 8,000 cpm, the velocity shall not exceed 0.2 in/sec.

F. For gear boxes, gear reducers, speed increasers, etc., vibration shall be tested by either velocity or acceleration measurements, as deemed appropriate by the Engineer and the vibration analysis expert. Unless otherwise specified in the detailed equipment specifications, radial vibration shall not exceed 0.2 in/sec; axial vibration shall not exceed 0.1 in/sec.

G. For all fans, radial and axial vibration shall not exceed 0.1 in/sec in accordance with GSA PBS 15-15. For all other equipment, radial vibration shall not exceed 0.2 in/sec, and axial vibration shall not exceed 0.1 in/sec.

H. All rotating assemblies of high-speed equipment shall be statically and dynamically balanced. The dynamic balance data must be certified, and results submitted to the Engineer.

I. Critical speeds of all rotating equipment shall meet the following:
   1. For stiff shaft designs, the first critical speed of the rotating equipment shall be at least 25 percent above the maximum design operating speed.
   2. For flexible shaft designs, critical speeds shall be at least 25 percent above or below normal design operating speeds.

J. The Contractor shall be responsible for unit and system assembly vibration testing and their results, which shall be within the specified limits. Copies of test results shall be submitted to the Engineer for review. Should the vibration field test results exceed shop test results, or the limits specified herein, the Contractor shall correct the deficiencies within thirty (30) days. After corrections have been completed, the vibration testing shall be rerun, and the results resubmitted to the Engineer for review.

K. The vibration test meter shall become the property of the Owner following completion of field vibration testing. The unit shall be delivered to the Owner in perfect working order, complete with case and all necessary probes or pickups. Operating instructions shall be included, and the Owner's personnel trained in its use by the Contractor.

L. Noise or vibration in any rotating equipment which the Engineer judges to be excessive or damaging, shall be cause for rejection.

1.25 HYDRAULIC SYSTEMS

A. All pipes, tubes, and hoses for hydraulic fluid shall be securely restrained against movement.

B. All hydraulic fluid reservoirs for hydraulic power packs shall be equipped with a low level shut-off mechanism which shall stop operation of the power pack when the level of fluid in the reservoir reaches a predetermined low level.

C. All hydraulic systems shall be equipped with an alarm to notify the operator of system malfunction.

1.26 PRESSURE AND TEMPERATURE GAUGES

A. The Contractor shall furnish a compound pressure/vacuum gauge on the suction and a pressure gauge on the discharge of each pump, compressor, and blower, unless otherwise specified. Gauges shall be 4 to 5 inches in diameter with phenolic cases and clear shatter-proof lenses. Gauges shall be suitable for use in harsh, vibrating environments and be glycerin filled. Gauges shall have a white background and black pointers and characters. Maximum scale reading shall be approximately twice the

maximum operating pressure of the fluid being measured. Accuracy shall be ±2 percent. The operating mechanism shall be of the Bourdon type with positive protection against any solids contamination of the operating mechanism provided. Pressure gauges shall be provided with NPT connections and shall be isolated from piping by gauge cocks. Pressure gauges on rotary or reciprocating equipment shall be provided with pressure snubbers.

B. The Contractor shall furnish a bi-metallic temperature gauge on the discharge of each air compressor or blower, unless otherwise specified. Temperature gauges shall be approximately 5 inches in diameter with stainless steel case and white background and black pointers and characters. All temperature gauges shall have a range of 0 to 250°F unless otherwise required for process conditions. Accuracy shall be ±1 percent. Temperature gauges shall be furnished with stainless steel thermowells and NPT connections.

C. Pressure gauges for steam service shall have stainless steel case and shall be equipped with pigtail siphon.

1.27 LIMIT SWITCHES AND SENSORS

A. Limit switches on equipment shall be of the heavy-duty, precision type with NEMA 4 steel enclosure and standard pre-travel lever or plunger operator as required, unless otherwise specified. Limit switches shall have SPDT or DPDT contacts rated not less than 5 amps inductive, 10 amps resistance at 120 volts AC. Limit switches in hazardous locations shall be enclosed in a cast aluminum, explosion-proof enclosure.

B. Pressure switches shall be of the snap-acting type with internal adjustment and shock-resistant, cast, waterproof enclosure, unless otherwise specified. Contacts shall be SPDT or DPDT rated minimum 15 amps at 125 volts AC. Switch operation shall be by means of a teflon diaphragm or a Type 316 stainless steel bellows, depending on pressure range. All wetted parts shall be of brass or stainless steel. Switch shall have a repeatability of ±1 percent of range or better. Switch shall be UL listed.

C. Temperature switches shall be of the non-indicating, snap-acting type with internal adjustment, oil-filled stainless steel sensing bulb, and shock resistant, cast watertight enclosure, unless otherwise specified. Contacts shall be SPDT or DPDT rated minimum 15 amps at 125 volts AC. Switch shall be furnished with a separable stainless steel well. Switch shall be UL listed.

1.28 EQUIPMENT SPEEDS

A. Maximum rotative speeds on mechanical and electrical equipment shall be as follows, unless otherwise permitted in the detailed equipment specifications or specified on the Drawings:
   1. All centrifugal, axial, and vortex pumps - 1,800 rpm
   2. Progressing cavity pumps in wastewater, scum, sludge, or abrasive slurry - 300 rpm
   3. Centrifugal, axial, and vortex pumps in wastewater, scum, sludge, or abrasive slurry - 1,800 rpm

4. Propeller fans (direct drive) - 1,200 rpm
5. Propeller fans (V-belt drive) - 700 rpm
6. Centrifugal fans and vent sets - 900 rpm
7. Rotary lobe compressors - 2,500 fpm pitch line velocity
8. Centrifugal compressors - 3,600 rpm

1.29 NOISE CRITERIA

A. Noise levels for all operating equipment shall not exceed 90 dB at 5 feet from the equipment when measured on the A scale of a calibrated sound level meter at slow response, unless otherwise specified

B. Noise criteria shall be met without the use of special external barriers or enclosures.

1.30 INSTALLATION CHECK

A. An experienced, competent, and authorized service representative of the manufacturer of each item of equipment or other person acceptable to the Engineer shall visit the site of the work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the equipment manufacturer's representative or other person authorized by the Engineer to perform the installation check shall be present when the equipment is placed in operation and shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of the Engineer.

B. Each equipment manufacturer's representative or other person authorized by the Engineer to perform the installation check shall furnish to the Owner, through the Engineer, a written report certifying that the equipment (1) has been properly installed and lubricated; (2) is in accurate alignment; (3) is free from any undue stress imposed by connecting piping or anchor bolts; and (4) has been operated under full load conditions and that it operated satisfactorily. The work described under these Contract Documents will not be accepted as complete until satisfactory installation certifications have been submitted in accordance with the requirements of this section.

C. The Contractor shall properly coordinate the visits by the manufacturer's representatives, particularly where the operation of an item of equipment is dependent on the operation of other equipment. Prior to calling the manufacturer's representative, the Contractor shall ensure that all necessary related equipment, structures, piping, and electrical work is complete. The Contractor shall pay for any revisits to the site by the manufacturer's representative made necessary due to the Contractor's failure to properly coordinate the visits.

D. The Contractor shall secure the services of the manufacturer's representative at the site of the work for as long as is necessary to check the installation and place the equipment in satisfactory operation.

E. Electrical connections to equipment shall be made only upon approval of the manufacturer's representative.

F. All costs for this work shall be included in the contract price(s) and no separate payment will be made.

1.31 FIELD TESTING

A. After installation and checkout, all equipment shall be field tested in the presence of the Engineer and in a manner satisfactory to him. During the field tests, the equipment shall be subjected to various full load and partial load conditions and emergency operating and shutdown conditions. The ability of the equipment to operate in the prescribed manner without overheating, jamming, excessive noise or vibration, or evidence of excessive wear shall be demonstrated to the satisfaction of the Engineer.

B. All equipment shall be tested before it is covered or insulated. All accessory equipment which may be damaged by conditions during the test shall be isolated or otherwise protected.

C. All testing instruments and gauges necessary for conducting the tests shall be furnished by the Contractor. Installed instruments and gauges shall be used whenever possible if calibrated and approved for the purpose. Calibrate all installed instruments and gauges and attach a cloth tag showing date of calibration. Portable test equipment used in field testing shall be calibrated in the presence of the Engineer or suitable written evidence attesting to the accuracy of the equipment shall be submitted.

D. A record shall be made of each field test showing operating temperatures and pressures, motor current and voltage, speed, flow rate, and other pertinent data. Information recorded for fans, blowers, compressors, and pumps shall include static pressures entering and leaving the equipment, fluid temperature entering and leaving the equipment, ambient temperature, barometric pressure and relative humidity, rpm, and discharge flow rate. Four (4) copies of all recorded test data and information shall be submitted to the Engineer for approval.

E. Field test all equipment handling or operating in water, wastewater, sludge, or corrosive or toxic materials using clean water at normal operating temperatures. Water used shall be potable water unless other sources are approved in writing by the Engineer.

F. Furnish all labor, materials, water, air, oil, power, fuel, chemicals, test equipment, and other items required to conduct the field tests, including any retests, unless otherwise specified in the detailed equipment stipulations.

G. Should the results of the tests indicate that the equipment has failed to perform in accordance with the requirements of the applicable detailed equipment specification, in the opinion of the Engineer, the Contractor shall make at his own expense such modifications or adjustments as required for satisfactory operation, including replacement of any or all components, if necessary. Following the modifications or adjustments, the Contractor shall repeat the field tests as specified herein. This procedure shall be repeated until the results of the field tests indicate that the equipment has satisfied the requirements of the applicable specification section.

H. The cost of all field testing shall be included in the contract price(s) and no separate payment will be made.

1.32 IDENTIFICATION OF PIPING AND EQUIPMENT

A. All piping and equipment shall be identified as follows: All equipment and piping specified to be painted shall be color coded. The colors shall be as specified in Section 09 9100, Painting. Insulated piping shall be identified using plastic bands, arrows, and letters, colored and sized in accordance with Section 09 9100.

B. All major items of equipment shall have an identification nameplate. The Contractor shall submit a suitable list of all items of major equipment to the Engineer, who will furnish the Contractor with an identification numbering system. The nameplates shall be of Type 304 stainless steel, No. 6 finish, and not less than No. 16 gauge with indented stamped lettering. Nameplates shall be attached to equipment bases in easily visible and accessible locations. Nameplates shall be fastened in a permanent manner, arranged not to damage the equipment, with not less than four stainless steel fasteners. All nameplates shall contain as a minimum the following information, where applicable:

1. Name of equipment (from equipment specifications)
2. Manufacturer
3. Model designation
4. Rated horsepower
5. Service factor
6. Electrical and insulation specifications
7. Speed (rpm)
8. Capacity and head (discharge pressure)
9. Net weight

Lettering shall be upper case, block style in size and spacing to suit the nameplate. A sample nameplate including fastenings shall be submitted to the Engineer for approval prior to manufacture of any of the nameplates. The identification nameplates shall not be painted.

C. Piping shall be identified with a designation and directional flow arrows as described in Section 09 9100, Painting.

D. All valves shall be identified with a round brass disc, approximately 1½ inches in diameter and not less than No. 14 gauge, coated with a clear lacquer. Discs shall be fastened to valves in a permanent manner; however, attachment by chain to handwheels or other operators shall not be acceptable. Discs shall be stamped using indented numerals and/or letters with a valve number corresponding to its identification number in the valve schedule to be included in the Operation and Maintenance Manual.

E. All push-button stations, switches, motor controllers, transmitters, and other control equipment shall have identification nameplates of the engraved, laminated plastic type affixed to or adjacent to the switch, push-button station, etc.

F. All manufacturer's nameplates, identification nameplates, and ASME code plates located on areas of equipment to be insulated shall be removed and reattached on uninsulated areas in a manner acceptable to the Engineer and in his presence.

1.33 WARNING SIGNS

A. Permanent warning signs shall be furnished and installed on all mechanical and electrical equipment where a hazard exists as specified herein. Signs shall be made in accordance with OSHA requirements and shall be suitable for exterior use. Mounting details shall be in accordance with manufacturer's recommendations; location as approved by the Engineer. Fasteners shall be stainless steel.

B. Warning signs shall be approximately 10 inches high by 14 inches wide, colored yellow and black, on minimum 0.080-inch aluminum stock.

C. Warning signs shall be furnished as follows

1. The following sign shall be affixed to all equipment which may be started automatically from a remote location:

CAUTION

THIS EQUIPMENT MAY START
AUTOMATICALLY
BY REMOTE CONTROL

2. The following sign shall be affixed to all electrical equipment or instrument panels, as applicable:

CAUTION - SHOCK HAZARD

THIS EQUIPMENT IS POWERED BY MULTIPLE SOURCES
CONTACTS MAY BE ENERGIZED AFTER
LOCAL POWER IS DISCONNECTED

3. The following sign shall be provided at all areas where oxygen or flammable materials are stored or used (colored red, white, and black):

DANGER

NO SMOKING, MATCHES OR OPEN FLAMES

4. The following sign shall be affixed to all entrance hatches or access manways on covered tanks and vessels:

CAUTION

OXYGEN DEFICIENT OR TOXIC CONDITIONS MAY EXST
FOLLOW PRESCRIBED PROCEDURES BEFORE ENTRY

5. The following sign shall be provided at all compressor vents and equipment blowoffs:

CAUTION

LOUD BLOWDOWN MAY OCCUR
WITHOUT WARNING

END OF SECTION

SECTION 01 6500

TRANSPORTATION AND HANDLING

1. GENERAL

1.1. SCOPE

A. Provide transportation of all equipment, materials, and products furnished under these Contract Documents to the site of the work. In addition, provide preparation for shipment and storage, unloading, handling and re-handling, short-term storage, extended storage, storage facilities, maintenance and protection during storage, preparation for installation, and all other work and incidental items necessary or convenient to the Contractor for the satisfactory prosecution and completion of the work.

1.2. TRANSPORTATION

A. Suitably box, crate, or otherwise protect all equipment during transportation.

B. Ship and deliver all equipment in the largest assembled sections practical or permitted by carrier regulations to minimize the number of field connections.

C. Ensure that the equipment is assembled and transported in such a manner so as to clear buildings, power lines, bridges, and similar structures encountered during shipment or delivery to the site of the work.

D. Ensure that the weights of the assembled sections do not exceed the capacity of the cranes or hoisting equipment where equipment will be installed using existing cranes or hoisting equipment.

E. Small items and appurtenances such as gauges, valves, switches, instruments, and probes which could be damaged during shipment shall be removed from the equipment prior to shipment and packaged and shipped separately. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

F. Paint temporary shipping braces and supports orange or yellow for easy identification.

1.3. HANDLING

A. Carefully handle all equipment, materials, and products to prevent damage or excessive deflections during unloading or transportation. All equipment, materials, and products damaged during transportation or handling shall be repaired or replaced by the Contractor at no additional cost to the Owner prior to being incorporated into the work.

B. Strictly follow lifting and handling drawings and instructions furnished by the manufacturer or supplier. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Shafts and operating mechanisms shall not be used as lifting points. Spreader bars or lifting beams shall be used when

the distance between lifting points exceeds that permitted by standard industry practice. Slings and chains shall be padded as required to prevent damage to protective coatings and finishes.

C. Under no circumstances shall equipment or products such as pipe, structural steel, casting, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.

D. Handle items such as nonmetallic pipe, nonmetallic conduit, flagpoles, and lighting poles using nonmetallic slings or straps.

END OF SECTION

SECTION 01 6600

STORAGE AND PROTECTION

1. GENERAL

1.1. SCOPE

A. Equipment shall be received, inspected, unloaded, handled, stored, maintained, and protected by the Contractor in a suitable location on or off site, if necessary, until such time as installation is required.

B. Storage and protection of Contractor-furnished equipment shall be in strict conformance with the requirements of the applicable provisions of the General Conditions of these Specifications.

1.2. STORAGE

A. Provide satisfactory storage facilities which are acceptable to the Engineer. In the event that satisfactory facilities cannot be provided on site, satisfactory warehouse, acceptable to the Engineer, will be provided by the Contractor for such time until the equipment, materials, and products can be accommodated at the site.

B. Equipment, materials, and products which are stored in a satisfactory warehouse acceptable to the Engineer will be eligible for progress payments as though they had been delivered to the job site.

C. Maintain and protect all equipment, materials, and products placed in storage and bear all costs of storage, preparation for transportation, transportation, re-handling, and preparation for installation.

D. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel, and sheet construction products shall be stored with one end elevated to facilitate drainage.

E. Building products and materials such as cement, grout, plaster, gypsum-board, particleboard, resilient flooring, acoustical tile, paneling, finish lumber, insulation, wiring, etc., shall be stored indoors in a dry location, unless otherwise permitted in writing by the Engineer. Building products such as rough lumber, plywood, concrete block, and structural tile may be stored outdoors under a properly secured waterproof covering.

F. Tarps and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarps and covers shall be arranged to prevent ponding of water.

1.3. EXTENDED STORAGE

A. In the event that certain items of major equipment have to be stored for an extended period of time, the Contractor shall provide satisfactory long-term storage facilities which are acceptable to the Engineer. The Contractor shall provide all special packaging, protective coverings, protective coatings, power, nitrogen purge, desiccants, lubricants, and exercising necessary or recommended by the manufacturer to properly maintain and protect the equipment during the period of extended storage.

END OF SECTION

SECTION 01 7329

CUTTING AND PATCHING

1. GENERAL

1.1. DEFINITIONS

A. Cutting and patching includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.

B. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

1.2. STRUCTURAL WORK

A. Do not cut-and-patch structural work in a manner resulting in a reduction of load-carrying capacity or load/deflection ratio. Submit proposal and request and obtain Engineer's approval before proceeding with cut-and-patch of structural work.

1.3. OPERATIONAL/SAFETY LIMITATIONS

A. Do not cut-and-patch operational elements and safety components in a manner resulting in decreased performance, shortened useful life, or increased maintenance. Submit proposals and requests and obtain Engineer's approvals before proceeding with cut-and-patches.

1.4. VISUAL/QUALITY LIMITATIONS

A. Do not cut-and-patch work exposed to view (exterior and interior) in a manner resulting in noticeable reduction of aesthetic qualities, as judged by Engineer.

B. Engage qualified personnel skilled in cutting, patching, removal, and replacement of specialized equipment and finish surfaces.

1.5. LIMITATIONS ON APPROVALS

A. Engineer's approval to proceed with cutting and patching does not waive right to later require removal/replacement of work found to be cut-and-patched in an unsatisfactory manner, as determined by the Engineer.

2. PRODUCTS

2.1. GENERAL

A. Use materials for cutting and patching that are identical to existing materials. If identical materials are not available or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual

effect. Use materials for cutting and patching that will result in equal-or-better performance characteristics.

3. EXECUTION

3.1. INSPECTION

A. Before cutting, examine surfaces to be cut and patched and conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

3.2. TEMPORARY SUPPORT

A. To prevent failure, provide temporary support of work to be cut.

3.3. PROTECTION

A. Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.

B. Avoid interference with use of adjoining areas or interruption of free passage to adjoining area.

C. Take precautions not to cut existing pipe, conduit, or duct serving existing building or equipment but scheduled to be relocated until provisions have been made to bypass them.

3.4. CUTTING

A. Use the cutting methods that are least likely to damage work to be retained or adjoining work. Where possible, review proposed procedures with the original installer; comply with original installer's recommendations.

B. Where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut and drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.

3.5. PATCHING

A. Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.

B. Restore exposed finish of patched areas, and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.

3.6. REPAIR OF DAMAGE

A. Repair equipment and finish surfaces damaged as the result of the work of this contract to the satisfaction of the Owner or replace with new material at no additional cost to the Owner.

END OF SECTION

SECTION 01 7423

FINAL CLEANING

1. GENERAL

1.1. SUMMARY

A. This section specifies administrative and procedural requirements for final cleaning at Substantial Completion.

1. Special cleaning requirements for specific elements of the work are included in appropriate sections of Divisions 2 through 48.

B. General project closeout requirements are included in Section 01 7800, Project Closeout.

C. Multiple Prime Contracts. Except as otherwise indicated, each prime Contractor is responsible for final cleaning his own work.

D. Environmental Requirements. Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.

1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

2. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted without the owner's permission. If allowed, all required permits shall be the responsibility of the Contractor.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions or General Provisions and other Division 1 Specification sections, apply to this section.

2. PRODUCTS

2.1. MATERIALS

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

3. EXECUTION

3.1. FINAL CLEANING

A. General. Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

B. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion for the entire project or a portion of the project.

1. Clean the project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petrochemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.

2. Remove tools, construction equipment, machinery and surplus material from the site.

3. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

4. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.

5. Broom clean concrete floors in unoccupied spaces.

6. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

7. Remove labels that are not permanent labels.

8. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that can not be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name plates.

9. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.

10. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

11. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills. Clean ducts, blowers, and coils if units were operated without filters during construction.

12. Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned out bulbs, and defective and noisy starters in fluorescent and mercury vapor fixtures.

13. Leave the project clean and ready for occupancy.

C. Compliances. Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remain after completion of associated construction have become the Owner's property, dispose of these materials as directed.

END OF SECTION

SECTION 01 7800

PROJECT CLOSEOUT

1. GENERAL

1.1. SUMMARY

A. This section specifies administrative and procedural requirements for project closeout, including but not limited to:

1. Inspection procedures.
2. Project record document submittal.
3. Operating and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate sections in Divisions 2 through 49.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3. SUBSTANTIAL COMPLETION

A. Preliminary Procedures. Before requesting inspection for certification of substantial completion, complete the following. List exceptions in the request.

1. Advise Owner of pending insurance change-over requirements.

2. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements

3. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures. On receipt of a request for inspection, the Engineer will either proceed with inspection or advise the Contractor of unfulfilled requirements. The Engineer will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Engineer will repeat inspection when requested and assured that the work has been substantially completed.

2. Results of the completed inspection will form the basis of requirements for substantial completion.

C. Reinspection Procedure. The Engineer will reinspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Engineer.

1. Upon completion of reinspection, the Engineer will prepare a certificate of final acceptance or advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

2. If necessary, reinspection will be repeated.

1.4. FINAL ACCEPTANCE

A. Preliminary Procedures. Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

2. Submit an updated final statement, accounting for final additional changes to the contract sum.

3. Submit a certified copy of the Engineer's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Engineer.

4. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.

5. Obtain and submit releases enabling the Owner unrestricted use of the work and access to services and utilities; include occupancy permits, operating certificates, and similar releases.

6. Submit record drawings, final project photographs, damage or settlement survey, property survey, and similar final record information.

7. Deliver any specified tools, spare parts, extra stock, and similar items.

8. Make final change-over of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of change-over in security provisions.

9. Submit all project close out forms completed and executed.

10. Submit operation and maintenance data.

11. Submit spare parts list.

12. Submit project record drawings (mark-up of plans showing revisions during construction).

13. Submit a final liquidated damages settlement statement, if required.

14. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

15. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems, or to provide control or flow diagrams. Coordinate these drawings with information contained in project record drawings to ensure correct illustration of the completed installation.

2. PRODUCTS (Not Applicable)

3. EXECUTION

3.1. CLOSEOUT PROCEDURES

A. Operating and Maintenance Instructions. Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments

B. A list of available instruction dates shall be submitted to the Owner through the Engineer at least two weeks in advance of the earliest proposed date for each instruction program. The Engineer will, within three business days, notify the Contractor of the Owner’s preferred date. To the maximum extent possible, instruction of related equipment systems will be conducted concurrently. The final coordination of the instruction is the sole responsibility of the Contractor.

C. Demonstrate the following procedures as part of instruction for operating equipment.

1. Start-up.

2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2. FINAL CLEANING

A. General. General cleaning during construction is required by the General Conditions.

B. Cleaning. Employ experienced workers or professional cleaners for final cleaning. Clean all work areas to original condition or to satisfaction of Owner and Engineer.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

2. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

C. Removal of Protection. Remove temporary protection and facilities installed for protection of the work during construction.

D. Compliance. Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION

SECTION 01 7823

OPERATING AND MAINTENANCE DATA

1. GENERAL

1.1. SUMMARY

A. This section specifies administrative and procedural requirements for operating and maintenance manuals including the following:

1. Preparation and submittal of operating and maintenance manuals for building operating systems or equipment.

2. Preparation and submittal of instruction manuals covering the care, preservation, and maintenance of architectural products and finishes.

3. Instruction of the Owner's operating personnel in operation and maintenance of building systems and equipment.

B. Special operating and maintenance data requirements for specific pieces of equipment or building operating systems are included in the appropriate sections of Divisions 2 through 49.

C. Preparation of shop drawings and product data are included in Section 01 3323, Shop Drawings, Product Data and Samples.

D. General closeout requirements are included in Section 01 7800, Project Closeout.

E. General requirements for submittal of project record documents are included in Section 01 7839, Project Record Documents.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section

1.3. QUALITY ASSURANCE

A. Operation and Maintenance Manual Preparation. In preparation of operation and maintenance manuals, use personnel thoroughly trained and experienced in operation and maintenance of the equipment or system involved.

1. Where written instructions are required, use personnel skilled in technical writing to the extent necessary for communication of essential data.

2. Where Drawings or diagrams are required, use drafters capable of preparing Drawings clearly in an understandable format.

B. Instructions for the Owner's Personnel. For instruction of the Owner's operating and maintenance personnel, use experienced instructors thoroughly trained and experienced in the operation and maintenance of the building equipment or system involve

1.4. SUBMITTALS

A. Submittal Schedule. Comply with the following schedule for submittal of operating and maintenance manuals.

1. Prior to the 80 percent completion point on the work, submit two draft copies of each manual to the Engineer for review. Include a complete index or table of contents of each manual. Draft submittal shall be in PDF format, and transmittal shall be electronic.

2. Prior to substantial completion, make corrections or modifications to comply with the Engineer's comments and submit the specified number of copies of each approved manual to the Engineer.

3. Number: Four final copies of each manual.

B. Form of Submittal. Prepare operating and maintenance manuals in the form of an instructional manual for use by the Owner's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.

1. Binders: For each manual, provide heavy-duty, commercial quality, 3-ring, vinyl-covered loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8½- by 11-inch paper. Provide a clear plastic sleeve on the spine to hold labels describing the contents. Provide pockets in the covers to receive folded sheets.

   a. Where two or more binders are necessary to accommodate data, correlate data in each binder into related groupings in accordance with the project manual Table of Contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.

   b. Identify each binder on the front and spine, with the typed or printed title "OPERATION AND MAINTENANCE MANUAL," project title or name, and subject matter covered. Indicate the volume number for multiple-volume sets of manuals.

2. Dividers: Provide heavy paper dividers with celluloid covered tabs for each separate section. Mark each tab to indicate contents. Provide a typed description of the product and major parts of equipment included in the section on each divider.

3. Protective Plastic Jackets: Provide protective transparent plastic jackets designed to enclose diagnostic software for computerized electronic equipment.

4. Text Material: Where written material is required as part of the manual, use the manufacturer's standard printed material, or if it is not available, specially prepared data, neatly typewritten, on 8½- by 11-inch, 20-pound white bond paper.

5. Drawings: Where drawings or diagrams are required as part of the manual, provide reinforced, punched binder tabs on the drawings and bind in with the text.

    a. Where oversized drawings are necessary, fold the drawings to the same size as the text pages and use as a fold-out.

    b. If drawings are too large to be used practically as a fold-out, place the drawing, neatly folded, in the front or rear pocket of the binder. Insert a typewritten page indicating the drawing title, description of contents, and drawing location at the appropriate location in the manual.

1.5. MANUAL CONTENT

A. In each manual include information specified in the individual specification section, and the following information for each major component of building equipment and its controls:

1. General system or equipment description.
2. Design factors and assumptions.
3. Copies of applicable shop drawings and product data.
4. System or equipment identification, including:
    a. Name of manufacturer.
    b. Model number.
    c. Serial number of each component.
5. Operating instructions.
6. Emergency instructions.
7. Wiring diagrams.
8. Inspection and test procedures.
9. Maintenance procedures and schedules.
10. Precautions against improper use and maintenance.
11. Copies of warranties.
12. Repair instructions including spare parts listing.
13. Sources of required maintenance materials and related services.
14. Manual index.

B. Organize each manual into separate sections for each piece of related equipment. As a minimum, each manual shall contain a title page, a table of contents, copies of product data supplemented by drawings and written text, and copies of each warranty, bond, and service contract issued.

1. Title Page: Provide a title page in a transparent plastic envelope as the first sheet of each manual. Provide the following information:

a. Subject matter covered by the manual.
b. Name and address of the project.
c. Date of submittal.
d. Name, address, and telephone number of the Contractor.
e. Name and address of the Engineer.
f. Cross reference to related systems in other operating and maintenance manuals.

2. Table of Contents: After the Title Page, include a typewritten table of contents for each volume, arranged systematically according to the project manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.

   a. Where more than one volume is required to accommodate data for a particular system, provide a comprehensive table of contents for all volumes in each volume of the set.

3. General Information: Provide a general information section immediately following the Table of Contents, listing each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the subcontractor or installer, and the maintenance contractor. Clearly delineate the extent of responsibility of each of these entities. In addition, list a local source for replacement parts and equipment.

4. Product Data: Where manufacturer's standard printed data is included in the manuals, include only sheets that are pertinent to the part or product installed. Mark each sheet to identify each part or product included in the installation. Where more than one item in a tabular format is included, identify each item, using appropriate references from the Contract Documents. Identify data applicable to the installation and delete references to information that is not applicable.

5. Written Text: Where manufacturer's standard printed data is not available, and information is necessary for proper operation and maintenance of equipment or systems, or it is necessary to provide additional information to supplement data included in the manual, prepare written text to provide necessary information. Organize the text in a consistent format under separate headings for different procedures. Where necessary, provide a logical sequence of instruction for each operating or maintenance procedure.

6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems, or to provide control or flow diagrams. Coordinate these drawings with information contained in project record drawings to ensure correct illustration of the completed installation.

7. Do not use original record documents as part of the operating and Maintenance Manuals.

8. Warranties, Bonds, and Service Contracts: Provide a copy of each warranty, bond, or service contract in the appropriate manual for the information of the Owner's operating personnel. Provide written data outlining procedures to be followed in the event of product failure. List circumstances and conditions that would affect validity of the warranty or bond.

1.6. INSTRUCTION OF THE OWNER'S PERSONNEL

A. Prior to substantial completion, instruct the Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Provide instruction at mutually agreed upon times.

1. For equipment that requires seasonal operation, provide similar instruction during other seasons.

2. Use operation and maintenance manuals as the basis of instruction for each piece of equipment or system. Review contents in detail to explain all aspects of operation and maintenance.

B. Training shall be conducted by an experienced, authorized service representative of the manufacturer.

2. PRODUCTS (Not Applicable).

3. EXECUTION (Not Applicable).

END OF SECTION

SECTION 01 7836

WARRANTIES AND BONDS

1. GENERAL

1.1. SUMMARY

A. This section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1. General closeout requirements are included in Section 01 7800, Project Closeout.

2. Specific requirements for warranties for the work and products and installations that are specified to be warranted, are included in the individual sections of Divisions 2 through 49.

B. Disclaimers and Limitations. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

C. Separate Prime Contracts: Each Prime Contractor is responsible for warranties related to its own contract.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section

1.3. DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4. WARRANTY REQUIREMENTS

A. Standard Warranty: Warrant all equipment, materials, products, and workmanship provided under these Contract Documents for a period of 12 months after the date of substantial completion established by the Engineer.

B. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

C. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty.

D. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. Complete warranty work as soon as possible after receipt of notice from the Owner for a warranty claim. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefitted from use of the work through a portion of its anticipated useful service life.

E. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

2. If the required repairs or replacements have not been completed or if positive and good faith efforts have not been made to complete the repairs or replacements within 30 consecutive calendar days after receipt of notice from the Owner of the warranty claim, the Owner shall be authorized to proceed with the repairs or replacements and the cost thereof shall be assessed against the Contractor's Performance Bond. Evidence of positive and good faith efforts shall include, as a minimum, joint visits by the Contractor and affected equipment vendors and manufacturers, and certified copies of purchase orders or invoices.

F. The Owner reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.

G. Multiple Equipment Failures. In the event of multiple equipment failures of major consequence prior to the expiration of the one-year warranty described above, disassemble, inspect, and modify or replace the affected equipment as necessary to prevent further occurrences. As used herein, "multiple equipment failures" shall be interpreted to mean two or more successive failures of the same kind in the same item of equipment or failures of the same kind in two or more items of similar equipment. Major equipment failures may include, but are not limited to, cracked or broken housings, piping, or vessels, excessive deflections, bent or broken shafts or structural members, broken or chipped gear teeth,

overheating, premature bearing failure, excessive wear, or excessive leakage around seals. Should multiple equipment failures occur in a given item or type of equipment, disassemble, inspect, modify or replace, as necessary, all equipment of the same size and type, and re-warrant for 12 months.

1.5. SUBMITTALS

A. Submit written warranties to the Engineer prior to the date certified for substantial completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of substantial completion for the work, or a designated portion of the work, submit written warranties upon request

1. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within 15 days of completion of that designated portion of the work.

B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier, or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Engineer for approval prior to final execution.

1. Refer to individual sections of Divisions 2 through 49 for specific content requirements, and particular requirements for submittal of special warranties.

C. Form of Submittal. At final completion, compile 2 copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Contract Documents.

1. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

2. PRODUCTS (Not Applicable).

3. EXECUTION (Not Applicable).

END OF SECTION

SECTION 01 7839

PROJECT RECORD DOCUMENTS

1. GENERAL

1.1. SUMMARY

A. This section specifies administrative and procedural requirements for project record documents.

B. Project record documents required include:

1. Marked-up copies of Contract Drawings.
2. Marked-up copies of approved shop drawings.
3. Newly prepared drawings
4. Marked-up copies of Specifications, Addenda, and Change Orders.
5. Marked-up product data submittals.
6. Construction photographs.
7. Field records for variable and concealed conditions.

C. Specific record copy requirements that expand requirements of this section are included in the individual sections of Division 2 through 49.

D. General project closeout requirements are included in Section 01 7800, Project Closeout.

E. Maintenance of Documents and Samples. Store record documents and samples in the field office apart from Contract Documents used for construction. Do not permit project record documents to be used for construction purposes. Maintain record documents in good order, and in a clean, dry, legible condition. Make documents and samples available at all times for inspection by the Engineer.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3. RECORD DRAWINGS

A. Mark-up Procedure. During the construction period, maintain a set of black-line prints of Contract Drawings and shop drawings for project record document purposes.

1. Mark these Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to information on concealed elements which would be difficult to identify or measure and record later. Items required to be marked include but are not limited to:

a. Dimensional changes to the Drawings.
b. Revisions to details shown on the Drawings
c. Depth of rock.
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. Locations of concealed internal utilities.
i. Changes made by Change Order.
j. Details not on original Contract Drawings.

2. Mark completely and accurately record prints of Contract Drawings or shop drawings, whichever is most capable of showing actual physical conditions. Where shop drawings are marked, show cross-reference on Contract Drawings location.

3. Mark record sets with red erasable colored pencil; use other colors to distinguish between changes for different categories of the work at the same location.

4. Mark important additional information which was either shown schematically or omitted from original Drawings.

5. Note construction change directive numbers, alternate numbers, Change Order numbers, and similar identification.

6. Responsibility for Markup: Where feasible, the individual or entity who obtained record data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on record drawings.

   a. Accurately record information in an understandable drawing technique.

   b. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.

7. At time of final acceptance, submit record drawings to Engineer for Owner's records. Organize into sets, bind, and label sets for Owner's continued use.

1.4. RECORD SPECIFICATIONS

A. Maintain one copy of the project Specifications, including addenda and modifications issued, for project record document purposes during the construction period.

1. Mark the Specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications and modifications issued. Note related project record drawings information, where applicable. Give particular attention to substitutions, selection of

product options, and information on concealed installations that would be difficult to identify or measure and record later.

1.5. RECORD PRODUCT DATA

A. Maintain one copy of each product data submittal for project record document purposes during the construction period.

1. Mark project data to indicate the actual product installation where the installation varies substantially from that indicated in product data submitted. Include significant changes in the product delivered to the site, and changes in manufacturer's instructions and recommendations for installation.

2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

3. Note related Change Orders and mark-up of record drawings, where applicable.

4. Upon completion of mark-up, submit a complete set of record product data to the Engineer for the Owner's records.

5. Where record product data are required as part of maintenance manuals, submit marked-up product data as an insert in the manual, instead of submittal as record product data.

1.6. MISCELLANEOUS RECORD SUBMITTALS

A. Refer to other specification sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to final acceptance, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Engineer for the Owner's records.

1. Categories of requirements resulting in miscellaneous records include, but are not limited to the following:

   a. Field records on excavations and foundations.
   b. Field records on underground construction and similar work.
   c. Survey showing locations and elevations of underground lines.
   d. Invert elevations of drainage piping.
   e. Surveys establishing building lines and levels.
   f. Authorized measurements utilizing unit prices or allowances.
   g. Inspections and certifications by governing authorities.
   h. Leakage and pressure test.
   i. Disinfection test results.
   j. Final inspection and correction procedures.

2. PRODUCTS (Not Applicable)

3. EXECUTION

3.1. RECORDING

A. Post changes and modifications to the documents as they occur. Contractor shall wait until the end of the project. The Engineer will periodically review record documents to ensure compliance with this requirement.

END OF SECTION

SECTION 01 7843

SPARE PARTS

1. GENERAL

1.1. SUMMARY

A. This section specifies administrative, procedural, and storage requirements for spare parts for the various systems specified under these Contract Documents.

1.2. DEFINITIONS

A. "Spare parts" are products that are finished, refined, or otherwise fabricated to be used as direct replacements of parts or whole units of the finished project (i.e., installed in equipment, electrical or mechanical, etc.).

1.3. DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

6. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.

7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

1.4. EXTENDED STORAGE

A. In the event items of major equipment must be stored for an extended period of time, provide satisfactory long-term storage facilities which are acceptable to the Engineer. Provide all special packaging, protective coverings, protective coatings, power, nitrogen purge, desiccants, and lubricants necessary or recommended by the manufacturer to properly maintain and protect the equipment during the period of extended storage.

1.5. IDENTIFICATION

A. Clearly mark and identify all parts with manufacturer's name and number and the equipment to which it belongs. Each part or box shall be separately identified.

1.6. TURNOVER OF SPARE PARTS TO OWNER

A. Provide Owner's representative with a complete inventory of all spare parts specified for installed systems. This inventory shall show:

1. Specification name and number.
2. Item number.
3. Description of items(s).
4. Quantity specified.
5. Storage location.

1.7. SPARE PARTS SUPPLIED

A. Supply all spare parts specifically listed in the individual equipment specification section and all spare parts that are customarily provided with each specified piece of equipment.

1.8. SPARE PARTS INVENTORY FORM

A. Create an inventory form listing all part numbers. Alternate forms may be used with Engineer's approval.

END OF SECTION

SECTION 01 7900

OPERATOR TRAINING

1. GENERAL

1.1. SCOPE

A. This specification section covers training of the Owner's operators and/or maintenance personnel as required by the individual equipment specification sections.

1.2. TRAINING

A. Training is required under the following specification sections:

1. 43 2113 Vertical Turbine Pumps

B. Each day of training shall be interpreted to mean a full 8-hour day at the Owner's facilities and project site, UNO.

2. PRODUCTS (Not Applicable)

3. EXECUTION

3.1. COORDINATION

A. Schedule and coordinate the training between the equipment manufacturers and the Owner.

B. Unless otherwise specified, training shall not be scheduled until the equipment has been installed, checked out, and started up by the manufacturer's authorized service representative. Training shall not be scheduled until the Contractor has submitted the final Operations and Maintenance (O&M) Manuals required by these Specifications.

C. Coordinate with the Owner to determine how many operators and/or maintenance personnel will be attending each session.

D. Coordinate with the Owner to determine the audiovisual equipment available in the Owner's classroom facilities.

E. Owner reserves the right to audiotape or videotape the training.

3.2. QUALIFICATIONS

A. Persons providing operator training shall be experienced, factory-trained representatives of the equipment manufacturer (not sales representatives).

B. Submit resumes showing qualifications and experience of the proposed trainers prior to scheduling the training.

3.3. LOCATION

A. On-site training shall be conducted at the project site using the actual installed equipment.

3.4. MATERIALS AND EQUIPMENT

A. The equipment representative shall provide copies of all course handouts and other materials needed for all of the Owner's personnel attending the training (up to a maximum of ten people). Where the training makes reference to the O&M manuals, it is not necessary to provide additional copies of the manuals above the number specified in these Specifications.

B. The equipment representative shall provide all necessary audiovisual equipment that is not available in the Owner's facilities.

3.5. CONTENT

A. Submit a proposed agenda and course outline for each training session at least 15 days prior to scheduling the training.

B. The training shall include both classroom and hands-on training (lecture and demonstration) with the equipment. In general, training time specified should be divided equally between classroom and the field.

C. As a minimum, the training shall cover the following items (as applicable):

1. Equipment Overview
    a. Review of equipment supplied
        1. Submitted data.
    b. Safety Issues
        1. Review safety cautions and warnings as contained in the manual.
        2. Observe normal common sense safety precautions.
            a. Danger, warning, and caution tags and symbols.
            b. Good housekeeping procedures.
            c. Factory installed safety features.
            d. Equipment manuals.
2. Operation
    a. Review of Operating Conditions
        1. Performance curve.
    b. Review of Operating Procedures
        1. Start-up
        2. Normal operation
        3. Shut-down
    c. Troubleshooting
        1. Loss of operating performance.
        2. Alarms or faults.
        3. Excessive power consumption.

        4. Vibration or noise.
        5. Overheating.
3. Maintenance
    a. Review submitted data contained in the job O&M manual.
        1. Assembly drawing and parts list.
        2. Technical data.
    b. Preventive Maintenance Procedures
        1. Periodic
            a) Adjustment
            b) Lubrication
            c) Calibration
        2. Records
            a) Initial measurement and recording
            a) Periodic checks
            b) Maintenance log
    c. Corrective Maintenance Procedures
        1. Disassembly
            a) Tools and equipment required
            b) Procedures
            c) Parts inspection
        2. Assembly procedure
        3. Program modifications
            a) Initialization
            b) Programming
            c) Program modifications
4. Service and Repair Parts
    a. How to Obtain
        1. Service
            a) Local
            b) Factory
        2. Repair parts
            a) Local
            b) Factory
    b. Emergency Service
        1. Local
        2. Factory
    c. Repair Parts Inventory
        1. Normal
        2. Emergency
5. Review
    a. Questions and Answers

END OF SECTION

SECTION 05 5113

METAL PAN STAIRS

1. GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preassembled steel stairs
2. Railings attached to metal stairs.
3. Handrails attached to walls adjacent to metal stairs.

1.2 COORDINATION

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

1.3 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:

1. Metal-pan-stair treads.
2. Handrail wall brackets.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

C. Delegated-Design Submittal: For stairs and railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding certificates.

1.4 QUALITY ASSURANCE

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

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

2. PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer to design stairs, and railings, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360.

C. Structural Performance of Railings: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

   a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
   b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
   c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

   a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
   b. Infill load and other loads need not be assumed to act concurrently.

3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

   a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

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

2.3 FASTENERS

A. 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.

B. Post-Installed Anchors: Torque-controlled expansion 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/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941/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, and nuts, ASTM F 594 (ASTM F 836M).

2.4 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts,[railings,] clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs and railings in shop to greatest extent possible.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections 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. Weld exposed corners and seams continuously unless otherwise indicated.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.

1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.

2. Locate joints where least conspicuous.
3. Fabricate joints that will be exposed to weather in a manner to exclude water.
4. Provide weep holes where water may accumulate internally.

2.5 FABRICATION OF STAIR RAILINGS

A. Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: 1-5/8-inch- (41-mm-) diameter posts top and bottom rails

B. Welded Connections: Fabricate railings with welded connections.

1. Fabricate connections that are exposed to weather in a manner that excludes water.

a. Provide weep holes where water may accumulate internally.

2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
3. Weld all around at connections, including at fittings.
4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
5. Obtain fusion without undercut or overlap.
6. Remove flux immediately.

C. Form changes in direction of railings as follows:

1. As detailed.

D. For changes in direction made by bending, use 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.

E. Close exposed ends of railing members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

G. Connect posts to stair framing by direct welding unless otherwise indicated.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.

1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
2. Provide ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.

I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports.

1. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.6 FINISHES

A. Finish metal stairs after assembly in accordance with Section 09 9100 UNO.

3. EXECUTION

3.1 INSTALLING METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding or bolting stair framing to structure or to weld plates cast into concrete unless otherwise indicated.

1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.

a. Clean bottom surface of plates.
b. Set plates for structural members on wedges, shims, or setting nuts.
c. Tighten anchor bolts after supported members have been positioned and plumbed.
d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.

1) Neatly finish exposed surfaces; protect grout and allow to cure.
2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. 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.
3. Comply with requirements for welding in "Fabrication, General" Article.

3.2 INSTALLING RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.

1. Space posts at spacing indicated or, if not indicated, as required by design loads.
2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
4. Secure posts and rail ends to building construction as follows:

   a. Anchor posts to steel by welding to steel supporting members.
   b. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with post-installed anchors and bolts.

B. Attach handrails to wall with wall brackets.

1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
2. Secure wall brackets to building construction as required to comply with performance requirements.

END OF SECTION

SECTION 09 9100

PAINTING

1 GENERAL

1.1 SUMMARY

A. This section includes furnishing all materials, equipment, and labor to accomplish all surface preparation and painting necessary for the satisfactory completion of the work included under these Contract Documents.

B. In general, the work included under this section shall include the surface preparation, shop priming, field priming, and/or field painting of all surfaces identified in Part 3.5 of this section. These surfaces include, but are not limited to, the following:

1. Ferrous metals (except stainless steel, galvanized, or pre-finished surfaces)
2. Piping and pipe insulation, including:
   a. Ductile Iron Pipe

C. Aluminum, bronze, copper, stainless steel, PVC, and/or other corrosion-resistant metal surfaces shall not be painted unless specifically called for on the Drawings or in these Contract Documents.

D. Factory finish coated equipment shall not be painted unless specifically called for on the Drawings or in Specifications.

E. Shop primed equipment and fabrications shall be inspected and tested prior to finish coating(s).

1.2 REFERENCES

The publications listed below from a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American National Scientific Institute (ANSI)

1. ANSI Z535.1 Safety Color

B. American Society for Testing and Materials (ASTM)

1. ASTM D 16-08 Terminology Relating to Paint, Varnish, Lacquer, and Related Products
2. ASTM D 4417-03 Standard Test Methods for field Measurement of Surface Profile of Blast Cleaned Steel

3. ASTM D 5402-06 Standard Practice for Assessing solvent Resistance of Organic Coatings Using Solvent Rubs

C. Code of federal Regulations (CFR) and Occupational Safety and Health Administration (OSHA)

1. 20 CFR 1910 Occupational Safety and Health Standards – Respiratory Protection
2. 29 CFR 1910.1000 Subpart Z – Toxic and Hazardous Substances – 1500
3. 29 CFR 1910.1200 Hazard Communications
4. 29 CFR Part 1926 Safety and Health Regulations for Construction

D. SSPC: The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineering (NACE)

1. SSPC-AB 1 Mineral and Slag Abrasives
2. SSPC-Guide 6 Guide for Containing Surface Preparation debris Generated During Paint Removal Operations
3. SSPC-PA 1 Shop, filed, and Maintenance Painting of Steel
4. SSPC-PA 2 Measurement of Dry Paint Thickness with Magnetic Gages
5. SSPC-PA Guide 3 Guide to Safety in Paint Application
6. SSPC-SP COM Surface Preparation Commentary for Steel and Concrete Substrates
7. SSPC-SP 1 Solvent Cleaning
8. SSPC-SP 2 Hand Tool Cleaning
9. SSPC-SP 3 Power Tool cleaning
10. SSPC-SP 5 White Metal Blast Cleaning
11. SSPC-SP 6/NACE 3 Commercial Blast Cleaning
12. SSPC-SP 7 Brush-Off Blast Cleaning
13. SSPC-SP 10/NACE 2 Near-White Metal Blast Cleaning
14. SSPC-SP 11 Power Tool Cleaning to Bare Metal
15. SSPC-SP 13/NACE 6 Surface Preparation of Concrete
16. SSPC-VIS 1 Visual Standard for Abrasive Blast Cleaned Steel (Standard Reference Photographs)

E. National Association of Pipe Fabricators (NAPF)

1. NAPF 500-03-01 Solvent Cleaning
2. NAPF 500-03-04 Abrasive Blast Cleaning of Ductile Iron Pipe

F. International Concrete Repair Institute (ICRI)

1. Guideline No. 301.2 Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays (formerly No. 03732 and Concrete Surface Profile (CSP) Chips.

1.3 DEFINITIONS

A. Definition of Painting Terms: ASTM D 16, unless otherwise specified.

B. Dry Film Thickness (DFT): thickness of a coat of cured paint measured in mils.

C. Wet Film Thickness (WFT): Thickness of a coat of uncured paint as measure in mils by a notched gage.

1.4 SUBMITTALS

A. Submit to the Engineer for his review the following information concerning the materials the Contractor proposes to use in work covered by this item:

1. A list of all components (paints or other materials) to be used in each painting system required herein.
2. A complete descriptive specification of each component.

B. All products submitted shall be lead- and chromate-free formulations and comply with current VOC emission regulations. Manufacturers technical data sheets must contain the following information:

1. Manufacturer's name
2. Type of paint or other generic identification
3. Manufacturer's stock number
4. Color (if any)
5. Type of gloss
6. Minimum flash point
7. Percent solids by volume
8. Recommended dry film thickness per coat
9. Theoretical coverage rates
10. Instructions for mixing, thinning, or reducing (as applicable)
11. Manufacturer's application recommendations
12. Safety and storage information
13. Viscosity at ambient temperature
14. Average dry times (dry to touch, dry to recoat) at ambient temperature.
15. Recommended thinners and maximum thinning permissible to meet current VOC regulations.
16. Recommended primer if applicable
17. Application method (brush, roll, conventional or airless spray)
18. VOC level of coating
19. Instructions for mixing multiple component materials

C. An authorized representative of the coatings manufacturer shall be present at the start-up and periodically during painting operations. Such representative shall observe the Contractor's workmanship and shall report to the Engineer any known deviations from the manufacturer's application recommendations. The coatings

manufacturer shall provide the Engineer, upon request, a written certification of quantities and types of materials provided for use on this project.

D. Contractor Qualification. Contractor must provide documentation that he has previously performed this type of work and provide job references as required by the Engineer. Provide a written guarantee against defective materials and workmanship in accordance with these Specifications.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver all paint, primers, varnishes, and sealers to the job site in their original, unopened containers not exceeding 5-gallon capacity each, unless otherwise specified herein or prior approved. Paint containers shall not be opened until they have been inspected and approved by the Engineer. All empty and partially used containers shall be retained and stored on the project site and made available for the Engineer's inspection upon request.

B. Store paint and related materials and equipment in a suitable location on the project site away from work areas and other storage areas. Strictly adhere to all applicable health, safety, and fire regulations controlling the storage of paint and related materials. Store and handle all materials in accordance with the manufacturer's recommendations.

C. Each container shall be marked with the manufacturer's name, product number, and batch number. The labels shall also show mixing and thinning instructions and recommended dry film thickness of each product. Use thinner recommended by the manufacturer. The Engineer must approve the use of accelerators. The Engineer must approve any substitutions of generic thinners.

D. Where shop priming is performed, the shop-primed material shall be delivered with a certification of date, ambient conditions, type of surface preparation and type of coating applied. Failure to provide certification and/or site testing that indicates non-conformance with contract requirements shall result in removal of material from project site for additional surface preparation and painting to achieve contract requirements.

1.6 JOB CONDITIONS

A. Strictly follow the manufacturer's recommendations concerning environmental conditions under which a material can be applied. No finishes shall be applied in areas where dust is being generated.

B. Cover or otherwise protect the finished work of other trades, surfaces not being painted concurrently, and/or surfaces that are not to be painted. Any injury or damage to such surfaces shall be remedied at

Contractor's expense to the satisfaction of the Engineer before final acceptance, and no separate payment therefore will be made.

1.7 TESTING EQUIPMENT

A. Furnish and make available to the Engineer the following items of testing equipment for use in determining if the requirements of this Specification section are being satisfied. The specified items of equipment shall be available for the Engineer's use at all times when field painting or surface preparation is in progress.

1. Wet film gauge
2. Surface thermometer
3. Spring micrometer with surface profile tape
4. Sling-psychrometer and psychrometric tables
5. Magnetic dry film gauge (Type 1 or Type 2) with appropriate calibration shims or plates.

2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The specific products and manufacturers listed for each general product classification in Part 2.2, Materials List, of this section are given identify the type, quality, and composition required for each product. Similar products of other manufacturers are subject to the review and approval of the Engineer in accordance with the provisions of Part 1.4, Submittals, of this section and the Contract Documents.

B. The same manufacturer shall produce all materials used in successive field coats. Material used in the first field coat over shop painted or previously painted surfaces shall cause no wrinkling, lifting, or other damage to underlying paint.

2.2 MATERIAL LIST

Primers and Finishes. Subject to compliance with requirements, provide one of the following:

<u>TYPE</u>

A. Primers

P-6 Exterior / Interior / Non-immersion
"Series N69 Hi-Build Epoxoline II," TNEMEC

B. Finishes

F-5 Exterior / Interior / Non-immersion - Epoxy
"Series N69 Hi-Build Epoxoline II," TNEMEC

F-6 Exterior - Urethane
"Series 1074 Endura-Shield II," TNEMEC

F-10 Below Grade - Coal Tar Epoxy
"46H-413 Hi-Build Tneme-Tar," TNEMEC

2.3 COLORS

A. Color Cards. Submit color cards for all paints, stains, or other materials to the Engineer for review and color selection.

2.4 PIPE AND EQUIPMENT IDENTIFICATION

A. Pipe Labels

1. Legends: Label all pipe work with prefabricated, professionally stenciled, wrap around plastic labels. Labels shall meet ANSI A131. Legends shall be descriptive of the function of the pipe, such as "ACID." Provide two labels, one label on each side of the pipe, at a suitable location along each pipe run. For long runs of pipe, provide labels at intervals not exceeding 20 feet. Locate the label on the pipe so that it will be in direct line of vision. Label may be omitted from one side if view is obstructed from that side. Where the flow in a pipe shall be at all times in one direction only, then a flow arrow shall be placed in front of each label on the pipe. Labels shall be manufactured by Brady, Panduit, or Engineer approved equal. The lettering and arrows shall be of same height. The size of lettering shall be as follows:

2.

Outside Diameter of Pipe or Covering	Size of Letters Letters
¾" to 1¼"	½"
1½" to 2"	¾"
2½" to 6"	1¼"
8" to 10"	2½"
Over 10"	3½"

3. Tag: For pipes smaller than ¾ inch in outside diameter, use a laminated plastic or aluminum tag with the lettering etched or stamped and filled in with black or contrasting enamel.

4. Legends and Flow Arrows: Label background colors shall be white. Legends shall be all capital, block lettering and black in color. Flow arrows shall be black in color. The above outline of intent designates the general extent of the identification work and is not exclusive of other similar work such as identification of pumps and other equipment as may be required by the Specifications.

5. Equipment Labels: Where specified in these Contract Documents or directed by the Engineer, paint stencil legends, in the same manner as a pipe of appropriate size on the individual units of equipment such as blowers, pumps, collector drives, compressors, silencers etc. All push buttons, starters, switches, etc., when remote from the equipment controlled and/or power packs, shall have labels of the engraved plastic type affixed to or adjacent to the remote switch, push button, starter, etc.

2.5 MIXING AND TINTING

A. All paints and other materials shall be mixed and tinted by the paint manufacturer prior to delivery to the job site, when possible.

B. Strictly adhere to the manufacturer's recommendations when job site mixing and/or tinting is required. The Contractor shall be solely responsible for the proper conduct of all on-site mixing and/or tinting.

3 EXECUTION

3.1 CONTRACTOR'S INSPECTION

A. Examine all surfaces scheduled to receive paint or other finishes for conditions that will adversely affect execution, permanence, or quality of work covered by this item. Surfaces which cannot be put into an acceptable condition through preparatory work as included in Part 3.2, Preparation of Surfaces, shall be immediately brought to the attention of the Engineer.

B. Do not proceed with surface preparation or coating application until surface conditions are suitable.

3.2 PREPARATION OF SURFACES

A. General. Where abrasive blasting is specified, a low free silica abrasive with a silica content of <5% shall be used. Mineral slag by-products may not be used. Abrasive blasting shall produce a surface profile of not less than 1.5 mils or greater than 3.5 mils or as specified by the manufacturer for the appropriate exposure condition.

B. Wood surfaces to be primed and/or painted shall be prepared in accordance with the following requirements prior to application of primer or paint:

1. Exterior or Interior, Painted: Surface must be dry, clean, and free of contaminants. Rough areas shall be sanded to a smooth, even surface and then vacuum cleaned. Knots, pitch pockets, and/or resinous sapwood shall be sealed with shellac, not over 2 pounds cut, prior to the application of primer. Holes, cracks, open joints, and other defects shall be puttied smooth following

the application of the primer. Putty used shall be compatible in all respects with the primer and finish coating.

2. Interior, Stained: Surface shall be thoroughly cleaned, sanded, and dusted. Final sanding shall be in the direction of the grain only. Dust shall be removed by vacuuming.

C. Shop Priming and Painting

1. Coat interior, inaccessible surfaces of equipment with an epoxy system suitable for the lifetime of the equipment at anticipated operating conditions and temperatures, unless otherwise specified or accepted.

2. Coat exterior and accessible interior surfaces with an appropriate epoxy system unless otherwise specified or accepted.

D. Concrete and Masonry (includes CMUs)

1. Existing Concrete and Masonry Walls

a. Concrete and masonry surfaces shall be prepared in accordance with SSPC-SP 13/NACE 6 to achieve ICRI CSP specified in 3.5, Protective Coating Schedule.

b. To minimize damage to substrate and subsequent repair, non-toxic chemical strippers may be used to remove previous paint.

c. Surfaces shall be cleaned of all dust, dirt, form oil, curing compounds, previous paint, filler, and other foreign matter.

d. Repair cracks, voids, bugholes, and honeycombed areas in accordance with coating manufacturer’s recommendations unless otherwise specified herein.

2. Concrete Floors

a. Concrete floors shall be prepared in accordance with SSPC-SP 13/NACE 6 to achieve ICRI CSP specified in 3.5, Protective Coating Schedule.

b. All surfaces shall be cleaned of all dust, dirt, form oil, curing compounds, previous paint, and other foreign matter.

c. Repair cracks, voids, bugholes, and honeycombed areas in accordance with coating manufacturer’s recommendations unless otherwise specified herein.

E. Ferrous Metal (Excluding Stainless Steel)

1. Immersion Surfaces: "Near-White Blast Cleaning" in accordance with SSPC-SP 10/NACE 2. Abrasive blasting shall achieve an anchor pattern or blast profile of between 30 and 40 percent of the dry film thickness of the first applied coat of primer or paint.

2. Non-Immersion Surfaces: "Commercial Blast Cleaning" in accordance with SSPC-SP 6/NACE 3). Abrasive blasting shall achieve an anchor pattern or blast profile of between 30 and 40 percent of the dry film thickness of the first applied coat of primer or paint.

3. Field Preparation of Shop Primed Surfaces: "Solvent Cleaning" in accordance with SSPC-SP 1. Shop primed ferrous metal surfaces that have been damaged or which show signs of corrosion shall be abrasive blasted cleaned in accordance with the specification given above for the particular finish coating to be applied prior to the application of the field primer or finish coating.

F. Ductile and Cast Iron

1. Immersion, Interior and Exterior Exposed: “Solvent Cleaning” and “Abrasive Blast Cleaning of Ductile Iron Pipe” in accordance with NAPF 500-03-01 and -04, respectively. Abrasive blasting shall achieve an anchor pattern or blast profile as recommended by the coatings manufacturer.

2. Field Preparation of Shop Primed Surfaces: “Solvent Cleaning” in accordance with NAPF 500-04-01. Shop primed iron surfaces that have been damaged or which show signs of corrosion shall be abrasive blasted and/or cleaned in accordance with the specifications given above for both asphaltic and non-asphaltic coating systems.

3.3 APPLICATION

A. Apply finish coatings with suitable brushes, rollers, or spray equipment per manufacturers instructions.

1. Rate of application shall not exceed the paint manufacturer's recommendation for the surface being coated.

2. Brushes, rollers, and spraying equipment shall be kept clean, dry, and free of contaminants at all times.

3. Stain shall be applied by brush or clean, dry cloth. Wipe or dry brush until desired toning is achieved. If deeper tone is required, repeat application after first coat is thoroughly dry.

4. Coatings shall be applied in accordance with paint manufacturer's recommendations and may be subject to inspection at all times by representatives of the Owner or manufacturer.

5. A moisture trap shall be placed in airline supply between the compressor and the pressure pot, airless pump, and/or blow

down hoses.

6. Operational regulators and gauges shall be provided for pressure tanks or airless pumps.

7. All spent abrasive and dust from blasting operations shall be removed from surfaces prior to painting application.

8. Blasted surfaces shall be coated with one coat of primer during the same day that blasting is done.

9. Priming shall not be applied closer than 6 inches to a non-blasted area. Any subsequent blasting operation shall not result in abrasive particles embedded in the paint film.

10. No painting shall take place when the temperature is below 50˚ F, or when the surface temperature is within 5˚ F of the dewpoint, or when the relative humidity is above 85%, unless approved by the Engineer.

11. Spray gun must be held perpendicular to the surface being coated, and handled in such a manner that dry over spray is held to a minimum.

12. 12. When paint is being applied to the interior of tanks or confined areas, sufficient explosion proof blowers or fans shall be installed to provide adequate ventilation. Adhere to the paint manufacturer's recommendations for forced air ventilation during application and curing. When isocyanate catalyzed coatings are being applied, positive pressure air supplied respirators must be used.

13. Cover or otherwise protect the finished work of other trades and surfaces that are not to be painted. Any injury or damage to such surfaces shall be remedied to the satisfaction of the Engineer at the expense of the Contractor before final acceptance and payment will be made.

14. The same manufacturer shall produce all materials used in successive field coats.

B. Field painting shall be in the number of coats specified in Part 3.5, Protective Coating Schedule, of this section. Shop or field-applied priming coats shall not be considered as one of the required field finish coats.

1. Individual field finish coats shall be tinted differently in order to distinguish each coat from preceding or succeeding coats.

2. Strictly comply with the coating manufacturer's recommendation for drying time between coats.

3. The Engineer shall inspect each coat before additional coats are applied. Only inspected coats will be considered in determining the number of coats applied.

C. Finish Coats. Finish coats shall be smooth, free of brush marks, streaks, runs, laps or pile-up of paint, and skipped or missed areas. Moldings, trim, and other ornaments shall be left clean and true to details with no undue amount of paint in corners and depressions. The edges of paint adjoining other materials or colors shall be clean and sharp with no overlapping. Where any portion of the finish of a wall has been damaged or is not acceptable, the entire wall shall be refinished.

3.4 TESTING AND INSPECTION

A. Ambient Conditions. Prior to and during paint application, the following ambient conditions shall be measured to confirm that all conditions are within specified limits:

1. Air temperature and relative humidity to be measured with a sling or battery operated psychrometer. The dew point shall be determined from approved psychrometric tables using measured wet- and dry- bulb thermometer readings.

2. Surface temperature to be measured with a surface temperature thermometer.

B. Surface Profile. Prior to paint application and after abrasive blasting, the surface to be painted shall be checked with surface profile tape to determine if the depth of profile specified has been achieved.

C. Film Thickness

1. Wet Film Thickness. The wet film thickness of each coat of paint shall be verified by measuring with an approved wet film thickness gauge as it is applied.

2. Dry Film Thickness. The dry film thickness (DFT) of each coat of paint and the entire system shall be measured with a Type 1 or Type 2 magnetic dry film thickness gauge in accordance with SSPC-PA 2. Five spot measurements (3 readings constitute 1 spot measurement) shall be taken for each 100 square feet area as outlined in SSPC-PA 2, Section 3.

3.5 PROTECTIVE COATING SCHEDULE

A. Primers and finishes shall be applied in accordance with the following schedule for the surface and exposure specified.

3.6 JOB SPECIFIC COATING REQUIREMENTS

A. The following new project elements are to be prepared and coated in accordance with the requirements listed above:

1. Ductile iron pipe and carbon steel pipe supports
2. Ferrous metal fabrications, columns, and shapes
3. Touch-up on factory finish-coated equipment (with compatible materials, see equipment specific specifications, shop drawings, and manufacturers instructions)

PROTECTIVE COATING SCHEDULE											
Item Description	**Generic Type**		**Surface Preparation**	**First Coat (Primer)**	**DFT Mils**	**Second Coat**	**DFT Mils**	**Third Coat**	**DFT Mils**	**Total DFT Mils (min)**	**Total Coats**
Ferrous Metal[1]											
Exterior Exposed	Epoxy/Polyurethane		SSPC-SP6	F-5	3-5	F-5	4-6	F-6	2-3	9	3
Interior Exposed	Epoxy		SSPC-SP6	F-5	3-5	F-5	4-6			7	2
Immersion	Epoxy		SSPC-SP10	F-5	3-5	F-5	4-6	F-5	4-6	11	3
Below Grade & Underground	Coal Tar Epoxy		SSPC-SP10	F-5	3-5	F-10	16-20			19	2
Ductile Iron Pipe											
Exterior Exposed	Epoxy/Polyurethane		NAPF 500-03-04[4]	F-5	3-5	F-5	4-6	F-6	2-3	9	3
Interior Exposed	Epoxy		NAPF 500-03-04[4]	F-5	4-6	F-5	4-6			8	2
Immersion	Epoxy		NAPF 500-03-04[4]	F-5	3-5	F-5	4-6	F-5	4-6	11	3

NOTES:

[1]Field priming of shop-primed ferrous metal surfaces is required only where the shop primer has been removed because of damage or apparent corrosion and the surface has been re-prepared in accordance with Part 3.2, Preparation of Surfaces, of this section.

[2,3]Not used.

[4]Provide additional cleaning per NAPF 500-03-01 “Solvent Cleaning” where required.

Some film thickness ranges listed are only achievable by spray applications. Roller applications may require additional coats.

END OF SECTION

SECTION 26 05 00

BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and Division-1 Specification sections, apply to work of this section and all following Division 26, Electrical Specifications.

1.2 SCOPE

A. Furnish all labor, materials, equipment and services necessary for and reasonably incidental to the complete installation of all electrical as shown on the drawings and as specified herein to result in a finished and operating facility.

B. Principal features of the installation are as follows:

1. A complete system of conduit and conductors to supply electrical energy to the new raw water pump and associated site metering.
2. Branch panelboards, wiring devices, motor control centers, etc.
3. Wiring in connection with mechanical equipment.
4. Control systems.
5. Connect new HVAC equipment.
6. Underground system installation.
7. Connection of equipment.
8. Demolition of existing electrical systems.
9. SCADA system wiring.

1.3 CODES AND STANDARDS

A. The entire electrical installation shall be made in strict accordance with the requirements of any and all City, County, State or Federal codes of Law having jurisdiction, the requirements and recommendations of the Board of Fire Underwriters, including all amendments and/or additions to the said codes, laws, requirements, and recommendations, the requirements and recommendations of the local utility, and the International Building Code.

B. Should any work shown on the drawings or herein specified be construed as being contrary to or not conforming to the previously mentioned codes, laws,

etc., the same shall be brought to the attention of the Engineer to be reviewed, approved, and/or corrected prior to final bid date.

C. Should any work shown on the drawings or herein specified be more rigid as to requirements than the requirements of the various codes, the drawings and specifications shall be followed in executing the work.

D. The Contractor shall file with proper authorities all necessary drawings as required by various codes, laws, ordinances and/or other requirements.

E. Permits, inspections and fees: The Contractor shall obtain all permits and inspections required for the work, and shall pay all costs and fees thereof including the Power Company's contribution to construction costs.

1.4 RELATED PROJECT DOCUMENTS

A. The complete set of project documents contain requirements that relate to the electrical construction work specified by the Division 26 electrical specifications and illustrated by the electrical design drawings. All project documents shall be referenced and conformed with for the required electrical installation work. Each specification section or subsection relates to all other sections or subsections. No specification section may be used as stand alone requirements.

1.5 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of electrical construction products of types required for this project whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: A firm with not less than 5 years of successful experience in installation of products similar to those required for this project.

C. UL Compliance: Comply with applicable portions of UL safety standards pertaining to electrical equipment and installation required for this project.

D. NEC Compliance: Comply with NEC and NESC as applicable to installation of equipment required for this project.

E. Comply with all current work safety rules and regulations.

PART 2 - GENERAL ELECTRICAL REQUIREMENTS

2.1 REQUIREMENTS

A. Drawings indicate the general character, scope, and arrangements of the

electrical installation. Approval of any change or departure from the drawings must be obtained from the Engineer.

B. Equal Products: Those items on the drawings or in these specifications designating particular product numbers limit their use only as to design, workmanship and quality, not manufacturer. Approval for alternate or substitute items shall be secured from the Engineer, and submittals for approval must be accompanied by all necessary descriptions, catalog sheets, etc. Authority over such submittals shall rest with the Engineer.

C. Workmanship: All work shall be performed by skilled workmen in a manner reflecting the best modern construction practices. It shall present, upon completion, a neat, orderly, finished appearance. All evidence of debris associated with the work shall be removed from the premises. All work shall conform to all OSHA workplace requirements.

D. Coordination with other trades to the fullest of ability in relation with others to result in a professional installation shall be complete, and more specifically, as follows:

1. The drawings and specifications are based on the best information available when prepared. Frequently minor changes occur with respect to the architectural plans, constructions, and the requirements of equipment furnished by others. The electrical contractor shall recognize this in bidding, supervising, and in planning construction.

2. Before locating conduit runs, boxes, etc., the drawings shall be carefully checked to see that they are in accord with the electrical drawings. Required adjustments shall be made with the General Contractor's superintendent and with the Engineer.

3. Before proceeding with the wiring for mechanical and equipment trades, each item requiring electrical work shall be reviewed with those responsible for their installation. The electrical contractor shall become well acquainted with their characteristics, location and arrangement for mounting. Changes in wiring arrangements and other adjustments, necessary or desirable, shall be reviewed with the Engineer for authorization. This applies also to all equipment for which wiring is required, such as HVAC units, water heating, pumps, thermostats, motors, pushbuttons, limit switches, fire protection systems, shop equipment, cooking equipment etc., as they occur.

E. Allowances for Contingencies: No change in contract price will be allowed for alternate work which requires approximately the same work to adjust or relocate electrical components or devices as part of the construction coordination work. An adequate allowance shall be included in the bid price for such coordination contingencies and for the additional work required by these coordination

adjustments.

F. Allowances for Contingencies: No change in contract price will be allowed for alternate work which requires approximately the same work to adjust or relocate electrical components or devices as part of the construction coordination work. An adequate allowance shall be included in the bid price for such coordination contingencies and for the additional work required by these coordination adjustments.

G. Coordinate the proposed locations of major raceway systems, equipment, and materials. Include the following:

1. Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance. Comply with code requirements for working space about electrical equipment.

2. Exterior wall and foundation penetrations.

3. Coordinate installation of required supporting devices and set sleeve in cast-in-place concrete, masonry, walls, and other structural components as they are constructed.

4. Equipment connections and support details.

5. Sizes and locations of required concrete pads and bases.

6. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

7. Penetrations in floors, walls and ceilings, and their relationship to other penetrations and installations.

H. Materials shall be new and unused, and shall bear the Underwriter's Seal where applicable.

I. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

J. Retain two sets of all equipment or device installation instructions and submit to the Engineer prior to project completion.

PART 3 - EXECUTION

3.1 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Refer to individual equipment shop drawings prior to rough-in installation work.

B. Refer to equipment specifications in Divisions 2 through 26 and the complete project drawing set for rough-in requirements.

3.2 ELECTRICAL INSTALLATIONS

A. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment.

B. Coordinate electrical systems, equipment, and materials installation with other building components.

C. Verify all dimensions by field measurements.

D. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.

E. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

F. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.

G. Where mounting heights are detailed or dimensioned, install systems, materials, and equipment to provide the maximum amount of headroom possible.

H. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

I. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.

J. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.

K. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

L. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.3 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors **2 inches** above finished floor level.

G. Size pipe sleeves to provide **1/4-inch** annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.

J. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

K. 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.

L. Underground, Exterior-Wall 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 mechanical sleeve seals.

3.4 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use 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.

3.5 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

3.6 CUTTING AND PATCHING

A. General: Perform cutting and patching in accordance with Division 1 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:

1. Perform cutting, fitting, and patching of electrical equipment and materials required to:

   a. Uncover Work to provide for installation of ill-timed Work.

   b. Remove and replace defective work.

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

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

   e. Install equipment and materials in existing structures.

f. Upon written instructions from the Engineer, uncover and restore Work to provide for Engineer observation of concealed Work.

2. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.

3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

5. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

B. Patch existing finished and disturbed new finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required or the surface and building components being patched.

3.7 TEST AND GUARANTEES

A. The Contractor shall perform, prior to final acceptance, an operations test to all electrical equipment. The entire installation shall be free from grounds and short circuits. Before the Owner operates the equipment for the first time, the Contractor shall furnish a person familiar with the equipment to instruct and assist the Owner's personnel in the proper operation and maintenance of said equipment.

B. Warranty-Guarantee: The electrical contractor shall warrant and the General Contractor shall guarantee that all work executed under this Division of the specifications will be free from defects in materials and workmanship for a period of one year from the date of final acceptance of the building. The above parties agree that they will, at their own expense, repair and replace all such defective work, and all other work damaged thereby, which becomes defective during the term of the warranty-guarantee.

3.8 PROTECTION OF MATERIALS

A. All work, fixtures, and materials shall be protected at all times. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemical, or mechanical injury. At final completion, all work shall be thoroughly cleaned and delivered in an unblemished condition.

B. The Contractor shall defer the installation of all electrical fixtures liable to damage until authorized by the Engineer. After fixtures are permanently installed, they shall be completely protected against breaking, damage, or the depositing of any waste or materials therein or thereon until the system is accepted.

C. Touch up all damaged painted surfaces on equipment to match original paint.

3.9 SHOP DRAWING AND MAINTENANCE MANUALS

A. Submit shop drawings in accordance with Division 1 requirements, shop drawings and wiring diagrams for the following:

1. Panelboard and switchgear modifications
2. Variable Frequency Drives

B. Materials and Equipment Submittals: Furnish catalog sheets or cuts for all items above, and submit catalog data of the following:

1. Panelboards
2. Wiring devices
3. Control devices
4. Disconnect switches
5. Fire Stop assemblies
6. Conduit systems
7. Communication control wiring
8. Distribution system wiring

C. Furnish all equipment submittals in one package to Engineer for approval. All partial submittals will be rejected, or will be held unchecked until submittals are complete.

D. Maintenance Manuals: Upon completion of the work, deliver to the Engineer for the Owner's use, two copies each of complete operation and maintenance instructions and data for the electrical equipment furnished under the electrical contract work. Data shall include catalog pages or data sheets for each piece of equipment, wiring diagrams showing the internal and external elements and their connections, manufacturer's maintenance manuals, bills of materials showing necessary data for ordering repair parts, and approved shop drawings. This information shall be furnished for the following systems and items.

1. Panelboards and switchgear modifications
2. Variable Frequency Drives

3.10 WORK IN CONNECTION WITH EQUIPMENT FURNISHED BY OTHERS

A. Mechanical: Furnish and install all necessary wiring for the supply and control of all mechanical work, including plumbing, heating, air conditioning, and ventilation. Furnish and install disconnect switches for motors where required by the codes. The contractor shall make provisions for variations in the mechanical equipment and make connections as required by the actual equipment furnished.

B. Motor wiring:

1. Services to equipment shall be checked out against that required by the equipment prior to service connection. Should the equipment require service different to that provided, the contractor shall call that fact to the attention of the Engineer prior to connection of the service. Check equipment to determine whether proper control and safety devices are provided to insure proper operation. Assist Owner in the initial operation of the equipment, and make any necessary adjustments to the service for proper operation.

2. Motor and Motor Controls: Where required, the manual motor starters shall be suitable for the application, Square D Co., Type F, K, M or T with proper overload protection, mounted in an appropriate box with a 120-volt pilot light. Disconnect switches shall be the heavy-duty type with "Dual Element" fuses, with an enclosure suitable for the application. Provide accessories necessary for the application.

3. Equipment shall be controlled by manual and automatic systems as required by the control documents, shown on the drawings and specified in this section of the specifications.

4. Air Conditioning and Heating Equipment: All air conditioning and heating equipment shall have fused disconnect switches or breakers installed at the unit. These switches or breakers shall be sized and be of the type as it appears on the label of the equipment.

5. Install and connect all package control equipment and control devices furnished under other divisions of these specifications including all interconnecting control wiring.

C. Work in Connection with Motors:

1. Rotation: All motors shall be checked for proper rotation just as soon as power is available. Should any motor rotate in the wrong direction, it shall be re-connected for proper operation.

2. Overload Heaters: Check all motor starters overload heater elements for the proper size to conform to the name plate rating of the motor. Should

an improper size unit be installed, the attention of the Engineer and the starter supplier shall be called to that fact.

3. Connection: The raceway connection to the individual motors shall be by means of a short length of flexible conduit. All pump motors shall be connected with type "UA" liquid tight flexible conduit. Connectors used with liquid tight flexible conduit shall be of a type made for the purpose and that will establish a continuous ground. All motors and all controls therewith shall be connected up completely as required for proper operation of the system involved.

D. Fire Protection Equipment: Furnish and install all necessary wiring for the power supply, control, fire alarm connection, and code compliance requirements for sprinkler, standpipe, or other fire protection systems. The fire protection work shall be in accordance with applicable sections fo the NDPA codes.

E. Owner Furnished: Furnish power wiring and connections to all equipment furnished by others and shown on the plans.

3.11 TEMPORARY WIRING

A. As soon as practicable after the roof is closed over, install temporary wiring and lighting throughout the building as specified in Division 1. Temporary wire may, if acceptable to the local code authority, consist of plastic type non-metallic sheathed cable having a ground wire to which all the receptacle ground poles shall be connected. The installation of the temporary wiring shall comply with the current codes and rulings of the local inspector. All breakers serving receptacle outlets shall have ground fault protection.

B. In renovation construction, maintain the existing lighting and power systems as required for temporary power or provide temporary wiring and lighting in accordance with (A.) above.

END OF SECTION

SECTION 26 05 19

WIRES AND CABLES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of electrical wire and electrical cable work is indicated by drawings and schedules.

B. Types of wire, cable and connectors in this section include, but are not limited to, the following and requirements of the service application:

1. Copper conductors
2. Fixture wires
3. Switchboard wires
4. Tap type connectors
5. Split-bolt connectors

C. Applications for wire, cable and connectors required for project are as follows:

1. Power distribution circuitry
2. Lighting circuitry
3. Appliance and equipment circuitry
4. Motor-branch circuitry
5. Control circuitry

D. All wire and cable shall conform to the latest requirements of the NEC and shall meet all ASTM/UL specifications. Wire and cable shall be new; shall have size, grade of insulation, voltage rating and manufacturer's name permanently marked on the outer covering at regular intervals. Complete descriptive literature shall be submitted to the Engineer for review and acceptance prior to installation.

E. Building wire #12 - #1 shall be applied based on 60 degree Celsius temperature rise. Building wire larger than #1 may be applied at its 75 degree Celsius temperature rise.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Wire and Cable:

   a. Advance Wire and Cable, Inc.
   b. General Cable Corp.
   c. Rome Cable Corp.
   d. Southwire

2. Connectors:

   a. AMP, Inc.
   b. Burndy Corp.
   c. Ideal Industries, Inc.

2.2 WIRE, CABLE, AND CONNECTORS

A. General: Except as otherwise indicated, provide wire, cable and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, and as required for the installation.

B. Wire: Provide factory-fabricated copper conductor, wire of sizes, ratings, materials, and types indicated for each service. Where type is not indicated, provide proper selection as determined by Installer to comply with project's installation requirements and NEC standards.

C. Connectors: Provide factory-fabricated, metal connectors of sizes, ratings, materials, types and classes as indicated for each service. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and NEC standards. All wiring nuts shall be twist-on type. Non-twist-on type wire nuts shall not be allowed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install electrical cables, wires and connectors as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices.

B. Coordinate cable and wire installation work with electrical raceway and

equipment installation work, as necessary for proper interface.

C. Pull conductors together where more than one is being installed in a raceway.

D. Use pulling compound or lubricant, where necessary; compound must not deteriorate conductor or insulation.

E. Use pulling means, including fish tape, cable or rope which cannot damage raceway.

F. Install exposed cable, parallel and perpendicular to surfaces or exposed structural members and follow surface contours, where possible.

G. Keep conductor splices to a minimum. Feeder Splices are not allowed.

H. Install splices and taps which have mechanical strength. Current and insulation rating shall be equivalent-or-better than conductor. All splices shall be compression type with 3M cold shrink and taped.

I. Use splice and tap connectors which are compatible with conductor material.

J. Identify and color-code conductors and cable according to Division 26 Section "Electrical Identification."

K. Wiring at Outlets: Install conductors at each outlet with at least 6 inches of slack.

L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeves for installing mechanical sleeve seals.

M. Install to seal underground exterior-wall penetrations.

N. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.2 FIELD QUALITY CONTROL

A. Prior to energization, test cable and wire for continuity of circuitry, and also for short circuits. Correct malfunctions when detected.

B. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

C. Use THHN/THWN stranded for all field motor and control work. Use solid copper only for building branch wiring circuits at size No. 12 and No. 10. All other wiring shall be class and type approved for the applications. Minimum conductor size shall be AWG number 12 except branch circuits in excess of 75 feet from panel to first outlet not smaller than No. 10 AWG.

D. Control cable:

1. Control cable shall be the size and have the number of conductors shown on the control system drawings. Control cable shall be used for motor controls and monitoring only. Color coding shall be ICEA, Method 1. Control cables between buildings shall be underground in conduit of the size shown in the control system schematic. Cabling shall provide a minimum of 25 percent spare conductors. Voltage rating shall be 600 volts.

E. Instrument cable:

1. All signal lines should be constructed of individually twisted pairs (6 to 10 twists per foot), including thermocouple extension leads. Cables should be made of twisted pairs, with all lays and pairs twisted in the same direction for maximum flexibility.

2. Wire size #16 AWG minimum for single pair runs under 5,000 feet in length. Wire size shall be #16 AWG for multi-pair cable runs under 5,000 feet in length.

3. Stranded tinned copper conductor shall be used for all wiring other than thermocouple extension leads.

4. Insulation resistance at 68 degrees Fahrenheit between conductors and between conductors and ground should be at least 500 megohms per 1,000 feet.

5. Multi-pair cable should be jacketed with poly-vinyl-chloride, polyethylene or Teflon at least 0.045" thick. Voltage rating shall be 600 volts. Cable shall be rated for wet location underground use.

F. Signal wiring

1. Low level analog (less than 500 millivolt d-c). Use twisted pairs which may be cabled with other pairs carrying similar voltage levels. Foil wraps or equivalent shielding is required for each cable withe the shield insulated from ground.

2. High level analog (greater than 500 millivolts d-c). Use twisted pairs

which may be cabled with other pairs carrying similar voltage levels and current levels less than 100 ma. Shielding is required.

3. Analog outputs (normally 0-4-d-c or 4-20 ma) - same as 1.

4. Contact inputs - use twisted pairs and run in separate conduit.

5. Contact outputs - same as 4.

6. Pulse inputs - same as 4.

G. Signal and shield grounding:

1. All shields must be grounded at one point only as close as possible to the signal source.

2. Thermocouples may be grounded or ungrounded.

3. Analog signals, if grounded, should be grounded as near the signal source as possible.

4. Resistance bulbs should not be grounded.

H. Signal and wiring separation:

1. High level analog signals may share the same conduit or run with contact or pulse signals.

2. Thermocouple and low level signals should be run in a separate conduit.

3. A minimum separation of 12 inches between analog signal leads and a-c power leads should be maintained. For a-c power leads carrying 100 amps or greater, a 24 inch separation should be maintained. Parallel runs should be limited to less than 500 feet. Perpendicular runs may be as close as 6 inches.

END OF SECTION

SECTION 26 05 20

ELECTRICAL CONNECTIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of electrical connections for equipment is indicated by drawings and schedules. Electric connections are hereby defined to include, but not necessarily limited to, connections for providing electrical power to equipment, control wiring connections, communication connections.

B. Types of electrical power and electrical system connections specified in this section includes, but is not limited to the following:

1. To motors
2. To equipment
3. To resistance heaters
4. To motor starters
5. To motor control equipment
6. From motor starters to motors
7. To transformers, inverters, rheostats, and similar current adjustment features of equipment
8. To ground
9. To master units of communication, signal and alarm

C. Motor starters and controls not furnished integrally with equipment are specified in applicable Electrical work sections along with installation specifications.

D. Refer to other specifications sections for motor starters and controls furnished with equipment; not work of this section.

E. Junction boxes and disconnect switches required for motors and other electrical units of equipment are specified in applicable Electrical work sections.

F. Refer to other specifications sections and the drawings for control system wiring work described and installed under Electrical work.

G. Refer to specification sections and plans of other work Divisions for specific individual equipment power requirements.

H. Furnish all labor and material and making power connections to all electric equipment furnished under the Architectural, Plumbing, Heating, Air Conditioning and equipment sections of the specifications and plans.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. AMP Products Corp.
2. Appleton Electric Co.
3. Burndy Corp.
4. Ideal Industries, Inc.
5. T and B - Thomas and Betts Corp.

2.2 MATERIALS AND COMPONENTS

A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories as needed to complete splices and terminations of types indicated.

B. Metal Conduit, Tubing and Fittings: Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) indicated for each type service. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements; comply with NEC requirements for raceways. Provide products complying with Electrical Work basic materials and methods section "Raceways", and in accordance with the raceway material required for the project.

C. Wire, Cable, and Connectors: Provide wires, cables, and connectors complying with Electrical Work basic materials and methods section "Wires and Cables".

D. Wire: Unless otherwise indicated, provide wires/conductors for electrical connections which match wires/conductors of wiring supplying power.

E. Connectors and Terminals: Provide electrical connectors and terminals as recommended by connector and terminal manufacturer for intended applications.

F. Electrical Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing and boots, solder, electrical soldering flux, wire nuts

and cable ties as recommended for use by accessories manufacturers for type services indicated. Only twist-on type wire nuts will be permitted for branch circuit wiring.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL CONNECTIONS

A. Install electrical connections as indicated; in accordance with connector manufacturer's written instructions and with recognized industry practices, and complying with requirements of NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.

B. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Wherever possible, mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

C. Coordinate installation of electrical connections for equipment with equipment installation work.

D. Cover splices with electrical insulation equivalent to, or of higher rating, than insulation on conductors being spliced.

E. Prepare cables and wires by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated.

F. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.

G. Tighten wire-binding connector screws firmly.

H. Provide flexible conduit for motor connections, and for other electrical equipment connections where subject to movement and vibration.

I. Provide liquid-tight metallic flexible conduit for connection of motors and for other electrical equipment where subject to movement and vibration, and also where subjected to one or more of the following conditions:

1. Exterior location
2. Moist or humid atmosphere where condensate can be expected to accumulate
3. Corrosive atmosphere

4. Subjected to water spray
5. Subjected to dripping oil, grease, or water

J. Refer to basic materials and methods section for identification of electrical power supply conductor terminations with markers approved as to types, colors, letter and marker sizes, by Engineer. Affix markers at each point of termination, as close as possible to each point of connection.

END OF SECTION

SECTION 26 05 24

SUPPORTING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of supports, anchors, sleeves and seals is indicated by drawings and schedules and/or specified in other Electrical work sections.

B. Types of supports, anchors, sleeves and seals specified in this section include but are not limited to the following:

1. Clevis hangers
2. Riser clamps
3. C-clamps
4. I-beam clamps
5. One-hole conduit straps
6. Two-hole conduit straps
7. Round steel rods
8. Lead expansion anchors
9. Toggle bolts
10. Wall and floor seals

C. Furnish and install supports, anchors, sleeves and seals for factory-fabricated equipment as required to properly and securely mount the equipment.

D. Furnish and install supports, braces, anchors and fasteners to meet seismic code requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES

A. General: Provide supporting devices; complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for a complete installation; and as herein specified. Where more than one type of device meets indicated requirements, selection is Installer's option. All support devices and hardware shall be 304 Stainless Steel.

B. Supports: Provide supporting devices of types, sizes and materials indicated;

and having the following construction features:

1. Clevis Hangers: For supporting 2" rigid metal conduit; stainless steel; with ½" dia. hole for round steel rod; approx. 54 pounds per 100 units.

2. Riser Clamps: For supporting 5" rigid metal conduit; stainless steel; with 2 bolts and nuts, and 4" ears; approx. 510 pounds per 100 units.

3. Reducing Couplings: Steel rod reducing coupling, ½" X 5/8"; stainless steel; approx. 16 pounds per 100 units.

4. C-Clamps: Black malleable iron; ½" rod size; approx. 70 pounds per 100 units.

5. I-Beam Clamps: 1-1/4" X 3/16" stock; 3/8" cross bolt; flange width 2"; approx. 52 pounds per 100 units.

C. One-Hole Conduit Straps: For supporting 3/4" rigid metal conduit; stainless steel; approx. 7 pounds per 100 units.

1. Two-Hole Conduit Straps: For supporting 3/4" rigid metal conduit, stainless steel; 3/4" strap width; and 2-1/8" between center of screw holes.

2. Hexagon Nuts: For ½" rod size; stainless steel; approx. 4 pounds per 100 units.

3. Round Steel Rod: Stainless steel; ½" dia.; approx. 67 pounds per 100 feet.

4. Offset Conduit Clamps: For supporting 2" rigid metal conduit; approx. 200 pounds per 100 units.

D. Anchors: Provide anchors of types, sizes and materials indicated; and having the following construction features:

1. Lead Expansion Anchors: ½"; approx. 38 pounds per 100 units.

2. Toggle Bolts: Springhead; 3/16" X 4"; approx. 5 pounds per 100 units.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering anchors which may be incorporated in the work include, but are not limited to, the following:

1. Ackerman Johnson Fastening Systems, Inc.
2. Ideal Industries, Inc.

3. Star Expansion Co.
4. U.S. Expansion Bolt Co.

F. Sleeves and Seals: Provide sleeves and seals, of types, sizes and materials indicated; and having the following construction features:

1. Wall and Floor Seals: Provide factory-assembled watertight wall and floor seals, of types and sizes indicated; suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws. Floor sleeves and seals shall match the fire rating of the assembly being penetrated.

G. Conduit Cable Supports: Provide cable supports with insulating wedging plug for non-armored type electrical cables in risers; construct for 2" rigid metal conduit; 3-wires, type wire as indicated; construct body of malleable iron casting with hot dip galvanized finish.

H. U-Channel Strut Systems: Provide U-channel strut system for supporting electrical equipment, 16-gauge 304 stainless steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, and with the following fittings which mate and match with U-channel:

1. Fixture hangers
2. Channel hangers
3. End caps
4. Beam clamps
5. Wiring stud
6. Thinwall conduit clamps
7. Rigid conduit clamps
8. Conduit hangers
9. U-bolts

I. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:

1. Greenfield Mfg. Co., Inc.
2. Midland-Ross Corp.
3. Unistrut Div; GTE Products Corp.

J. 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.

2.2 FABRICATED SUPPORTING DEVICES

A. Pipe Sleeves: Provide pipe sleeves, suitable for the application, of one of the following:

1. Sheet-Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate from the following gauges: 3" and smaller, 20 gauge; 4" to 6", 16 gauge; over 6", 14 gauge.

2. Steel-Pipe: Fabricate from schedule 40 galvanized steel pipe; remove burrs.

3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.

4. Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.

B. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:

1. Lead and Oakum: Caulked between sleeve and pipe.

C. Fire Barriers: Provide galvanized steel conduit sleeves through all fire wall, floor ceiling or barrier penetration. Seal sleeve with an approved expanding fire/smoke material. The wall penetration and seal assembly shall equal the fire rating of the barrier penetrated. Refer to Architectural plans for the location and type of fire barrier construction.

PART 3 - EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES

A. Install hangers, anchors, sleeves and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA, NEC, MSS, and ANSI/NEMA for installation of supporting devices.

B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.

C. Install hangers, supports, clamps and attachments to support piping properly

from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with maximum spacings indicated.

D. Tighten sleeve seal nuts until sealing grommets have expanded to form watertight seal.

E. Install all supporting devices to meet seismic requirements.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. 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).

D. 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: Beam clamps complying with MSS SP

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.

E. 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 5 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 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and support. 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 9 painting sections for cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint o 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

SECTION 26 05 26.1

GROUNDING AND GROUND-FAULT PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of grounding and ground-fault protection work is as directed by the NEC and additional grounding as indicated by the contract documents.

B. Types of grounding and ground-fault protection in this section include but are not limited to the following:

1. Grounding:

   a. Underground metal piping
   b. Underground metal water piping
   c. Underground metal structures
   d. Grounding electrodes
   e. Grounding rods
   f. Separately derived systems
   g. Service equipment
   h. Enclosures
   i. Systems
   j. Equipment

2. Ground-Fault Protection

   a. Ground-fault circuit interrupters
   b. Ground-fault sensing and relaying equipment

C. Provide an equipment grounding conductor in all feeder wiring runs. Provide ground bus in all panels, switchboards and equipment enclosures. Bond ground conductor in all metallic enclosures.

D. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 GROUNDING

A. Materials and Components: Except as otherwise indicated, provide each electrical grounding system indicated, with assembly of materials including, but not necessarily limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, and other items and accessories needed for complete installation. Where more than one type meets indicated requirements, selection is Installer's option. Where materials or components are otherwise indicated, comply with NEC, NEMA and established industry standards for applications indicated.

B. Equipment Grounding Conductor: Where specified or required by the application, provide code size equipment grounding conductors throughout the raceway system. Bond the equipment grounding conductor at all metal enclosures, equipment frames, housings, racks, etc. entered.

C. Electrical Bonding Jumpers:

1. Bonding Jumper Braid: Copper braided tape, constructed of 30-gauge bare copper wires and properly sized for indicated applications.

2. Flexible Jumper Strap: Flexible flat conductor, 480 strands of 30-gauge bare copper wire; 3/4" wide, 9/1-2" long; 48,250 CM. Protect braid with copper bolt hole ends with holes sized for 3/8" dia. bolts.

D. Electrical Grounding Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC.

E. Ground rods: Steel with copper welded exterior, 3/4" dia. X 10 feet long.

F. Electrical Grounding Connections Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, thermoweld process, bonding straps, as recommended by accessories manufacturers for type services indicated.

2.2 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUND-FAULT PROTECTION DEVICES

A. General: Except as otherwise indicated, provide ground-fault protection devices and components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for applications indicated.

B. Circuit Interrupters/Circuit-Breakers: Provide where required 1" wide module bolt-on panel board circuit breakers, with integral ground-fault circuit interrupters, UL-rated Class A, Group 1; 20-amperes ratings, 1-pole construction, 120-volts, 60 Hz, 22000 AIC. Provide with solid-state ground-fault sensing and signaling, with 5 milliamperes ground-fault sensitivity, plus or minus 1 milliampere. Equip with PUSH-TO-TEST capability. Provide modules which fit panelboards in which they are located.

C. Ground-fault Sensing and Relaying Equipment: Provide ground-fault sensing and relaying equipment for 480 V, 60 Hz, grounded system consisting of current sensor to encircle and monitor circuit's phase and neutral conductors, relaying equipment to provide desired ground-fault current sensitivity and time-current response characteristics, monitor panel, and low voltage power circuit-breaker, equipped to function in conjunction with other elements of GFP system, and constructed with the following features:

1. Current Sensors: Provide zero sequence current sensors for feeder and branch devices and ground return sensors for main service device; inputs compatible to relay. Construct sensor frame so it can be opened to permit removal or installation around conductors without disturbing conductors. Provide test winding in sensor for testing operation of GFP unit including sensor pick-up, relay, and circuit protection device operation.

2. Ground-Fault Relay: Provide solid-state ground-fault relay, which requires no external source of electrical power, drawing energy to operate GFP system directly from output of current sensor. Construct with adjustable pick-up current sensitivity for GF currents from 200 to 1200 amperes, with calibrated dial to show pick-up point settings. Provide factory-set time delay of 0.5 seconds and which precludes tampering with setting after installation.

3. Circuit Breaker: Provide molded case circuit breaker of ratings indicated. Construct with thermal and magnetic elements for conventional overload and fault current protection; and with GF trip mechanism capable of being activated by GF relay causing opening of circuit when ground fault of required magnitude occurs.

4. Monitor Panel: Provide monitor panel capable of indicating relay

operation, and provide means for testing system with or without interruption of service. Construct so GF system can not be left in an inactive or OFF state. Provide indicator lamps and TEST and RETEST control switches.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering ground-fault sensing and relaying equipment which may be incorporated in the work include, but are not limited to, the following:

1. General Electric co.
2. Siemens
3. Square D Co.
4. Eaton Co.

PART 3 - EXECUTION

3.1 INSTALLATION OF GROUNDING AND GROUND-FAULT PROTECTION SYSTEMS

A. Install electrical grounding systems and ground-fault protection devices as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure grounding and ground-fault protection devices comply with requirements. Comply with requirements of NEC, NESC, and NEMA standards for installation of grounding and ground-fault protection systems and devices. Provide ground fault system where code required.

B. Coordinate with other electrical work as necessary to interface installation of grounding system and ground-fault protection devices with other work.

C. Weld cable connections to ground rods and coat with protective asphaltic paint.

D. Install braided type bonding jumpers with ground clamps on water meter piping to electrically bypass water meter.

E. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.

F. Install ground-fault protection devices complying with electrical winding polarities indicated.

G. Fasten ground-fault sensing devices without mechanical stresses, twisting or misalignment being exerted by clamps, supports, bus bars or cables.

H. Install ground-fault sensing windows symmetrically around power conductor bus bars or cable. Maintain clearances between conductors and ground-fault sensor body recommended by device manufacturer.

I. Set field-adjustable GFP devices for pickup and time sensitivity ranges as indicated, after installation of devices.

J. Where indicated on the drawings, provide additional isolated ground system. Isolated ground systems shall provide electrical isolation from outlet or device continuous to service equipment neutral/ground bonding point.

3.2 APPLICATIONS

A. Conductors:

1. Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Grounding bus:

1. Install in electrical and control equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

2. Install bus on insulated spacers 1 inch minimum, from wall 6 inches above finished floor, unless otherwise indicated.

C. Conductor terminators 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 Structural Steel: Welded connectors.

3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.

2. Receptacle circuits.

3. Single-phase motor and appliance branch circuits.

4. Three-phase motor and appliance branch circuits.

5. Flexible raceway runs.

6. 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.

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.

3.4 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 tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

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 three 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. 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 so vibration is not transmitted to rigidly mounted equipment.

3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

D. 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, using a bolted clamp connector or by bolting 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.

3.5 FIELD QUALITY CONTROL

A. Upon completion of installation of ground-fault protection devices and after electrical circuitry has been energized, demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.

B. Upon completion of installation of electrical grounding system, test ground resistance with ground resistance tester. Where tests show resistance-to--ground is over 3 ohms, take appropriate action to reduce resistance to 3 ohms or less by driving additional ground rods. Then retest to demonstrate compliance.

C. Perform resistance-to-ground tests of electrical grounding system one year following time of substantial completion and submit written report indicating results. Where resistance is greater than 3 ohms, chemically treat soil to reduce resistance to 3 ohms or less. Then retest to demonstrate compliance.

3.6 PERSONNEL TRAINING

A. Building Maintenance Personnel Training: Train Owner’s building maintenance personnel in procedures for testing and determining resistance-to-ground values fo grounding system. Also instruct maintenance personnel in preparation and application of chemical solution for earth surrounding grounding rods for reducing ohmic resistance to required levels.

END OF SECTION

SECTION 26 05 33.13

RACEWAYS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of raceways is indicated by drawings and application. Provide raceway as required by the application. All exposed conduit shall be rigid galvanized steel conduit as indicated on the drawings. Use schedule 40 PVC under slab or encased. Provide a code size grounding conductor in all nonmetallic conduit. Install an insulated code size grounding conductor in all metallic raceway systems and connect/bond to all electrical system boxes, enclosures, frames and device grounds. Connect this conductor to all equipment frames, metallic boxes, device frames and other metallic components of the electrical distribution and utilization systems.

B. Types of raceways in this section include the following:

1. Flexible metal conduit
2. Liquid-tight flexible metal conduit
3. Rigid aluminum metal conduit
4. Rigid nonmetallic conduit
5. Surface metal and nonmetallic raceways
6. Electrical nonmetallic tubing

PART 2 - PRODUCTS

2.1 METAL AND NONMETALLIC CONDUIT AND TUBING

A. General: Provide metal and nonmetallic conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements, and comply with fire codes and applicable portions of NEC for raceways.

B. Provide connectors, fittings, accessories and installation tools suitable for the product and application.

C. Install conduit systems complying with manufacturers' published product information.

D. Minimum conduit system shall be rigid galvanized steel except as otherwise noted.

E. Minimum conduit shall be 3/4 inch.

2.2 WIREWAYS

A. General: Provide electrical raceways of types, grades, sizes, weights (wall thicknesses), number of channels, for each type service indicated. Provide complete assembly of raceway including, but not necessarily limited to, couplings, offsets, elbows, expansion joints, adapters, holddown straps, end caps, and other components and accessories as needed for complete system. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements, and comply with applicable provisions of NEC for electrical raceways.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL RACEWAYS

A. Install electrical raceways where indicated; in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA "Standard of Installation", and complying with recognized industry practices.

B. Coordinate with other work including metal and concrete deck work, as necessary to interface installation of electrical raceways and components with other work.

C. Level and square raceway runs, and install at proper elevations/heights.

D. Complete installation of electrical raceways before starting installation of cables/wires within raceways.

E. Install flexible conduit for motor connections, and for other electrical equipment connections where subject to movement and vibration.

F. Install liquid-tight flexible conduit for connection of motors and for other electrical equipment where subject to movement and vibration, and also where subjected to one or more of the following conditions:

1. Exterior location
2. Moist or humid atmosphere where condensate can be expected to accumulate
3. Subjected to water spray
4. Subjected to dripping oil, grease, or water

G. Wherever possible, install horizontal raceway runs above water and steam piping.

H. Provide secure fastening and support of conduit systems from the building structural system using materials manufactured for the intended application.

I. Provide surface metal raceways where surface mounted applications is required in existing buildings, particularly for light switches and receptacle installations.

J. Support conduit runs in accordance to seismic code requirements.

K. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid galvanized steel conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

L. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

3.2 INSTALLATION

A. 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.

B. Complete raceway installation before starting conductor installation.

C. Install temporary closures to prevent foreign matter from entering raceways.

D. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

E. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

F. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.

G. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.

2. Space raceways laterally to prevent voids in concrete.

3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.

4. Change from nonmetallic tubing to rigid aluminum conduit before rising above the floor.

H. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

1. Run parallel or banked raceways together on common supports.

2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

I. Join raceways with fittings designed and approved for that purpose and make joints tight. Use insulating bushings to protect conductors.

J. Tighten set screws of threadless fittings with suitable tools.

K. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.

2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

L. 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.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of

refrigerated spaces.

2. Where otherwise required by NFPA 70 such as Classified Hazardous locations.

N. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

O. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures. Use LFMC in damp or wet locations for equipment subject to vibration, noise transmission, or movement; and for all motors.

3.3 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touch-up coating recommended by manufacturer.

END OF SECTION

SECTION 26 05 33.16

ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of electrical box and electrical fitting work is indicated by drawings and schedules.

B. Types of electrical boxes and fittings in this section include, but are not limited to, the following and the requirements of the application:

1. Outlet boxes
2. Junction boxes
3. Pull boxes
4. Conduit bodies
5. Bushings
6. Locknuts
7. Knockout closures

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS

A. Outlet Boxes: Provide FS type outlet boxes and accessories where rigid galvanized conduits are used. All exterior pull boxes and junction boxes shall be nema4XSS. Provide explosion proof boxes in classified locations per NFPA 70.

B. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and fulfilling requirements of individual wiring situations. Choice of accessories is Installer's option.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering interior outlet boxes which may be incorporated in the work include, but are not limited to, the following:

1. Appleton Electric Co.
2. Crouse-Hinds Co.

3. RACO, Inc.
4. Steel City/Midland-Ross Corp.

D. Conduit Bodies: Provide galvanized cast-metal threaded conduit bodies, of type, shapes and sizes, to suit respective locations and installation, construct with threaded-conduit-entrance ends, removable covers, and corrosion-resistant screws.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering conduit bodies which may be incorporated in the work include, but are not limited to, the following:

1. Appleton Electric Co.
2. Crouse-Hinds Co.
3. Thomas & Betts Co., Inc.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

A. General: Install electrical boxes and fittings where indicated, complying with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in compliance with recognized industry practices to ensure that products fulfill requirements.

B. Coordinate installation of electrical boxes and fittings with wire/cable and raceway installation work.

C. Provide knockout closures to cap unused knockout holes where blanks have been removed.

D. Install boxes and conduit bodies in those locations to ensure ready accessibility of electrical wiring.

E. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surface.

F. Fasten boxes rigidly to substrates or structural surfaces to which attached, or solidly embedded electrical boxes in concrete or masonry.

G. Provide electrical connections for installed boxes.

H. Use cast metal outlets and device boxes for all exposed work outside.

I. Ground all metallic junction boxes by bonding to the system raceway grounding conductor. Ground the yoke or frame of all box mounted devices.

END OF SECTION

SECTION 26 05 53

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent and type of electrical identification are indicated herein and as follows:

1. Operational instructions and warnings
2. Danger signs
3. Equipment/system identification signs
4. Conduit identification
5. Power and control wiring identification
6. Terminal marking

1.2 QUALITY ASSURANCE

A. Comply with ANSI A13.1 AND ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFT 1910.145.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering identification products which may be incorporated in the work include, but are not limited to, the following:

1. W. H. Brady Co.
2. Ideal Industries, Inc.
3. Seton Name Plate Co.

2.2 ELECTRICAL IDENTIFICATION MATERIALS

A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but

provide single selection for each application.

B. Cable/Conductor Identification Bands: Provide manufacturer's standard vinyl-cloth self-adhesive cable/conductor markers of wrap-around type; either prenumbered plastic coated type, or write-on type with clear plastic self-adhesive cover flap; numbered to show circuit identification. Provide markers for all field control wiring.

C. Self-Adhesive Plastic Signs: Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings; of sizes suitable for application areas and adequate for visibility, with proper wording for each application (as examples: 208V, EXHAUST FAN).

1. Colors: unless otherwise indicated or required by governing regulations, provide orange signs with black lettering.

2. Mark the identification of all disconnect switches.

D. Engraved Plastic-Laminate Signs: Provide engraving stock melamine plastic Laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, black and white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Mark all panelboard and equipment panels.

E. Thickness: 1/16", for units up to 20 sq. in. or 8" length; 1/8" for larger units.

F. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.

2.3 LETTERING AND GRAPHICS

A. General: Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and working as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment.

2.4 UNDERGROUND-LINE WARNING TAPE

A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.

1. Not less than 6 inches (150 mm) wide by 4 mils (0.102 mm) thick
2. Compounded for permanent direct-burial service
3. Embedded continuous metallic strip or core

4. Printed legend shall indicate type of underground line

2.5 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: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch (6.4 mm) grommets in corners for mounting. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs: 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. 1/4-inch (6.4 mm) grommets in corners for mounting. 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 36 INCHES (915 MM).

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION

A. General installation requirements:

1. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.

2. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

3. Conduit Identification: Where electrical conduit is exposed in spaces with exposed mechanical piping which is identified by a color-coded method, apply color-coded identification on electrical conduit in a manner similar

to piping identification. Except as otherwise indicated, use orange as coded color for conduit.

4. Equipment/System Identifications: Install engraved plastic-laminate sign on each major unit of electrical equipment in building; including central or master unit of each electrical system including communication/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work.

    a. panelboards, electrical cabinets and enclosures, motor contorl centers
    b. access panel/doors to electrical facilities
    c. transformers
    d. control stations
    e. motor disconnects
    f. telephone and communications switching equipment

5. Power-Circuit Conductor Identification: For primary and secondary conductors No. 6 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

6. Branch-Circuit Conductor and Receptacles Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use write-on tags. Identify each ungrounded conductor according to source and circuit number.

7. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.

8. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.

    a. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.

    b. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed

connections.

c. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

9. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.

10. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.

a. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:

(1) power transfer switches
(2) controls with external control power connections

b. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

11. Instruction signs:

a. Operating Instructions: 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.

b. Emergency Operating Instructions: 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.

B. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate the substrate.

3.2 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color 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.

G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors

1. Color shall be factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.

2. Colors for 208/120-V Circuits:

   a. phase A: black
   b. phase B: red
   c. phase C: blue

3. Colors for 480/277-V Circuits:

   a. phase A: brown
   b. phase B: orange
   c. phase C: yellow

4. 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.

H. 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.

END OF SECTION

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The extent of wiring device work is indicted by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.

B. Types of electrical wiring devices in this section include the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Isolated-ground receptacles.
4. Tamper-resistant receptacles.
5. Weather-resistant receptacles.
6. Snap switches.
7. Wall-switch and exterior occupancy sensors.
8. Communications outlets.
9. Pendant cord-connector devices.
10. Cord and plug sets.

1.02 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

1.03 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. TVSS: Transient voltage surge suppressor.

F. UTP: Unshielded twisted pair.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.05 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.

C. Samples: One for each type of device and wall plate specified, in each color specified.

1.06 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.07 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.01 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. Pass & Seymour/Legrand (Pass & Seymour)

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.02 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

2.03 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)

2.04 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. Weather-Resistant GFCI Convenience Receptacles, 125V, 20A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, 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; WRVGF20.
b. Hubbell; GFTR20.
c. Pass & Seymour; 2095TRWR.

2.05 TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

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; CWL520R
b. Hubbell; HBL2310
c. Pass & Seymour; L520-R

2.06 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.07 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.08 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."

D. Key-Operated 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. Cooper; AH1221L.
b. Hubbell; HBL1221L.
c. Leviton; 1221-2L.
d. Pass & Seymour; PS20AC1-L.

2. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.

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; 1995.
b. Hubbell; HBL1557.
c. Leviton; 1257.
d.. Pass & Seymour; 1251.

F. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.

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; 1995L.
b. Hubbell; HBL1557L.
c. Leviton; 1257L.
d. Pass & Seymour; 1251L.

2.09 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, stainless steel unless noted otherwise.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum in-use 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 in-use type lockable cover.

PART 3 - EXECUTION

3.01 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 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.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.

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. 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.

1. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.02 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.03 IDENTIFICATION

A. Comply with Section 26 05 53 "Electrical Identification."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.04 FIELD QUALITY CONTROL

A. 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.

B. Wiring device will be considered defective if it does not pass tests and inspections.

END OF SECTION

SECTION 26 28 12

MOTOR AND CIRCUIT DISCONNECTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of motor and circuit disconnect switch work is indicated by drawings, schedules, and code requirements. Types of motor and circuit disconnect switches in this section including the following:

1. Equipment disconnects
2. Appliance disconnects
3. Motor-circuit disconnects

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Square D Company
2. Cutler-Hammer

2.2 FABRICATED SWITCHES

A. Heavy-Duty Safety Switches: Provide surface-mounted, heavy-duty type, sheet steel enclosed safety switches, of types, sizes and electrical characteristics indicated; fusible type, rated 240 volts or 4XSS, 600 volts, 400 amperes and below, 60 hertz, 3-blades, 4-poles, solid neutral; incorporating quick-make, quick-break type switches; so construct that switch blades are visible in OFF position with door open. Equip with operating handle which is integral part of enclosure base and whose position is easily recognizable, and is padlockable in OFF position; construct current carrying parts of high-conductivity copper, with silver-tungsten type switch contacts, and positive pressure type reinforced fuse clips. Provide NEMA type 4XSS enclosure for outdoor.

B. Fuses: Provide fuses for safety switches, as recommended by switch manufacturer, of classes, types, and ratings needed to fulfill electrical

requirements for service indicated. Provide fuses to match equipment label requirements when fuse information is furnished as part of the equipment label.

PART 3 - EXECUTION

3.1 INSTALLATION OF MOTOR AND CIRCUIT DISCONNECT SWITCHES

A. Install motor and circuit disconnect switches where required by code, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products fulfill requirements.

B. Coordinate motor and circuit disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.

C. Install disconnect switches used with motor-driven appliances, and motors and controllers within sight of controller position unless otherwise indicated.

D. Mount disconnect switches securely. Use stainless steel or silicon bronze fasteners for mounting outdoor switches.

E. Where building walls or equipment frames do not provide suitable mounting surface, provide galvanized unistrut frames or racks which will securely support the disconnect switch. Indoor frames may be painted unistrut frames.

END OF SECTION 26 28 12

SECTION 26 28 16

OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Extent of overcurrent protective device work is indicated by drawings, schedules, and code requirements.

B. Types of overcurrent protective devices in this section include the following:

1. Circuit breakers
2. Fuses

C. Provide overcurrent protection for all electrical work.

D. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than one unit of each.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Circuit breakers:

   a. Square D Company
   b. Cutler-Hammer

2. Fuses:

   a. Bussman Mfg. Co.
   b. Littelfuse Co.

2.2 CIRCUIT BREAKERS

A. General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings and electrical characteristics indicated or required, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for a complete installation.

B. Molded-Case Circuit Breakers: Provide factory-assembled, molded-case circuit breakers amperes rated as indicated on the drawings, 600-Volts for 480-Volt system and 240-Volts for 208-Volt system, 60 HZ, 3-pole or single-pole as indicated with RMS symmetrical interrupting ratings as required by the application and location within the distribution system. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole, ampere ratings as indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Provide push-to-trip button on cover for mechanically tripping circuit breakers. Construct breakers for mounting and operating in any physical position and in an ambient temperature of 40 C. Provide with mechanical screw type removable connector lugs, AL/CU rated.

2.3 FUSES

A. General: Except as otherwise indicated, provide fuses of types, sizes and ratings and electrical characteristics indicated or required, which comply with manufacturer's standard design, materials, and construction in accordance with published product information, and with industry standards and configurations.

B. Class L Fuses: Provide NEMA Class L fuses in current ratings indicated or required, for service entrances and main and feeder circuits.

C. Class J (K-5) Fuses: Provide NEMA Class J (K-5), dual-element types, with time delay of 10 seconds at 500% of rating, for use with switches.

D. Where equipment nameplate requires a specific fuse, the required fuse shall be furnished.

PART 3 - EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

A. Install overcurrent protective devices as indicated or required, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation and application of overcurrent protective devices.

B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.

C. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cables.

D. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of devices.

E. Install fuses, if any, in fused circuit breakers and fused disconnect switches.

3.2 ADJUST AND CLEAN

A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

3.3 FIELD QUALITY CONTROL

A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION

SECTION 26 29 23

VARIABLE FREQUENCY DRIVE

PART 1 - GENERAL

1.1 SUMMARY

A. Scope: Provide labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for adjustable or variable frequency motor controllers (identified as VFDs or Variable Frequency Drives) as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

B. Section Includes: The work specified in this Section includes, but shall not be limited to, Variable Frequency Drives (VFDs) rated 600 V and less for the speed control of three-phase squirrel-cage induction motors, and synchronous motors as specified herein and where shown on the associated schedules and the Drawings. The VFD manufacturer shall supply a passive harmonic filter using a combination of inductors and capacitors that is mounted in the enclosed drive cabinet. The harmonic filter configuration shall result in a current waveform that approximates near sinusoidal input current waveform and compliant with requirements of IEEE 519. The power section shall be insensitive to phase rotation of the AC line.

C. Related Sections: Related sections include, but shall not be limited to, the following:

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

2. Applicable general requirements for electrical Work specified within Division 26 Specification Sections, apply to this Section.

3. Refer to the specifications sections for the VFD driven equipment for additional requirements.

1.2 REFERENCES

A. General, Publications: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless

otherwise specified.

1. ANSI®/NFPA® 70 - National Electrical Code® (NEC®)

2. CSA® C22.2 No. 14-M91 - Industrial Control Equipment

3. IEC 61000 - Electromagnetic Compatibility

4. NEMA Classifications

    a. NEMA 250 - Enclosures for Electrical Equipment
    b. NEMA ICS7 - Industrial Control and Systems Adjustable Speed Drives
    c. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection Installation and Operation of Adjustable Speed Drives

5. UL Ratings

    a. UL® 50 - Enclosures for Electrical Equipment
    b. UL 98 - Disconnect Switches
    c. UL 507 - Electric Fans
    d. UL 508 - Industrial Control Equipment
    e. UL 508C or UL 61800-5-1 - Power Conversion Equipment
    f. UL 991 - Safety Tests for Safety Related Controls Employing Solid State Devices

6. OSHA® 1910.95 - AC Drive Controller Acoustical Noise

7. IBC® - International Building Code®

8. ASCE/SEI 7® - Seismic Performance Requirements

9. ICC ES AC156 - Shake-Table Test Acceptance Criteria

10. IEEE519 - "IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems"

B. General, Definitions: Unless specifically defined within the Contract Documents, the words or acronyms contained within this specification shall be as defined by the references listed within this specification, the Contract Documents, or, if not listed by either, by common industry practice.

1.3 SUBMITTALS

A. General: Submit sufficient information to determine compliance with the Contract Documents. Identify submittal data with the specific equipment tags and/or

service descriptions to which they pertain. Submittal data shall be clearly marked to identify the specific model numbers, options, and features of equipment and Work proposed.

1. Refer to Section 01300 - Submittals.

2. All deviations from the Contract Documents shall be indicated within a submittal. Each deviation shall reference the corresponding drawing or specification number, show the contract document requirement text and/or illustration, and shall be accompanied by a detailed written justification for the deviation.

B. Product Data: Submit product data specific to each type and rating of VFD proposed to include the following:

1. Manufacturer, supplier, and proposal specific contact information.

2. Manufacturer's catalog data indicating model numbers, equipment specifications and construction features including all furnished options, and accessories.

3. VFD assembly rated input KVA and output KVA, percent efficiency, operating characteristics, and electrical characteristics.

4. Maximum Btu heat release data and ambient cooling requirements.

5. Enclosure type, NEMA rating, material and finishes.

6. Certification of UL conformity

C. Shop Drawings: Submit shop drawings for each product and accessory required. Include information not fully detailed in manufacturer's standard product data. Shop drawings shall include, but not be limited to the following:

1. Equipment assembly. Indicate dimensions, shipping section dimensions, weights, foundation requirements, required clearances, location and size of each field connection, and mounting and installation instructions.

2. Include elementary and interconnection diagrams for power, signal, control, and communications wiring. Diagrams shall provide the minimum detail as shown for drawings in the appendix of NFPA 79. All field terminals shall be identified and updated later within the O&M data to include actual field connection information. Drawings shall not be typical, but be provided for each VFD furnished.

D. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout

on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Required working clearances and required area above and around VFDs.

2. Show VFD layout and relationships between electrical components and adjacent structural and mechanical elements.

3. Show support locations, type of support, and weight on each support.
4. Indicate field measurements.

E. Operation & Maintenance (O&M) Manuals: Submit installation, operation and maintenance data to be included within operation and maintenance manuals, O&M data shall include but not be limited to the following:

1. Manufacturer, supplier, support, and repair center specific contact information.

2. Manufacturer's standard operation and maintenance data assembled for each size and type of equipment furnished.

3. All configured settings/parameters for adjustable components updated to an as-installed and commissioned stated if different from the factory default.

4. List of furnished and recommended spare parts.

5. Statement of standard Warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of VFDs of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of five years.

1. The VFD manufacturer shall have a valid ISO 9001 certification and an applicable quality assurance system.

2. The VFD manufacturer shall have the Environment Certification ISO 14001 for EcoDesign.

B. Commissioning and Training: VFDs shall be inspected and commissioned by a factory trained representative of the VFD manufacturer. VFD operation and maintenance training shall be conducted by a factory-by a factory-trained representative of the VFD manufacturer trained in the installation, operation, and maintenance of the VFD.

C. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

1. Without limiting the generality of other requirements of this Section, all work specified herein shall conform to or exceed the applicable requirements of the following standards; provided, that wherever the provisions of said publications are in conflict with the requirements specified herein, the more stringent requirements shall apply:

a. ANSI/NFPA 70: National Electrical Code

b. EN61800-5: Electronic equipment for use in power installation

c. CSA C22.2 No. 14-M91: Industrial Control Equipment

d. IEC 68 Part 2-3: Basis Environmental Testing Procedures Part 2: Tests - Test Ca: Damp Heat

e. IEC 146.1: Semiconductor Converters - General Requirements and Line Commutated Converters Part 1-1: - Specifications of Basic Requirements

f. IEC 664: Insulation Co-ordination for Equipment within Low-Voltage Systems

g. IEC 447: Man-Machine Interface Actuating Principles

h. IEC 439 Part 1: Low Voltage Switch gear and Control gear Components

i. IEC 364: Electrical Installation of Buildings

j. IEC 204/NFPA 79: Electrical Equipment of Industrial Machines/Industrial Machinery

k. IEC 106: Guide for Specifying Environmental Conditions for Equipment Performance Rating

l. IEC 529: Degrees of protection provided by enclosure

m. IEC 1000: Electromagnetic Compatibility

n. IEC 1800: Adjustable speed Electrical power drive systems

o. IEC 721: Classification of Environmental Conditions

p. IEC 255-8: Overload Relays

q. IEC 801-2,-3,-4,-5: Immunity Tests

r. NEMA ICS Part 4: Overload Relays

s. NEMA ICS7: Industrial Control and Systems Variable Speed Drives

t. UL 508C, UL 61800-5-1: UL Standard for Safety Power Conversion Equipment

D. Single Source Responsibility: Obtain VFDs and required accessories from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work. Any materials which are not produced by the manufacturer shall be acceptable to and approved by the manufacturer.

E. All VFDs shall be functionally tested by the manufacturer. A test report shall be submitted upon request by the Engineer.

1.5 SPECIAL TOOLS AND SPARE PARTS

A. Spare parts shall be provided for each type and size of VFD furnished greater than 125 HP 460V, and 60 HP 230V. Provide at least one complete set of all plug-in replaceable components of each size and type used. At a minimum the following shall be provided:

1. Power and control fuses
2. Non-LED type indicating lights
3. Rectifier power semiconductors
4. Inverter power semiconductors
5. One of each type of printed circuit board and gate firing board
6. Other field replaceable components

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prior to delivery to the Project site, ensure that suitable storage space is available to store materials in a well ventilated area protected from weather, moisture, soiling, extreme temperatures, humidity, and corrosive atmospheres. Materials shall be protected during delivery and storage and shall not exceed the manufacturer stated storage requirements.

B. Deliver materials to the Project site in supplier's or manufacturer's original

wrappings and containers, labeled with supplier's or manufacturer's name, material or product brand name, and lot number, if any.

C. Inspect and report any concealed damage or violation of delivery storage, and handling requirements to the Engineer.

1.7 WARRANTY

A. General: Refer to Warranty provisions of the General Contract. An 18-month parts warranty shall be provided on materials and workmanship from the date of invoice from an authorized distributor.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide ABB ACS880 ULH with soft start bypass.

B. The VFD manufacturer shall provide for repair and service of the drive components with worldwide support. Manufacturer of the VFDs shall maintain staffed service facilities within 150 miles of the jobsite.

C. The VFD manufacturer shall provide remote diagnostic services in conjunction with the VFD's user interface to provide QR code, or equivalent, linked access to worldwide web based enhanced diagnostics, documentation, and customer service.

2.2 SYSTEM REQUIREMENTS

A. Variable Frequency Drives (VFDs) shall provide for the starting and speed control of standard IEC or NEMA B design AC inverter duty asynchronous motors and synchronous motors with permanent magnets by the adjustment of output voltage and frequency.

B. The VFD manufacturer shall design the device with more than 70% of recyclability rate.

C. The VFD Manufacturer shall design the device according to the IEC 62635 guidelines to reduce the carbon footprint. The materials used in the VFD shall be recyclable, non-toxic and flame retardant. The VFD manufacturer shall provide the carbon foot print of the devices.

D. The VFDs shall be built to comply with the UL standard and shall be marked in accordance with to UL 508 or UL 61800-5-1.

E. The VFD shall be compliant with the "Green" Premium label (REACH, RoHS-2, EOL, and PEP).

2.3 Variable Frequency Drives

A. The VFD shall be a digitally controlled drive, using Pulse Width Modulation (PWM).

B. Environment and Construction

1. The VFD shall be rated to withstand the following environmental conditions while able to give a 100% output current continuously. Where derating is necessary to meet on site environmental conditions, the manufacturer shall submit the VFDs derated performance. The derating factor shall be specified so that neither the lifetime of the VFD nor the unit's performance, overload capability included, nor the reliability of the VFD shall suffer.

   a. Storage Temperature: -40°C to 70°C.

   b. Operating Temperature for UL Type 1 VFDs: -15°C to 50°C without derating, up to 60°C with derating of power stage (UL Type 1)

   c. Operating Temperature for enclosed VFDs: 0°C to 40°C without derating, down to -10°C with enclosure heater, up to 55°C with derating of power stage.

   d. Relative Humidity: +/-95% relative humidity without condensation per IEC 60068-2-3.

   e. Operating Altitude: approximately 1000m without derating, up to 4800m with derating.

   f. Corrosion Protection Level: Class 3C3 according to IEC 60721-3-3 for cooling air and chemical gases

   g. Biological Protection Level: Class 3B1 according IEC 60721-3-3

   h. Dust Protection Level: Class 3S3 according to IEC 60721-3-3

   i. Vibration and Shock Protection Level: Class 3M3 according to IEC 60721-3-3

2. The VFDs shall have an integral enclosure that shall protect from ingress of dirt and water in accordance with UL Type 1 gasketed. The user

interface terminal shall be rated UL Type 12, mounted on front face of enclosure, and accessible for programming and controls with the main door closed.

3. VFD enclosures shall be front cabinet accessible and constructed in conformance with IEC 60439-1. Conduit entry shall be top entry. The VFD enclosure shall have a forced air and heat sink cooling system that does not require liquid or air condition cooling components for ambient temperatures within the drives stated ambient temperature operating range.

C. Application Requirements

1. The VFD shall be able to control motors using the following motor control types in accordance with the applications needs and energy savings: Volts per hertz VC Standard, Volts per hertz VC 5pts, Volts per hertz VC Quad.,Synchronous motor control, Volts per hertz VC Energy Saving.

2. The VFD shall provide a Real Time Clock management with battery backup.

3. The VFD shall be capable of automatic tuning of motor parameters through measurement of the motor without rotation, and without the need to disconnect the load from the motor.

4. The VFD shall provide functionality adjustable within the drive parameters to reduce voltage surges on motor cables.

5. The Contractor shall provide AC chokes and filters to fit installation and motor requirements per the following guidelines:

a. Voltage reflection suppression for motors compliant to IEC60034-25 or NEMA MG1 Part 31

1) Unshielded motor cable length up to 500 feet (150 meters) shall be managed with the VFD functionality

2) Unshielded motor cable length up to 1000 feet (300 meters) an AC choke shall be required

3) Unshielded motor cable length up to 1640 feet (500 meters) a dV/dt filter shall be required

4) Unshielded motor cable length up to 3280 feet (1000 meters) a Sinus filter shall be required

b. Voltage reflection suppression with motors not compliant to IEC60034-25 or NEMA MG1 Part 31

1) Unshielded motor cable length up to 50 meters a dV/dt filter shall be required

2) Unshielded motor cable length up to 1000 meters a Sinus filter shall be required

6. Requirements for harmonic mitigation:

a. VFDs shall be IEEE 519-2014 drive terminal compliant using a passive harmonic filter.

1) Total harmonic voltage distortion (THDV): Less than 3%

2) Total current demand distortion (TDDI): Less than 5% and harmonic table require-ments for ISC/IL less than 20.

b. The VFD manufacturer shall utilize a Low Pass shunt type harmonic filters within each drive cabinet enclosure. The filters shall be a second order high pass design utilizing line reactors, capacitors and bleeder resistors. Filter capacitors shall be sequenced using a contactor, which is controlled by the VFD. The VFD shall control the capacitor contactor as a function of drive loading. The VFD shall disconnect the filter capacitors during off conditions of the VFD. The compensation kVAR shall be matched to the kVAR demand such that the true power factor does not exceed 0.95 lagging. The capacitors shall not affect steady state operation of the VFD while operating from either utility or generator power. The switch in of the filter shall not create power source transient disturbances which cause shutdown of other VFD equipment already on line. Capacitor voltage rating shall be 600 Volts for operation on a nominal 480 Volt system.

c. The full load efficiency of drive system with a harmonic filter shall be greater than 96%.

d. The VFD and harmonic filter shall be mounted in the same drive system enclosure.

D. Performance Requirements

1. The VFD shall be rated for the nominal input voltage specified or shown on the drawings. The VFD shall have an input voltage tolerance within the following range of the corresponding nominal input voltage:

a. Standard product, three phases power supply:

1) 200V -15% 240V +10%, three-phase up to 100 HP / 75 KW

2) 380V -15% 480V +10%, three-phase up to 250 HP / 160 KW

3) 500 to 690V -15% / +10%, three-phase up to 250 HP / 160 KW

b. Enclosed Drive System, three phases power supply :

1) 200V -15% 240V +10%, three-phase up to 60 HP / 45 KW

2) 380V -15% 480V +10%, three-phase up to 1,100 HP / 800 KW

3) 500 to 600V -15% / +10%, three-phase up to 1,500 HP / 1,500 KW

2. The VFD shall meet the following minimum operating requirements:

a. Rated Frequency: 50 Hz -5% to 60 Hz + 5%

b. Displacement Power Factor: +/-0.97

c. Efficiency:

1) >98 % at nominal load for VFD (IP 21 / UL Type 1)

2) >97.5 % at nominal load for enclosed VFD systems.

3) >96 % at nominal load for low harmonic VFD(IP 21 / UL Type 1)

4) >95.5 % at nominal load for low harmonic enclosed VFD systems.

d. Overload Capability: for Normal duty loads (variable torque centrifugal pumps and fans) 110% for 1 minute, for Heavy Duty loads 150% of nominal current for 1 minute

e. Harmonics Mitigation: <5% at VFD input terminals at 80-100% load

f. Surge immunity according to IEC/EN 61000-4-5 Level 3

3. The VFD shall provide a speed range in the motor quadrant 1:100 in sensor less vector control and in the generator quadrant 1:50 in sensor less vector control.

4. The VFD shall provide an over torque capability better than 110% of the rated motor torque for normal duty applications and 150% of the rated motor torque for heavy duty applications, during 60sec, every 10 minutes.

5. The VFD shall provide a speed accuracy ±10% of the nominal slip of the motor in sensor less vector control

6. The VFD shall provide a torque control accuracy ±15% in sensor less vector control for AC motors.

E. Protection

1. The VFD shall be UL 508 or UL61800-5-1 listed for use on distribution systems.

2. The VFD shall have coordinated short circuit rating designed to UL 508C or UL 61800-5-1 and NEMA ICS 7.1 Short Circuit Rating: Select Rating 65 kAIC

3. Upon power-up the VFD shall automatically test for valid operation of memory, option module, loss of analogue reference input, loss of communication, DC to DC power supply, control power and the pre-charge circuit.

4. The VFD shall be protected against short circuits, between output phases and ground and the logic and analogue outputs.

5. The VFD shall have a selectable ride through function that will allow the logic to maintain control for a minimum of one second without tripping.

6. The deceleration mode of the VFD shall be programmable for normal and trip conditions. The stop modes shall include freewheel stop, fast stop.

7. Upon loss of the analog process follower reference signal, the VFD shall trip and/or operate at a user-defined speed set by a software programmed speed settings or last speed.

8. The VFD shall integrate a protection against IGBT and heat sink over temperature.

9. The VFD shall have solid state thermal protection that is UL Listed and meets UL 508C as a Class 10 overload protection and meets IEC 947.

10. The VFD shall have a motor thermal memory retention function per UL requirements.

11. The VFD shall be able to protect the motor when temperature probes are connected.

12. The VFD shall be able to limit the motor surge (I dv/dt) at twice the DC bus voltage

13. The VFD shall provide IGBT protection

    a. IGBT overcurrent protection
    b. IGBT check up sequence
    c. IGBT check up sequence before PWM enable sequence
    d. IGBT over-heat protection

14. The VFD shall provide VFD Current protection

    a. Phase short circuit protection
    b. Ground protection
    c. Over-current protection

15. The VFD shall provide VFD Voltage error protection

    a. Mains over-voltage protection
    b. Mains under-voltage protection
    c. DC Bus over-voltage protection
    d. DC Bus pre-charge protection

16. The VFD shall provide VFD Thermal protection

    a. VFD over-temperature protection
    b. FAN management
    c. Switching Frequency management

17. The VFD shall provide internal error detection.

18. The VFD shall provide Motor protection functions

    a. Motor output phase detection
    b. Motor surge voltage
    c. Motor over load detection
    d. Motor stall protection

19. The VFD shall provide Application protection functions

    a. Catch on fly function
    b. Mains input phase lost protection
    c. Motor over-speed input protection
    d. Current limitation
    e. Power limitation
    f. Reverse inhibition
    g. Under-load protection
    h. Over-load protection
    i. External error management
    j. Loss of follower signal
    k. Thermal Sensor management
    l. PID Feedback
    m. Customer defined input

F. Indicators

1. The VFD shall display a signal by LED near the connection point of the device when a hazardous voltage is present.

2. The VFD shall have 3 LEDs for local diagnostics.

3. The VFD shall have 3 dual color LEDs for embedded communication status.

4. The VFD shall have 4 dual color LEDs for optional communication status

G. User Interface

1. A detachable UL Type 12/IP65 rated bi-color backlit graphical user interface terminal with keypad and capacitive wheel shall be provided for monitoring, annunciation, and configuration. The graphical display shall change to a red backlit color when an alarm occurs. The door mounting for the user interface shall be done with a 22 mm hole.

2. The displayed messages shall be in plain text English.

3. A "Simply Start "menu for fast and easy commissioning shall be provided and parameter setting shall be easily accessible and user friendly with plain text messaging and actual setting range.

4. The keypad shall be capable of providing password protection.

5. The user interface shall be capable of saving and downloading configurations of the VFDs, as well as porting them to other VFDs.

6. The user interface shall offer a Mini-USB port for mass storage or PC device connection.

7. The mechanical mounting for the user interface on the cabinet shall be done with a 22 mm hole.

8. The VFD shall have self-diagnostic capabilities to display alarms, errors, and warnings as they occur and be able to store at least 15 last messages into the memory. These shall be accessible by PC maintenance tools or web server with flash record for data logging expertise.

9. The user interface shall be identical throughout the power range to avoid confusion amongst the users and need for training in several different units.

H. Control Interface:

1. VFD shall interface with automation systems to monitor, control, display, and record data for use in processing reports. VFD settings shall be retained within VFD's nonvolatile memory.

2. The speed command and reference may come from different control sources:

   a. I/O terminals
   b. Communication network
   c. Web server
   d. Remote graphic display terminal

3. A minimum of the following standard inputs / outputs shall be provided to interface with control systems and instrumentation:

   a. Analog Inputs: 3 programmable 0(4)-20 mA or 0-10 vdc.

      1) 2 analog inputs shall also be programmable for temperature sensors (PTC, PT100, PT1000, KTY84)

   b. Analog Outputs: 2 programmable 0(4)-20 mA or 0-10 vdc

   c. Discrete Inputs: 6 programmable isolated logic inputs as either sink or source

      1) 2 discrete inputs shall also be programmable as 0-30 kHz pulse inputs
      2) 2 discrete inputs shall be dedicated Safe Torque Off safety

function in accordance with IEC/EN 61508-1 SIL3

d. Discrete Outputs: 3 programmable relay contacts

1) 1 discrete output shall be dedicated to product watchdog logic

4. Programmable analog inputs shall be able to be assigned the following parameters:

a. Speed reference
b. Summing reference
c. Subtracting reference
d. Multiplying reference
e. Torque reference
f. Torque limitation
g. PID feedback
h. Manual PID reference
i. PID speed reference
j. Forced local reference

5. Programmable analog outputs shall be able to be assigned the following parameters:

a. Motor current
b. Motor frequency
c. Motor torque (signed or unsigned)
d. Motor power
e. Motor voltage
f. Output frequency (signed or unsigned)
g. PID error
h. PID feedback
i. PID output
j. PID reference
k. Ramp output
l. Signed ramp
m. Drive thermal state
n. Motor thermal state
o. Pressure sensor
p. Flow sensor

6. Programmable discrete inputs shall be able to be assigned the following parameters:

a. Run
b. Forward

c. Reverse
d. Jog
e. Preset speeds
f. Reference switching
g. Ramp switching
h. Error reset
i. Error inhibition
j. Product reset
k. PID regulation mode (auto)
l. PID speed regulation mode (manual)
m. PID integral reset
n. Preset PID reference
o. Sleep/wake-up
p. Activate sleep mode by flow detection
q. Analogue torque limitation activation
r. Torque reference sign
s. Command switching
t. Parameter sets selection
u. Fast stop
v. DC injection
w. Freewheel stop
x. + speed
y. - speed
z. External error
aa. Pre Fluxing
bb. Forced local control
cc. Current limitation activation
dd. Output contactor feedback
ee. Reference memorization
ff. Auto-tuning
gg. Forced operation
hh. Under load detection
ii. Overload detection
jj. Limiting low speed operating time
kk. Switching frequency, noise reduction
ll. Drive lock assignment
mm. Outlet pressure switch select
nn. Pipe fill
oo. External anti jam trigger
pp. Dry running no flow switch select
qq. Pump low flow no flow switch select

7. Programmable discrete outputs shall be able to be assigned the following parameters:

a. Ready

b. Drive running
c. Frequency reference attained
d. Current attained
e. High speed attained
f. Drive error
g. Frequency threshold attained
h. Torque sign
i. Motor thermal state attained
j. Drive thermal state attained
k. Torque or current limitation attained
l. Output contactor command
m. Input contactor command
n. Current present
o. Power removed
p. Alarm Groups
q. Alarms: load slipping, 4-20mA loss, brake control, external error, PTC, PID error, PID feedback, IGBT temperature, under voltage, torque control, drive temperature, braking resistor, fan counter, fan feedback, customer warning, power threshold, electrical power drift
r. Active configuration
s. Active parameter set
t. Active channel
u. DC bus charged
v. DC bus charging
w. Water Command: jockey pump, priming pump
x. Water running: anti-jam, pipe fill, priming pump, jockey pump
y. Water warning: dry running, flow, inlet pressure, outlet pressure, pump cycling, anti-jam, outlet pressure switch

8. Safety Inputs

a. The VFD shall provide 2 inputs dedicated to Safe Torque Off (STO) safety function, which prohibits unintended equipment operation, in accordance with IEC/EN 61508-1 SIL3.

b. The VFD shall be compliant with EN13849 (PL e).

c. The VFD shall be compliant with safety of machinery EN 954-1

d. The VFD manufacturer shall provide the certified schematics and the list of devices in order to comply with IEC/EN 60204-1 stopping category 0 and 1.

e. The VFD shall integrate the safety contacts in compliance with EN-81 13.2.2.3

I. Communications

1. The VFD shall provide at a minimum 1 Modbus and 1 Ethernet Modbus TCP communications ports. In addition the following communications options shall be provided as necessary for communications. Refer to communication requirements specified elsewhere within the Contract Documents.

    a. Allen Bradley Ethernet IP, RJ45 dual port for daisy chain

2. VFD Ethernet ports shall be IPv6 compliant, allow for web server access and provide network management via SNMP and clock synchronization.

3. The VFD shall provide an embedded web server for enhanced diagnostic, configuration, parameter access, and energy management. There shall be the capability to create a user-defined custom dashboard for viewing drive and process status through tables, charts, and graphical views. It shall be possible to export data in standard table format using the webserver, for information around energy consumption as well as error and warning history.

4. The VFD shall be compliant with the Cyber Security Management ISA Secure /Achilles.

5. The VFD shall be capable of providing Wi-Fi connectivity via option for wireless diagnostic, configuration, and parameter access.

6. VFD communications modules shall be capable of being remotely powered by a separate external 24 VDC to allow for continued communications when the drive power supply is off.

7. The VFD shall provide integration connectivity via

    a. DHCP protocol for Fast Device Replacement
    b. DTM library in compliance with standard FDT technology

J. Configuration

1. The VFD shall be capable of accepting independent command and speed reference signals from:

    a. Terminals
    b. Modbus port
    c. Ethernet port
    d. Communication option card
    e. Keypad display.

2. The VFD shall provide a Speed set-point function capable of:

    a. Maximum output frequency function
    b. Low and High speed scaling and limitation function
    c. Jump frequency
    d. Speed summing references function
    e. Preset-speed references function
    f. Jog function
    g. Up-Down speed references

3. The VFD shall provide a Stop function capable of:

    a. Deceleration ramp on power loss
    b. Freewheel stop
    c. Stop by DC injection at motor stop detection
    d. Stop by DC injection by Logic Input
    e. Stop on deceleration ramp adaptation

4. The VFD shall have an acceleration/deceleration, time adjustable ramp function capable of:

    a. Ramp type: linear ramp, S shape ramp, with U or customized profile.
    b. Ramp Deceleration adaptation
    c. Ramp switching

5. Application programming dedicated to pumps

    a. The VFD shall provide Pump Control & Monitoring Functions

        1) Centrifugal pump characteristics and configurations.

        2) Pump monitoring function in order to define data relevant for pump (acceleration, low speed, high speed, etc.)

        3) Application Units function in order to define units used in applications

        4) Pump Cyclic Start Protection in order to protect the pump against too many restarts in a dedicated time period.

        5) Multi-pump functions.

    b. The VFD shall provide Pump Protection Functions

        1) Anti-Jam function in order to remove automatically

clogging substances from the pump impellers.

2) Pipe Cleaning function in order to start pump regularly to avoid sedimentation in pump impeller

3) Cavitation Pump Protection

4) Inlet protection in order to avoid system dry running.

c. The VFD shall provide Application control functions

1) Stop and Go function in order to reduce consumption of VFD in case of pump doesn't work

2) Pulse input in order to connect a flow meter.

3) Process control (PID) function in order to maintain a process at a given pressure or flow reference.

4) Flow limitation function in order to allow limiting the consumption of water.

5) Friction loss compensation function in order to compensate pressure losses in pipes due to friction.

6) Pipe Fill function in order to manage a smooth control during pipe filling and to lessen the affects of water hammer.

7) Sleep wake-up function in order to manage periods of the application when process demand is low and when it is not needed.

8) Low demand function in order to define periods of the application when process demand is low in order to save energy.

9) Jockey pump control function in order to start a jockey pump, during sleep period, to maintain emergency service pressure or demand such as low water.

10) Sensor management in order to define how will be used drive inputs to manage Pressure sensor or flow sensor

d. The VFD shall provide Application protection functions

1) High flow protection function in order to detect pipe burst or detect running outside normal working area

2) Outlet pressure protection function in order to fix minimum and maximum pressure.

e. The VFD shall provide Pump curve input to help optimize pump performance.

1) Input and storage of the pump characteristics including 5 points of the pump curve.

2) A best efficiency point (BEP) function in order to run in optimum conditions and detect deviation from this point.

K. Diagnostics and Configuration

1. The VFD Supplier shall have Windows based PC software for configuring and diagnosing the VFD. It shall be possible to set and modify parameters, control the drive, read actual values and make trend analysis using the software. The PC-tools may be connected to the VFD by wired or wireless connection.

2. The VFD shall display all faults in plain text and help screens shall be available to guide the user in the troubleshooting. Codes are not acceptable.

3. The VFD shall provide a Real Time Clock management for time stamping of detected errors.

4. The VFD shall display detected errors with QR codes to guide the user in the troubleshooting.

5. The VFDs must provide LED lights to indicate the status of the VFD.

6. The VFD must have the ability to dynamically display I/O status.

L. Energy Management

1. The VFD shall provide a data logging function in order to keep files ready for maintenance or user.

2. The VFD shall provide information related to Energy management through different ways such as: web server, keypad, facet for SCADA, communication networks.

3. The user interface shall be able to display a chart relative to energy efficiency and energy management.

   a. Report in KW
   b. Display energy history for instant, weekly, monthly, and yearly.
   c. Trend base on variation /time
   d. All power measurement precision must be less than 5 % of deviation.

4. The user interface shall be able to display the "efficient" set point for pump based on pump characteristics.

5. The user interface shall be able to display the "efficiency board" including CO2 savings, Savings viewer, and Return of Investment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine VFD exterior and interior prior to installation. Report any damage and do not install any VFDs that are structurally, moisture, or mildew damaged.

B. Prior to locating the VFD at the planned installation site, ensure that the location is prepared for the installation and that the storage or operating condition requirements can be maintained. Verify installation space requirements are satisfied. Report any conditions that are detrimental to performance of the work. Proceed with installation only after detrimental conditions have been corrected.

C. Before, during, and after installation ensure that the VFD is protected from area construction activities and site contaminants.

3.2 INSTALLATION

A. Installation shall comply with manufacturer's instructions, drawings, and recommendations.

3.3 FIELD QUALITY CONTROL

A. Configuration and Startup: Provide the services of a qualified factory-trained manufacturer's representative to assist the installing contractor with the installation, configuration and startup of each VFD. The manufacturer's representative shall inspect the installation of each VFD prior to energizing and configure each VFD for operation under the specified conditions. The manufacturer's representative shall conduct the initial startup and operation of each VFD. The manufacturer's representative shall revisit the project site as

often as necessary to ensure that all issues are corrected and that the installation and operation are the VFD are satisfactory.

B. Certification: The Contractor shall submit a written report certifying that each VFD has been installed, configured, and tested under load in accordance with the manufacturer's recommendations. This report shall be signed by a factory-trained manufacturer's representative and shall include a listing of all modifications and adjustments made onsite to include any settings / parameters not are not identified as factory defaults within the equipment's O&M documentation.

C. Specified products shall be tested as a system for conformance to specification requirements prior to scheduling the acceptance tests. Contractor shall conduct performance verification tests in the presence of Government representative, observing and documenting complete compliance of the system to the specifications. Contractor shall submit a signed copy of the test results, certifying proper system operation before scheduling tests.

3.4 TRAINING

A. The services of a factor-trained instructor shall be provided for the purpose of training the Owner's staff in the proper operation and maintenance of the VFDs. Training shall consist of not less than 1 session with 4 hours of onsite classroom and hands-on instruction for a minimum of 4 attendees per session. The instructor shall provide sufficient time and detail in each session to cover the following as a minimum:

1. Theory of operation
2. Operation of VFDs furnished
3. Maintenance and configuration
4. Configurations of VFDs furnished
5. Troubleshooting and repair
6. Replacement of component level parts

END OF SECTION

SECTION 31 2000

EARTHWORK

1. GENERAL

1.1 SCOPE

A. This section includes earthwork and related operations, including but not limited to clearing and grubbing the construction site; dewatering; excavating all classes of material encountered; pumping, draining, and handling of water encountered in the excavations; handling, storage, transportation, and disposal of all excavated and unsuitable material; construction of fills and embankments; backfilling around structures and pipe; backfilling all trenches and pits; compacting; all sheeting, shoring, and bracing; preparation of subgrades; surfacing and grading; and any other similar, incidental, or appurtenant earthwork operation which may be necessary to properly complete the work.

B. Provide all services, labor, materials, and equipment required for all earthwork and related operations necessary or convenient to the Contractor for furnishing a complete work as shown on the Drawings or specified in these Contract Documents.

1.2 GENERAL

A. The elevations shown on the Drawings as existing are taken from the best available data and are intended to give reasonable, accurate information about the existing elevations. They are not precise, and the Contractor should satisfy himself as to the exact quantities of excavation and fill required.

B. Perform earthwork operations in a safe and proper manner taking appropriate precautions against all hazards.

C. Maintain in good condition at all times all excavated and fill areas for structures, trenches, fills, topsoil areas, embankments, and channels until final acceptance by the Owner. Repair all damage caused by erosion or other construction operations using material of the same type as the damaged materials.

D. If soil borings are available for the area of this work, they will be on file at the Owner's address where they will be made available for review or may be included as an appendix to these Specifications. This information is made available for such use as Contractor may choose to make of it in the preparation of his bid, but the Owner gives no guarantee, either expressed or implied, that it represents a true or complete cross section of all of the

material to be encountered in performing the excavation and earthwork on this project.

E. Earthwork operations within the rights-of-way of the State Department of Transportation, the County Road Department, and the respective cities shall be conducted in accordance with the requirements and provisions of the permits issued by those agencies for the construction within their respective rights-of-way. Such requirements and provisions, where applicable, shall take precedence over and supersede the provisions of these Specifications.

F. Control grading to prevent water running into excavations. Obstruction of surface drainage shall be avoided and a means shall be provided whereby storm water can be uninterrupted in existing gutters, other surface drains, or temporary drains. Material for backfill or for protection of excavation in public roads from surface drainage shall be neatly placed and kept shaped so as to cause the least possible interference with public travel. Free access must be provided to all fire hydrants, valves, meters, and private drives.

G. No classification of excavated materials will be made and no separate payment for rock removal shall be allowed. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work, regardless of the type, character, composition, or condition thereof, no separate payment shall be allowed.

H. Tests for compaction and density shall be conducted through the Contractor by an independent testing laboratory selected by him and acceptable to the Engineer. Costs of compaction tests performed by an independent testing laboratory shall be paid for directly by the Contractor. Make all necessary excavations and supply any samples of materials necessary for conducting compaction and density tests. Pay the cost of all retests made necessary by the failure of materials to conform to the requirements of these Contract Documents.

I. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, "Excavations, Trenching, and Shoring," and Subpart O, "Motor Vehicles, Mechanized Equipment, and Marine Operations," and shall be conducted in a manner acceptable to the Engineer.

J. It is understood and agreed that a thorough investigation by the Contractor has been made of the surface and subsurface conditions of the site and any special construction problems which might arise as a result of nearby watercourses and floodplains, particularly in areas where construction activities may encounter water-bearing sands and gravels or limestone solution channels. Provide all services, labor, equipment, and materials necessary or convenient for completing the work.

2. PRODUCTS (Not applicable)

3. EXECUTION

3.1 INITIAL SITE PREPARATION

A. Preparatory to beginning construction operations, remove from the site all vegetative growth, trees, brush, stumps, roots, debris, and any other objectionable matter, including fences, buildings, and other structures shown on the Drawings in the construction areas which are designated for removal or which, if left in place, would interfere with the proper performance or completion of the contemplated work, would impair its subsequent use, or would form obstructions therein.

B. Grub and remove stumps and roots to a depth not less than 5 feet below grade. Fill all holes or cavities which extend below the subgrade elevation of the proposed work with compacted layers of crushed rock or earth backfill conforming to the requirements specified here for backfill. Do not incorporate organic material from clearing operations in excavation backfill or embankment material.

C. Exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, buildings, and other structures located in the construction area but not within designated clearing limits as shown on the Drawings or within the limits of embankments, excavations, or proposed structures. Repair or replace any of the aforementioned items damaged by Contractor's operation or construction activities.

D. Remove and dispose of any excess material resulting from clearing or site preparation operations. Dispose of such materials in a manner acceptable to the Engineer and at an approved location where such materials can be lawfully placed.

3.2 DEWATERING

A. Provide and maintain at all times during construction ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the work. Dewatering shall be accomplished by methods which will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. Methods of dewatering may include sump pumps, well points, deep wells, or other suitable methods which do not damage or weaken structures, foundations, or subgrades. Shallow excavations may be dewatered using open ditches, provided such ditches are kept open and free-draining at all times. The actual dewatering methods used shall be acceptable to the Engineer.

B. Do not place concrete or mortar in water nor allow water to rise over newly placed concrete or mortar for at least 24 hours after placement, unless specifically authorized by the Engineer. No concrete structure shall be exposed to unequal hydrostatic forces until the concrete has reached its specified 28-day strength. Do not allow water to rise above bedding during pipe-laying operations. Exercise care to prevent damage to pipelines or structures resulting from flotation, undermining, or scour. Dewatering operations shall commence when ground or surface water is first encountered and shall be continuous until water can safely be allowed to rise in accordance with the provisions of this section. Protect excavations from the entrance of surface water to the extent possible by the use of dikes and/or covers.

C. Standby pumping equipment shall be on the jobsite. A minimum of 1 standby unit (a minimum of 1 for each 10 in the event well points are used) shall be available for immediate installation should any pumping unit fail. The design and installation of well points or deep wells shall be suitable for the accomplishment of the work. Submit drawings or diagrams on proposed well point or deep well dewatering systems to the Engineer for review.

D. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, excavate and replace the affected areas with crushed rock at no cost to the Owner.

E. Dispose of the water from the work in a suitable manner without damage to adjacent property. Conveyance of the water shall not interfere with traffic flow or treatment facilities operation. Do not drain water into work built or under construction without prior consent of the Engineer. The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.

F. Provide sedimentation and desilting basins as necessary or when directed by the Engineer to prevent the entrance of excessive or injurious amounts of sand and silt from surface runoff or dewatering operations into storm drains or receiving waters. The system used for desanding or desilting the water shall be a baffled structure and shall provide not less than 5 minutes detention time and shall be designed to have a "flow-through" velocity not exceeding 0.2 foot per second at the anticipated peak flow. The method of desanding or desilting and the point of disposal shall be subject to the approval of the Engineer.

G. Dispose of water safely and in accordance with applicable Environmental Protection Agency, U.S. Army Corps of Engineers, and State Water Quality Control Division standards and permits.

3.3 SHEETING, SHORING, AND BRACING

A. The sides of all excavations shall be sufficiently sheeted, shored, and braced as necessary to prevent slides, cave-ins, settlement, or movement of the banks; to maintain the excavation clear of all obstructions; and to provide safe working conditions. Wood or steel sheeting shall be used in wet, saturated, or flowing ground. All sheeting, shoring, and bracing shall have sufficient strength and rigidity to withstand the pressure exerted and to maintain shape and position under all circumstances.

B. Correctly assessing the need for sheeting, analyzing the stresses induced, and maintaining regulatory compliances shall be totally the responsibility of the Contractor. Since the Engineer does not dictate or determine the Contractor's sequence or limits of excavation, the Engineer assumes no responsibility for sheeting and shoring. The Contractor must employ or otherwise provide for adequate professional structural and geotechnical engineering supervision to assess the need for sheeting and shoring and design same. Results of sheeting and shoring analysis and design shall be submitted to the Engineer on request.

C. Excavations adjacent to existing or proposed buildings and structures, or in paved streets or alleys, shall be sheeted, shored, and braced adequately to prevent undermining beneath or subsequent settlement of such structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition. Any damage to structures or pavements occurring through settlements, water or earth pressures, slides, caves, or other causes due to failure or lack of sheeting or bracing, or improper bracing or occurring through negligence or fault of the Contractor in any other manner shall be repaired by the Contractor at his own expense.

D. Sheeting, shoring, or bracing materials shall not be left in place unless otherwise specified or shown on the Drawings or ordered by the Engineer in writing. Such materials shall be removed in such manner that no danger or damage will occur to new or existing structures or property, public or private, and so that cave-ins or slides will not take place. Trench sheeting shall be left in place until backfill has been brought to a level 12 inches above the top of the pipe. It shall then be cut off and the upper portion removed. Sheeting for structures shall be left in place until backfill has been brought to a level 12 inches above the top of the bottom footing. It shall then be cut off and the upper portion removed.

E. All holes and voids left in the work by the removal of sheeting, shoring, or bracing shall be filled and thoroughly compacted.

3.4 EXCAVATION

A. General

1. Excavation shall include the removal of all material from an area necessary for the construction of a pipeline or structure. Excavations shall provide adequate working space and clearances for the work to be performed therein.

2. All material excavated below the bottom of concrete walls, footings, and foundations shall be replaced, by and at the expense of the Contractor, with Class B concrete to the lines and grades shown on the Drawings, except where otherwise shown on the Drawings, specified herein, or authorized by the Engineer.

3. Where quicksand, soft clay, spongy or swampy earth, or other materials unsuitable for subgrade or foundation purposes are encountered below the excavation limits, they shall be removed and disposed of to the level of suitable material. Areas so excavated shall be backfilled with Class B concrete or with compacted layers of crushed rock, sand, or other approved material conforming to the requirements specified herein for backfill to the lines and grades shown on the Drawings.

4. Place barriers at each end of all excavation and at such places as may be necessary along excavations to warn all pedestrian and vehicular traffic of such excavations. Place lights along excavations from sunset each day to sunrise of the next day until the excavations are backfilled. Barricade all excavations in such a manner as to prevent persons from falling or walking into any excavation.

B. Rock Excavation

1. Rock encountered in the process of excavation for structures shall be uncovered and stripped of all loose materials over the entire limits of excavation.

2. Rock encountered for removal in a trench section shall be uncovered for a distance of not less than 50 feet.

3. Excavate rock and large boulders in trenches over the horizontal limits of excavation and to depths as shown on the Drawings.

4. Backfill the space below grade for pipelines to the proper grade with compacted layers of crushed rock or sand conforming to the requirements specified herein for backfill. Where pipe sewers are constructed on concrete cradles, excavate rock to the bottom of the cradle as shown on the Drawings.

5. Excavate rock under structures to lines and grades shown on the Drawings. Unless specified otherwise, where rock excavation has been carried below grade, the Contractor shall backfill to grade with Class B concrete at his own expense.

6. Where rock foundation is obtained at grade for over 50 percent of the area of any one structure, the portion of the foundation that is not rock shall be excavated below grade to reach a satisfactory foundation of rock. The portion below grade shall be backfilled with Class B concrete.

7. Where rock foundation is obtained at grade for less than 50 percent of any one structure and satisfactory rock cannot be found over the remaining area by reasonable additional excavation, the rock shall be removed for a depth of 12 inches below grade and the space below grade shall be backfilled to the proper grade with compacted layers of crushed rock conforming to the requirements specified herein for backfill.

8. Drilling and blasting operations, if allowed, shall be conducted with due regard for the safety of persons and property in the vicinity and in strict conformity with requirements of all ordinances, laws, and regulations governing blasting and the use of explosives. Conduct rock excavation near existing pipelines or other structures with the utmost care to avoid damage. Promptly repair injury or damage to other structures and properties to the satisfaction of the Owner by the Contractor at his own expense. The Contractor is advised to hire qualified consultants to perform a "pre-blast survey" in area where damage could occur due to blasting; all expenses for such survey must be borne by the Contractor, and no separate payment for same will be made.

9. Complete rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation directed by the Engineer before construction of any structure is started in the vicinity.

C. Borrow Excavation

1. Wherever the backfill of excavated areas or the placement of embankments or other fills requires specified material not available at the site or material in excess of suitable material available from the authorized excavations, such materials shall be obtained from other sources. This may require the opening of borrow pits at points not immediately accessible from the work. In such cases make suitable arrangements with the property owner and pay all costs incident to the borrowed material including royalties, if any, for the use of the material. Before a borrow pit is opened, the quality and suitability of the material to be obtained therefrom shall be approved by the Engineer.

2. Borrow pits shall be cleared, grubbed, and finish-graded in accordance with the requirements specified herein.

D. Roadway Excavation. Roadway excavation shall consist of excavation for roadways and parking areas in conformity with lines, grades, cross sections, and dimensions shown on the Drawings. After shaping to line, grade, and cross section, the subgrade shall be rolled until compacted to a

depth of at least 6 inches to 100 percent of the maximum density at optimum water content as determined by AASHTO T99, Method A. This operation shall include any reshaping and wetting required to obtain proper compaction. All soft or otherwise unsuitable material shall be removed and replaced with suitable material.

E. Trench Excavation

1. Trench excavation shall consist of the removal of materials necessary for the construction of water, sewer, and other pipelines and all appurtenant facilities including manholes, inlets, outlets, headwalls, collars, concrete saddles, piers, and pipe protection called for on the Drawings.

2. Excavation for pipelines shall be made in open cut unless shown otherwise on the Drawings. Trenches shall be cut true to the lines and grades shown on the Drawings or established by the Engineer on the ground. The banks of trenches shall be cut in vertical, parallel planes equidistant from the pipe centerline. From an elevation 12 inches above the top of the pipe to the bottom of the trench, the horizontal distances between vertical planes for different sizes of pipe shall not exceed those shown on the Drawings. When sheeting is used, the width of the trench shall be considered as the distance between the inside faces of the sheeting. The bottom of the trench shall be cut carefully to the required grade of the pipe except where bedding materials or cradles are shown, in which case the excavation shall extend to the bottom of the bedding or cradles as shown on the Drawings. Minimum pipe cover shall be as shown on the Drawings or specified in these Contract Documents.

3. Unless specified elsewhere herein or shown on the Drawings, the minimum trench width shall be the diameter of the pipe plus 12-inches clear space on each side. Unless specified elsewhere herein or shown on the drawings, the minimum cover over the top of the pipe shall be 30-inches.

4. The use of a motor-powered trenching or sawing machine will be permitted, but full responsibility for the preservation, replacement, and/or repair of damage to any existing utility services and private property shall rest solely with the Contractor. Tailings from rock trenching shall not be used as pipe embedment or backfill and shall be disposed of by the Contractor.

5. Bell holes for bell and spigot pipe and/or mechanical joint pipe shall be excavated at proper intervals so the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of all joints in the pipe. Bell holes shall not be excavated more than 10 joints ahead of pipe laying. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.

6. Excavation for manholes, outlets, collars, saddles, piers, and other pipeline structures shall conform to the additional requirements specified herein for structural excavation.

7. Pipe trenches shall not be excavated more than 400 feet in advance of pipe laying and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic.

8. Wherever pipe trenches are excavated below the elevation shown on the Drawings, the Contractor, at his own expense, shall fill the void thus made at the proper grade with Class B concrete or with compacted layers of crushed rock or sand conforming to the requirements specified herein for backfill, unless otherwise specified herein or shown on the Drawings.

9. In all cases where materials are deposited along open trenches, they shall be placed so that no damage will result to the work and/or adjacent property in case of rain or other surface wash.

F. Structural Excavation

1. Structural excavation shall consist of the removal of all materials necessary for the construction of structures, including tanks, foundations, footings, wet wells, dry wells, box culverts, flumes, channels, buildings, and other miscellaneous structures.

2. The bottoms of structural excavations shall be true to the lines and grades shown on the Drawings. Faces of excavations shall not be undercut for extended footings. Except as provided herein for excavation of unsuitable material or rock, where the excavation is carried below the subgrade elevation shown on the Drawings, the Contractor shall backfill the void thus made to the proper grade with Class B concrete at his own expense.

3.5 BACKFILLING

A. Materials for backfilling shall conform to the following requirements or as specifically noted on the drawing:

1. Select Earth Backfill: Fine, sound, loose earth containing optimum moisture content for compaction to 90 percent of maximum density, free from all wood, vegetable matter, debris, and other objectionable material, and having scattered clods, stones, or broken concrete less than 1 1/2-inches in maximum dimension except that the maximum particle size shall be 3/4-inch when used with PVC or other flexible thermoplastic pipe.

2. Common Earth Backfill: Sound, loose earth containing optimum moisture content for compaction to 90 percent of maximum density, free from all wood, vegetable matter, debris, and other objectionable material, and having scattered clods, stones, or broken concrete and pavement less than 6 inches in maximum dimension.

3. Sand: Natural or imported sand conforming to ASTM D 1073.

4. Crushed Stone: Washed size 67 stone as noted or specified herein.

5. Class B Concrete: Class B concrete as specified elsewhere in these Specifications or on the Drawings.

B. General

1. Earth backfill shall be compacted to not less than 90 percent of the maximum density as determined by ASTM D 698 at a moisture content within 3 percentage points, unless otherwise specified herein. Crushed stone and sand shall be compacted to not less than 83 percent of the solid volume density as determined from the bulk specific gravity by AASHTO T-84 and T-85 and the dry weight of the aggregate.

2. Material that is too dry for adequate compaction shall receive a prior admix of sufficient water to secure optimum moisture content. Material having excessive water content shall not be placed at any time.

3. Backfill material required to be compacted shall be placed in horizontal layers not to exceed 6 inches in thickness (before compaction) and compacted in place by ramming, tamping, or rolling, unless otherwise specified herein. Compaction shall be accomplished by power-driven tools and machinery wherever possible. Compaction and consolidation of sand and crushed stone backfill shall be accomplished using vibrating equipment in a manner acceptable to the Engineer.

C. Backfilling Trenches

1. The backfilling of sewers, water, and other pipeline trenches shall be started immediately after the construction of same has been inspected, tested, and approved by the Engineer. Select backfill or crushed stone as shown on the Drawings or specified herein shall be placed in the trench under and on each side of the pipe in 6-inch layers for the full width of the trench and thoroughly and uniformly compacted by ramming and/or tamping to a minimum of 90 percent of the maximum density determined as specified herein. Select earth backfilling or crushed stone as shown on the Drawings or specified herein shall start above the pipe bedding. Sufficient select backfill or crushed stone as shown on the Drawings shall be placed around the pipe and compacted to provide a cover of not less than 12 inches over the top of the pipe. Mechanical compactors or tampers shall not be used within 12 inches of pipe. Compaction in this area shall be accomplished by

hand methods. Backfilling shall proceed simultaneously on both sides of the pipe to prevent lateral displacement. Final backfill shall be as specified herein or shown on the Drawings.

2. Caution shall be used during backfill operations for PVC or other flexible thermoplastic pipe to prevent pipe deformation. PVC or other flexible thermoplastic pipe shall not be subjected to roller or wheel loads until a minimum of 30 inches of backfill has been placed over the top of the pipe. A hydrohammer shall NOT be used until a minimum depth of 48 inches of backfill has been placed over the top of the pipe.

3. In streets and alleys, across sidewalks and driveways, and at any other improved areas subject to vehicular traffic or other superimposed loads, crushed rock backfill shall be placed and compacted in 12-inch layers from the bottom of the trench upward for the full depth of the trench. Crushed rock backfill shall be compacted by use of a hydrohammer or approved vibratory compactor. The top 6 inches of the finished subgrade shall be equal to not less than 100 percent of the maximum density as determined by ASTM D 698 at a moisture content of within 3 percentage points of optimum. When field tests show failure to meet the density requirement, the subgrade shall be loosened by disking, harrowing, or other approved methods to a depth of not less than 6 inches, then reshaped and re-compacted as indicated in this paragraph.

4. Trenches under concrete slabs and footings of structures shall be completely backfilled with compacted sand or crushed rock or filled with Class B concrete as shown on the Drawings.

5. All backfilling shall be done in such a manner that the pipe or structure over or against which it is being placed will not be disturbed or injured. Any pipe or structure injured, damaged, or moved from its proper line or grade during backfilling operations shall be removed and repaired to the satisfaction of the Engineer and then re-backfilled.

D. Backfilling Around Structures

1. Unless otherwise noted, backfilling around structures shall consist of common earth backfill placed in 6-inch layers and compacted by tamping to a minimum of 90 percent of the maximum density determined as specified herein for the full depth of the excavation from the bottom to the finished grade. No backfill shall be placed against concrete structures until the concrete has reached its specified 28-day compressive strength. Where practical, compaction of structural backfill shall be accomplished by power-driven tamping equipment.

2. Where crushed rock mats under slabs and foundations are called for on the Drawings, excavate below grade to the depth of the crushed rock mat as shown on the Drawings and install a compacted crushed rock bed. This shall be finished to a true line or plane and even with the subgrade of the concrete foundations, piers, footings, or slabs.

Before placing any crushed stone, remove all loose earth or debris. This crushed rock mat shall extend 12 inches beyond all slabs and foundations or to edges of sheet piling.

3. Crushed rock mats 12 inches or less in thickness shall be constructed of compacted layers of crushed rock conforming to Section 903.23, Size 7 (½-inch to No. 4), of the SSRBC.

4. Crushed rock mats of thickness greater than 12 inches shall have the top 12 inches constructed of compacted layers of crushed rock as specified above. That portion below the top 12 inches shall be constructed of compacted layers of crushed rock conforming to Section 903.05, Class A, with a modified gradation of 6 inches to dust as received from the crusher.

5. The use of earth backfill to support footings, foundations, and structures shall not be permitted, unless otherwise shown on the Drawings.

3.6 FILLS AND EMBANKMENTS

A. Fills and embankments shall consist of all earth fills except backfills in trenches or around structures. Unless special material is specified or shown on the Drawings, material for fills and embankments shall consist of excavated material from structures or of a mixture of such excavated materials and materials borrowed from other sources by the Contractor. All material used for fills and embankments shall be free from wood, vegetable matter, debris, soft or spongy earth or clay, large rock, or other objectionable material and shall be acceptable to the Engineer.

B. Materials shall be placed in the fill or embankment in successive layers 8 inches or less in thickness before compaction, each layer being approximately horizontal and extending to the full limit of the required cross section, and shall be compacted over the entire surface to not less than 95 percent of the maximum density as determined by ASTM D 698 at a moisture content of within 3 percentage points of optimum. The process shall be repeated for each layer of material until the fill or embankment conforms to the plan lines, grades, and cross sections. The degree of compaction and moisture content required, the method of tamping, and the equipment used shall be approved by the Engineer.

C. The area over which the fill or embankment is to be constructed shall first be cleared of all vegetation, debris, and other objectionable material and, if the ground is in a loose, uncompacted condition, it shall be compacted to a minimum 95 percent of maximum density determined as specified herein.

D. No material shall be placed beyond the sloping lines of embankment unless so ordered by the Engineer. Material allowed to be placed beyond the lines of embankment shown on the Drawings will be compacted as required above unless otherwise authorized by the Engineer.

E. Material for embankments or roadway fills shall be placed in 6-inch maximum lifts and shall be compacted by rolling with power rollers weighing not less than 10 tons, with sheepsfoot rollers, with vibrating rollers, or with pneumatic tire rollers, as required to accomplish the work. While and as each layer is deposited, water shall be applied in sufficient amount to ensure optimum moisture to secure the compaction specified.

F. The use of trucks, carryalls, scrapers, tractors, or other heavy hauling equipment shall not be considered as rolling in lieu of rollers, but the traffic of such hauling equipment shall be distributed over the fill in such a manner as to make the use of the compaction afforded thereby as an addition to compaction by the use of rollers.

G. Wherever a trench passes through a fill or embankment, the fill or embankment material shall be placed as compacted to an elevation 12 inches above the top of the pipe before the trench is excavated.

H. Subgrades for all roadbeds shall meet the requirements of Subsection 2.5 C.4.

3.7 DISPOSAL OF WASTE AND UNSUITABLE MATERIALS

A. All materials removed by excavation which are suitable for the purpose shall be used to the extent possible for backfilling pipe trenches, foundations, and footings and for making embankment fills or for such other purposes as may be shown on the Drawings. All materials not used for such purposes shall be considered as waste materials and the disposal, thereof shall be made at the Contractors expense in a manner and at locations approved by the Engineer.

B. Waste materials shall be spread in uniform layers and neatly leveled and shaped. Spoil banks shall be provided with sufficient and adequate openings to permit surface drainage of adjacent lands.

C. Unsuitable materials, consisting of wood, vegetable matter, debris, soft or spongy clay, peat, and other objectionable material so designated by the Engineer, shall be removed from the work site and disposed of at the Contractors expense, in a manner and at a location approved by the Engineer.

D. No unsuitable or waste material shall be dumped on private property unless written permission is furnished by the owner of the property and unless a dumping permit is issued from the local jurisdiction.

E. The Contractor is responsible for any and all permits and other requirements, such as sediment runoff control necessitated by the disposal of waste material.

3.8 FINAL GRADING

A. After other earthwork operations have been completed, the sites of all structures, roads, and embankments shall be graded within the limits and to the elevations shown on the Drawings. Grading operations shall be so conducted that materials shall not be removed or loosened beyond the required limits. The finished surfaces shall be left in smooth and uniform planes such as are normally obtainable from the use of hand tools. If Contractor is able to obtain the required degree of evenness by means of mechanical equipment, the use of hand labor methods will not be required. Neatly trim and finish slopes and ditches to slopes shown on the Drawings unless otherwise approved by the Engineer.

B. Grade and dress all finished ground surfaces to present a surface varying not more than plus or minus 0.10 foot as regards local humps or depressions, unless otherwise specified or shown on the Drawings, and shall be acceptable to the Engineer.

C. When specific grading requirements are not shown on the drawings, the contractor shall grade all areas within the limits of construction, or otherwise disturbed by construction, to drain and to match the existing, adjacent ground.

3.9 TOPSOIL

A. All areas to be planted with trees or shrubs, or with sprigged grass as shown on the plans, shall be prepared by grading to a smooth, even surface to a level 4 inches below the elevation of the finished grade shown on the Drawings. It shall then be brought to a neat and finished grade by the addition of 4 inches of approved topsoil.

B. Topsoil removed from the construction area may be stockpiled and reused or topsoil may be obtained from approved borrow areas. If obtained from borrow areas, make suitable arrangements with the property owner and pay all costs incident to the borrowed material including royalties.

3.10 SETTLEMENT

A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within 1 year after final acceptance of the work by the Owner.

B. Make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from the Engineer or Owner.

3.11 DUST CONTROL

A. The Contractor shall use all means necessary to control dust on and near the work and all off-site borrow areas.

B. The Contractor shall thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors and concurrent performance of work on the site.

END OF SECTION

SECTION 32 1000

NEW AND REPLACEMENT PAVING

1. GENERAL

1.1. SUMMARY

A. This section includes provisions for hot-mixed asphalt paving and mineral aggregate subbase over prepared subgrade for trench width, full pavement width paving, and other areas as shown on the Drawings.

B. Prepared subgrade is specified in Section 31 2000, Earthwork.

C. Proof rolling of prepared subgrade is included in this section.

D. Saw-cutting of edges of existing pavement is required to minimize subsidence of the pavement into the trench and to minimize the width of pavement replacement.

1.2. RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and Division 1 Specification sections, apply to this section.

1.3. SUBMITTALS

A. Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

1. Material certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

2. Pavement marking plan indicating lane separations and defined parking spaces. Note dedicated handicapped spaces with international graphics symbol.

1.4. SITE CONDITIONS

A. Weather Limitations. Apply prime and tack coats when ambient temperature is above 50°F (10°C) and when temperature has not been below 35°F (1°C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct hot-mixed asphalt surface course when atmospheric temperature is above 40°F (4°C) and when base is dry. Base course may be placed when air temperature is above 30°F (-1°C) and rising.

C. Grade Control. Establish and maintain required lines and elevations.

2. PRODUCTS

2.1. MATERIALS

A. General. Use locally available materials and gradations that exhibit a satisfactory record of previous installations.

B. Coarse Aggregate. Sound, angular crushed stone, crushed gravel, or properly cured crushed blast furnace slag, complying with ASTM D 692-00.

C. Fine Aggregate. Sharp-edged natural sand or sand prepared from stone, properly cured blast furnace slag, gravel, or combinations thereof, complying with ASTM D 1073-99.

D. Mineral Filler. Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

E. Asphalt Cement. ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.

F. Prime Coat. Cut-back asphalt type, ASTM D 2027; MC-30, MC-70, or MC-250.

G. Tack Coat. Emulsified asphalt; ASTM D 977.

H. Mineral Aggregate Subbase. SSRBC, Section 303, Type A (Class A aggregate, Grading D).

I. Geotextile Fabric. 6 oz/sy, woven, polypropylene fabric; Mirafi, Inc., Type 600x, or equal.

J. Lane Marking Paint. Alkyd-resin type, ready-mixed complying with AASHTO M 248, Type I.

1. Color: White.
2. Color: Yellow.

2.2. TYPES OF PAVEMENT

A. Replace all existing pavement in streets, driveways, or parking areas which is removed, destroyed, or damaged by construction of improvements as specified herein, as shown on the Drawings, or as called for in the Bid Schedule. Unless otherwise shown or specified, all paved surfaces shall be replaced in kind or as required by permit. Unless shown or specified otherwise, a minimum of 2” of asphaltic concrete or 4” portland cement shall be utilized over a minimum compacted mineral aggregate base course. Restoration shall extend a minimum of 12” outside the extents of trench width. Materials, equipment, and construction methods used for paving work shall conform to the Specifications applicable to the particular type required for replacement, repair, or new pavements.

B. Where sewerage or water lines and appurtenances are constructed in or across unpaved, chert, or crushed stone surfaced streets, roadways, driveways, or parking areas, repair or replace the surface removed or damaged with a minimum of 6 inches of crushed stone in accordance with Section 401, "Mineral Aggregate Surface," SSRBC.

C. In no case shall paving repair be commenced without prior approval of the Engineer of the type of pavement, the equipment to be used, and the method or procedure to be used.

D. The pavement mixture shall not be spread until the designated surface has been previously cleaned and prepared, is intact, firm, properly cured, dry, and the tack coat has been applied.

3. EXECUTION

3.1. SURFACE PREPARATION

A. Remove loose material from compacted subgrade surface immediately before applying subbase.

B. Roll prepared subgrade surface to check for unstable areas and areas requiring additional compaction.

C. Do not begin paving work until deficient subgrade areas have been corrected and are ready to receive subbase.

D. Place mineral aggregate subbase and compact in accordance with the applicable SSRBC specifications to provide a minimum of 6 inches or as shown on Drawings. Subbase thickness greater than 8 inches shall be placed in two or more layers.

E. Roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

F. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

G. Prime Coat. Apply at rate of 0.20 to 0.50 gallon per square yard over compacted subbase. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile components.

H. Tack Coat. Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into hot-mixed asphalt pavement. Distribute at rate of 0.05 to 0.15 gallon per square yard of surface.

I. Allow to dry until at proper condition to receive paving.

J. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

3.2. PLACING MIX

A. General. Place hot-mixed asphalt mixture on prepared surface, spread, and strike off. Spread mixture at minimum temperature of 225°F (107°C). Place areas inaccessible to equipment by hand. Place each course to required grade, cross-section, and compacted thickness.

B. Paver Placing. Place in strips not less than 10 feet wide, unless otherwise acceptable to Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

C. Immediately correct surface irregularities in finish course behind paver. Remove excess material forming high spots with shovel or lute.

D. Joints. Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of hot-mixed asphalt course. Clean contact surfaces and apply tack coat.

E. Curbs. Construct curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust.

F. Place curb materials to cross-section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms as soon as material has cooled.

3.3. ROLLING

A. General. Begin rolling when mixture will bear roller weight without excessive displacement.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling. Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling, if required, with hot material.

D. Second Rolling. Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been evenly compacted.

E. Finish Rolling. Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained 95 percent laboratory density.

F. Patching. Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot-mixed asphalt. Compact by rolling to specified surface density and smoothness.

G. Protection. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.4. TRAFFIC AND LANE MARKINGS

A. General. Provide traffic and lane markings in all areas where markings have been damaged due to trench width pavement. On full width pavement, provide markings in all areas were markings were present at beginning of project or where markings are designated to be provided on the Drawings.

B. Cleaning. Sweep and clean surface to eliminate loose material and dust.

C. Striping. Use chlorinated-rubber base traffic lane-marking paint, factory-mixed, quick-drying, and non-bleeding.

D. Do not apply traffic and lane marking paint until layout and placement have been verified with Engineer.

E. Apply paint with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide minimum 12 to 15 mils dry thickness.

3.5. WHEEL STOPS

A. General. Secure wheel stops to hot-mixed asphalt surface with not less than two ¾-inch-diameter galvanized steel dowels embedded in precast concrete at ⅓ points. Size length of dowel to penetrate at least ½ hot-mixed asphalt depth.

3.6. FIELD QUALITY CONTROL

A. General. Testing in-place hot-mixed asphalt courses for compliance with requirements for thickness and surface smoothness will be done by Owner's testing laboratory. Repair or remove and replace unacceptable paving as directed by Engineer.

B. Thickness. In-place compacted thickness tested in accordance with ASTM D 3549 will not be acceptable if exceeding following allowable variations:

1. Base Course: plus or minus 1/2 inch.
2. Surface Course: plus or minus 1/4 inch.

C. Surface Smoothness: Test finished surface of each hot-mixed asphalt course for smoothness, using 10-foot straightedge applied parallel with and at right angles

to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness:

1. Base Course Surface: 1/4 inch.

2. Wearing Course Surface: 3/16 inch.

3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is ¼ inch.

D. Check surface areas at intervals as directed by Engineer.

END OF SECTION

SECTION 33 0130

BYPASS FLOW CONTROL

1. GENERAL

1.1. SCOPE

A. Furnish, install, and maintain bypass pumping equipment required for the construction of the project. The contractor shall use bypass pumping units or other methods which have been approved by the Engineer.

2. EXECUTION

2.2. BYPASS PUMPING

A. Install a bypass pump of sufficient capacity to transport a minimum of 2,800 GPM at 425-feet TDH. The bypass pumping shall continue until the construction of the transmission wye and valve installation is complete.

2.3. CONTRACTORS RESPONSIBILITY

A. It shall be the Contractor's responsibility to install, operate, and maintain the bypass pumps during all operations. It shall also be the Contractor's responsibility to have a standby pump of equal size available on-site during the entire pumping operation.

B. The Contractor shall submit to Engineer a bypass pumping plan for review and approval prior to commencement of bypass pumping operations. This plan shall include at a minimum, but not limited to, pump curves, hydraulic calculations, coordination and staffing requirements, and locations of suction and discharge.

C. The use of wheel ramps are required for piping where such crosses areas and entrances/exits subject to vehicular traffic. The use of "lay flat" hose shall be used where necessary.

D. The Contractor shall notify the Engineer and/or his representative at least 24 hours in advance of all bypass pumping operations. The Contractor shall obtain approval prior to commencement of bypass pumping operations.

2.4. LIABILITY

A. Damages to private or public property that result from bypass pumping operations are Contractor's responsibility.

END OF SECTION

SECTION 33 1113.13

DUCTILE IRON PIPE AND FITTINGS

GENERAL

1.1. SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to furnish, install, and field pressure test ductile iron piping, including all fittings, wall pipe and sleeves, couplings, tappings, anchor blocks, and accessories, as specified herein and/or shown on the Drawings.

1.2. REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. American National Standards Institute/American Water Works Association (ANSI/AWWA) Publications

1.	ANSI/AWWA C104/A21.4	Cement-Mortar Lining for Ductile Iron Pipe
2.	ANSI/AWWA C105/A21.5	Polyethylene Encasement for Ductile-Iron Pipe Systems
3.	ANSI/AWWA C110/A21.10	Ductile Iron and Grey-Iron Fittings, 3-Inch through 48-Inch, for Water and Other Liquids
4.	ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings
5.	ANSI/AWWA C115/A21.15	Flanged Ductile Iron Pipe with Ductile Iron or Grey Iron Threaded Flanges
6.	ANSI/AWWA C116/A21.16	Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces
7.	ANSI/AWWA C150/A21.50	Thickness Design of Ductile Iron Pipe
8.	ANSI/AWWA C151/A21.51	Ductile Iron Pipe, Centrifugally Cast, for Water
9.	ANSI/AWWA C153/A21.53	Ductile Iron Compact Fittings, 3-Inch through 24-Inch and 54-Inch through 64-Inch, for Water Service
10.	ANSI/AWWA C600	Installation of Ductile Iron Water Mains and Their Appurtenances

C. American Society of Mechanical Engineers / American National Standards Institute (ASME/ANSI) Publications

1. ASME/ANSI B16.1-98 Cast Iron Flanges and Flanged Fittings

D. National Association of Pipe Fabricators (NAPF) Publications

1. NAPF 500-03-01 Solvent Cleaning
2. NAPF 500-03-04 Abrasive Blast Cleaning of Ductile Iron Pipe

1.3. QUALITY ASSURANCE

A. Submit to the Engineer written evidence that the pipe furnished under this Specification is in conformance with the material and mechanical requirements specified herein. Certified copies of independent laboratory test results or mill test results from the pipe supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate ASTM or AWWA testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the Engineer may require that the Contractor furnish test reports from an independent testing laboratory on samples of pipe materials.

1.4. SHOP DRAWINGS AND ENGINEERING DATA

A. Submit complete shop drawings and engineering data on all piping and accessories to the Engineer in accordance with the requirements of Section 01 3323 - Shop Drawings, Product Data, and Samples.

B. Shop drawings shall indicate piping layout in plan and section and shall be completely dimensioned. The Drawings shall include a complete schedule of all pipe, fittings, valves, specials, hangers, and supports. Special castings shall be clearly detailed showing all pertinent dimensions.

C. Furnish the Engineer with lists, in duplicate, of all pieces of pipe and fittings in each shipment received. These lists shall give the serial or mark number, weight, class, size, and description of each item received.

1.5. STORAGE AND PROTECTION

A. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel, and sheet construction products shall be stored with one end elevated to facilitate drainage.

1.6. SHOP PAINTING

A. All ductile iron pipe and fittings shall be cleaned and provided with an asphaltic coating and cement lining applied at the factory, unless otherwise specified herein.

1.7. GUARANTEE

A. Provide a guarantee against defective materials and workmanship in accordance with the requirements of Section 01 7836, Warranties and Bonds.

1.8. ACCEPTABLE MANUFACTURERS

A. Ductile iron pipe must be the products of member companies of the Ductile Iron Pipe Research Association (DIPRA). Products from manufacturers who are not DIPRA member companies shall not be utilized in the work covered by these Specifications.

PRODUCTS

2.1. GENERAL

A. No broken, cracked, deformed, misshapen, imperfectly coated, or otherwise damaged or defective pipe or fittings shall be used. All such material shall be removed from the site of the work.

B. Minimum pipe wall thickness and pressure class of pipe shall be as follows, unless otherwise shown on the Drawings or directed by the Engineer:

2.2. DUCTILE IRON PIPE

Pipe Size	Pressure Class (psi)	Wall Thickness in Inches
3-Inch Ductile Iron	350	0.25
4-Inch Ductile Iron	350	0.25
6-Inch Ductile Iron	350	0.25
8-Inch Ductile Iron	350	0.25
10-Inch Ductile Iron	350	0.26
12-Inch Ductile Iron	350	0.28
14-Inch Ductile Iron	250	0.28
16-Inch Ductile Iron	250	0.3
18-Inch Ductile Iron	250	0.31
20-Inch Ductile Iron	250	0.33
24-Inch Ductile Iron	200	0.33
30-Inch Ductile Iron	150	0.34
36-Inch Ductile Iron	150	0.38

A. Ductile iron pipe shall be designed in accordance with ANSI/AWWA C150/A21.50, "Thickness Design of Ductile Iron Pipe," using 60,000-psi tensile strength, 42,000-psi yield strength, and 10 percent elongation. Additionally, ring bending stress is limited to 48,000 psi to provide a 2.0 safety factor based upon ultimate bending stress.

B. Ductile iron pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51, "Ductile Iron Pipe Centrifugally Cast for Water," and shall be made of ductile iron having a minimum tensile strength of 60,000 psi, a minimum yield strength of 42,000 psi, and 10 percent minimum elongation.

2.3. DUCTILE IRON FITTINGS

A. All fittings shall conform in every respect to ANSI/AWWA C110/A21.10, "Ductile Iron Compact Fittings for Water Service" or ANSI/AWWA C153/A21.53, "2-Inch through 24-Inch for Water and Other Liquids."

B. All fittings shall be for pressure rating of 250 psi, unless otherwise shown on the Drawings, directed, or specified herein.

C. Flanged fittings, in general, shall be ANSI pattern using long radius elbows except where space limitations prohibit the use of same. Design of all fittings, whether long or short pattern, shall be as indicated or dimensioned on the Drawings. Special fittings, wall pipes, and sleeves shall conform to the dimensions and details shown on the Drawings.

2.4. JOINTS FOR DUCTILE IRON PIPE AND FITTINGS

A. General

1. Joints for ductile iron pipe and fittings shall be mechanical joints, flanged joints, push-on joints, or bell and spigot joints, as shown on the Drawings or specified herein.

2. All ductile iron pipe laid underground shall be joined using mechanical joints or push-on type joints, unless otherwise shown on the Drawings, specified, or directed.

B. Mechanical Joints

1. Mechanical joints shall consist of a bolt joint of the stuffing box type as detailed in ANSI A21.10 and described in ANSI A21.11.

2. Mechanical joints shall be thoroughly bolted in accordance with the manufacturer's recommendations with Tee Head Bolts and bolts of high strength, low-alloy steel having a minimum yield point strength of 40,000 psi and an ultimate tensile strength of 70,000 psi.

3. Gaskets, bolts, and nuts shall conform to ANSI A21.11. Gaskets shall be neoprene, SBR, or rubber of such quality that they will not be damaged by the liquid or gases with which they will come into contact.

4. Glands shall be of high strength ductile iron.

C. Flanged Joints

1. Flanged joints shall conform to ANSI B16.1, Class 125, in accordance with Table 10.23 of ANSI A21.10, unless otherwise indicated.

2. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolts and nuts shall conform in dimensions to the American Standard heavy series. Nuts shall be hexagonal, cold pressed. Bolts and nuts shall be zinc plated, cold pressed, steel machine bolts, conforming to ASTM A 307, Grade B. Cadmium plating shall be by an approved process and shall be between 0.003 and 0.0005 inch thick. After each joint has been made, all bolts, heads, and nuts shall be coated with two coats of coal tar epoxy (total of 16-mil dry film thickness [DFT]) or approved equal coating.

3. Gaskets shall be full face type, 1/8 inch thick, conforming to the requirements of AWWA C111.

4. Flanges on ductile iron pipe shall be screw type. Pipe threads shall be of such length that with flanges screwed home, the end of the pipe shall project beyond the face line of the flange. Flange and pipe shall then be machined to give a flush finish to the pipe and the flange and surface shall be normal to the axis of the pipe. Ductile iron flanges shall be of such design that the flange neck completely covers the threaded portion of the pipe to protect same against corrosion. All pipe with screw type flanges shall be assembled, faced, and drilled at the point of manufacture, unless otherwise approved by the Engineer.

5. Where tap or stud bolts are required, flanges shall be drilled and tapped accordingly.

D. Push-On Joints

1. Push-on joints shall conform to ANSI A21.11. Details of the joint design shall be in accordance with the manufacturer's standard practice.

2. Gaskets shall be in accordance with ANSI A21.11 and shall be of such quality that they will not be damaged by the liquid or gases with which they will come into contact.

E. Flexible Restrained Joints (for Horizontal Directional Drilling (HDD))

1. Joints used for HDD shall be boltless, flexible restrained, with smooth contoured bells. Joints with bulky glands or flanges that may prevent the smooth flow of drilling fluid/soil slurry over the joint are not acceptable.

2. Joint seals and joint used for HDD, when properly assembled and installed, shall be capable of dependably handling the specified internal pressure and pulling loads, in straight alignment or at maximum rated joint deflection, required for the project.

2.5. PIPE COATING AND LINING

A. All ductile iron pipe and fittings buried underground shall have a standard asphaltic outside coating conforming to ANSI/AWWA C151/A21.51. All exposed or immersed ductile iron pipe and fittings shall have an outside shop prime coat of epoxy coating of TNEMEC Series 20 Pota-Pox or approved equal at 4 to 6 mils DFT and two additional coats at 4 to 6 mils DFT per coat. Total minimum DFT of coating system shall be 12-mils. Total maximum DFT shall not exceed 18-mils.

B. All ductile iron pipe and fittings used for water or wastewater shall have cement mortar lining of standard thickness in accordance with ANSI A21.4.

C. Where a special lining is indicated on the Drawings for resistance to corrosive wastewater, all ductile iron pipe and fittings shall have a ceramic filled, amine-cured, epoxy lining. Coating shall be Protecto 401, Series 431 Perma-Shield PL, by TNEMEC, or Engineer approved equal. Coating shall be applied at 40-mil DFT. Follow manufacturer's recommendations for lining bell sockets, spigot ends, flange faces, etc., and for touch up and repair of field cuts.

D. No lining shall be provided for ductile iron piping and fittings used for air.

2.6. PIPE COUPLINGS

A. Pipe couplings shall be installed where shown on the Drawings, required for installation, or directed by the Engineer.

B. Pipe couplings shall conform to the requirements of Section 33 1121, Pipe Couplings and Expansion Joints.

2.7. WALL PIPE AND WALL SLEEVES

A. Furnish and install ductile iron wall pipe or wall sleeves where ductile iron piping connects with or passes through concrete walls or floors and in locations where small piping and electric wiring and conduits connect with or pass through concrete walls or floors.

B. Where wall pipes or sleeves are to be installed flush with the wall or slab, the flange or bell shall be tapped for studs. Where the flange or bell will project beyond the wall, the projection shall be sufficient to allow for installation of connecting bolts.

2.8. SPARE PARTS

A. Furnish 4 spare gaskets for each size and type of joint requiring the use of a gasket. Furnish 8 bolts and nuts of each size and type used for ductile iron pipe joints.

EXECUTION

3.1. LAYING

A. Proper and suitable tools and appliances for safe and convenient handling

and laying of pipe and fittings shall be used. Great care shall be taken to prevent the pipe coating from being damaged, particularly cement linings on the inside of the pipes and fittings. Any damage shall be remedied as directed by the Engineer.

B. Carefully examine all pipe and fittings for defects just before laying and no pipe or fitting shall be laid which is defective. If any defective pipe or fitting is discovered after having been laid, it shall be removed and replaced in a satisfactory manner with a sound pipe or fitting by the Contractor at his own expense.

C. Thoroughly clean all pipes and fittings before they are laid and keep clean until they are used in the completed work. Open ends of pipe shall be kept plugged with a bulkhead during construction.

D. Pipe laid in trenches shall be laid true to line and grade on a firm and even bearing for its full length at depths and grades as shown on the Drawings. Adequate precautions shall be taken to prevent flotation of pipelines prior to backfilling. Installation of ductile iron pipe in underground pressure piping systems shall conform to the requirements of AWWA C600. Excavation of trenches, embedment, and backfilling around pipes shall conform to the requirements of Section 31 2000, Earthwork and as shown on the drawings. Embedment shall be select earth and final backfill shall be common earth for unimproved areas. Embedment and final backfill shall be #67 crushed stone for improved areas. Embedment shall be #67 crushed stone in rock trenches.

E. All ductile iron piping laid underground shall have a minimum of 30-inches of cover above the top of the pipe unless otherwise shown on the Drawings.

F. All elbows, tees, branches, crosses, and reducers in pressure piping systems shall be adequately restrained against thrust. Underground pressure piping shall be restrained by thrust restrained joints (EBAA Meg-A-Lug or Engineer approved equal). Install restraints in accordance with manufacturer's recommendations. Install number of restraints recommended by manufacturer for size of pipe, type of fitting, and type of soil, or as shown on the Drawings.

G. All ductile iron pipes entering buildings or basins shall be adequately supported between the structure and undisturbed earth as shown on the Drawings to prevent breakage resulting from settlement of backfill around the structure.

H. Wall pipe and wall sleeves shall be accurately located and securely fastened in place before concrete is poured. All wall pipe and wall sleeves shall have wall collars properly located to be in the center of the wall where the respective pipes are to be installed.

I. Wall pipe and wall sleeves shall be installed when the wall or slab is constructed. Blocking out or breaking of the wall for later insertion shall not be permitted.

J. Cutting or weakening of structural members to facilitate pipe installation shall

not be permitted. All piping shall be installed in place without springing or forcing.

K. Sufficient couplings and flanged joints shall be provided to facilitate equipment installation and removal.

L. Exposed ductile iron piping shall be supported as shown on the Drawings or specified herein.

3.2. CUTTING

A. Whenever pipe requires cutting to fit the lines, the work shall be done in such manner as to leave a smooth end at right angles to the axis of the pipe. When a piece of pipe is cut to fit into the line, no payment will be made for the portion cut off and not used.

B. Whenever existing pipe requires cutting to install new fittings, the work shall be done in such manner as to leave a smooth end at right angles to the axis of the pipe and special care shall be exercised to guard against breaking or splitting the existing piping.

C. All cutting of ductile iron pipe shall be done with a cutting saw. All burrs shall be removed from the inside and outside edges of all cut pipe.

3.3. JOINING

A. Mechanical Joints

1. The successful operation of the mechanical joint specified requires that the spigot be centrally located in the bell and that adequate anchorage be provided where abrupt changes in direction and dead ends occur.

2. The surfaces with which the rubber gasket comes in contact shall be brushed thoroughly with a wire brush just prior to assembly to remove all loose rust or foreign material which may be present and to provide clean surfaces which shall be brushed with a liberal amount of soapy water or other approved lubricant just prior to slipping the gasket over the spigot end and into the bell. Lubricant shall be brushed over the gasket prior to installation to remove loose dirt and lubricate the gasket as it is forced into its retaining space.

3. Joint bolts shall be tightened by the use of approved wrenches and to a tension recommended by the pipe manufacturer. When tightening bolts, it is essential that the gland be brought up toward the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket. This may be done by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, and last, the remaining bolts. This cycle shall be repeated until all bolts are within the range of acceptable torques. If effective sealing is not attained at the maximum torque indicated above, the joint shall be disassembled and reassembled after thorough cleaning. Overstressing of bolts to compensate for poor installation shall not be permitted.

4. After installation, bolts and nuts in buried or submerged piping shall be given 2 heavy coats of a bituminous paint.

B. Flanged Joints

1. All flanges shall be true and perpendicular to the axis of the pipe. Flanges shall be cleaned of all burrs, deformations, or other imperfections before joining. Flanged joints shall be installed so as to ensure uniform gasket compression. All bolting shall be pulled up to the specified torque by crossover sequence. Where screwed flanges are used, the finished pipe edge shall not extend beyond the face of the flange, and the flange neck shall completely cover the threaded portion of the pipe.

2. Connections to equipment shall be made in such a way that no strain is placed on the equipment flanges. Connecting flanges must be in proper position and alignment and no external force may be used to bring them together properly.

3. After installation, bolts and nuts in buried or submerged piping shall be given 2 heavy coats of a bituminous paint.

C. Push-On Joints and Flexible Restrained Joints

1. The inside of the bell and the outside of the pipe from the plain end to the guide stripe must be wiped clean immediately before assembling the pipe joint. Then the rubber gasket shall be inserted into a groove or shaped recess in the bell. Both the bell and spigot ends to be joined shall be wiped again to ensure they are thoroughly clean. A liberal coating of special lubricant furnished by the pipe manufacturer shall be applied to the outside of the pipe from the plain end to the yellow guide stripe and to the inside of the gasket. The plain end shall be centered in the bell and the spigot pushed home. Wherever possible the pipe shall be socketed by hand; however, jacking may be required to push the spigot in place on the larger sizes of pipe. The completed joint shall be permanently sealed and watertight.

2. Whenever the pipe is cut in the field, the cut end shall be conditioned so it can be used in making up a joint by filing or grinding the cut end to remove burrs or sharp edges that might damage the gasket.

D. Permissible Deflection of Joints

1. Deflection of ductile iron pipe at joints for long radius curves or for avoiding obstacles shall be permitted only upon approval of the Engineer.

2. Where deflection of Push on or Mechanical joints is permitted, such deflection shall be made in accordance with and shall not exceed 80 percent of the maximum deflection angle provided in Tables 3 and 4 of AWWA C600-05.

3. Where deflection of flexible restrained joints is permitted or necessary for

pipe installation during horizontal directional drilling, such deflection shall not exceed 50 percent of the maximum deflection angle provided in Table 3 of AWWA C600.

E. Joints of Dissimilar Metals. When a flanged joint consists of a ductile iron flange mated to a steel or alloy flange, the steel flanges shall be flat-faced and furnished with full-faced gaskets, insulating bushings, and stainless steel bolts.

3.4. SERVICE CONNECTIONS

A. Small service lines and branches shall connect to larger ductile iron mains using ductile iron tapped tees and crosses, in general and unless otherwise shown.

B. Tapped tees and crosses shall have minimum 2-inch NPT branch connections and shall be furnished with mechanical joint ends.

3.5. CUT-INS TO EXISTING PIPING

A. Cut-ins to existing ductile iron piping for installation of new mechanical joint fittings and valves shall be made using ductile iron cutting-in sleeves, in general and unless otherwise shown.

B. Cutting-in sleeves shall have a pressure rating not less than that of the existing pipeline and shall be furnished with a mechanical joint end on one end and a plain end on the other.

3.6. DRILLING AND TAPPING

A. Wherever required, ductile iron pipe and fittings shall be drilled and tapped to receive drainage or any other piping. All holes shall be drilled accurately at right angles to the axis of any pipe or fitting. Where plugs are drilled, holes shall be at right angles to the face of the plug.

B. Where the size of the pipe to be connected is such as to require bosses for connection and when the pipe wall thickness is too thin to permit the effective length of pipe threads to be utilized as necessary for the size pipe being connected by threads, furnish such pipe with cast-on bosses suitable for drilling, tapping, and connecting such pipe. Alternately, where shown or specified, a tapped saddle clamp may be used in lieu of a cast-on boss. Saddle clamp shall be of the heavy-duty type with O-ring gaskets and 2 heavy U-bolt clamps.

C. All tapping shall be carefully and neatly done by skilled workmen with suitable tools.

D. Where connections are made between new and old piping, the connections shall be made in a thorough and workmanlike manner using proper fittings and specials to suit actual conditions.

E. Cut-ins to existing and operating pipelines shall be done at times agreeable to the Owner upon approval of the Engineer.

F. Existing pipelines that may be cut or damaged during the performance of work under this item shall be repaired, reconnected, and returned to service in equal or better condition in which they were found and in accordance with the requirements of this Specification.

G. No separate payment will be made for drilling, tapping, making connections, cut-ins, repairs to damaged existing pipelines, and reconnections in existing pipelines

3.7. AIR RELIEF AND FLUSHING

A. Expel all air from the pipe before applying the specified hydrostatic test. If hydrants, blow-offs, or air release valves are not available at the high points, make the necessary taps at points of highest elevation before the test is made and insert plugs after the test has been completed.

B. Thoroughly flush the lines after expelling all the air to remove foreign material in the pipe during installation. Flush the lines at hydrants and blow-offs to maintain a minimum velocity in the main of 2.5 fps.

3.8. HYDROSTATIC TESTING

A. After all piping has been placed, backfilled, and flushed, each run of newly laid pipe, or any valved section thereof, shall be tested by the Contractor in the presence of the Engineer, and tests shall be continued until all leaks have been made tight to the satisfaction of the Engineer.

B. All piping shall be subject to a hydrostatic gauge pressure equal to 150 percent of the maximum operating pressure of the pipe section under test or 150 psig, whichever is greater, based on the elevation of the lowest point of the section of pipe under test and corrected to the elevation of the test gauge. The test shall be maintained for a minimum of two consecutive hours. The test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed gate or butterfly valves.

C. The specified test pressure shall be applied by means of a pump connected to the pipe.

D. Allow the system to stabilize at the test pressure before conducting the test.

E. The hydrostatic test (AWWA C600) shall be based upon leakage and pressure. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

1. Allowable leakage: No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{}$$

Where:

2. L = allowable leakage, in gallons per hour

3. S = length of pipe tested, in feet

4. D = nominal diameter of the pipe, in inches

5. P = average test pressure during the leakage test, in pounds per square inch (gauge)

This formula is based on an allowable leakage of 11.65 gpd/mi/in of nominal diameter at a pressure of 150 psi.

6. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/h/in of nominal valve size shall be allowed.

7. When hydrants are in the test section, the test shall be made against the main valve in the hydrant.

F. Acceptance of Installation. Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified, repairs or replacements shall be corrected at the Contractor's expense by tightening, replacing packing or gaskets, or replacing defective portions of the piping system. Caulking will not be permitted. If the defective portion cannot be located, the Contractor, at his expense, shall remove and reconstruct as much of the original work as necessary to obtain an acceptable installation.

G. All visible leaks are to be repaired regardless of the amount of leakage.

H. The Contractor shall bear the complete cost of the tests, including set-up, labor, temporary piping, blocking, gauges, bulkheads, water, and any other materials required to conduct the tests.

3.9. DISINFECTION

A. Potable water lines shall be disinfected in accordance with requirements of Section 33 1300, Disinfecting of Water Utility Distribution, following installation and testing.

B. Water for testing or flushing potable water lines must be dechlorinated or held in detention basins or otherwise discharged in such a manner that chlorinated water is not discharged into waters of the State.

END OF SECTION

SECTION 33 1216

VALVES

1 GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to furnish and install all metal valves, including operators, boxes, and accessories, as specified herein, shown on the Drawings, or required for proper completion of the work under these Contract Documents.

B. The Contractor's attention is called to the fact that all valves, especially in the smaller sizes, are not necessarily shown completely on the Drawings, which are more or less schematic. Furnish and install all valves indicated or required for proper operation of the equipment or services requiring such valves.

1.2 SHOP DRAWINGS AND ENGINEERING DATA

A. Submit complete shop drawings and engineering data to the Engineer in accordance with the requirements of Section 01 3323 - Shop Drawings, Product Data and Samples.

1.3 STORAGE AND PROTECTION

A. Store and protect valves and accessories in accordance with the requirements of the valve manufacturer or as directed by the Engineer.

B. Completely drain valves prior to shipment. Protect ends of flanged and mechanical joint valves with full size wooden baffles securely bolted to the valve ends. Size of baffles shall be at least equal to outside diameter of flange. Secure valves 24 inches in size and larger to a wooden skid to facilitate handling and storage.

1.4 SHOP PAINTING

A. Clean, shop prime, and shop paint valves and accessories in accordance with the requirements of these Specifications.

B. All interior and exterior nonmachined, nonbearing ferrous surfaces on iron body valves, gates, and accessories shall be blast cleaned and painted at the factory with two coats of asphaltic varnish conforming to Federal Specification TT-V-51c, unless otherwise specified. Exterior nonmachined, nonbearing ferrous surfaces on valve operators and on nonsubmerged or nonburied butterfly and eccentric plug valves shall be blast cleaned and painted at the factory with one coat of zinc chromate primer conforming to Federal Specification TT-P-645 and one coat of compatible alkyd enamel. Other paint systems may be proposed by the valve supplier, subject to the Engineer's approval.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit complete operation and maintenance data on the valves in accordance with the requirements of Section 01 7823, Operating and Maintenance Data.

1.6 QUALITY ASSURANCE

A. The valve manufacturers shall furnish a written certification to the Engineer that all valves and operators furnished comply with all applicable requirements of the governing AWWA standards specified herein.

1.7 GUARANTEE

A. Provide a guarantee against defective equipment and workmanship in accordance with the requirements of Section 01 7836, Warranties and Bonds.

2 PRODUCTS

2.1 GENERAL

A. All castings, regardless of material, shall be free from surface defects, swells, lumps, blisters, sandholes, or other imperfections.

B. All valves shall have the name of the manufacturer, rated working pressure, and size of the valve cast upon the body or bonnet in raised letters. Alternately, the name of the valve manufacturer, rated working pressure, and size may be stamped on a stainless-steel identification plate permanently attached to the valve body or bonnet. Valves specified to conform with AWWA requirements shall have the letters "AWWA" cast upon the valve body or bonnet in raised letters.

C. Valves and operating mechanisms shall be of the proper size and dimensions to fit the pipe connections thereto and shall be installed in the position and within the space shown on the Drawings.

D. The direction of rotation of the operator to open the valve shall be to the left (counterclockwise), unless otherwise specified. Each valve body or operator shall have cast thereon the word OPEN and an arrow indicating the direction to open.

E. A union or coupling shall be provided within 2 feet on each side of a threaded end valve unless the valve can be otherwise easily removed from the piping. This shall not apply to soldered end valves in copper plumbing.

F. All exposed bolts and nuts on buried or submerged valves and operators shall be brass or stainless steel for corrosion resistance. Exposed bolts and nuts on exposed valves and operators shall be of corrosion-resistant materials or shall be zinc or cadmium plated.

G. Valves and operators shall be of the proper size to fit the pipe connections and shall fit in the position and space as shown on the Drawings.

H. Valve operators shall be of sufficient size and capacity to seat, unseat, and operate the valve under the maximum specified differential pressure. Where no maximum differential pressure is specified, the operator shall be designed for a differential pressure equal to the maximum working pressure of the valve. Additional allowances shall be made for the lubricating and/or scale-forming tendencies of the fluid.

2.2 GATE VALVES

A. All gate valves smaller than 2-inches and those larger than 24-inches shall be of the single disc, double sealed, solid tapered wedge type, unless otherwise specified. Gate valves in sizes 2 through 24-inches shall be of the single disc, resilient seated type, unless otherwise specified. Valves shall have non-rising stems and be capable of being repacked under pressure when valve is fully open. Minimum working pressures shall be 200 psi for valves through 14-inches in size and 150 psi for valves 16-inches and larger.

B. Gate valves smaller than 2-inches shall be bronze body, bronze fitted valves, and have 150-pound, cast bronze body, union bonnet, Teflon-impregnated asbestos packing, and threaded ends per ANSI B2.1. Bronze shall conform to ASTM B62. Brass for nuts and gland shall conform to ASTM V16. Valve discs shall be reversible. For use in copper plumbing, furnish gate valves with solder ends per ANSI B16.18.

C. Gate valves larger than 24-inches in water and wastewater shall be iron body, bronze mounted valves conforming in all respects to the applicable material and dimensional requirements of AWWA C500. Gate valves shall have an 0-ring or self-adjusting chevron packing stem seal, and 125-pound flanged ends per ANSI B16.1, except for valves to be buried underground, which shall have mechanical joint ends per ANSI A21.11 (AWWA C111). Body seat rings shall be ASTM B62 bronze and be screwed into the body so as to be field replaceable. Disc faces and all moving parts shall be bronze or bronze mounted. Cast iron for body and bonnet shall conform to ASTM A126, Grade B.

D. Gate valves in sizes 2 through 24-inches for use in water and wastewater shall be of the ductile iron body, resilient seated type, manufactured in conformance with AWWA C509. Gate shall be of ductile iron with bonded resilient seat and integral flush drain. Minimum working pressure shall be 200 psi when unbalanced pressure is applied to either side of the gate. Gate valves shall have a minimum of two 0-ring stem seals; one above and one below the integral stem collar. The area between the 0-rings shall be filled with permanent lubricant. Valve shall have no metal fasteners or screws exposed in the wetted portion of the valve. All ferrous surfaces shall be shot-blasted to a white metal finish. All interior and exterior valve surfaces, including the interior of the gate and all bolt holes shall be coated with an epoxy coating in accordance with AWWA C550. The minimum thickness of the coating shall be 8 mils. Valve ends shall be of the type required for the installation as specified herein or shown on the Drawings and meet the requirements as specified in Paragraph C of this section.

E. Gate valves 3-inches in size and larger in steam service shall have 125-pound cast iron body, bronze trim, and outside stem and yoke.

F. Furnish gate valves with nut, wrench, chain, or handwheel operators as shown on the Drawings. Unless otherwise shown or specified, valves shall have operators as specified in this section. Extension stems, floor stands, and valve boxes and covers shall be furnished where shown or required.

G. Resilient wedge valves for buried service 16-inch diameter and larger shall have bevel gear operators, unless otherwise noted.

2.3 BUTTERFLY VALVES

A. Unless otherwise shown or specified, butterfly valves shall be of the resilient seated, tight-closing type and conform in all respects to the applicable material and dimensional requirements of AWWA C504. Wafer-type butterfly valves in sizes 24-inches and larger shall conform to all general requirements of AWWA C504 except laying length. Butterfly valves shall operate from fully open to fully closed with a 90-degree rotation of the valve stem.

B. Valves shall be designed for the working pressures and/or pressure class designations shown on the Drawings or specified in these Specifications. If a working pressure or pressure rating is not given, the following requirements shall apply:

Service	AWWA Pressure Rating
Low Pressure Air	25B
Wastewater or Sludge	150B
Potable or Plant Water	150B

C. Wafer type valves shall have a pressure rating of not less than 150 psi. Valves shall be drip-tight and bubble-tight at rated pressure differential across the valve in both directions.

D. Valve body shall be one-piece, constructed of cast iron conforming to ASTM A126, Class B. The diameter of the opening shall be not less than the diameter of the corresponding pipe size. Unless otherwise specified, valve body shall be of the short- body style in accordance with Table 2 of AWWA C504. This requirement shall not apply to wafer type valves. No part of the valve internals shall extend beyond the valve ends when the valve is in the closed position. Short-body valves shall have 125-pound flanged ends per ANSI B16.1. Wafer type valves shall be designed to fit between 125- pound flanges per ANSI B16.1.

E. Disc shall be cast bronze conforming to ASTM B143, Alloy 1A, cast iron conforming to ASTM A126, Class B, Ni-Resist cast iron conforming to ASTM A436, Type 1 or 2, or Ni-resist ductile iron conforming to ASTM A439, Type D2. When used in wastewater or raw water, disc shall be streamlined with no exterior ribbing or openings.

F. Shafts shall be polished stainless steel conforming to ASTM A276, Type 304 or Type 316. All keys and pins used in securing valve disc to shafts shall be stainless steel or monel.

G. Valve seat shall be one-piece, molded synthetic rubber, Buna-N (Hycar) for wastewater and Buna-N or neoprene for air. Where temperatures exceed 180°F, EPT or Viton seats shall be used. Retaining rings, if used, shall be stainless steel. The method of mounting valve seat shall conform to the applicable requirements of AWWA C504, Section 3.5. Valve seats in sizes 24-inches and larger shall be field replaceable without necessity of chipping, burning, or cutting. Seats secured with retaining rings shall be fully adjustable. Metal seat mating surfaces shall be smoothly contoured and polished 18-8 stainless steel or monel. Alloy cast iron will not be acceptable as a seat mating surface. Sprayed or plated seat mating surfaces will not be acceptable.

H. Shaft seals shall be 0-ring or self-adjusting chevron packing of Buna-N or neoprene. Shaft seals shall conform to the requirements of AWWA C504, Section 3.7, and shall be of a design that allows replacement of the seal without removing the valve shaft. Alternately, pull-down packing is acceptable if the packing is adjustable and replaceable without removing valve operator.

I. Valve bearings shall be self-lubricating, sleeve-type bearings of corrosion resistant materials. Bearing load shall not exceed 2,500 psi. Provide valves 24-inches in size and larger with an adjustable, two-way thrust bearing to center the disc in the valve and allow the valve to be installed with the valve stem vertical. Bearing shall be easily accessible for adjustment.

J. Where the valve is installed adjacent to a fitting, flow meter, another valve, or similar items, furnish a spool piece or adaptor coupling as a spacer so that valve disc does not interfere with the operation of the adjacent meter or valve or contact cement linings on pipe or fittings.

K. Furnish valve with a lever operator, rotary manual operator, electric motor operator, or pneumatic cylinder operator as shown on the Drawings. Unless otherwise shown or specified, furnish a lever operator on valves 6-inches and smaller and a rotary manual operator on valves 8-inches and larger. Furnish extension stem and floorstand where shown or required.

L. Butterfly valves for drinking water service shall be coated interior and exterior with 10 mils, minimum, of TNEMEC Potapox 20, fully compliant with AWWA C550.

M. Butterfly valves shall be as manufactured by Dezurik, Pratt, Golden Anderson, or Engineer approved equal.

2.4 TWO-WAY PLUG VALVES

A. Two-way plug valves, unless otherwise shown or specified, shall be of the eccentric, non-lubricated type with resilient, neoprene-faced or epoxy-coated plugs providing drip-tight shut-off at rated pressure. Port area shall not be less than 100 percent of the corresponding full pipe area in sizes 16- inches and smaller and 100 percent of the corresponding full pipe area in valves 18- inches and larger. Two-way valves shall operate from fully open to fully closed with a 90-degree rotation of the valve stem.

B. Valves shall be designed for a working pressure of not less than 175 psi in sizes through 16-inches and 150 psi in sizes 18-inches and larger. Valves shall be drip-tight at rated pressure differential in both directions.

C. Valves shall have bodies of ASTM A126, Grade B or ASTM A48, Grade 40 cast iron. Valves 4-inches and larger in size shall have bolted bonnet.

D. Body seats for resilient-faced plugs shall be welded in and contain a minimum of 90 percent nickel. Welded-in seats shall conform to the applicable requirements of AWWA C507, Section 3.2 and AWWA C504, Section 3.5.

E. Plugs without a resilient coating or facing shall be epoxy coated and shall have a field replaceable, full-circle rubber seat securely attached to the plug. Body seats shall be nylon coated.

F. Shaft seal shall be of the self-adjusting or split-V type of Buna-N and shall comply with the applicable requirements of AWWA C504, Section 3.7 and AWWA C507, Section 3.2. Seals requiring adjustment shall be adjustable and replaceable without bonnet or shaft removal.

G. Supply bearings in both the upper and lower journals. Bearings shall be permanently lubricated and replaceable with stainless steel, bronze, or specially coated corrosion resistant sleeves and bushings. Bearings shall conform to the applicable requirements of AWWA C504, Section 9 and AWWA C507, Section 8.

H. Valves sized 2 1/2-inches and smaller shall have threaded ends per ANSI B2.1. End connections for valves sized 3-inches and larger shall be 125-pound flanged per ANSI B16.1, except for valves to be buried underground, which shall have mechanical joint ends per ANSI A21.11 (AWWA C111). Flanged end valves in sizes 12- inches and smaller shall have a laying length equal to that of an AWWA gate valve of the same size.

I. Valves intended for buried or submerged service shall be sealed against the entrance of water and dirt.

J. Furnish valves with a lever operator, rotary manual operator, or electric motor operator as shown on the Drawings. Unless otherwise shown or specified, a lever operator shall be furnished on valves 6-inches and smaller, and a rotary manual operator with handwheel shall be furnished on valves 8-inches and larger. Extension stem, floorstand, and valve box shall be furnished where shown or required.

K. Two-way plug valves shall be DeZurik, Golden Anderson, or Engineer approved equal.

2.5 CURB STOPS AND CORPORATION STOPS

A. Curb stops shall be of all-bronze construction with straight-through unobstructed pattern flow, Teflon-coated plug, top and bottom 0-ring plug seals, 0-ring port seals, and solid tee handle. Valves shall be suitable for 175 psi minimum working pressure. A quarter turn shall operate the valve from fully open to fully

closed position. Valves shall comply with the applicable requirements of AWWA C800.

B. Furnish curb stops with cast iron foot pieces to permit the curb box to rest on a solid surface without bearing on the curb stop or piping.

C. Curb boxes shall be of cast iron, have a 2-inch inside diameter, and be of the extension type with lid and plug. One compatible steel shut-off rod of suitable length shall be furnished. Coat curb boxes and bases with a suitable bituminous coating.

D. Corporation stops for service line connections shall be precision fitted, individually lapped, ground joint key stops of all bronze construction. For tapped connections to water mains, inlet threads shall be of the steep taper, corporation stop type. Corporation stops shall conform to the applicable requirements of AWWA C800.

2.6 AIR RELEASE VALVES

A. Air release valves shall have nylon or stainless steel body and cover, stainless steel float, stainless steel or bronze trim, and Buna-N seat. All other attaching parts or internal parts shall be stainless steel.

B. Valve shall be designed for a working pressure of 0 to 150 psi unless otherwise shown or specified and shall be equipped with an orifice appropriate to the venting needs of the pipeline.

C. Sewage valves shall be equipped with an elongated body, a 2-inch NPT inlet connection, and a 1/2-inch NPT outlet connection and shall be provided with 2-inch inlet shut-off valve, 1-inch blow-off valve, and 1/2-inch back-flush valve with quick-disconnect coupling and flushing hose with quick-disconnect connections.

D. Air release valves shall be installed in valve pit, complete with tapping saddle and connecting line to main, gate valve, etc., and at the location(s) shown on the Drawings. Valves 2- inches and smaller shall have NPT screwed inlet. Combination air vacuum/air release valves shall be ARI, or Engineer approved equal.

2.7 PRESSURE REDUCING VALVES FOR WATER

A. Pressure reducing valves shall automatically reduce a higher inlet pressure to a preset, steady outlet pressure. The reducing valve shall be very sensitive to slight pressure changes and immediately control the main valve to maintain the desired pressure. Valve outlet pressure shall be adjustable between 3 and 30 psi.

B. The main valve shall be direct acting, single seated, spring-loaded, diaphragm-actuated, globe type valve. When the downstream pressure exceeds the pressure setting, the main valve shall close drip-tight. Piston actuators will not be acceptable. Main valve shall be guided at two locations. No external packing glands shall be used and the diaphragm shall not be used as a seating surface.

C. Pressure reducing valves sized 2-inches and smaller shall have cast bronze body; stainless steel seat ring; Teflon, Buna-N, or composition disc and diaphragm; and outside screw adjustment. Valves shall be suitable for 230-psi inlet pressure. Valves shall be furnished with threaded ends per ANSI B2.1.

D. Pressure reducing valves 3-inches and larger shall have cast iron body, bronze trim, bolted cover, and pilot-controlled main valve. The pilot control system shall be external, connected to the valve with union fittings. Pressure setting shall be adjustable by a single screw adjustment enclosed in a tamperproof housing. Valve shall be suitable for an inlet pressure of not less than 175 psi. Valves sized 2 1/2-inches shall have threaded ends per ANSI B2.1. Valves 3-inches and larger shall have 125-pound, flanged ends per ANSI B16.1. Valve body and cover shall be of cast iron conforming to ASTM A48. Valve trim and pilot control shall be of ASTM B61 or B62 bronze. Pilot control trim shall be stainless steel. Pilot valve shall be supplied with an integral strainer constructed of heavy and fine mesh monel screens to protect the pilot control system from foreign particles. Pilot-controlled valves shall be GA Industries Fig. 45-D, or Engineer approved equal.

E. A separate Y-pattern strainer with threaded or bolted cleanout shall be furnished and installed immediately upstream of each pressure reducing valve. Area through the screen shall be not less than 4 times the full pipe area. Strainers shall have a pressure rating not less than that of the protected pressure regulating valve.

F. A 2-inch pressure gauge with tee-head, bronze gauge cock shall be installed on the upstream and downstream side of each pressure regulating valve unit. Pressure gauges on the upstream side shall have a range of approximately 0 to 160 psi. Pressure gauges on the downstream side shall have a range of approximately 0 to 80 psi.

2.8 BALL VALVES

A. Ball valves shall be of the quarter turn type with full pipe size opening through the valve. Ball valves shall be suitable for a differential working pressure in either direction of not less than 400 psi.

B. Ball valves shall have a three-piece, bolted body designed to allow the interior portion of the valve to be removed without disturbing adjacent piping.

C. Unless otherwise specified or required, ball valves shall have brass body, self-aligning brass ball, blowout-proof brass stem, reinforced Teflon seats and seals, plastic-coated plated steel handle, and threaded ends per ANSI B2.1.

D. In stainless steel piping, or where specified, valve shall have a forged Type 316 stainless steel body, ball, and trim.

2.9 CHECK VALVES

A. Check valves shall be of the swing type suitable for use in either horizontal or vertical piping, unless otherwise shown or specified. Disc shall swing entirely clear of the path of flow when in the open position. All internal parts shall be readily accessible and easily replaced in the field.

B. Check valves in sizes 2 1/2-inches and smaller shall be Y-pattern, regrinding, bronze body, and bronze mounted valves. Valves shall have 200-pound cast bronze body, renewable bronze disc, screwed cap, and threaded ends per ANSI B2.1. Bronze for body and cap shall conform to ASTM B61. Brass nuts and pin shall conform to ASTM B16. Valves shall have a hinge bumper capable of preventing the valve from sticking in the open position and an arrow cast on the valve body to indicate direction of flow.

C. Check valves in sizes 3-inches and larger shall be iron body, bronze mounted valves conforming to AWWA C508, epoxy-coated inside and outside. Valves shall have 125-pound cast iron body, bolted and gasketed cover, stainless steel or bronze hinge pin, rubber faced, renewable, bronze or cast iron resilient disc, renewable bronze seat ring, outside lever and adjustable weight, and 125-pound flanged ends per ANSI B16.1. Cast iron for body and cap shall conform to ASTM A126, Grade B. Bronze for disc and seats shall conform to ASTM B584. Iron body check valves shall be Golden Anderson, or Engineer approved equal.

D. Valves shall be installed with pressure under the disc.

E. Check valves in air or gas piping sized 2 1/2-inches or smaller shall be bronze, swing type check valves conforming to the requirements of Item B above, except that the disc shall have a replaceable, resilient seat of Buna-N or Teflon. Bronze check valves for air or gas service shall be Nibco Fig. T-453-W, Kennedy Fig. 442, or equal.

F. Check valves in air or gas piping sized 3-inches and larger shall be of the double plate, spring-loaded, clapper type with cast iron body, aluminum, bronze or bronze plates, stainless steel hinge pin and springs, and Buna-N seats. When operating temperatures exceed 180°F, Viton seats shall be used. Check valves shall be wafer style bodies suitable for mounting between two 125-pound ANSI B16.1 flanges. Check valves shall be rated for a working pressure of not less than 150 psi. Install clapper style check valves in horizontal piping with the pin in a vertical position.

2.10 HOSE BIBBS

A. Hose bibbs shall be angle hose valves of bronze construction suitable for 125 psi minimum working pressure. Valves shall have a renewable Teflon or resilient disc and shall be furnished with a 3/4-inch male hose outlet connection. Body and bonnet shall be ASTM B62 bronze. Valves shall be furnished with a suitable cap and chain. Inlet connection shall be threaded per ANSI B2.1.

2.11 ALTITUDE VALVES

A. Altitude valves shall be single-acting, hydraulically operated, pilot actuated, diaphragm or piston type globe valves designed for ground level control of water level in storage tanks. Valve shall be of the non-throttling differential type and shall be air and water cushioned on closing to prevent surges on shutoff. Valve shall be suitable for 175 psi working pressure. Operating point and closing speed shall be adjustable.

B. Valve shall have a cast iron body and bolted bonnet conforming to ASTM A126, Class B, bronze pilot control valve and main valve trim, resilient seat disc, stainless steel pilot trim, and reinforced synthetic rubber diaphragm. Seat ring, disc, and diaphragm shall be removable without removing the valve from the line. Piston type valves shall be constructed with removable resilient seals and guides to prevent metal-to-metal contact. No external packing glands shall be used and the diaphragm shall not be used as a seating surface. Main valve stem shall be guided at both ends. Pilot control shall be three-way, hydraulically balanced, diaphragm type.

C. An indicator rod shall be provided to show valve position. A fine mesh stainless steel or Monel strainer shall be provided in the control piping. A 4 1/2-inch pressure gauge calibrated in both psi and feet of water shall be provided on both sides of the altitude valve.

D. Valve shall be furnished with 125-pound flanged ends per ANSI B16.1.

E. A standard repair kit shall be supplied for the altitude valve. Kit shall include liner cap, seat ring, cover gasket, indicator packing, vent packing, and piston cup for main valve, seat ring, lower packing, upper packing, stem gasket, and diaphragm for pilot.

F. Altitude valves shall be GA Industries Figure 3200-D; or approved equal.

2.12 FLAP VALVES

A. Flap valves shall be designed to withstand the stresses resulting from high-head seating applications and to maintain sensitivity to unseating heads.

B. Flap valves shall have iron bodies and shall be bronze mounted. Valves shall be furnished with bronze hinge pins, flap rings, and seat rings.

C. Valves shall be furnished with 125-pound flanged ends per ANSI B 16.1.

2.13 KNIFE GATE VALVES

A. Knife gate valves shall be of the flanged wafer type with outside stem and yoke and a metal-seated, knife-blade gate with a beveled edge designed to push aside or cut through solids in its path. Knife gate valve shall have full round port opening and shall have a working pressure of at least 125 psi in sizes 10-inches and smaller and 50 psi in sizes 12-inches and larger. Valves shall be capable of providing bi-directional, drip tight shutoff.

B. Knife gate valves shall have a heavy, one-piece body and end flanges of steel or cast iron. Valves shall be lined throughout with stainless steel, including the chest and packing areas. Liner shall extend beyond flange to form raised face mating surface. Knife gate shall be of ground and polished stainless steel of sufficient thickness to resist deformation of rated pressure across the gate. A full circle, raised-face seat with machined gate jambs at the sides and bottom shall be provided to hold the gate and assure positive seating. Seat shall have a neoprene or Buna-N elastomer D shaped ring recessed into the face of the valve

seat for a driptight shutoff. All wetted parts of the valve shall be of Type 304 stainless steel.

C. Knife gate shall be sealed with a minimum of four rings of Teflon or neoprene-impregnated asbestos packing. Gland shall be of corrosion-resistant material or shall be specially coated for corrosion resistance. Gland bolts and nuts shall be stainless steel.

D. A heavy, fabricated, angular steel yoke assembly with stainless steel rising stem and bronze yoke sleeve shall be provided on the valve. Valve shall be provided with handwheel operator or extension stem and floorstand as shown on the Drawings. Valves 24-inches and larger shall have a geared operator.

E. Ends of the valve shall be flanged and shall be drilled to mate with 125-pound cast iron flanges per ANSI B16.1.

F. Knife gate valves shall be Orbinox, Dezurik, Fabri-Valve, or Engineer approved equal.

2.14 MANUAL VALVE OPERATORS

A. All gate valves shall be furnished with manual operators as follows, unless otherwise shown or specified:

B. Operating nuts for buried or submerged valves shall be standard 2-inch square nuts and shall conform to AWWA C500, Section 19. Extension stems, valve boxes, and stem guides shall be furnished where shown, specified, or required for proper operation.

C. Manual rotary operators for buried or submerged service shall be totally enclosed and completely sealed to prevent the entrance of water and dirt. Buried or submerged operators shall be finished on the outside with a bituminous or other approved coating. Rotary operators for buried or submerged service shall be capable of withstanding 300 foot-pounds of torque on the operating nut or handwheel. A corrosion-resistant, dial type valve position indicator shall be provided at the operating nut on the extension stem of buried operators to provide a remote indication of valve position.

D. All manual rotary and lever operators shall be capable of seating or unseating the valve disc under the most adverse conditions in the particular application with not more than an 80-pound pull on the handwheel or lever. Valve operators shall be capable of holding the valve in any position between fully open and fully closed without creeping or fluttering. Operators shall be provided with adjustable, mechanical, stop-limiting devices to prevent over-travel of the valve disc in the open and closed positions. Manual rotary and lever operators shall comply with all applicable requirements of AWWA C540, Sections 11.1, 11.2, and 11.3.

2.15 VALVE BOXES

A. All buried valves shall be provided with three-piece, cast iron, extension sleeve type valve boxes suitable for the depth of cover shown on the Drawings.

B. Valve boxes shall not be less than 5- inches in diameter, shall have a minimum thickness of 3/16-inch at any point, and shall be provided with suitable cast iron bases and covers. Covers shall have cast thereon an appropriate name designating the service for which the valve is intended ("W" for water, "S" for drain or waste lines). Covers in roadways shall be of the deep locking type.

C. All parts of valve boxes, bases, and covers shall be heavily coated with a suitable bituminous finish.

D. Valves and boxes shall be set plumb. Each valve box shall be placed directly over the valve it serves with the top of the box flush with the finished grade.

2.16 T-HANDLE OPERATING WRENCH

A. Furnish two T-handle, steel valve operating wrenches with sockets compatible with standard 2-inch square valve operating nuts.

B. The operating wrenches shall be at least 36-inches in length.

2.17 SPARE PARTS

A. Furnish the following spare parts where applicable for the valves specified herein:

1.	Stem packing	One set each type and size of valve
2.	Renewable stainless steel or bronze seat ring	One each type and size of valve
3.	0-ring stem or shaft seals	One set each type and size of valve
4.	Resilient seat or disc	One each type and size of valve
5.	Shaft bearings or bushings	One set each type and size of valve
6.	Hinge pin, disc, spring, and disc bolts	One set each type and size of check valve
7.	Gaskets	One set each type and size of valve
8.	Special tool or seat wrench required for valve servicing and maintenance	One each

B. Suitably protect spare parts against corrosion and impact to withstand long-term storage. All parts shall be clearly labeled and identified by manufacturer's name and number and the valve to which they belong.

3 EXECUTION

3.1 FACTORY TESTS

A. Test all valves at the point of manufacture for proper and unobstructed operation and for leakage and adequacy of design.

B. Test iron body gate valves in accordance with AWWA C500, Section 5.

C. Test butterfly and plug valves in accordance with AWWA C504, Section 5.

D. Test iron body check valves in accordance with AWWA C508, Section 5.

E. All other valves shall be given an operation test, a leakage test at rated pressure differential, and a hydrostatic test at two times rated pressure. During the hydrostatic test, there shall be no leakage through the metal, the end joints, or the shaft or stem seal, nor shall any part be permanently deformed. During the leakage test, leakage shall not exceed that permitted by ANSI 816.104, Class IV for metal seated valves and Class VI for resiliently seated valves.

3.2 INSTALLATION

A. Install all valves in strict conformance with the Drawings and approved Shop Drawings and manufacturer's instructions.

B. Install all underground valves using a concrete valve box with cast iron frame and cover or in a cast iron valve box as specified herein.

C. Install valves in such a way that operators and packing are easily accessible. Valves with field replaceable seats shall be installed with sufficient clearance to permit removal of valve bonnet and stem without removing valve from the line.

D. Field measure and carefully coordinate stem size and threading where new operators are to be installed on existing valves.

3.3 FIELD TESTING

A. Following installation, test all valves under the anticipated operating conditions. The ability of the valves to operate properly without leakage, binding, sticking, fluttering, or excessive operating torque shall be demonstrated to the satisfaction of the Engineer. At Contractor's expense, adjust and/or replace any valve as necessary to ensure satisfactory operation.

END OF SECTION

SECTION 43 2113

VERTICAL TURBINE PUMPS

PART - 1 GENERAL

1.1 SCOPE OF WORK

A. Furnish, install, and test one (1) complete water-lubricated, open line shaft, multi-stage vertical turbine pumps, motors, and accessories. Pumps shall be suitable for pumping raw water. Install pumps as shown on the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Division 26 - Electrical

1.3 QUALITY ASSURANCE

A. Pump shall be furnished by a manufacturer regularly engaged in the manufacture of pumping equipment.

B. Pumps shall be designed to perform satisfactorily with a reasonable service life when operated either continuously or intermittently in typical services.

C. Factory Testing. The pump shall be fully tested on water at the manufacturer's plant before shipment. Witnessed tests shall consist of checking the unit at its rated speed, head, capacity, efficiency, and brake horsepower, and at such other conditions of head and capacity to properly establish the performance curve (8 points minimum). Certified copies of test curves shall be submitted to Engineer. The standards of the Hydraulic Institute shall govern the procedures and calculations for these tests.

D. Field Testing. The installed pumps shall be field tested in accordance with the specifications of this section and the requirements of the pump and motor manufacturer, whichever more stringent. Field tests shall include vibration, alignment, alarm and protective functions, and pump performance.

1.4 SHOP DRAWINGS AND ENGINEERING DATA

A. Submit complete shop drawings and engineering data to the Engineer in accordance with the requirements of Section 01 3323, Shop Drawings, Product Data, and Samples.

B. Submit complete detailed equipment, hydraulic, and electrical diagrams and a functional description of the pumping system, as indicated on the Drawings and described herein. Information shall include but not be limited to:
   1. Complete detailed equipment, hydraulic and control diagrams, ventilation, electrical diagrams, and specifications.
   2. Pump data, including certified pump efficiency, flow, NPSH required, and horsepower curves.
   3. Complete sectional detail drawings showing the placement of all equipment.

4. Instructions for operating pumps under all design conditions.
5. Lubrication, maintenance, and trouble-shooting instructions complete with necessary diagrams and schematics.
6. Complete parts list with cross-section schematics.
7. Complete wiring schematics for motors, motor controls, and other electrical components supplied with the pump systems, including interface details of the motor control system starting equipment.

C. Show predicted pump performance characteristics with pump operating point plotted for each size and capacity pump specified. Show pump inlet, bowl, column, and discharge head losses. Curves for variable speed pumps shall be provided at 100-rpm intervals between the minimum and maximum speeds required to achieve the specified operating conditions. Manufacturer's recommended operating range for stable operation and prevention of surge, cavitation and vibration shall be provided. Under no circumstances shall the manufacturers recommended operating range be less than that required to meet the pump operating conditions specified.

D. The manufacturer shall state the minimum submergence required for the proposed equipment.

E. Submit NPSH curve. NPSHr margin calculations shall be performed in accordance with the following: The acceptable minimum NPSHa less NPSHr margin shall be 5 feet at any specified operating condition falling within 75 percent and 125 percent of best efficiency capacity at the speed required to achieve the specified operating condition, and not less than 8 feet for any specified operating condition falling outside that zone.

F. Prior to the manufacture of the pump, the pump manufacturer shall submit a technical report to the Engineer with the required dynamic analysis outlined below. The dynamic vibration analysis of the pump and motor system shall be conducted by a 3rd party, such as Mechanical Solutions Inc. of Whippany, NJ, and the pump manufacturer will collaborate with the 3rd party by providing the information required to perform the analyses. To comply with the following pump-system dynamics requirements, the pump manufacturer will provide all necessary pump components either through 2D drawings and/or 3D solid models so that the natural frequencies and critical speeds of the combined pump-system can be accurately predicted. Motor weight, CG, reed frequency information as well and motor rotating shaft dimensions and polar moment of inertia will be required to be submitted by the selected motor manufacturer.
   1. Structural Analysis: Perform a detailed structural dynamic analysis (Finite Element Analysis or FEA) of the combined pump/motor system, including the nearby foundation and the piping out to the first restraint or expansion joint, as defined in the ANSI/HI 9.6.8 guidelines. The analysis shall not assume the foundation is rigid as a boundary condition, rather it shall incorporate the foundation design shown on the drawings. The structural dynamic analysis shall be performed using detailed 3D finite element techniques. All pump components, such as casing, bearing frame, suction cover, top cover, pump shaft, impeller, etc. will be explicitly modeled from drawings and/or solid models provided by the pump manufacturer. The model shall take account the effects of the water in the sump at both the low and high-water levels. The structural dynamic analysis shall predict that no first or second bending mode frequencies will exist within a pump speed range from +15% above max and -15% below minimum operating speeds.
   2. Lateral Rotordynamic Analysis: A lateral rotordynamic analysis of the pump rotating

assembly including the pump shaft, impeller, rotating wear rings, intermediate shaft, and motor rotor shall be conducted. The analysis shall take into account the flexibility of the bearing frame. This analysis shall identify and predict that the first lateral critical speed shall have a separation margin of at least +15% above the maximum speed or -15% below the minimum speed. If a design modification cannot resolve a separation margin deficiency or is not practical, a forced dampened response analysis shall be performed to demonstrate that the pump rotor will function properly over the speed range.

3. Torsional Rotordynamic Analysis: A torsional rotodynamic analysis of the complete rotating system including the pump rotor, motor rotor, extended shafting, drive shafts, and coupling(s) shall identify and predict that no torsional natural frequencies occur within a separation margin extending -15% below to +15% above the specified pump operating speed range. No natural frequencies shall be +/-10% of 2x time running speed, line frequency, 2x line frequency, vane pass frequency, and VFD control frequencies. If a design modification cannot resolve a separation margin deficiency or it is not practical to modify the shafting system, a forced damped response analysis shall be performed to demonstrate that infinite life will be achieved with a safety factor of at least two.
4. A detailed report will be submitted that documents the analysis techniques, assumptions, results, conclusions, and recommendations. The Campbell diagrams shall be included in the report, documenting the structural lateral, rotating component lateral, and torsional analysis results, graphically demonstrating the separation margins specified above. The analysis is to be in accordance with ANSI/HI 9.6.8-2014 Edition about Rotodynamic Pumps – Guideline for Dynamic of Pumping Machinery.

G. Submit manufacturers design and calculations for pump and motor thrust ratings, including bearing life calculations. Indicate minimum rating on motor thrust bearing and confirm proposed pump meets or exceed those requirements.

1.5 STORAGE AND PROTECTION

A. Store and protect pumps, motors, controls, and accessories in accordance with the requirements of Section 01 6600, Storage and Protection.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit complete operation and maintenance data on the pumps, motors, and controls in accordance with the requirements of Section 01 7823, Operating and Maintenance Data.

1.7 GUARANTEE

A. Provide a guarantee against defective equipment and workmanship in accordance with the requirements of Section 01 7836, Warranties and Bonds.

1.8 FACTORY TESTS

A. Test the pumps at the place of manufacture in accordance with the standards of the Hydraulic Institute for testing of pumps. When tested, each pump shall be driven by a certified motor or calibrated dynamometer.

B. Before shipment, furnish to the Engineer the pump manufacturer's certified test reports on each pump. The test reports to be certified by a corporate officer of the manufacturer and cover the following items:
   1. Capacity versus head curve U.S. gallons per minute and feet.
   2. Efficiency versus flow curve in percent.
   3. Brake horsepower versus flow curve.
   4. Speed of rotation.
   5. Impeller size and number.
   6. Required NPSH versus flow rate.
   7. Torque versus speed.

C. Submit four copies of all test reports.

D. If factory tests results fail to demonstrate compliance with the requirements of this section, modify and/or replace the deficient pump(s) as necessary at no additional cost to the Owner and resubmit certified factory test reports on each modified or replacement pump.

1.9 REFERENCE STANDARDS

A. The following reference standards apply.
   1. American National Standard Institute (ANSI)
   2. American Society of Testing and Materials (ASTM)
   3. National Electrical Manufacturers Association (NEMA)
   4. American Water Works Association (AWWA)
   5. Hydraulic Institute (HI)

PART - 2 PRODUCTS

2.1 GENERAL

A. Pumps furnished under this section shall be the product of one pump manufacturer.

   1. Pump shall be shipped as a complete unit without the need for field assembly except for mounting of the motor and accessories.

2.2 DESCRIPTION

A. Discharge Head. Discharge head shall be configured as shown on the Drawings and shall be constructed of high-grade fabricated steel, with a minimum thickness of 0.375". Discharge shall be of the above base surface type as indicated on the Drawings. A suitable motor base of standard NEMA configuration shall be an integral part of the pump head. The top of the head shall have a machined register to fit the motor, include jacking bolts. It shall be of sufficient strength to carry the complete weight of the entire pump assembly and motor and withstand the hydraulic loads imposed on it by the system. The stuffing box shall have the proper type and amount of packing to prevent excessive leakage. The head shall include a tapped opening for draining away leakage from the packing. Discharge flange shall be ANSI B16.5 Class 300 of the size and location shown. The head and motor shaft shall be ASTM A582, Type 416 stainless steel furnished with

a four-piece flanged coupling above the stuffing box and inside the pump head. The discharge head shall be machined to accept the sole plate. Lifting lugs shall be provided on the discharge head. Lugs shall be capable of supporting the entire weight of the pump assembly. All bolts and anchor bolts shall be 300 Series stainless steel. Nuts shall be of different grade and hardness than bolts to mitigate galling. The pump head shall be mounted on an ASTM A36 steel baseplate. Plate shall be machined on one side.

B. Foundation Plate. The pump manufacturer shall provide foundation plate in addition to the discharge head baseplate. The foundation plate shall be of substantial fabricated steel construction with a minimum thickness of 1.5 inches. The foundation plate shall be machined to mate with the discharge head base plate and shall be furnished with anchor bolt holes to allow field placement and leveling prior to pump installation.

C. Column Assembly. Column pipe shall have a maximum length of any section of five (5) feet. Column length shall be calculated so that bearing spacing interval shall not operate within 15 percent below or 15 percent above its first critical speed at any operating RPM. The upper end of the pipe shall be flanged to the pump head. The column sections shall be flanged on both ends. The flanges shall have machined male and female registers to ensure proper alignment after assembly. The bottom column section shall be properly adapted to connect to the bowl assembly. The column assembly shall be of the open line shaft type. Column pipe shall be steel pipe conforming to the requirements of ANSI/ASTM A53 (latest revision) Grade A or ASTM A106-58T Grade B. Column pipe shall have flanged ends and bolted together with 300 Series stainless steel bolts and nuts. Nuts shall be of different grade and hardness than bolts to mitigate galling.

Inner column shafting shall be turned, ground and precision polished 17-4PH H1075 stainless steel of ample size to operate pump without distortion or vibration. Each section of shafting shall have a tolerance of 0.001 inch in diameter and a maximum total indicator runout of 0.0003 inch. Line shaft bearings shall be mounted in ASTM B-145 bronze drop in type or integrally welded steel bearing retainers. The line shaft bearings shall be spiraled rubber. The bearings shall be press in type. Bearing retainers including bearings shall be spaced on 5-foot maximum intervals. Line shaft couplings shall be AISI 410 stainless steel and shall be keyed. Maximum shaft length shall be five (5) feet per section. The two-piece top shaft shall be 17-4PH H1075 stainless steel.

D. Bowl Assembly. The pump bowls shall be of close-grained ASTM A 48, Class 30 cast iron or ASTM A536 ductile iron and free from blow holes. Bowls shall have integrally cast diffusion vanes. Each bowl shall contain a neoprene bearing and an Federalloy C89835 bronze bearing above each impeller. The interior of the pump bowls shall be furnished with an enamel or porcelain coating. Each bowl shall include lateral seal wear ring, Type 416 stainless steel. Each bowl assembly shall include a sand collar of bronze, ASTM B 505, Alloy 836.

1. Impellers shall be of Aluminum Bronze C952 accurately machined, finished, mechanically and dynamically balanced. The impellers shall be of the enclosed design and polished for maximum efficiency. Impellers shall be fastened by ASTM A 582, Type 303 stainless steel key to a 17-4PH stainless steel shaft.
2. The suction manifold shall be of the bell design and made of ASTM A 48, Class 30 cast iron and include permanently greased Federalloy C89835 bronze.

E. Strainer. The strainer shall be of the basket, clip-on type constructed of ASTM A 743, Type 316 stainless steel. The openings of the strainer shall be at least four times the impeller eye area. Include vortex suppressor on each pump.

F. Motor. The motor shall be premium efficient, 3 phase, 60 hertz, 460 volts, vertical hollow shaft extra-high thrust type rated for continuous duty. Minimum motor efficiency at full load rpm shall be 95 percent with a minimum power factor of 86 percent. Motor shall be equipped with sensing devices to activate an alarm and shut down the motor for the following conditions:

1. Winding over temperature (RTDs), 100-ohm Platinum.
2. Bearing over temperature (RTDs), 100-ohm Platinum.
3. Excessive Vibration Switch & Monitor, equal to Robertshaw 566-A1, 4-20 mADC output, 120 VAC reset coil, space heater, 110/1/60 power, 0 to 15-second start-up delay function.
4. Excessive Vibration Switch, equal to Robertshaw 365-A8-H, SPDT output, 120 VAC reset coil, space heater, 110/1/60 power, 0-to-4-minute start-up delay function. Set point adjustment to be recommended by pump/motor supplier.

Motor shall be equipped with anti-friction bearings, and a lower steady bushing. The spherical roller type thrust bearings shall be oil lubricated and shall have an AFBMA minimum B10 life rating of 5 years and B50 life of 25 years based on the maximum thrust at the specified design operating conditions. Synthetic oil lubrication shall be contained in an oil reservoir with sight level gauge and fill and drain openings with plugs. Synthetic oil shall be suitable for the thrust conditions required. Bearing calculations shall be certified and submitted to Engineer for review and approval. Bearings shall be insulated.

The base shall have a machined register to fit on the pump discharge head. The motor shall be NEMA Design B, with a maximum temperature rise of 80C over 40C ambient. Insulation shall be Class F or better. Motor insulation shall be designed to meet NEMA MG 1, Part 31 (1600-volt peak at a minimum of 0.1 microsecond rise time). RTDs shall be provided in the stator windings (2 per phase) and in the upper and lower bearings.

All internal surfaces shall be coated with epoxy paint. It shall be Type I weather protected and the nameplate rating of the motor shall not be exceeded at any pump operating condition. Motor shall have a service factor of 1.15 or greater on sine wave power and 1.0 on inverter power.

Provide a suitably sized motor junction box. Coordinate with the Drawings for size and number of conduits. Contractor to coordinate with the electrical subcontractor.

Motors shall be supplied with a non-reverse ratchet. Motors shall be furnished with space heaters to provide sufficient wattage to maintain the internal temperature of the motor at a level approximately 10°C above the ambient temperature while the motor is not in operation. Space heaters shall be of the silicone rubber strip type attached directly to the stator end turns and the leads shall be brought out to an auxiliary terminal box. Space heaters shall be rated for operation on a single phase, 60 hertz, 120-volt system. The unit shall meet applicable requirements of the latest NEMA standards. Conduit boxes shall be suitable for conduit number and size entry as shown on the plans.

The horsepower rating shall be such that the motor will not be overloaded beyond the nameplate horsepower rating at a point along the design pumping curve. Motor shall be

specifically designed for operation with a variable frequency drive and shall meet NEMA MG-1 Part 31. Inverter duty motors shall be provided with Type 2 thermal protection as specified in NEMA MG 1-12.53.2. Sound pressure levels shall be measured according to IEEE 85 and shall not exceed 85 decibels as measured on the A-Weighted Scale at five (5) feet from any motor surface under no load, free field conditions.

All motors shall be given a complete initial test in accordance with IEEE 112 method B and shall include the following items: Current Balance, High Potential Test, Vibration Test, Winding Resistance, Locked Rotor Current, No Load Running Current, Full Load Heat Run, Full Load Percent Slip, Efficiency at 100%, 75% and 50% Load, Power Factor at 100%, 75% and 50% Load. Three (3) copies of certified test reports shall be submitted to the purchaser upon completion of all required tests.

G. Surface Preparation and Shop Painting. All surfaces shall be properly prepared, primed, and painted by the pump manufacturer as part of the work under this section. All surfaces in contact with the liquid shall be prepared, primed, and painted. Steel fabrications shall be prepared to SSPC-SP10 specifications. Cast or ductile iron shall be prepared to NAPF 500-03. First coat shall be TNEMEC V140/N140-1255 Pota-Pox Plus at C 6.0-8.0 mils DFT, or equal. Second coat shall be TNEMEC V140/N140-15B1 Pota-Pox Plus at 6.0-8.0 mils DFT, or equal. The epoxy coating shall be approved for potable water in compliance with NSF and AWWA standards and a certification of this compliance shall be provided. As a minimum, surfaces to be coated include the discharge head interior and exterior, column pipe interior and exterior, interior, and exterior of bowls.

H. A glycerin filled indicating pressure gauge shall be installed on the discharge flange of each pump. Gauges shall have Type 316 stainless steel movement and stainless steel or alloy case. Except as otherwise indicated, gauges shall have a 1/4-inch threaded connection and a Type 316 stainless steel snubber adapter. Gauges shall be calibrated to read with an accuracy of ± 0.5 percent of the indicated pressure. Gauges shall be vibration and shock resistant. Gauges shall have a 4-1/2-inch diameter dial and shall be furnished with stainless steel diaphragm seals and needle valve shut-offs. Discharge gauges shall be pressure type, calibrated over the appropriate operating head ranges specified for each pump. Gauges shall have a range of 0-300 psi. Gauges shall be Trerice, 450LFSS.

I. An adequately sized air and vacuum valve shall be furnished by the pump supplier. A 304 stainless steel ball valve and SCH40 stainless-steel threaded nipples shall be provided. Pump discharge head shall include a welded boss connection with NPT threads.

2.3 PUMP CHARACTERISTICS SCHEDULE

Description	Raw Water Pumps
Number Pumps Required	1
Continuous Flow 1 (primary duty), gpm:	5,600
Head 1, feet:	492
Minimum Efficiency @ Flow 1, %:	82
Maximum NPSHr, Duty 1	16
Continuous Flow 2 (maximum duty), gpm:	6,200
Head 2, feet:	445

Maximum NPSHr, Duty 2	25
Continuous Flow 3 (minimum duty), gpm:	4,100
Head 3, feet:	568
Maximum NPSHr, Duty 3	25
Minimum Shutoff, feet:	660
Discharge Flange, Diameter inches x Class:	18 x ANSI B16.5 Class 300
Minimum Column Diameter, inches:	18
Motor Horsepower:	900
Motor Speed, Nominal RPM:	1,200
Power Supply: Volts, Phase, Hertz	460V, 3 phase, 60 Hz

The above specified operating points (1, 2, and 3) shall be within the preferred operating region (POR). The performance specified above is at the bowl discharge.

2.4 MANUFACTURER SCHEDULE

Manufacturer	Model No.
Peerless	24MA-18HH

PART - 3 EXECUTION

3.1 SYSTEM INSTALLATION

A. Comply with all handling and installation procedures recommended by the pump system manufacturer. Pumps shall be connected to the pipe system without placing any strain on either the pump or pipe system. Mount the electrical controls and perform necessary wiring to connect the pumps to the electrical service. Connect motor condition sensing devices to the pump control panel or variable frequency drive enclosure as shown on the plans.

B. Following installation, the pumps and controls shall be thoroughly checked out and tested by a qualified field representative of the pump manufacturer. The manufacturer's representative shall furnish the Engineer with a written certification of satisfactory installation.

3.2 TESTING

A. The pump Supplier shall perform, in the pump manufacturer’s shop, the pump running test in accordance with the procedures of the Hydraulic Institute Standards ANSI/HI 14.6, acceptance level 1U. Pump tests shall be witnessed. The Contractor shall be responsible for all costs associated with inspection and testing of materials, products, or equipment at the place of manufacture. This shall include costs for travel, meals, lodging, and car rental for three (3) Owner-designated inspectors for the number of days required to complete such inspections or observations, if the place of manufacture, fabrication and factory testing is more than one hundred (100) miles outside the geographical limit of the project site. Witnessed pump performance tests shall be in accordance with the applicable ANSI/HI test standard.

B. NPSHR tests shall be performed using the method described for Figure 2.6.4 in ANSI/HI 2.6. All NPSHR tests shall extend from 10 percent to 120 percent of Best Efficiency Flow at full speed. Not less than ten data points shall be developed during the test. Failure to achieve guaranteed performance (capacity and head, efficiency, nameplate horsepower or NPSHR) shall be cause for rejection. Tolerances shall be the most restrictive set forth in the applicable standard.

C. All test procedures shall be in strict conformance with the referenced standards, except prediction of performance of a trimmed impeller from test data of the larger impeller will not be permitted. If trimming is required, the pump shall be retested. Under no circumstances shall deviations from specified operating conditions, though allowed by the referenced standards, result in overload beyond rating of the driver furnished with the equipment, nor shall such deviations result in power requirements greater than the driver's nameplate rating.

D. Each pump shall be performance tested at design speed and rated conditions using a certified motor or a calibrated dynamometer. Under no circumstances shall the motor nameplate rating, not including the service factor, be exceeded at any point along the design curve. Pumps may be tested with a shorter base to bell length if necessary to accommodate Supplier's test facility.

E. The Supplier shall submit complete pump test reports, including test arrangement, instrumentation and calibration data, test procedures, test data, and data-reduction calculations. Performance test data shall be plotted in curve form with the guaranteed design points shown. Pump pressure performance curves shall be continually rising towards shut-off. In no case shall "dips" or "dog-legs" be permissible in pump pressure performance curves and shall be cause for rejection.

3.3 START UP AND OPERATION

A. The Manufacturer to furnish the services of a factory-trained field engineer specializing in this work to inspect and adjust the equipment after installation, supervise start-up and instruct the Owner's personnel in its proper use. Provide a minimum of one day of operator training for both operation and routine maintenance requirements for the pumps and motors.

B. Field Tests: A 3rd party, such as Mechanical Solutions Inc. of Whippany, NJ, shall be hired by the Contractor to conduct the field test of the pumps.
   1. Test each unit under actual operating conditions to show that each pump unit operates satisfactorily without cavitation, overheating, or overloading, and free from excessive vibration and noise throughout the complete head and capacity range at rated speed.
   2. Startup, checking, and operation of the equipment over the entire speed range. Vibration requirements are as follows: Vibration of installed pumps shall be measured in accordance with Hydraulic Institute Standards 9.6.4. RMS vibration velocity on any component when the pump is operating at any specified continuous duty operating condition shall not exceed the limits established for the appropriate machine by Figure 9.6.4.2.5.1b. Vibration at the specified continuous duty operating condition points between the minimum and maximum for at least 5

pumping conditions satisfactory to the Engineer. Vibration shall be measured by the independent Troubleshooting and Engineering Firm noted above.

3. Experimental Modal Analysis (i.e., Bump Tests) is required to demonstrate there are no field installed resonant conditions due to misalignment, the foundation, or the connecting piping and its supports when operating at any speed within 10% of the specified operating range. If structural natural frequencies are detected within 10% of the running speed range, the Contractor shall retain the same independent mechanical vibration testing and analysis firm to determine if the vibrations are potentially damaging or could become potentially damaging in the future, and if so, identify the root cause of the resonance, and report the actions to be taken to correct the issue. The independent mechanical vibration testing and analysis firm shall be the same firm that completed the dynamic analysis above.
4. Pump performance shall be documented by obtaining concurrent readings, showing motor voltage, amperage, pump suction head, and pump discharge head, for at least 4 pumping conditions within the specified continuous operating range at the respective pump rpm. Each power led to the motor shall be checked for proper current balance. All motors shall be megged before start-up and results documented.
5. Determination of bearing temperatures by a contact-type thermometer. A running time of at least 20 minutes shall be maintained for this test.
6. Contractor must demonstrate, for each pump, successful operation and pump shut down of motor protective features.
7. Allow Engineer to observe field tests. Give 10 days written notice to Engineer before performing tests.
8. Demonstrate successful operation to the satisfaction of the Engineer. Make, at Contractor's expense, all necessary changes, modifications, and/or adjustments required to assure satisfactory and efficient operation.
9. The 3rd party firm shall provide a written report detailing the field test procedure and test results.

C. Pump Manufacturer's authorized representative to provide a written report to the Engineer noting that pumps and motors have been installed in accordance with manufacturer's recommendations, are in conformance with project performance requirements, and are ready for operation.

END OF SECTION