

Project Manual for:

2024 CDBG Jamestown Sewer Improvements

Bid# J-2025-1

City of Jamestown

Harvey Stowers, Mayor
Sherri Bowden, Alderman
Kaye Bridges, Alderman
James Cooper, Alderman
Becky Duncan, Alderman
Steve McCoy, Alderman

PREPARED BY:



March 2026

Set Number _____

CITY OF JAMESTOWN

2024 CDBG JAMESTOWN SEWER IMPROVEMENTS



03/09/2026

TO BID, CONTRACTOR MUST OBTAIN FROM ISSUING OFFICE

SPECIFICATIONS

This project consists of the rehabilitation of one (1) sanitary sewer lift station, approximately 1,722 linear feet of gravity sewer, and nine (9) service cleanouts utilizing cured-in-place pipe (CIPP) methods, as well as the rehabilitation of six (6) manholes using a cementitious epoxy lining system, located in Jamestown, Tennessee.

City of Jamestown

List of Contracts

16699

J-2025-1

Rye Engineering, PLC
4210 West Main Street
Erin, TN 37061

ADVERTISEMENT FOR BIDS

Project No. J-2025-1

City of Jamestown (Owner)

Separate sealed bids for 2024 CDBG Jamestown Sewer Improvements for

will be received by City of Jamestown

at the office of Jamestown City Hall; 314 E Central Ave, Jamestown TN 38556

until One o'clock P.M., C.S.T. April 9th, 2026, and then at said office publicly opened and read aloud.

The Information for Bidders, Form of Bid, Form of Contract, Plans, Specifications, and Forms of Bid Bond, Performance and Payment Bond, and other contract documents may be examined at the following:

Online at ryeengineering.com or at the Issuing Office, Monday through Friday between the hours of 8:30 am - 4:00 pm

and may obtain copies of the Bidding Documents as described below.

Copies may be obtained at the office of Rye Engineering, PLC

located at 4210 West Main Street, Erin, TN 37061 upon payment of \$ 100.00

for each set. Any unsuccessful bidder, upon returning each set promptly and in good condition, will be refunded his payment, and any non-bidder upon so returning such a set will be refunded \$ 100.00.

The owner reserves the right to waive any informalities or to reject any or all bids.

Each bidder must deposit with his bid, security in the amount, form and subject to the conditions provided in the information for Bidders.

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, Section 3, Segregated Facility, Section 109 and E.O. 11246.

No bidder may withdraw his bid within 60 days after the actual date of the opening thereof.

03/09/2026 (Date) Harvey Stowers, Mayor

INFORMATION FOR BIDDERS

1. Receipt and Opening of Bids

The City of Jamestown (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 office of City of Jamestown until one o'clock A.M./P.M., C.S.T April 9th, 2026, and then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, addressed to Mayor Harvey Stowers at 314 E Central Ave, Jamestown, TN 38556 and designated as bid for 2024 CDBG Jamestown Sewer Improvements.

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 60 days after the actual date of the opening thereof.

2. Preparation of Bid:

Each bid must be submitted on the prescribed form and accompanied by Certification of Bidder Regarding Equal Employment Opportunity, Acknowledgment Regarding Bidder SAM Registration, Certification of Bidder Regarding Section 3 and Segregated Facilities, and Drug-Free Workplace Affidavit. All blank spaces for bid prices must be filled in, in ink or typewritten, in both words and figures, and the foregoing Certifications must be fully completed and executed when submitted.

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his/her address, the name of the project for which the bid is submitted, license number, expiration date thereof, and license classification of the contractor applying to bid for the prime contract, and for the electrical, plumbing, heating, ventilation, and air conditioning contracts, and all other information required by State law..

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. Each bidder shall write on the outside of the envelope containing its bid: 1) its Contractor's license number; 2) that part of the classification applying to the bid. If this is not done, the bid will not be opened.

3. Subcontracts:

The bidder is specifically advised that any person, for, or other party to whom it is proposed to award a subcontract under this contract:

- a. Must be acceptable to the owner; and
- b. Must submit Certification by Proposed Subcontractor Regarding Equal Employment Opportunity, and Certification of Proposed Subcontractor Regarding Section 3 and Segregated Facilities. Approval of the proposed subcontract award cannot be given by the owner unless and until the proposed subcontractor has submitted the Certifications and/or other evidence showing that it has fully complied with any reporting requirements to which it is or was subject.

Although the bidder is not required to attach such Certifications by proposed subcontractors to his/her bid, the bidder is here advised of this requirement so that appropriate action can be taken to prevent subsequent delay in subcontract awards.

4. Telegraphic Modification:

Any bidder may modify his/her bid by telegraphic communication at any time prior to the scheduled closing time for receipt of bids provided such telegraphic communication is received by the Owner prior to the closing time, and, provided further, the Owner is satisfied that a written confirmation of the telegraphic modification over the signature of the bidder was mailed prior to the closing time. The telegraphic 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 telegraphic modification.

5. Method of Bidding:

The Owner invites the following bid(s):

Unit Price

6. Qualification of Bidder:

The Owner may make such investigations as s/he deems 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.

7. Bid Security:

Each bid must be accompanied by cash, certified check of the bidder, or a bid bond prepared on the form of bid bond attached thereto, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5% of the bid. Such cash, checks or bid bonds will be returned to all except the three lowest bidders within three days after the opening of bids, and the remaining cash, checks or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the contract, or, if no award has been made within 60 days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he/she has not been notified of the acceptance of his/her bid.

8. Liquidated Damages for Failure to Enter into Contract:

The successful bidder, upon his/her failure to refuse to execute and deliver the contract and bonds required within 10 days after she/he has received notice of the acceptance of his/her bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his/her bid.

9. Time of 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 180 consecutive calendar days thereafter. Bidder must agree also to pay as liquidated damages, the sum of \$ 250,000 for each consecutive calendar day thereafter as hereinafter provided in the Supplemental General Conditions.

10. Condition of Work:

Each bidder must inform him/herself 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/her obligation to furnish all material and labor necessary to carry out the provisions of his/her contract. Insofar as possible, the contractor, in carrying out the work, must employ such methods as will not cause any interruption of or interference with the work of any other contractor.

11. Addenda and Interpretations:

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

Every request for such interpretation should be in writing addressed to Seth W. Rye, P.E. and Micah Westerman, E.I. at srye@ryeengineering.com and mwesterman@ryeengineering.com 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 mailed by certified mail with return receipt requested or emailed to all prospective bidders (at the respective addresses furnished for such purposes), not later than two days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his/her bid as submitted. All addenda so issued shall become part of the contract documents.

12. Security for Faithful Performance:

Simultaneously with his/her 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. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner.

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.
- d. Stated allowances.

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. Method of Award - Lowest Qualified Bidder:

After receiving bids and determining the amount of funds estimated by the OWNER as available to finance the contract, the OWNER will award the contract to the lowest responsible bidder. The lowest responsible bidder will be determined upon the basis of the lowest base bid or lowest base bid combined with alternates (additive or deductive). If the contract is to be awarded based on the lowest base bid with alternates, alternates will be accepted in the numerical order in which they are listed in the Form of Bid.

17. Obligation of Bidder:

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

18. Safety Standards and Accident Prevention: With respect to all work performed under this contract, the Contractor shall:

- a. Comply with the safety standards provisions of applicable laws, building and construction codes and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, the requirements of the Occupational Safety and Health Act of 1970 (Public Law 91-596), and the requirements of Title 29 of the Code of Federal Regulations, Section 1518 as published in the "Federal Register," Volume 36, No. 75, Saturday, April 17, 1971.
- b. Exercise every precaution at all times for the prevention of accidents and the protection of persons (including employees) and property.
- c. Maintain at his/her office or other well known place at the job site, all articles necessary for giving first aid to the injured, and shall make standing arrangements for the immediate removal to a hospital or a doctor's care of persons (including employees), who may be injured on the job site. In no case shall employees be permitted to work at a job site before the employer has made a standing arrangement for removal of injured persons to a hospital or a doctor's care.

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, _____

as Principal, and _____
as Surety, are hereby held and firmly bound unto _____
as owner in the penal sum of _____ 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.

Signed, this _____ day of _____, 20_____.

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

NOW, THEREFORE,

- (a) If said Bid shall be rejected, or in the alternate.
- (b) If said Bid shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said Bid) and shall furnish a bond for his 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 an 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 the Surety have hereunto set their hand and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

Principal (L.S.)

Surety
By: _____

SEAL

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

BID FOR UNIT PRICE CONTRACTS

Place _____

Date _____

Project No. J-2025-1

Proposal of _____ (hereinafter called "Bidder")¹ a corporation, organized and existing under the laws of the State of _____, partnership, or an individual doing business as _____.

To the _____ (hereinafter called "Owner")

Gentlemen:

The Bidder, in compliance with your invitation for bids for the construction of a

_____, having examined the plans 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 prices stated below. These prices are to cover all expenses 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 _____ consecutive calendar days thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages the sum of \$ _____ for each consecutive calendar day thereafter as hereinafter provided in Paragraph 3.c. of the Supplemental General Conditions.

¹ _____
Insert corporation, partnership or individual as applicable.

Bidder acknowledges receipt of the following addendum:

Bidder agrees to perform all the _____ work described in the specifications and shown on the plans, for the following unit prices:

Base Bid: Gravity Sewer Rehabilitation

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Mobilization (Maximum 3% of Gravity Sewer Rehabilitation Base Bid)	1	LS		
				Dollars & Cents	Dollars & Cents
				(\$)	(\$)
2	Pre-Clean, Pre and post-CCTV, Remove Obstructions and/or perform active infiltration control measures, as needed, includes Heavy cleaning if necessary.	1,573	LF		
				Dollars & Cents	Dollars & Cents
				(\$)	(\$)
3	8" Gravity Sewer Rehabilitation including CIPP Liner installation, curing, post-CCTV, lateral reinstatement, perform physical properties testing and correct any deficiencies	1,573	LF		
				Dollars & Cents	Dollars & Cents
				(\$)	(\$)
4	Allowance for Point Repairs Found in CCTV	1	LS	Twenty-five thousand dollars and Zero Cents	Twenty-five thousand dollars and Zero Cents
				Dollars & Cents	Dollars & Cents
				(\$ 25,000.00)	(\$ 25,000.00)
SUBTOTAL OF GRAVITY SEWER REHABILITATION BASE BID					
					Dollars & Cents
					(\$)

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

Base Bid: South Main Lift Station Rehabilitation

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Mobilization (Max 3% of Lift Station Rehabilitation Base Bid)	1	LS		
				Dollars & Cents	Dollars & Cents
				(\$)	(\$)
2	Installation of new submersible pumps, piping, electrical, systems integration, controls, SCADA, Metering, fencing, site work, traffic control, bypass connection, valves, EPSC Measures, etc. as shown in the construction plans and specifications. Lump Sum Bid shall include any necessary bypass pumping required while the station is down.	1	LS		
				Dollars & Cents	Dollars & Cents
				(\$)	(\$)
SUBTOTAL OF SOUTH MAIN LIFT STATION REHABILITATION BASE BID					
					Dollars & Cents
					(\$)

(\$)

Total of All Base Bid Items Written (Dollars & Cents)

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

Additive Alternate

Item	Description	Quantity	Unit	Unit Price	Total Price
1	Clean & TV Sanitary Sewer Laterals (Lateral Launch)	9	EA		
				Dollars & Cents (\$)	Dollars & Cents (\$)
2	CIPP Lateral Lining (up to 4 LF)	9	EA		
				Dollars & Cents (\$)	Dollars & Cents (\$)
3	CIPP Lateral Lining (for each LF after 4 LF)	377	LF		
				Dollars & Cents (\$)	Dollars & Cents (\$)
4	Line Manholes with Structural Epoxy (First 4 VF)	6	EA		
				Dollars & Cents (\$)	Dollars & Cents (\$)
5	Line Manholes with Structural Epoxy (In Addition to the First 4 VF)	9	LF		
				Dollars & Cents (\$)	Dollars & Cents (\$)
6	Cut in Cleanout at STA 4+45 & Line up to cleanout	1	LS		
				Dollars & Cents (\$)	Dollars & Cents (\$)

(\$)

Total of All Additive Alternate Items Written (Dollars & Cents)

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

(Amounts are to be shown in both words and figures. In case of discrepancy, the amount shown in words will govern.)

The above unit prices 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 60 days after the scheduled closing time for receiving bids.

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

Upon receipt of written notice of the acceptance of this bid, bidder will execute the formal contract attached within 10 days and deliver a Surety Bond or Bonds as required by Article 5 of the General Conditions. The bid security attached in the sum of

_____ (\$ _____) 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: _____
(Title)

(SEAL - if bid is by a corporation)

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE



Department of Economic and Community Development

Stuart McWhorter
Commissioner

Bill Lee
Governor

October 2, 2025

The Honorable Harvey Stowers
Mayor
314 East Central Avenue
Jamestown, Tennessee 38556

Re: 2024 Jamestown CDBG – Sewer System Improvements, PO 16699
Letter of Removal of Environmental Condition (LORREC)

Dear Mayor Stowers:

On July 31, 2025, the environmental review record was received in this office. Additional documentation was received through October 1, 2025. It was determined that the above referenced project was exempt under HUD regulations 24 CFR, Part 58, Section 34 (a)(12). There being no valid objections, the grant condition, requiring this project to be environmentally cleared, was removed on October 2, 2025.

Please note the following mitigation measures and/or conditions identified in the Environmental Review Record:

The **Tennessee Historical Commission State Historic Preservation Office**, in a letter dated November 26, 2024, stated: “We have no objections to your proceeding with your undertaking. If your agency proposes any modifications in current project plans or discovers any archaeological remains during the ground disturbance or construction phase, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act.”

The **Cherokee Nation**, in a letter dated January 17, 2025, stated: “The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office (Office) reviewed this project, cross referenced the project’s legal description against our information, and found no instances where this project intersects or adjoins such resources. Thus, the Nation does not foresee this project imparting impacts to Cherokee cultural resources at this time. However, the Nation requests that the City of Jamestown halt all project activities immediately and re-contact our Office for further consultation if items of cultural significance are discovered during the course of this project. Additionally, the Nation requests that the City of Jamestown conduct appropriate inquiries with other pertinent Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation’s databases or records.”

You cannot proceed with your project until you have satisfied all contract conditions.

If you have any questions, please call Lea Thomason at (615) 517-8531.

Sincerely,



Allison Fox
CDBG Project Manager

cc: Amanda Mainord
Seth Rye
Micah Westerman
Lea Thomason
Allison Fox

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

CLEARANCE OF LOREC NOTATIONS for P&S APPROVAL

Project Name 2024 CDBG Jamestown Sewer Improvements

Contract Number J-2025-1

Agency, Date and Notation 1:

Tennessee Historical Commission State Historic Preservation Office; November 26, 2024

Response to Notation 1:

The Tennessee Historical Commission State Historic Preservation Office, in a letter dated November 26, 2024, stated: “We have no objections to your proceeding with your undertaking. If your agency proposes any modifications in current project plans or discovers any archaeological remains during the ground disturbance or construction phase, please contact this office to determine what further action, if any, will be necessary to comply with Section 106 of the National Historic Preservation Act.”

Agency, Date and Notation 2:

Cherokee Nation; January 17, 2025

Response to Notation 2:

The Cherokee Nation, in a letter dated January 17, 2025, stated: “The Nation maintains databases and records of cultural, historic, and pre-historic resources in this area. Our Historic Preservation Office (Office) reviewed this project, cross referenced the project’s legal description against our information, and found no instances where this project intersects or adjoins such resources. Thus, the Nation does not foresee this project imparting impacts to Cherokee cultural resources at this time. However, the Nation requests that the City of Jamestown halt all project activities immediately and re-contact our Office for further consultation if items of cultural significance are discovered during the course of this project. Additionally, the Nation requests that the City of Jamestown conduct appropriate inquiries with other pertinent Historic Preservation Offices regarding historic and prehistoric resources not included in the Nation’s databases or records.”

Agency, Date and Notation 3:

Response to Notation 3:

This form must accompany Plans and Specifications sent to ECD.

CLEARANCE OF LOREC NOTATIONS for P&S APPROVAL

Project Name 2024 CDBG Jamestown Sewer Improvements

Contract Number J-2025-1

Agency, Date and Notation 4:

Response to Notation 4:

Agency, Date and Notation 5:

Response to Notation 5:

Agency, Date and Notation 6:

Response to Notation 6:

This form must accompany Plans and Specifications sent to ECD.

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

CLEARANCE OF LOREC NOTATIONS for P&S APPROVAL

Project Name 2024 CDBG Jamestown Sewer Improvements

Contract Number J-2025-1

Agency, Date and Notation 7:

Response to Notation 7:

Agency, Date and Notation 8:

Response to Notation 8:

Agency, Date and Notation 9:

Response to Notation 9:



Signature, Title

02/09/2026
Date

This form must accompany Plans and Specifications sent to ECD.

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

ACKNOWLEDGEMENT REGARDING BIDDER SAM REGISTRATION

Pursuant to 2 CFR Parts 183 and 215 and the requirement of the U.S. Department of Housing and Urban Development (HUD), contractors procured directly by grantees, sub-grantees, and/or sub-recipients of HUD funds, including CDBG 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 acknowledges that it must have an active SAM UEI (Unique Entity ID) to be awarded this contract and that without an active SAM UEI the bidder's proposal may be disallowed.
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

Pursuant to 2 CFR Parts 183, 215, and 2424, and the requirement of the U.S. Department of Housing and Urban Development (HUD), subcontractors for projects that are funded in whole or in part by HUD 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 erroneous by 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: _____

CERTIFICATION OF BIDDER REGARDING SECTION 3 AND SEGREGATED FACILITIES

NAME OF PRIME CONTRACTOR: _____

PROJECT NUMBER: J-2025-1

The undersigned hereby certifies that

- Section 3 provisions are included in the Contract.
- This grant project exceeds \$200,000 of CDBG assistance, and the contractor will comply with all Section 3 requirements detailed in the CDBG Manual, including:
 - reporting total labor hours worked,
 - reporting total labor hours worked by Section 3 workers,
 - reporting total labor hours worked by Targeted Section 3 workers,
 - Providing documentation of Section 3 worker status as required for all workers for the project under the covered contract.
- No segregated facilities will be maintained as required by Title VI of the Civil Rights Act of 1964.

Name & Title of Signer (Print or Type)

Signature

Date

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____.

My commission expires: _____

Notary Public

CERTIFICATION BY PROPOSED SUBCONTRACTOR REGARDING EQUAL EMPLOYMENT OPPORTUNITY

NAME OF PRIME CONTRACTOR: _____

PROJECT NUMBER: J-2025-1

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: _____

**CERTIFICATION OF PROPOSED SUBCONTRACTOR
REGARDING SECTION 3 AND SEGREGATED FACILITIES**

NAME OF SUBCONTRACTOR: _____

PROJECT NUMBER: J-2025-1

The undersigned hereby certifies that

- Section 3 provisions are included in the Contract.
- If contract equals or exceeds \$200,000, the contractor will comply with all Section 3 requirements detailed in the CDBG Manual, including:
 - reporting total labor hours worked,
 - reporting total labor hours worked by Section 3 workers,
 - reporting total labor hours worked by Targeted Section 3 workers,
 - Providing documentation of Section 3 worker status as required for all workers for the project under the covered contract.
- No segregated facilities will be maintained as required by Title VI of the Civil Rights Act of 1964.
-

Name & Title of Signer (Print or Type)

Signature

Date

**STATEMENT OF COMPLIANCE CERTIFICATE
ILLEGAL IMMIGRANT**

EACH CONTRACTOR BIDDING SHALL FILL IN AND SIGN THE FOLLOWING

Bidder Name: _____

Address: _____

City: _____ State _____ Zip _____

This is to certify that _____ have fully complied with all the requirements of T.C.A. § 12-3-309, stating:

- (1) No state governmental entity shall contract to acquire goods or services from any person who knowingly utilizes the services of illegal immigrants in the performance of a contract for goods or services entered into with a state governmental entity;
- (2) No person may contract to supply goods or services to a state governmental entity if that person knowingly utilizes the services of illegal immigrants in the performance of a contract to supply goods or services entered into with the state or a state entity.

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 T.C.A. § 12-3-309.

Name: _____

Title: _____

Signature: _____

Date: _____

CERTIFICATION OF NON-BOYCOTT OF ISRAEL

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.

I certify this statement to be true and correct.

Bidder Name Printed

Date

Signature of Bidder

Company

SECTION 00412

IRAN DIVESTMENT ACT CERTIFICATION

SUBJECT CONTRACT NUMBER(S): J-2025-1

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

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE



NOTICE

Tenn. Code Ann. § 12-12-106 requires the chief procurement officer to publish, using credible information freely available to the public, a list of persons it determines engage in investment activities in Iran, as described in § 12-12-105.

For these purposes, the State intends to use the attached list of "Entities determined to be non-responsive bidders/offerers pursuant to the New York State War Divestment Act of 2012."

While inclusion on this list would make a person ineligible to contract with the state of Tennessee, if a person ceases its engagement in investment activities in Iran, it may be removed from the list.

If you feel as though you have been erroneously included on this list please contact the Central Procurement Office at CPO.Website@tn.gov.

List Date: May 4, 2022

Source: <https://www.ogs.ny.gov/iran-divestment-act-2012>

1. Ak Makina, Ltd.
2. Amona
3. Bank Markazi Iran (Central Bank of Iran)
4. Bank Mellat
5. Bank Melli Iran
6. Bank Saderat Iran
7. Bank Sepah
8. Bank Tejarat
9. China Precision Machinery Import- Export Corporation (CPMIEC)
10. ChinaOil (China National United Oil Corporation)
11. China National Offshore Oil Corporation (CNOOC)
12. China National Petroleum Corporation (CNPC)
13. Indian Oil Corporation
14. Kingdream PLC
15. Naftiran Intertrade Co. (NICO)
16. National Iranian Tanker Co. (NITC)
17. Oil and Natural Gas Corporation (ONGC)
18. Oil India, Ltd.
19. Persia International Bank
20. Petroleos de Venezuela (PDVSA Petróleo, SA)
21. PetroChina Co., Ltd.
22. Petronet LNG, Ltd.
23. Sameh Azar Tajak Co. (SATCO)
24. Shandong FIN CNC Machine Co., Ltd.
25. Sinohydro Co., Ltd.
26. Sinopec Corp. (China Petroleum & Chemical Corporation)
27. SKS Ventures
28. SK Energy Co., Ltd.
29. Som Petrol AS
30. Unipet (China International United Petroleum & Chemicals Co., Ltd.)
31. Zhuhai Zhenrong Co.

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>.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, the contractor must pay all covered workers at least \$13.30 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 2025. The applicable Executive Order minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

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) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than "SU", "UAVG", "SA", or "SC" denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate 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. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: JAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a

weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The "SU" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the 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. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The "SA" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

- a) a survey underlying a wage determination
- b) an existing published wage determination
- c) an initial WHD letter setting forth a position on a wage determination matter
- d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail 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 an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail 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 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

" END OF GENERAL DECISION

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 20____, by and between The City of Jamestown, herein called "Owner", acting herein through its _____

_____, and _____
STRIKE OUT (a corporation) (a partnership)
INAPPLICABLE (an individual doing business as _____)
TERMS

of _____, County of _____ and State of _____, hereinafter called "Contractor".

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

_____ Dollars (\$ _____) and all extra work in connection therewith, under the terms as stated in the General and Special Conditions of the Contract; and at this (its or their) own property cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal, the General Conditions, Supplemental General Conditions and Special Conditions of the Contract, the plans, which include all maps, plats, blue prints, and other drawings and printed or written explanatory matter thereof, the specifications and contract documents therefore as prepared by _____, herein entitled "the Architect/Engineer", and as enumerated in Paragraph 1 of the Supplemental General Conditions, all of which are made a part hereof and collectively evidence and constitute the contract.

The Contractor hereby agrees to commence work under this contract on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete the project within 150 consecutive calendar days thereafter. The Contractor further agrees to pay, as liquidated damages, the sum of \$ 250.00 for each consecutive calendar day thereafter as hereinafter provided in Paragraph 3 of the Supplemental General Conditions.

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the contract, subject to additions and deductions, as provided in the General Conditions of the Contract, and to make payments on account thereof as provided in Paragraph 3, "Payments to Contractor", of the Supplemental General Conditions.

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

(Seal)
ATTEST: _____
(Owner)

(Secretary)

By: _____

(Witness)

(Title)

(Seal)

(Contractor)

(Secretary)

By: _____

(Witness)

(Title)

(Address, City, State, and Zip Code)

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

BONDING AND INSURANCE

1. This Attachment sets forth bonding and insurance requirements for grants. No other bonding and insurance requirements shall be imposed other than those normally required by the grantee.
2. Except as otherwise required by law, a grant that requires the contracting (or subcontracting) for construction or facility improvements shall provide for the grantee to follow its own requirements relating to bid guarantees, performance bonds, and payment bonds unless the construction contract or subcontract exceeds \$150,000 (See 2 CFR 200.88). For those contracts or subcontracts exceeding \$150,000, the Federal agency may accept the bonding policy and requirements of the grantee provided the Federal agency has made a determination that the Government's interest is adequately protected. If such a determination has not been made, the minimum requirements shall be as follows:
 - a. A bid guarantee from each bidder equivalent to five percent of the bid price. The "bid guarantee" shall consist of a firm commitment such as a bid bond, certified check, or other negotiable instrument accompanying a bid as assurance that the bidder will, upon acceptance of his bid, execute such contractual documents as may be required within the time specified.
 - b. A performance bond on the part of the contractor for 100 percent of the contract price. A "performance bond" is one executed in connection with a contract to secure fulfillment of all the contractor's obligations under such contract.
 - c. A payment bond on the part of the contractor for 100 percent of the contract price. A "payment bond" is one executed in connection with a contract to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.
3. Where the Federal Government guarantees or insures the repayment of money borrowed by the grantee, the Federal agency, at its discretion, may require adequate bonding and insurance if the bonding and insurance requirements of the grantee are not deemed adequate to protect the interest of the Federal Government.
4. Where bonds are required in the situations described above, the bonds shall be obtained from companies holding certificates of authority as acceptable sureties (31 CFR 223).

NOTE: AIA Document A311 is acceptable for use as Performance and Payment Bonds.

CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, _____, the duly authorized and acting legal representative of the City of Jamestown do hereby certify as follows:

I have examined the attached contract(s) and surety bonds and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representatives; that said representatives have full power and authority to execute said agreements on behalf of the respective parties named thereon, and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with terms, conditions and provisions thereof.

Date: _____

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

**Certification
of
Compliance with Minimum Standards for Accessibility by the Physically Handicapped**

Contract No. J-2025-1

Project Name: 2024 CDBG Jamestown Sewer Improvements

Address: City of Jamestown

Pursuant to the requirements of the Architectural Barriers Act of 1968, 42 USC 4151, and the regulations issued subsequent thereto, the undersigned certifies that the design of the above-mentioned project is in conformance with the minimum standards contained in the American Standard Specifications for Making Buildings and Facilities Accessible To and Usable by the Physically Handicapped, Number A-117.1R-1971 (as modified by 41 CFR 101-19.603).

Professional Registrant for the Project: Seth W. Rye

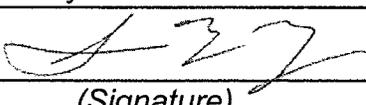
Legal Name and Address: Seth W. Rye

4210 West Main Street

Erin, TN 37061

Registration Number: 106804

Name: Seth W. Rye


(Signature)

Date: 11/12/25

Local Government Official: 

(Signature)

Status of Land Acquisition

All permanent easements, land purchases, city/county/state right of ways, Department of Transportation, Corps of Engineers and railroad permits and any other land access agreements must be obtained and recorded (if applicable) with the appropriate agencies prior to ECD approval of plans and specifications.

Please check the following boxes and sign below:

Yes No N/A

 All permanent easements necessary for the construction of this project have been acquired and recorded with the appropriate agency.

 All land acquisition necessary for the construction of this project has been acquired and recorded with the appropriate agency.

 All right-of-ways, permits, and land access agreements necessary for the construction of this project have been acquired and recorded with the appropriate agency(s).

OR

 The construction of this project requires no acquisition of land, permanent easements, right-of-ways, permits or land access agreements.



Signature of grantee, engineer/architect,
or project administrator

11/12/2025

Date

**This form must be sent to ECD before we
can approve plans and specifications.**

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

Community Development Block Grant Program GENERAL CONDITIONS

1. Contract and Contract Documents

The project to be constructed and pursuant to this contract will be financed with assistance from the Tennessee Community Development Block Grant Program and is subject to all applicable Federal laws and regulations.

The Plans, Specifications and Addenda, hereinafter enumerated in Paragraph 1 of the Supplemental General Conditions 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 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:

1.1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct or change the Bidding Requirements or the Contract Documents.

1.2. *Agreement*--The written contract 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.

1.3. *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 be accompanied by such supporting documentation as is required by the Contract Documents.

1.4. *Asbestos*--Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

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

1.6. *Bidding Documents*--The advertisement or invitation to Bid, instructions to bidders, the Bid form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.7. *Bidding Requirements*--The advertisement or invitation to Bid, instructions to bidders, and the Bid form.

1.8. *Bonds*--Performance and Payment bonds and other instruments of security.

1.9. *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 Times, issued on or after the Effective Date of the Agreement.

1.10. *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 Notice to Proceed, 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 Written Amendments, Change Orders, Work Change Directives, Field Orders and ENGINEER's written interpretations and classifications issued pursuant to paragraphs 3.5, 3.6.1, and 3.6.3 on or after the Effective Date of the Agreement. Shop Drawing submittals approved pursuant to paragraphs 6.26 and 6.27 and the reports and drawings referred to in paragraphs 4.2.1.1 and 4.2.2.2 are not Contract Documents.

1.11. *Contract Price*--The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.9.1 in the case of Unit Price Work).

1.12. *Contract Times*--The numbers of days or the dates stated in the Agreement: (i) to achieve Substantial Completion, and (ii) to complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment, in accordance with paragraph 14.13.

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

1.14. *defective*--An adjective which when modifying the word Work refers to Work that is unsatisfactory, faulty or deficient, in that it 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).

1.15. *Drawings*--The drawings which show the scope, extent and character of the Work to be furnished and performed by CONTRACTOR and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents. Shop drawings are not Drawings as so defined.

1.16. *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.

1.17. *ENGINEER*--The person, firm or corporation named as such in the Agreement.

1.18. *ENGINEER's Consultant*--A person, firm, or corporation having a contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

1.19. *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 Times.

1.20. *General Requirements*--Sections of Division 1 of the Specifications.

1.21. *Hazardous Waste*--The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

1.22. *Laws and Regulations: Laws or Regulations*--Any and all applicable laws, rules, regulations, ordinances, codes and orders of any and all governmental bodies, agencies, authorities and courts having jurisdiction.

1.23. *Liens*--Liens, charges, security interests or encumbrances upon real property or personal property.

1.24. *Milestone*--A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

1.25. *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.

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

1.27. *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.

1.28. *Partial Utilization*--Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.29. *PCBs*--Polychlorinated biphenyls.

1.30. *Petroleum*--Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Wastes and crude oils.

1.31. *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.

1.32. *Radioactive Material*--Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

1.33. *Resident Project Representative*--The authorized representative of ENGINEER who may be assigned to the site or any part thereof.

1.34. *Samples*--Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

1.35. *Shop Drawings*--All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

1.36. *Specification*--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.

1.37. *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.

1.38. *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 purposes for which it is intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by ENGINEER's written recommendation of final payment in accordance with paragraph 14.13. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

1.39. *Supplementary Conditions*--The part of the Contract Documents which amends or supplements these General Conditions.

1.40. *Supplier*--A manufacturer, fabricator, supplier, distributor, materialman or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

1.41. *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.

1.42. *Unit Price Work*--Work to be paid for on the basis of unit prices.

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

1.44. *Work Change Directive*--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 6.23. A Work Change Directive will not change the Contract Price or the Contract Times, but is evidence that the parties expect that the change directed or documented by a Work Change Directive 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 Times as provided in paragraph 10.2.

1.45. *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 construction-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 Times; Notice to Proceed:

2.3. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement, or, 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 Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

Starting the Work:

2.4. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run, but no Work shall be done at the site prior to the date on which the Contract Times commence 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, ambiguity 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, ambiguity or discrepancy in the Contract Documents, unless CONTRACTOR knew or reasonably should 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. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2.6.2. a preliminary schedule for Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing and processing such submittal;

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.

2.7. Before any Work at the site is started, CONTRACTOR and OWNER shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with paragraphs 5.4, 5.6 and 5.7.

Preconstruction Conference:

2.8. Within twenty days after the Contract Times start to run, but before any Work at the site is started, a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.6, procedures for handling Shop Drawings and other submittals, processing Applications for Payment and maintaining required records.

Initially Acceptable Schedule:

2.9. Unless otherwise provided in the Contract Documents, 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 review for acceptability to ENGINEER as provided below the schedules submitted in accordance with paragraph 2.6. CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to CONTRACTOR until the schedules are submitted to and acceptable to ENGINEER as provided below. The progress schedule will be acceptable to ENGINEER as providing an orderly progression of the Work to completion within any specified Milestones and the Contract Times, but such acceptance will neither impose on ENGINEER responsibility for the sequencing, scheduling or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefore. CONTRACTOR's schedule of Shop Drawing and Sample submissions will be acceptable to ENGINEER as providing a workable arrangement for reviewing and processing the required submittals. CONTRACTOR's schedule of values will be acceptable to ENGINEER as to form and substance.

ARTICLE 3--CONTRACT DOCUMENT: 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 or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed whether or not specifically called for. When words or phrases which have a well-known technical or construction industry or trade meaning are used to describe Work, materials or equipment, such words or phrases shall be interpreted in accordance with that meaning. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in paragraph 9.4.

3.3. Reference to Standards and Specifications of Technical Societies; Reporting and Resolving Discrepancies:

3.3.1. Reference to standards, 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 in the Contract Documents.

3.3.2. If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the Work or of any such standard, specification, manual or code or of any instruction of any Supplier referred to in paragraph 6.5, CONTRACTOR shall report it to ENGINEER in writing at once, and, CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as authorized by paragraph 6.23) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.5 or 3.6; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

3.3.3. Except as otherwise specifically stated in the Contract Documents or as may be provided by amendment or supplement thereto issued by one of the methods indicated in paragraph 3.5 or 3.6, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the Contract Documents and:

3.3.3.1. the provisions of any such standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

3.3.3.2. the provisions of any such Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

No provision of any such standard, specification, manual, code or instruction shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to OWNER, 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 inconsistent with the provisions of paragraph 9.13 or any other provision of the Contract Documents.

3.4. Whenever 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, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the

design concept of the completed Project as a functioning whole as shown or indicated in 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 9.13 or any other provision of the Contract Documents.

Amending and Supplementing Contract Documents:

3.5. 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:

3.5.1. a formal Written Amendment.

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

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

3.6. 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:

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

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

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

Reuse of Documents:

3.7. CONTRACTOR, and any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with OWNER (i) shall not 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 or ENGINEER's Consultant, and (ii) shall not reuse any of such Drawings, Specifications, other documents or copies on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaption by ENGINEER.

ARTICLE 4--AVAILABILITY OF LANDS; SUBSURFACE AND 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. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a correct statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's lien against such lands in accordance with applicable Laws and Regulations. OWNER shall identify any encumbrances or restrictions not of general application but

specifically related to use of lands so furnished with which CONTRACTOR will have to comply in performing the Work. 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 and OWNER are unable to agree on entitlement to or the amount or extent of any adjustments in the Contract Price or the Contract Times as a result of any delay in OWNER's furnishing these lands, rights-of-way or easements, CONTRACTOR may make a claim therefore as provided in Articles 11 and 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.

4.2. *Subsurface and Physical Conditions:*

4.2.1. *Reports and Drawings:* Reference is made to the Supplementary Conditions for identification of:

4.2.1.1. *Subsurface Conditions:* Those reports of explorations and tests of subsurface conditions at or contiguous to the site that have been utilized by ENGINEER in preparing the Contract Documents; and

4.2.1.2. *Physical Conditions:* Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) that have been utilized by ENGINEER in preparing the Contract Documents.

4.2.2. *Limited Reliance by CONTRACTOR Authorized: Technical Data:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

4.2.2.1. the completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto, or

4.2.2.2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or

4.2.2.3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.

4.2.3. *Notice of Differing Subsurface or Physical Conditions:* If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the site that is uncovered or revealed either:

4.2.3.1. is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraphs 4.2.1 and 4.2.2 is materially inaccurate, or

4.2.3.2. is of such a nature as to require a change in the Contract Documents, or

4.2.3.3. differs materially from that shown or indicated in the Contract Documents, or

4.2.3.4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then

CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected the job or performing any Work in connection therewith (except in an emergency as permitted by paragraph 6.23), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such conditions or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

4.2.4. *ENGINEER's Review:* ENGINEER will promptly review the pertinent conditions, determine the necessity of OWNER's obtaining additional exploration 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 Contract Documents Change:* If ENGINEER concludes that a change in the Contract Documents is required as a result of a condition that meets one or more of the categories in paragraph 4.2.3, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document the consequences of such change.

4.2.6. *Possible Price and Times Adjustments:* An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of such uncovered or revealed condition causes an increase or decrease in CONTRACTOR's cost of, or time required for performance of, the Work; subject, however, to the following:

4.2.6.1. such condition must meet any one or more of the categories described in paragraphs 4.2.3.1 through 4.2.3.4, inclusive;

4.2.6.2. a change in the Contract Documents pursuant to paragraph 4.2.5 will not be an automatic authorization of nor a condition precedent to entitlement to any such adjustment;

4.2.6.3. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraphs 9.10 and 11.9; and

4.2.6.4. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Times if;

4.2.6.4.1. CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a bid or becoming bound under a negotiated contract; or

4.2.6.4.2. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test or study of the site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or

4.2.6.4.3. CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.2.3.

If OWNER and CONTRACTOR are unable to agree on entitlement to or as to the amount or length of any such equitable adjustment in the Contract Price or Contract Times, a claim may be made therefore as provided in Articles 11 and 12. However, OWNER, ENGINEER and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses or damages sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.3. Physical Conditions--Underground Facilities:

4.3.1. *Shown or 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. The cost of all of the following will be included in the Contract Price and CONTRACTOR shall have full responsibility for: (i) reviewing and checking all such information and data, (ii) locating all Underground Facilities shown or indicated in the Contract Documents, (iii) coordination of the Work with the owners of such Underground Facilities during construction, and (iv) the safety and protection of all such Underground Facilities as provided in paragraph 6.20 and repairing any damage thereto resulting from the Work.

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, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.23), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence of the Underground Facility. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document such consequences. 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 Times, 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 that CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER and CONTRACTOR are unable to agree on entitlement to or the amount or length of any such adjustment in Contract Price or Contract Times, CONTRACTOR may make a claim therefore as provided in Articles 11 and 12. However, OWNER, ENGINEER and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses or damages incurred or sustained by CONTRACTOR on or in connection with any other project or anticipated project.

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, 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.

4.5. Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material:

4.5.1. OWNER shall be responsible for any Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site. OWNER shall not be responsible for any such materials brought to the site by CONTRACTOR, Subcontractors, Suppliers or anyone else for whom CONTRACTOR is responsible.

4.5.2. CONTRACTOR shall immediately: (i) stop all Work in connection with such hazardous condition and in any area affected thereby (except in an emergency as required by paragraph 6.23), and (ii) notify OWNER and ENGINEER (and thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such hazardous condition or take corrective action, if any. CONTRACTOR shall not be required to resume Work in connection with such hazardous condition or in any such affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR special written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of such Work stoppage or such special conditions under which Work is agreed by CONTRACTOR to be resumed, either party may make a claim therefore as provided in Articles 11 and 12.

4.5.3. If after receipt of such special written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order such portion of the Work that is in connection with such hazardous condition or in such affected area to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a claim therefore as provided in Articles 11 and 12. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

4.5.4. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents, other consultants and subcontractors of each and any of them from and against all

claims, costs, losses and damages arising out of or resulting from such hazardous condition, provided that: (i) any such claim, cost, loss or damage 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 there from, and (ii) nothing in this subparagraph 4.5.4 shall obligate OWNER to indemnify any person or entity from and against the consequences of that person's or entity's own negligence.

4.5.5. The provisions of paragraphs 4.2 and 4.3 are not intended to apply to Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site.

ARTICLE 5--BONDS AND INSURANCE

Performance, Payment 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 provided otherwise by Laws or Regulations 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 form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall 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 Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's 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 ten days thereafter substitute another Bond and surety, both of which must be acceptable to OWNER.

5.3. Licensed Sureties and Insurers; Certificates of Insurance:

5.3.1. All Bonds and insurance required by the Contract Documents to be purchased and maintained by OWNER or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue Bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.3.2. CONTRACTOR shall deliver to OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain in accordance with paragraph 5.4. OWNER shall deliver to CONTRACTOR, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by CONTRACTOR or any other additional insured) which OWNER is

required to purchase and maintain in accordance with paragraphs 5.6 and 5.7 hereof.

CONTRACTOR's Liability Insurance:

5.4. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and furnished and as will provided 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, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

5.4.1. claims under workers' compensation, disability benefits and other similar employee benefit acts;

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

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

5.4.4. claims for damages insured by customary personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (ii) by any other person for any other reason;

5.4.5. 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 there from; and

5.4.6. 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 policies of insurance so required by this paragraph 5.4 to be purchased and maintained shall:

5.4.7. with respect to insurance required by paragraphs 5.4.3. through 5.4.6 inclusive, include as additional insured (subject to any customary exclusion in respect of professional liability) OWNER, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insured, and include coverage for the respective officers and employees of all such additional insured;

5.4.8. include the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

5.4.9. include completed operations insurance;

5.4.10. include contractual liability insurance covering CONTRACTOR's indemnity obligations under paragraphs 6.12, 6.16 and 6.31 through 6.33;

5.4.11. 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 CONTRACTOR and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.3.2 will so provide);

5.4.12. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing *defective* Work in accordance with paragraph 13.12; and

5.4.13. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and CONTRACTOR shall furnish OWNER and each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued evidence satisfactory to OWNER and any such additional insured of continuation of such insurance at final payment and one year thereafter).

OWNER's Liability Insurance:

5.5. In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.4, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability 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 in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

5.6.1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

5.6.2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work and Work in transit and shall insure against at least the following perils fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils as may be specifically required by the Supplementary Conditions;

5.6.3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

5.6.4. cover materials and equipment stored at the site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER; and

5.6.5. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR and ENGINEER with thirty days written notice to each other additional insured to whom a certificate of insurance has been issued.

5.7. OWNER shall purchase and maintain such trailer 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, ENGINEER's Consultants and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

5.8. All the policies of insurance (and 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 canceled or materially changed or renewal refused until at least thirty days' prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.11.

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 identified in the Supplementary Conditions. The risk of loss within such identified 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 policies provided under paragraphs 5.6 or 5.7, 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.

5.11. Waiver of Rights:

5.11.1. OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraphs 5.6 and 5.7 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds in such policies and will provide primary coverage for all losses and damages caused by the perils covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds under such policies for losses and damages so caused. None of the above waivers shall extend to the

rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

5.11.2. In addition, OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER'S Consultants and the officers, directors, employees and agents of any of them, for:

5.11.2.1. loss due to business interruption, loss of use or other consequential loss extending beyond direct physical loss or damage to OWNER's property or the Work caused by, arising out of or resulting from fire or other peril, whether or not insured by OWNER; and

5.11.2.2. loss or damage to the completed Project or part thereof caused by, arising out of or resulting from fire or other insured peril covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to paragraph 14.10, after substantial completion pursuant to paragraph 14.8 or after final payment pursuant to paragraph 14.13.

Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in this paragraph 5.11.2 shall contain provisions to the effect that in the event of payment of any such loss, damage or consequential loss the insurers will have no rights of recovery against any of CONTRACTOR, Subcontractors, ENGINEER, ENGINEER'S Consultants and the officers, directors, employees and agents of any of them.

Receipt and Application of Insurance 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 fiduciary 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 fiduciary 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 be made, OWNER as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, OWNER as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, OWNER as fiduciary shall give bond for the proper performance of such duties.

Acceptance of Bonds and Insurance; Option to Replace;

5.14. If either party (OWNER or CONTRACTOR) has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within ten days after receipt of the certificates (or other evidence requested) required by paragraph 2.7. OWNER and

CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

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 any 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 permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6. CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence:

6.1. CONTRACTOR shall supervise, inspect 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 specification of a specific means, method, technique, sequence or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed 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 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, lay out and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the site. Except as otherwise required for 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. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of OWNER. 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 instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

Progress Schedule:

6.6. CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.9 as it may be adjusted from time to time as provided below:

6.6.1. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.9) proposed adjustments in the progress schedule that will not change the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

6.6.2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of paragraph 12.1. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.7. Substitutes and "Or-Equal" Items:

6.7.1. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be accepted by ENGINEER under the following circumstances:

6.7.1.1. *"Or-Equal"*: If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for acceptance of proposed substitute items.

6.7.1.2. *Substitute Items*: If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under

subparagraph 6.7.1.1., it will be considered a proposed substitute item. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. The procedure for review by the ENGINEER will include the following as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances. Requests for review of proposed substitute items of material or 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 first 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 in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will 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 or credits 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 will be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute.

6.7.1.3. *CONTRACTOR's Expense*: All data to be provided by CONTRACTOR in support of any proposed "or-equal" or substitute item will be at CONTRACTOR's expense.

6.7.2. *Substitute Construction Methods or Procedures*: If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.7.1.2.

6.7.3. *Engineer's Evaluation*: ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.7.1.2 and 6.7.2. ENGINEER will be the sole judge of acceptability. No "or-equal" or 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 "or-equal" or substitute. ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in

evaluating substitutes proposed or submitted by CONTRACTOR pursuant to paragraphs 6.7.1.2 and 6.7.2 and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER accepts a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute item.

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 organization (including those who are to furnish the principal items of materials or 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 removed on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable substitute, the Contract Price will be adjusted 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.

6.9.1. 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 for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between OWNER and ENGINEER and any such Subcontractor, Supplier or other person or organization, nor 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.

6.9.2. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the work under a direct or indirect contract with CONTRACTOR. CONTRACTOR shall require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with the ENGINEER through CONTRACTOR.

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 or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.6 or 5.7, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants and all other additional insureds for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

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. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from 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 invention, design, process, product or device not specified in the Contract Documents.

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 performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses and damages caused by, arising out of or resulting there from; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR or CONTRACTOR's obligations under paragraph 3.3.2.

Taxes:

6.15. CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by CONTRACTOR in accordance with 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 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 thereof or of any adjacent land or areas, resulting from the performance of the Work. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant and anyone directly or indirectly employed by any of them from and against all claims, costs, losses and damages arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER or any other party indemnified hereunder to the extent caused by or based upon 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. CONTRACTOR shall leave the site clean and ready for occupancy by OWNER at Substantial Completion of the Work. 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 Change Directives, 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 counter part 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 persons on the Work site or who may be affected by the Work;

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, lawns, 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 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 ENGINEER's Consultant or anyone employed by any of them or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR or any Subcontractor, Supplier or other person or organization directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for 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).

Safety Representative:

6.21. CONTRACTOR shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

Hazard Communication Program:

6.22. CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the site in accordance with Laws or Regulations.

Emergencies:

6.23. 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 OWNER or ENGINEER, 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 by CONTRACTOR in response to such an emergency, a Work Change Directive or Change Order will be issued to document the consequences of such action.

6.24. Shop Drawings and Samples:

6.24.1. CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the accepted schedule of Shop Drawings and Sample submittals (see paragraph 2.9). All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. 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 show ENGINEER the materials and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.26.

6.24.2. CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with said accepted schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.26. The numbers of each Sample to be submitted will be as specified in the Specifications.

6.25. Submittal Procedures:

6.25.1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

6.25.1.1. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto.

6.25.1.2. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the Work, and

6.25.1.3. all information relative to CONTRACTOR's sole responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

CONTRACTOR shall also have reviewed and 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. Each submittal will bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

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

6.26. ENGINEER will review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals accepted by ENGINEER as required by paragraph 2.9. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed project as a functioning whole as indicated by the Contract Documents. ENGINEER's review and approval will not extend to means, methods, techniques, sequences or procedures of construction (except where particular means, method, technique, sequence or procedure of construction is specifically and expressly called for 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 6.25.3 and ENGINEER has given written approval of each such variation by 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 complying with the requirements of paragraph 6.25.1.

6.28. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submissions accepted by ENGINEER as required by paragraph 2.9, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at 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 OWNER and CONTRACTOR may otherwise agree in writing.

6.30. CONTRACTOR's General Warranty and Guarantee

6.30.1. CONTRACTOR warrants and guarantees to OWNER, ENGINEER and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

6.30.1.1. abuse, modification or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors or Suppliers; or

6.30.1.2. normal wear and tear under normal usage.

6.30.2. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

6.30.2.1. observations by ENGINEER;

6.30.2.2. recommendation of any progress or final payment by ENGINEER;

6.30.2.3. the issuance of a certificate of Substantial Completion or any payment by OWNER to CONTRACTOR under the Contract Documents;

6.30.2.4. use or occupancy of the Work or any part thereof by OWNER;

6.30.2.5. any acceptance by OWNER or any failure to do so;

6.30.2.6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER pursuant to paragraph 14.13;

6.30.2.7. any inspection, test or approval by others; or

6.30.2.8. any correction of *defective* Work by OWNER.

Indemnification:

6.31. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by, arising out of or resulting from the performance of the Work, provided that any such claim, cost, loss or damage: (i) 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 (ii) is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, 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 caused in part by any negligence or omission of a person or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such person or entity.

6.32. In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, 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 6.31 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, Supplier or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

6.33. The indemnification obligations of CONTRACTOR under paragraph 6.31 shall not extend to the liability of ENGINEER and ENGINEER's Consultants, officers, directors, employees or agents caused by the professional negligence errors or omissions of any of them.

Survival of Obligations:

6.34. All representations, indemnifications, warranties and guarantees made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Work and termination or completion of the Agreement.

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, or let other direct contracts therefore which shall contain General Conditions similar to these, or have other work performed by utility owners. If the fact that such other work is to be performed was not noted in the Contract Documents, then: (i) written notice thereof will be given to CONTRACTOR prior to starting any such other work, and (ii) CONTRACTOR may make a claim therefore as provided in Articles 11 and 12 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 amount or extent thereof.

7.2. CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and 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 other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, 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 the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects or deficiencies in such other work that render it unavailable or unsuitable

for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure so to report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent or nonapparent defects and deficiencies in such other work.

Coordination:

7.4. If OWNER contracts with others for the performance of other work on the Project at the site, the following will be set forth in Supplementary Conditions:

7.4.1. the person, firm or corporation who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified;

7.4.2. the specific matters to be covered by such authority and responsibility will be itemized; and

7.4.3. the extent of such authority and responsibilities will be provided.

Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility in respect of such coordination.

ARTICLE 8--OWNER'S RESPONSIBILITIES

8.1. Except as otherwise provided in these General Conditions, 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.

8.3. OWNER shall furnish the data required of OWNER under the Contract Documents promptly and shall make payments to CONTRACTOR promptly when 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 drawings of physical conditions in existing structures at or contiguous to the site that have been utilized by ENGINEER in preparing the Contract Documents.

8.5. OWNER's responsibilities in respect of purchasing and maintaining liability and property insurance are set forth in paragraphs 5.5 through 5.10.

8.6. OWNER is obligated to execute Change Orders as indicated in paragraph 13.4.

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.

8.9. The OWNER shall not supervise, direct or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences or procedures of construction or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

8.10. OWNER's responsibility in respect of undisclosed Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Materials uncovered or revealed at the site is set forth in paragraph 4.5.

8.11. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents, OWNER's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

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 as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, ENGINEER will endeavor for the benefit of OWNER 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 generally to the Contract Documents. On the basis of such visits and on-site observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work. ENGINEER's visits and on-site observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.13, and particularly, but without limitation, during or as a result of ENGINEER's on-site visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work.

Project Representative:

9.3. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more continuous observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.13 and in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the site who is not ENGINEER's Consultant, agent or employee, the responsibilities and authority and limitations thereon 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 the intent of and reasonably inferable from Contract Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER or CONTRACTOR believes that a written clarification or interpretation justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree to the amount or extent thereof, if any, OWNER or CONTRACTOR may make a written claim therefore 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 Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR who shall perform the Work involved promptly. If OWNER or CONTRACTOR believes that a Field Order justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree as to the amount or extent thereof, OWNER or CONTRACTOR may make a written claim therefore 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* or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER 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 authority as to Shop Drawings and Samples, see paragraphs 6.24 through 6.28 inclusive.

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

9.9. In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

Determinations 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 the 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 decision 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 and to ENGINEER written notice of intention to appeal from ENGINEER's decision and: (i) an appeal from ENGINEER's decision is taken within the time limits and in accordance with the procedures set forth in Exhibit GC-A, "Dispute Resolution Agreement," entered into between OWNER and CONTRACTOR pursuant to Article 16, or (ii) if no such Dispute Resolution Agreement has been entered into, a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to ENGINEER's decision, unless otherwise agreed in writing by OWNER and CONTRACTOR. Such appeal will not be subject to the procedures of paragraph 9.11.

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 Times will be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph. Written notice of each such claim, dispute or 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 start of the occurrence or event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other party within sixty days after the start of such occurrence or event unless ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of such claim, dispute or other matter. The opposing party shall submit any response to ENGINEER and the claimant within thirty days after receipt of the claimant's last submittal (unless ENGINEER allows additional time). ENGINEER will render a formal decision in writing within thirty days after receipt of the opposing party's submittal, if any, in accordance with this paragraph. ENGINEER's written decision on such claim, dispute or other matter will be final and binding upon OWNER and CONTRACTOR unless: (i) an appeal from ENGINEER's decision is taken within the time limits and in accordance with the procedures set forth in EXHIBIT GC-A, "Dispute Resolution Agreement," entered into between OWNER and CONTRACTOR pursuant to Article 16, or (ii) if no such Dispute Resolution Agreement has been entered into, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within thirty days after the date of such decision and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction to exercise such rights or remedies as the appealing party may have with respect to such claim, dispute or other matter in accordance with applicable Laws and Regulations within sixty days of the date of such decision, unless otherwise agreed in writing by OWNER and CONTRACTOR.

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 or

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 pursuant to Article 16.

9.13. Limitations on ENGINEER's Authority and Responsibilities:

9.13.1. Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise or performance of any authority or responsibility by ENGINEER shall create, impose or give rise to any duty owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them.

9.13.2. ENGINEER will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

9.13.3. 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.

9.13.4. ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds and certificates of inspection, tests and approvals and other documentation required to be delivered by paragraph 14.12 will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests and approvals that the results certified indicate compliance with, the Contract Documents.

9.13.5. The limitations upon authority and responsibility set forth in this paragraph 9.13 shall also apply to ENGINEER's Consultants, Resident Project Representative and assistants.

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. Such additions, deletions or revisions will be authorized by a Written Amendment, a Change Order, or a Work Change Directive. 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 adjustment in the Contract Price or an adjustment of the Contract Times that should be allowed as a result of a Work

Change Directive, a claim may be made therefore 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 Times with respect to any Work performed that is not required by the Contract Documents as amended, modified and supplemented as provided in paragraphs 3.5 and 3.6 except in the case of any emergency as provided in paragraph 6.23 or in the case of uncovering Work as provided in paragraph 13.9.

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

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

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

10.4.3. changes in the Contract Price or Contract Times 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 Times) 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 CONTRACTOR's 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 adjustment 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 start of the occurrence or 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 the start of such occurrence or event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of the claim) and shall be accompanied by claimant's written statement that the adjustment claimed covers all known amounts to which the claimant is entitled as a result of said occurrence or 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 adjustment in the Contract Price will be determined as follows:

11.3.1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such 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. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 11.6.2);

11.3.3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 11.3.2, 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 paragraph 11.6).

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 amount 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. Such employees shall include without limitation superintendents, foremen and other personnel employed full-time at the site. 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' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. 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 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 or furnished by Subcontractors. If required by OWNER, CONTRACTOR shall

obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER who will then determine, with the advice of ENGINEER, which bids, if any, will be accepted. If any 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 and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in paragraphs 11.4, 11.5, 11.6 and 11.7. 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 the 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) caused by damage to the Work, not compensated by insurance 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.

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 part 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 subparagraph 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.

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

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

11.7. Whenever the cost of any Work is to be determined pursuant to paragraphs 11.4 and 11.5, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

Cash Allowance:

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 furnished and performed for such sums as may be acceptable to OWNER and 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 cost 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 and no demand for additional payment on account of any of the foregoing 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.

11.9. 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 price 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. OWNER or CONTRACTOR may make a claim for an adjustment in the Contract Price in accordance with Article 11 if:

11.9.3.1. 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

11.9.3.2. there is no corresponding adjustment with respect to any other item of Work; and

11.9.3.3. if CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12--CHANGE OF CONTRACT TIMES

12.1. The Contract Times (or Milestones) may only be changed by a Change Order or a Written Amendment. Any claim for an adjustment of the Contract Times (or Milestones) 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 Times (or Milestones) 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 Times (or Milestones) will be valid if not submitted in accordance with the requirements of this paragraph 12.1.

12.2. All time limits stated in the Contract Document, are of the essence of the Agreement.

12.3. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a claim is made therefore as provided in paragraph 12.1. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions or acts of God. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.4. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay. In no event shall OWNER be liable to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from (i) delays caused by or within the control of CONTRACTOR, or (ii) delays beyond the control of both parties including but not limited to fires, floods,

epidemics, abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

ARTICLE 13--TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.1. *Notice of Defects:* Prompt notice of all defective Work of which OWNER or ENGINEER have actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected or accepted as provided in this Article 13.

Access to Work:

13.2. OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories and governmental agencies with jurisdiction interests will have access to the Work at reasonable times for their observation, inspecting and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's site safety procedures and programs so that they may comply therewith as applicable.

Tests and Inspections:

13.3. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

13.4. OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

13.4.1. for inspections, tests or approvals covered by paragraph 13.5 below;

13.4.2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.9 below shall be paid as provided in said paragraph 13.9; and

13.4.3. as otherwise specifically provided in the Contract Documents.

13.5. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection, or approval. CONTRACTOR shall also be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work, or of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work.

13.6. If any Work (or the work of others) that is to be inspected, tested or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation.

13.7. Uncovering Work as provided in paragraph 13.6 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.

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 pay all claims, costs, losses and damages caused by, arising out of or resulting from such uncovering, exposure, observation, inspection and testing and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); 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 therefore 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 Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction; and, if the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a claim therefore 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 surety or 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 Work that is not *defective*. CONTRACTOR shall pay all claims, costs, losses and damages caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.12. Correction Period:

13.12.1. 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: (i) correct such *defective* Work, or, if it has been rejected by OWNER, remove it from the site and replace it with Work that is not *defective*, and (ii) satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. 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 claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

13.12.2. 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 Amendment.

13.12.3. Where *defective* Work (and damage to other Work resulting therefrom) has been corrected, removed or replaced under this paragraph 13.12, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

Acceptance of Defective Work:

13.1. 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 pay all claims, costs, losses and damages attributable to OWNER's evaluation of and determination to accept such *defective* Work (such costs to be approved by ENGINEER as to reasonableness). 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 therefore 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 from ENGINEER 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, or 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. In connection with such corrective and remedial action, OWNER may exclude 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 or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors and ENGINEER and ENGINEER's Consultants access to the site to enable OWNER to

exercise the rights and remedies under this paragraph. All claims, costs, losses and damages incurred or sustained by OWNER in exercising such rights and remedies will be charged against CONTRACTOR 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 therefore as provided in Article 11. Such claims, costs, losses and damages will include but not be limited to all costs of repair or 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 Times (or Milestones) because of any delay in the 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 the date established for each progress payment (but not more 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 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:

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 executed Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

14.5.1. the Work has progressed to the point indicated.

14.5.2. the quality of the Work is generally 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

14.5.3. the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.

However, by recommending any such payment ENGINEER will not thereby be deemed to have represented that: (i) 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 (ii) that there may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

14.6. ENGINEER's recommendation of any payment, including final payment, shall not mean that ENGINEER is responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of Work, or for any failure of CONTRACTOR to perform or furnish Work in accordance with the Contract Documents.

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 the representations to OWNER referred to in paragraph 14.5. 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. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.4 inclusive.

OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

14.7.5. claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work,

14.7.6. Liens have been filed in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens.

14.7.7. there are other items entitling OWNER to a set-off against the amount recommended, or

14.7.8. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.7.1. through 14.7.3 or paragraphs 15.2.1 through 15.2.4 inclusive;

but OWNER must have CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction 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 therefore. 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 therefore. 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 and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

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 at OWNER's option of any substantially completed part of the Work which: (i) has specifically been identified in the Contract Documents, or (ii) OWNER, ENGINEER and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, 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 that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such 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 therefore. 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. 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 such measures as are necessary to complete such Work or remedy such deficiencies.

Final Application for Payment:

14.12. After CONTRACTOR has completed all such corrections to the satisfaction of ENGINEER and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance required by paragraph 5.4, certificates of inspection, marked-up record documents (as provided in paragraph 6.19) and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.4.13, (ii) consent of the surety, if any, to final payment, and (iii) 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 of such releases or waivers of Liens and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that: (i) the releases and receipts include all labor, services, material and equipment for which a Lien could be filed, and (ii) 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. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

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 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. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.15. 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.

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.

Waiver of Claims:

14.15. The making and acceptance of final payment will constitute:

14.15.1. 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, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

14.15.2. 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. At any time and without cause, OWNER may 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 adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes an approved claim therefore 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 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 adjusted from time to time pursuant to paragraph 6.6);

15.2.2. if CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;

15.2.3. if CONTRACTOR disregards the authority of ENGINEER; or

15.2.4. if CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents;

OWNER may, after giving CONTRACTOR (and the surety, if any,) 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 all claims, costs, losses and damages sustained by OWNER arising out of or resulting from completing the Work such excess will be paid to CONTRACTOR. If such claims, costs, losses and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses and damages incurred by

OWNER will be reviewed by ENGINEER as to their reasonableness and when so approved by ENGINEER incorporated in a Change Order, provided that 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 monies due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

15.4. Upon seven day's written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Agreement. In such case, CONTRACTOR shall be paid (without duplication of any items);

15.4.1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

15.4.2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

15.4.3. for all claims, costs, losses and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and

15.4.4. for reasonable expenses directly attributable to termination.

CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

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 of 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 notice to OWNER and ENGINEER, and provided OWNER and ENGINEER do not remedy such suspension or failure within that time, terminate the Agreement and recover from OWNER payment on the same terms as provided in paragraph 15.4. In lieu of terminating the Agreement and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within thirty days after it is submitted, or OWNER has failed for thirty days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may upon seven day's written notice to OWNER and ENGINEER stop the Work until payment of all such amount due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.5 are not intended to preclude CONTRACTOR from making claim under Articles 11 and 12 for an increase in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping Work as permitted by this paragraph.

ARTICLE 16--DISPUTE RESOLUTION

If and to the extent that OWNER and CONTRACTOR have agreed on the method and procedure for resolving disputes between them that may arise under this Agreement, such dispute resolution method and procedure, if any, shall be as set forth in Exhibit CC-A, "Dispute Resolution Agreement," to be attached hereto and made a part hereof. If no such agreement on the method and procedure for resolving such disputes has been reached, and subject to the provisions of paragraphs 9.10, 9.11, and 9.12, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

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 or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

Computation of Times:

17.2.1. When any period of time 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 will constitute a day.

Notice of Claim:

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.

Cumulative Remedies:

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 6.12, 6.16, 6.30, 6.31, 6.32, 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.

Professional Fees and Court Costs Included:

17.5. Whenever reference is made to "claims, costs, losses and damages," it shall include in each case, but not be limited to, all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs.

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3. A. Payments to Contractor

1. To insure the proper performance of this contract, the Owner shall retain five percent (5%) of the amount of each estimate until final completion and acceptance of all work covered by this contract: Provided that the Contractor shall submit his estimate not later than the first day of the month: Provided further that on completion and acceptance of each separate building, public work, or other division of the contract, on which the price is stated separately in the contract, payment may be made in full, including retained percentages thereon, less authorized deductions.
2. In preparing estimates the material delivered on the site and preparatory work done may be taken into consideration.
3. All material and work covered by partial payments made shall thereupon become the sole property of the Owner, but this provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payments have been made or the restoration of any damaged work, or as a waiver of the right of the Owner to require the fulfillment of all of the terms of the contract.
4. Owner's Right to Withhold Certain Amounts and Make Application Thereof: The Contractor agrees that he will indemnify and save the Owner harmless from all claims growing out of the lawful demands of subcontractors, laborers, workers, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, power tools, and all supplies, including commissary, incurred in the furtherance of the performance of this contract. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature hereinabove designated have been paid, discharged, or waived. If the Contractor fails so to do, then the Owner may, after having served written notice on the said Contractor, either pay unpaid bills, of which the Owner has written notice, direct, 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 whereupon payment to the Contractor shall be resumed, in accordance with the terms of this contract, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor or his Surety. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner shall be considered as a payment made under the contract by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

B. Payments by Contractor

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 ninety percent (90%) 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.

C. Time for Completion and Liquidated Damages

It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion as specified in the contract of the work to be done hereunder are ESSENTIAL CONDITIONS of this contract; and it is further mutually understood and agreed that the work embraced in this contract shall be commenced on a date to be specified in the "Notice to Proceed".

The Contractor agrees that said work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work described herein is a reasonable time for the completion of the same, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

If the said Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this contract, to pay to the Owner the amount specified in the contract, not as a penalty but as liquidated damages for such breach of contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work.

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 periodical estimates.

It is further agreed that time is of the essence of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this contract. Provided that the Contractor shall not be charged with liquidated damages or any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; Provided further that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the work is due:

- (a) To any preference, priority or allocation order duly issued by the Government.
- (b) To unforeseeable cause 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 severe weather; and
- (c) To any delays of Subcontractors or suppliers occasioned by any of the causes specified in subsections (a) and (b) of this article:

Provided further that the Contractor shall, within ten (10) days from the beginning of such delay, unless the Owner shall grant a further period of time prior to the date of final settlement of the contract, notify the Owner, in writing, of the delay and notify the Contractor within a reasonable time of its decision in the matter.

D. Protection of Lives and Health

"The Contractor shall exercise proper precaution at all times for the protection of persons and property and shall be responsible for all damages to persons or property, either on or off the site, which occur as a result of his prosecution of the work. The safety provisions of applicable laws and building and construction codes, in addition to specific safety and health regulations described by Chapter XIII, Bureau of Labor Standards, Department of Labor, Part 1518, Safety and Health Regulations for Construction, as outlined in the Federal Register, Volume 36, No. 75, Saturday, April 17, 1971. Title 29 - LABOR, shall be observed and the Contractor shall take or cause to be taken, such additional safety and health measures as the Contracting Authority may determine to be reasonably necessary."

E. Subcontracts

The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5 (a)(1) through (10) and such other clauses as the (Department of Housing and Urban Development) may by appropriate instructions require, and also 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 the contract clauses in 29 CFR 5.5.

F. Interest of Member of or Delegate to Congress

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.

G. Other Prohibited Interests

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.

H. Use and Occupancy Prior to Acceptance by Owner

The Contractor agrees to the use and occupancy of a portion or unit of the project before formal acceptance by the Owner, provided the Owner:

- (a) Secures written consent of the Contractor except in the event, in the opinion of the Architect/Engineer, the Contractor is chargeable with unwarranted delay in final clean-up of punch list items or other contract requirements.
- (b) Secures endorsement from the insurance carrier and consent of the surety permitting occupancy of the building or use of the project during the remaining period of construction, or,
- (c) When the project consists of more than one building, and one of the buildings is occupied, secures permanent fire and extended coverage insurance, including a permit to complete construction. Consent of the surety must also be obtained.

I. Photographs of the Project

If required by the Owner, the Contractor shall furnish photographs of the project, in the quantities and as described in the Supplemental General Conditions.

J. Suspension of Work

Should the Owner be prevented or enjoined from proceeding with work either before or after the start of construction by reason of any litigation or other reason beyond the control of the Owner, the Contractor shall not be entitled to make or assert claim for damage by reason of said delay; but time for completion of the work will be extended to such reasonable time as the Owner may determine will compensate for time lost by such delay with such determination to be set forth in writing.

4. FEDERAL LABOR STANDARDS PROVISIONS

Applicability

The Project or Program to which the construction work covered by this contract pertains is being assisted by the United States of America and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

A. 1. (i) Minimum Wages

All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less than often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR Part 5.5(a)(iv). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 FR Part 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

- (ii)(a) 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. HUD shall approve an additional classification and wage rate and fringe benefits therefore 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.
- (b) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)
- (c) In the event the contractor, the laborers or mechanics to be employed in the classification or their representative, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)
- (d) The wage rate (including the fringe benefits where appropriate) determined pursuant to subparagraphs (1)(b) or (c) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.
- (iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

- (iv) If the contractor does not make payments to a trustee or other third persons, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1215-0140.)

2. Withholding

HUD or its designee 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 the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices and trainees, employed by the contractor or any subcontractor the full amount of wages required by the contract.

In the event of failure to pay any laborer or mechanic, including any apprentice or trainee, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The Comptroller General shall make sure disbursements in the case of direct Davis-Bacon Act contracts.

3. (i) Payrolls and basic records.

Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1 (b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1215-0140 and 1215-0017.)

- (ii)(a) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR Part 5.5(a)(3)(i). This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB Control Number 1215-0149).
- (b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:
- (1) That the payroll for the payroll period contains the information required to be maintained under 29 CFR Part 5.5(a)(3)(i) and that such information is correct and complete;

- (2) That each laborer or mechanic (including each apprentice and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;
- (3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.
- (c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph A.3.(ii)(b) of this section.
- (d) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.
- (iii) The contractor or subcontractor shall make the records required under paragraph A.3.(i) of this section available for inspection, copying, or transcription by authorized representative of HUD or its designee or the Department of Labor, and shall permit such representative to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR Part 5.12.
4. (i) Apprentices.

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe

benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees.

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity.

The utilization of apprentices, trainees and journeyman under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act requirements.

The contractor shall comply with the requirements of 29 CFR Part 3 which are incorporated by reference in this contract.

6. Subcontracts.

The contractor or subcontractor will insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as HUD or its designee may by appropriate instructions require, and also 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 the contract clauses in 29 CFR Part 5.5

7. Contract termination; debarment.

A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1010, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part "Whoever, for the purpose of ...influencing in any way the action of such Administration ...makes, utters or publishes any statement, knowing the same to be false ...shall be fined not more than \$5,000 or imprisoned not more than two years, or both."

11. Complaints, Proceedings, or Testimony by Employees.

No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Contract are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. Contract Work Hours and Safety Standards Act

As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

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 subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefore 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 subparagraph (1) of this paragraph, in the sum of \$10 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 subparagraph (1) of this paragraph.

3. Withholding for unpaid wages and liquidated damages.

HUD or its designee 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 contract, 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 subparagraph (2) of this paragraph.

4. Subcontracts.

The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph (1) through (4) of this paragraph 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 subparagraphs (1) through (4) of this paragraph.

C. Health and Safety

1. No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.
2. The contractor shall comply with all regulations issued by the Secretary of Labor pursuant to Title 29 Part 1926 (formerly part 1518) and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act (Public Law 91-54, 83 Stat. 96).
3. The Contractor shall include the provisions of this Article in every subcontract so that such provisions will be binding on each subcontractor. The Contractor shall take such action with respect to any subcontract as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

5. SPECIAL HAZARDS

The Contractor's and his Subcontractor's Public Liability and Property Damage Insurance shall provide adequate protection against the following special hazards:

6. CONTRACTOR'S AND SUBCONTRACTOR'S PUBLIC LIABILITY, VEHICLE LIABILITY, AND PROPERTY DAMAGE INSURANCE

As required under Article 5 of the General Conditions, the Contractor's Public Liability Insurance and Vehicle Liability Insurance shall be in an amount not less than \$ 1,000,000 for injuries, including accidental death, to any one person, and subject to the same limit for each person, in an amount not less than \$ 1,000,000 on account of one accident, and Contractor's Property Damage Insurance in an amount not less than \$ 1,000,000.

The Contractor shall either (1) require each of his subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage Insurance of this type and in the same amounts as specified in the preceding paragraph, or (2) insure the activities of his subcontractors in his own policy.

7. PHOTOGRAPHS OF PROJECT

As provided in Paragraph 3.1 of the Supplemental General Conditions, the Contractor will furnish photographs in the number, type, and stage as enumerated below:

8. SCHEDULE OF OCCUPATIONAL CLASSIFICATIONS AND MINIMUM HOURLY WAGE RATES AS REQUIRED UNDER PARAGRAPH 4.B OF THE SUPPLEMENTAL GENERAL CONDITIONS

Given on Pages 36, 37, 38, and 39

9. BUILDER'S RISK INSURANCE

As provided in the General Conditions, Article 5.6, the Contractor will/~~will not~~** maintain Builder's Risk Insurance (fire and extended coverage) on a 100 percent completed value basis on the insurable portions of the project for the benefit of the Owner, the Contractor, and all Subcontractors, as their interests may appear.

** ~~Strike out one.~~

10. SPECIAL EQUAL OPPORTUNITY PROVISIONS

A. Activities and Contracts Not Subject to Executive Order 11246, as Amended

(Applicable to Federally assisted construction contracts and related subcontracts \$10,000 and under.)

During the performance of this contract, the Contractor agrees as follows:

1. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants for employment are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, 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.
2. The Contractor shall post in conspicuous places, available to employees and applicants for employment, notices to be provided by Contracting Officer setting forth the provisions of this nondiscrimination clause. The Contractor shall state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
3. Contractors shall incorporate foregoing requirements in all subcontracts.

B. Executive Order 11246 (contracts/subcontracts above \$10,000)

1. Section 202 Equal Opportunity Clause

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, 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, 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.
- 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 without regard to race, color, religion, sex, or national origin.
- c. 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 by the Contract Compliance Officer advising the said labor union or workers' representatives of the Contractor's commitment under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- d. 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.
- e. 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 Department of the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and others.
- f. 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 cancelled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized 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.

g. The Contractor will include the provisions of the sentence immediately preceding paragraph a. and the provisions of paragraphs a. through g. in every subcontract or purchase order unless exempted by rules, regulations, 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 Department may direct as a means of enforcing such provisions, including sanctions for non-compliance. 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 Department, the Contractor may request the United States to enter into such litigation to protect the interest of the United States.

2. Notice of Requirement for Affirmative Action to ensure Equal Employment Opportunity (Executive Order 11246).
(Applicable to contracts/subcontracts exceeding \$10,000.)

- a. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.
- b. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation	Goals for female participation
Insert Goals	Insert Goals
12%	6.9%

NOTE: THESE GOALS MUST BE PROVIDED. Also, list State Geographic Area to be covered on following page.

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or Federally assisted) performed in the covered area. If the Contractor performs construction work in a geographic area located outside of the covered area, it shall apply the goals established for such geographic area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its Federally involved and non-Federally involved construction.

The contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

- c. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.
 - d. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is Fentress County, TN.
3. Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)
- a. As used in these specifications:
 - (1) "Covered area" means the geographical area described in the solicitation from which this contract resulted;
 - (2) "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
 - (3) "Employer identification number" means the federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;
 - (4) "Minority" includes:
 - (a) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

- (b) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South America or other Spanish Culture or origin, regardless of race);
 - (c) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands);
 - (d) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
- b. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
- c. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

- d. The Contractor shall implement the specific affirmative action standards provided in paragraphs g.(1) through (16) of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing contracts in geographical areas where they do not have a Federal or Federally-assisted construction contract shall apply the minority and female goals established for the geographic area where the contract is being performed. Goals are published periodically in the Federal Register in notice form and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.
- e. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
- f. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.
- g. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

- (1) Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
- (2) Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its union have employment opportunities available, and maintain a record of the organization's responses.
- (3) Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.
- (4) Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
- (5) Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under g.(2) above.

- (6) Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company's EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.
- (7) Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- (8) Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- (9) Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date of the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
- (10) Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

- (11) Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR part 60-3.
- (12) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- (13) Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
- (14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- (15) Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
- (16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
- h. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations g.(1) through (16). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under g.(1) through (16) of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation shall not be a defense for the Contractor's non-compliance.

- i. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
- j. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
- k. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
- l. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
- m. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps at least as extensive as those standards prescribed in paragraph g. of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

- n. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company's EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee, the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number where assigned, social security number, race, sex, status (e.g., mechanic, apprentice trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and location at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractor shall not be required to maintain separate records.
- o. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

C. Certification of Nonsegregated Facilities (Over \$10,000)

By the submission of this bid, the bidder, offeror, applicant or subcontractor certifies that he/she does not maintain or provide for his/her employees any segregated facility at any of his/her establishments, and that he/she does not permit employees to perform their services at any location, under his/her control, where segregated facilities are maintained. He/She certifies further that he/she will not maintain or provide for employees any segregated facilities at any of his/her establishments, and he/she will not permit employees to perform their services at any location under his/her control where segregated facilities are maintained. The bidder, offeror, applicant or subcontractor agrees that a breach of this certification is a violation of the Equal Opportunity Clause of this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms, and other storage or dressing areas, ***transportation and housing facilities provided for employees which are segregated on the basis of race, color, religion, or are in fact segregated on the basis of race, color, religion, or otherwise. He/She further agrees that (except where he/she has obtained identical certifications from proposed subcontractors for specific time periods) he/she will obtain identical certification from proposed subcontractors prior to the award of subcontracts exceeding \$10,000 which are not exempt from the provisions of the Equal Opportunity Clause; that he/she will retain such certifications in his/her files; and that he/she will forward the following notice to such proposed subcontractors (except where proposed subcontractors have submitted identical certifications for specific time periods).

D. Civil Rights Act of 1964

Under Title VI of the Civil Rights Act of 1964, no person shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

E. Section 109 of the Housing and Community Development Act of 1974

No person in the United States shall on the grounds of race, color, national origin, or sex be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity funded in whole or in part with funds made available under this title.

F. "The Section 3 Clause"

1. The work to be performed under this contract is on a project assisted under a program providing direct Federal financial assistance from the Department of Housing and Urban Development and is subject to the requirements of section 3 of the Housing Urban Development Act of 1968, as amended, 12 U.S.C. 1701u. Section 3 requires that to the greatest extent feasible, opportunities for training and employment be given to lower income residents of the area of the Section 3 covered project, and contracts for work in connection with the project be awarded to business concerns which are located in, or owned in substantial part by persons residing in the area of the Section 3 covered project.
2. The parties to this contract will comply with the provisions of said Section 3 and the regulations issued pursuant thereto by the Secretary of Housing and Urban Development set forth in 24 Part CFR 135, and all applicable rules and orders of the Department issued thereunder prior to the execution of this contract. The parties to this contract certify and agree that they are under no contractual or other disability which would prevent them from complying with these requirements.
3. The contractor will send to each labor organization or representative of workers with which he has a collective bargaining agreement or other contract or understanding, if any, a notice advising the said labor organization or workers' representative of his commitments under this Section 3 clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment or training.
4. The contractor will include this Section 3 clause in every subcontract for work in connection with the project and will, at the direction of the applicant for or recipient of Federal Financial assistance, take appropriate action pursuant to the subcontract upon a finding that the subcontractor is in violation of regulations issued by the Secretary of Housing and Urban Development, 24 CFR Part 135. The contractor will not subcontract with any subcontractor where it has notice or knowledge that the latter has been found in violation of regulations under 24 CFR part 135 and will not let any subcontract unless the subcontractor has first provided it with a preliminary statement of ability to comply with the requirements of these regulations.

5. Compliance with the provisions of Section 3, the regulations set forth in 24 CFR Part 135, and all applicable rules and orders of the Department issued thereunder prior to the execution of the contract, shall be a condition of the Federal financial assistance provided to the project, binding upon the applicant or recipient, its contractors and subcontractors, its successors, and assigns to those sanctions specified by the grant or loan agreement or contract through which Federal assistance is provided, and to such sanctions as are specified by 24 CFR Part 135.

G. Age Discrimination Act of 1975

No person in the United States shall, on the basis of age, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under, any program or activity receiving Federal financial assistance.

H. Section 504 Handicapped

Non-Discrimination for Handicapped Workers

No otherwise qualified handicapped individual in the U.S., as defined in Section 7, Paragraph 6 of the Rehabilitation Act of 1973 shall, solely by reason of this handicap, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance.

11. CERTIFICATION OF COMPLIANCE WITH AIR AND WATER ACTS

(Applicable to Federally assisted construction contracts and related subcontracts exceeding \$100,000)

Compliance with Air and Water Acts

During the performance of this contract the contractor and all subcontractors shall comply with the requirements of the Clean Air Act, as amended, 42 USC 1857 et seq., the Federal Water Pollution Control Act, as amended, 33 USC 1251 et seq., and the regulations of the Environmental Protection Agency with respect thereto, at 40 CFR Part 15, as amended.

In addition to the foregoing requirements, all nonexempt contractors and subcontractors shall furnish to the Owner, the following:

1. A stipulation by the Contractor or subcontractors, that any facility to be utilized in the performance of any nonexempt contract or subcontract, is not listed on the List of Violating Facilities issued by the Environmental Protection Agency (EPA) pursuant to 40 CFR 15.20.

2. Agreement by the Contractor to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 USC 1857c-8) and Section 308 of the Federal Water Pollution Control Act, as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.
3. A stipulation that as a condition for the award of the contract, prompt notice will be given of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility utilized, or to be utilized for the contract, is under consideration to be listed on the EPA List of Violating Facilities.
4. Agreement by the Contractor that he will include, or cause to be included, the criteria and requirements in paragraph (1) through (4) of this section in every nonexempt subcontract and requiring that the Contractor will take such action as the Government may direct as a means of enforcing such provisions.

12. SPECIAL CONDITIONS PERTAINING TO HAZARDS, SAFETY STANDARDS AND ACCIDENT PREVENTION

A. Lead-Based Paint Hazards

(Applicable to contracts for construction or rehabilitation of residential structures.) The construction or rehabilitation of residential structures is subject to the HUD Lead-Based Paint regulations, 24 CFR Part 35. The Contractor and Subcontractors shall comply with the provisions for the elimination of lead-base paint hazards under sub-part B of said regulations. The Owner will be responsible for the inspections and certifications required under Section 35.14(f) thereof.

B. Use of Explosives (Modify as Required)

When the use of explosives is necessary for the prosecution of the work, the Contractor shall observe all local, state and Federal laws in purchasing and handling explosives. The Contractor shall take all necessary precaution to protect completed work, neighboring property, water lines, or other underground structures. Where there is danger to structures or property from blasting, the charges shall be reduced and the material shall be covered with suitable timber, steel or rope mats.

The Contractor shall notify all owners of public utility property of intention to use explosives at least eight hours before blasting is done, close to such property. Any supervision or direction of use of explosives by the engineer, does not in any way reduce the responsibility of the Contractor or his Surety for damages that may be caused by such use.

C. Danger Signals and Safety Devices (Modify as Required)

The Contractor shall make all necessary precautions to guard against damages to property and injury to persons. He shall put up and maintain in good condition, sufficient red or warning lights at night, suitable barricades and other devices necessary to protect the public. In case the Contractor fails or neglects to take such precautions, the Owner may have such lights and barricades installed and charge the cost of this work to the Contractor. Such action by the Owner does not relieve the Contractor of any liability incurred under these specifications or contract.

13. FLOOD DISASTER PROTECTION

This Contract is subject to the requirements of the Flood Disaster Protection Act of 1973 (P.L. 93-234). Nothing included as a part of this Contract is approved for acquisition or construction purposes as defined under Section 3(a) of said Act, for use in an area identified by the Secretary of HUD as having special flood hazards which is located in a community not then in compliance with the requirements for participation in the national flood insurance program pursuant to Section 201(d) of said Act; and the use of any assistance provided under this Contract for such acquisition or construction in such identified areas in communities then participating in the national flood insurance program shall be subject to the mandatory purchase of flood insurance requirements of Section 102(a) of said Act.

Any contract or agreement for the sale, lease, or other transfer of land acquired, cleared or improved with assistance provided under the Contract shall contain, if such land is located in an area identified by the Secretary as having special flood hazards and in which the sale of flood insurance has been made available under the National Flood Insurance Act of 1968, as amended, 42 U.S.C. 4001 et seq., provisions obligating the transferee and its successors or assigns to obtain and maintain, during the ownership of such land, such flood insurance as required with respect to financial assistance for acquisition or construction purposes under Section 102(a) of the Flood Disaster Protection Act of 1973.

14. ACCESS TO RECORDS/MAINTENANCE OF RECORDS

The Contractor shall maintain accounts and records, including personnel, property, and financial records, adequate to identify and account for all costs pertaining to the contract and such other records as may be deemed necessary by the locality to assure proper accounting for all funds. These records will be available for audit purposes to the locality or the State or any other authorized representative, and will be retained for three years after contract completion unless permission to destroy them is granted by the locality. Moreover, the locality, State, or any authorized representative shall have access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purpose of making audit, examination, excerpts, and transcriptions.

15. CONFLICT OF INTEREST OF OFFICERS OR EMPLOYEES OF THE LOCAL JURISDICTION, MEMBERS OF THE LOCAL GOVERNING BODY, OR OTHER PUBLIC OFFICIALS

No officer or employee of the local jurisdiction or its designees or agents, no member of the governing body, and no other public official of the locality who exercises any function or responsibility with respect to this contract, during his/her tenure or for one year thereafter, shall have any interest, direct or indirect, in any contract or subcontract, or the proceeds thereof, for work to be performed. Further, the contractor shall cause to be incorporated in all subcontracts the language set forth in this paragraph prohibiting conflict of interest.

16. DRUG-FREE WORKPLACE

Under the provisions of Tennessee Code Annotate § 50-9-113 enacted by the General Assembly effective 2001, a) employers with five (5) or more employees who contract with either the state or a local government to provide construction services are required to submit an affidavit stating that they have a drug free workplace program that complies with Title 50, Chapter 9, in effect at the time of submission of a bid at least to the extent required of governmental entities. The statute, imposes other requirements on the contractor, but the grantee's responsibility is specifically limited in section (b) of the state as follows:

(b) A written affidavit by the principal officer of a covered employer provided to a local government at the time such bid or contract is submitted stating that the employer is in compliance with this section shall absolve the local government of all further responsibility under this section and any liability arising from the employer's compliance or failure of compliance with the provisions of this section.

17. PROJECT SIGN

If a project sign is erected, it must include the following:

Governor (*Name*)
Department of Economic and Community Development
Commissioner (*Name*)
CDBG Grant (*Amount*)

CERTIFICATION OF COMPLIANCE WITH THE BUILD AMERICA, BUY AMERICA ACT (BABA)

This document is used to certify that, as required by the Build America, Buy America (BABA) Act, all of the iron, steel, manufactured products, and construction materials incorporated into an infrastructure project are produced in the United States, unless exempted by a HUD general waiver or a project-/product-specific waiver approved by the Made in America Office (MIAO) at the Office of Management and Budget (OMB).

For covered materials not otherwise exempted from the Buy America Preference (BAP), the undersigned certifies the following:

- All iron and steel used in the project are produced in the United States. This means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States;
- All manufactured products used in the project are produced in the United States. This means the manufactured product was manufactured in the United States, and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard that meets or exceeds this standard has been established under applicable law or regulation for determining the minimum amount of domestic content of the manufactured product;
- All construction materials used in the project are manufactured in the United States. This means that all manufacturing processes for the construction material occurred in the United States.

All BAP covered materials are noted within these plans and specifications. The signatory shall provide a list of all covered materials using the provided "BABA Covered Materials and Manufactured Goods List" document.

I hereby certify this information is complete and accurate and agree to provide documentation collected on the country of origin for all covered materials I caused to be incorporated into or affixed to an infrastructure project.

Bidder Name Printed

Date

Signature of Bidder

Company

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

CITY OF JAMESTOWN

**2024 CDBG JAMESTOWN SEWER
IMPROVEMENTS**

TECHNICAL SPECIFICATIONS



03/09/2026

TO BID, CONTRACTOR MUST
GETS FROM ISSUING OFFICE

2024 CDBG JAMESTOWN SEWER IMPROVEMENTS

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TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

SECTION 01 00 00
GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 GENERAL SCOPE AND SPECIAL PROVISIONS

- A. The Work consists of rehabilitating of one (1) sanitary sewer lift station, approximately 1,722 linear feet of gravity sewer, and nine (9) service cleanouts utilizing Cured-in-Place Pipe (CIPP) methods, as well as rehabilitating six (6) manholes with a cementitious epoxy lining system, located in Jamestown, Tennessee.
- B. The Contractor shall be responsible for all costs associated with the materials, equipment, and labor necessary to construct, and test all proposed items shown on the Drawings. Contractor shall also be responsible for the traffic control, worker protection, environmental pollution control, waste disposal and all other ancillary actions required to complete the work as shown on the Drawings.
- C. Submittals

All project submittals shall be submitted to the Engineer (Seth W. Rye, P.E., Rye Engineering PLC, 4210 West Main Street, Erin, Tennessee 37061).

- 1. Unless otherwise specified, the Contractor shall provide five sets of submittals and/or shop drawings for Engineer review.
- 2. Submittals shall be clear and legible, and of sufficient size for legibility and clarity of the presented data.
- 3. The submittal transmittal page shall include at a minimum the following information:
 - a. Contractor identification:
 - i. Contractor
 - ii. Supplier
 - iii. Manufacturer
 - iv. Supplier or Manufacturer Representative
 - b. Date of submission
 - c. Project number
 - d. Project name

- e. Description/identification of the product
- f. Reference to Contract drawing(s), if applicable
- g. Specification section number, page and paragraph(s), if applicable
- h. Reference to applicable standards, such as ASTM or Federal Standards numbers
- i. Contractor's approval and certification statement
- j. Reference to previous submittal (for resubmittals)

D. Contractor shall schedule all work in close coordination with Owner and Engineer. Due to the criticality of the pump station down time, timely work is crucial.

E. Existing Utilities, Underground Pipelines and Electric Conduit

From investigations during the design surveys, at least the following existing utilities were found to be present in the area:

- Water Lines..... The City of Jamestown, TN
- Sewer Lines..... The City of Jamestown, TN
- Power Lines Volunteer Energy Cooperative; Jamestown, TN
- Telephone Lines..... Twin Lakes Telephone Cooperative Corporation; Gainesboro, TN

Precautions shall be taken by the Contractor to avoid damage to existing overhead and underground utilities.

F. Project Sign

1. The General Contractor shall erect a sign at the Project site identifying the Project. The sign shall be erected within twenty-one (21) days after the Notice to Proceed and shall be in accordance with the Specifications and details included in this Section. The project sign and sign panel shall be installed by the Contractor at the location designated by the Owner's Representative. Wording and colors shall be as shown on the detail at the end of this Section.
2. The project sign shall be furnished, erected, and maintained by the Contractor in accordance with the following specifications:
 - a. Sign Panel: The sign panel shall be constructed of 3/4-inch minimum thickness marine plywood rabbited into a 2-inch x 4-inch wood frame. All fasteners used in the construction of the sign shall be of a rustproof nature.

- b. Painting: All supports, trim and back of the sign panel shall be painted with at least two (2) coats of the same paint used for the sign face. All paint used shall be exterior grade paint, suitable for use on wood signs.
- c. Sign Supports: The supports for the project sign shall be at least two 4" by 4" treated wood posts. The sign panel shall be securely fastened to the sign supports with at least six (6) 3/8" galvanized bolts, nuts and washers. The positioning and alignment of the sign shall be as determined by the Owner's Representative.
- d. Maintenance: The project sign shall be maintained by the Contractor, in good condition, at all times, for the duration of construction.
- e. Removal of Sign from Project Site: The removal of the project sign from the construction site by the Contractor shall be at the completion of construction, when ordered by the Owner's Representative.
- f. Payment: The cost of the fabrication, erection, maintenance, and removal of the project sign, including all labor and materials, shall be included in the General Contractor's Lump Sum Bid. No extra payment will be made for obliterating certain names and offices and replacement thereof of others because of administrative changes during the course of this Contract.
- g. Identification Plate – NOT USED

G. Progress Pictures

1. The Contractor shall furnish progress pictures to the Engineer at the end of each month at the time the estimate is submitted. The pictures shall be submitted in digital and print format, with descriptions. These pictures shall be approximately 3" x 5" and clearly show the work performed. The name of the project, Contractor's name, and the date shall be shown on the progress pictures. Twenty pictures minimum shall be required per month.

H. Documents at Site

2. Contractor shall maintain an approved original set of Drawings and Specifications on Site at all times. Said Drawings, Specifications and permits shall be available for inspection by Engineer, Owner and SFM officials at all times.

END OF SECTION

SECTION 01 29 00

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The Bid Form lists each item of the Project for which payment will be made. No payment will be made for any items other than those listed in the Bid Form.
- B. Required items of work and incidentals necessary for the satisfactory completion of the work which are not specifically listed in the Bid Form, and which are not specified in this Section, shall be considered incidental to the work. All costs thereof shall be considered as included in the lump sum or unit prices bid for the various Bid items. The Contractor shall prepare the Bid accordingly.
- C. Contractor shall include in the prices provided for the items listed herein adequate amounts considered by Contractor to cover all costs associated with furnishing all tools, equipment, supplies, manufactured articles and for all labor, operations, taxes, commissions, transportation and handling, bonds, permit fees, insurance, overhead and profit for each item.

1.02 BASE BID ITEMS - GRAVITY SEWER REHABILITATION

- A. Unit prices bid by Contractor are deemed to be full compensation for all required labor, products, tools, equipment, plant, transportation, testing, inspection, services, incidentals, administrative, procedures, applicable taxes, permit fees, overhead, profit, and other miscellaneous expenses, unless specified otherwise.
- B. Mobilization (Maximum of 3% of Gravity Sewer Rehabilitation Base Bid)

1. MEASUREMENT

- a. Measurement for the Mobilization (Maximum of 3% of Gravity Sewer Rehabilitation Base Bid) will be measured as a lump sum bid item. The lump sum shall include all labor, materials, and all equipment necessary to Mobilize on site to prepare for beginning work. Partial payments may be made as "stored materials" for payment and performance bonds costs, but receipts shall be submitted as stored materials. Payment shall not be made for mobilization until equipment is mobilized on site.

2. PAYMENT

- a. Payment will be made at the unit price listed on the bid form. The price on the bid form shall not exceed 3% of the Gravity Sewer Rehabilitation Base Bid. If it does, then Contractor shall only be paid for 3% of the Gravity Sewer Base Bid.

C. Pre-Clean, Pre and Post -CCTV, Remove Obstructions and/or perform active infiltration control measures, as needed, includes Heavy cleaning if necessary.

1. MEASUREMENT

a. Measurement for Pre-Clean, Pre and post-CCTV, Remove Obstructions and/or perform active infiltration control measures will be measured as a unit price bid item for every Linear Foot (LF) of Pre-CCTV performed in the project. This item includes heavy cleaning if necessary, and no additional payments shall be made for heavy cleaning. This item includes CCTV footage after the CIPP liner is installed. The unit price shall include all labor, materials, and all equipment necessary to complete the work, per the construction drawings and specifications.

2. PAYMENT

a. Payment will be made at the unit price listed on the bid form.

D. 8" Gravity Sewer Rehabilitation (CIPP)

1. MEASUREMENT

a. Measurement for the 8" Gravity Sewer Rehabilitation will be measured as a unit price bid item for every Linear Foot (LF) of CIPP installed during the project. Work includes CIPP liner installation, curing, post-CCTV inspection, lateral reinstatement, physical properties testing, and correction of deficiencies. The unit price shall include all labor, materials, and all equipment necessary to complete the work, per the construction drawings and specifications.

2. PAYMENT

a. Payment will be made at the unit price listed on the bid form.

E. Allowance for Point Repairs found in CCTV

3. MEASUREMENT

b. Measurement for the Allowance for Point Repairs will be measured as a Lump Sum bid item. This is to be used at the owners discretion, if any point repairs are found necessary during CCTV.

4. PAYMENT

b. Payment will be made in an amount determined by the severity of the point repairs, and up to the allowance amount shown in the lump sum. This will be at the owner's discretion.

1.03 BASE BID ITEMS - SOUTH MAIN LIFT STATION REHABILITATION

A. Unit prices bid by Contractor are deemed to be full compensation for all required labor, products, tools, equipment, plant, transportation, testing, inspection, services, incidentals, administrative, procedures, applicable taxes, permit fees, overhead, profit, and other miscellaneous expenses, unless specified otherwise.

B. Mobilization (Max 3% of Lift Station Rehabilitation Subtotal)

1. MEASUREMENT

a. Measurement for the Mobilization (Max 3% of Lift Station Rehabilitation Subtotal) will be measured as a lump sum. The lump sum shall include all labor, materials, and all equipment necessary to Mobilize on site to prepare for beginning work. Partial payments may be made as "stored materials" for payment and performance bonds costs, but receipts shall be submitted as stored materials. Payment shall not be made for mobilization until equipment is mobilized on site.

2. PAYMENT

a. Payment will be made at the unit price listed on the bid form. The price on the bid form shall not exceed 3% of the Lift Station Rehabilitation Base Bid. If it does, then Contractor shall only be paid for 3% of the Lift Station Rehabilitation Base Bid

C. Lift Station Rehabilitation Improvements

1. MEASUREMENT

a. Measurement for Lift Station Rehabilitation will be measured as a Lump Sum (LS) item in the project. Work includes installation of new submersible pumps, piping, electrical systems, systems integration, controls, SCADA, metering, fencing, site work, traffic control, bypass connections, valves, EPSC measures, and all other work shown in the construction plans and specifications. The lump sum shall include any necessary bypass pumping required while the station is down.

2. PAYMENT

a. Payment will be made at the Lump Sum price listed on the bid form.

1.04 ADDITIVE ALTERNATES

A. The additive alternates listed below may be selected by the owner, at the discretion of the owner and in partial quantities, if necessary, to stay within the financial constraints of the project.

B. Clean & TV Sanitary Sewer Laterals (Lateral Launch)

1. MEASUREMENT

a. Measurement for Clean & TV Sanitary Sewer Laterals will be measured as a unit price bid item for Each (EA) lateral launch performed in the project. This shall include heavy cleaning if necessary. No additional payment shall be made for heavy cleaning. The unit price shall include all labor, materials, and all equipment necessary to complete the work, per the construction drawings and specifications.

2. PAYMENT

a. Payment will be made at the unit price listed on the bid form.

C. CIPP Lateral Lining (Up to 4 LF)

1. MEASUREMENT

a. Measurement for CIPP Lateral Lining (Up to 4 LF) will be measured as a unit price bid item for Each (EA) lateral lined. The unit price shall include all labor, materials, and all equipment necessary to complete the work, per the construction drawings and specifications.

2. PAYMENT

a. Payment will be made at the unit price listed on the bid form.

D. CIPP Lateral Lining (For Each LF After 4 LF)

1. MEASUREMENT

a. Measurement for CIPP Lateral Lining (For Each LF After 4 LF) will be measured as a unit price bid item for every Linear Foot (LF) beyond the initial 4 LF. The unit price shall include all labor, materials, and all equipment necessary to complete the work, per the construction drawings and specifications.

2. PAYMENT

a. Payment will be made at the unit price listed on the bid form.

E. Line Manholes with Structural Epoxy (First 4 VF)

1. MEASUREMENT

- a. Measurement for Line Manholes with Structural Epoxy (First 4 VF) will be measured as a unit price bid item for Each (EA) manhole in the project. The unit price shall include all labor, materials, and all equipment necessary to complete the work, per the construction drawings and specifications.

2. PAYMENT

- a. Payment will be made at the unit price listed on the bid form.

F. Line Manholes with Structural Epoxy (In Addition to the First 4 VF)

1. MEASUREMENT

- a. Measurement for Line Manholes with Structural Epoxy (In Addition to the First 4 VF) will be measured as a unit price bid item for every Vertical Foot (VF) beyond the initial 4 VF. The unit price shall include all labor, materials, and all equipment necessary to complete the work, per the construction drawings and specifications.

2. PAYMENT

- a. Payment will be made at the unit price listed on the bid form.

G. Cut in Cleanout at STA 4+45 & Line up to Cleanout

1. MEASUREMENT

- a. Measurement for Cut in Cleanout at STA 4+45 & Line up to Cleanout will be measured as a Lump Sum (LS) bid item. The lump sum shall include all labor, materials, and all equipment necessary to complete the work, per the construction drawings and specifications. This work shall include any concrete/ asphalt cutting, gravel backfill, pipe, glue, concrete/ asphalt restoration, etc. It should also include the lining of the service up to the cleanout. The area should be restored to original or better condition.

2. PAYMENT

- a. Payment will be made at the Lump Sum price listed on the bid form.

END OF SECTION

SECTION 01 66 00

PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

- A. This Section includes General Requirements for storing and protecting materials and equipment.
- B. The Contractor shall be responsible for storage and handling of Owner furnished equipment.

1.02 STORAGE

- A. Store and protect materials and equipment in accordance with manufacturer's recommendations and the Contract Documents.
- B. Contractor shall make all arrangements and provisions necessary for, and pay all costs for, storing materials and equipment. Excavated materials, construction equipment, and materials and equipment to be incorporated into the Work shall be placed to avoid damaging the Work and existing facilities and property, and so that free access is maintained at all times to all parts of the Work and to public utility installations in vicinity of the Work. Store materials and equipment neatly and compactly in locations that cause minimum inconvenience to Owner, other contractors, public travel, and owners, tenants, and occupants of adjoining property. Arrange storage in manner to provide easy access for inspection.
- C. Areas available at the Site for storing materials and equipment will be discussed with the Owner at the Pre-Bid Meeting and Kickoff Meeting of the project.
- D. Contractor shall be fully responsible for loss or damage (including theft) to stored materials and equipment.
- E. Do not open manufacturer's containers until time of installation, unless recommended by the manufacturer, required to verify all contents or otherwise specified in the Contract Documents.
- F. Do not store materials or equipment in structures being constructed unless approved by Engineer in writing.
- G. Do not use lawns or other private property for storage without written permission of the owner or other person in possession or control of such premises. Prior to use written permission must be submitted to Engineer for record purposes.

1.03 PROTECTION

- A. Equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipping, handling, and storage, in accordance with Section 01 65 00, Product Delivery Requirements.

- B. Store all materials and equipment off the ground or floor on raised supports such as skids or pallets.
- C. Protect painted surfaces against impact, abrasion, discoloration, and other damage. Painted equipment surfaces that are damaged or marred shall be repainted in their entirety in accordance with equipment manufacturer and paint manufacturer requirements, to the satisfaction of Engineer.
- D. Protect electrical equipment, controls, and instrumentation against moisture, water damage, heat, cold, and dust. Space heaters provided in equipment shall be connected and operating at all times until equipment is placed in operation and permanently connected.

1.04 UNCOVERED STORAGE

- A. The following types of materials may be stored outdoors without cover on supports so there is no contact with the ground:
 - 1. Reinforcing steel.
 - 2. Structural steel.
 - 3. Piping.
 - 4. Precast concrete materials.
 - 5. Castings.
 - 6. Handrails and railings.
 - 7. Grating.
 - 8. Checker plate.
 - 9. Metal stairs.
 - 10. Metal access hatches.
 - 11. Fiberglass products.
 - 12. Rigid electrical conduit.
 - 13. Loose granular material.
 - 14. Others as directed by Owner.

1.05 COVERED STORAGE

- A. The following materials and equipment may be stored outdoors on supports and completely covered with covering impervious to water:
 - 1. Rough lumber.
 - 2. Filter media.
 - 3. Masonry units.
 - 4. Grout and mortar materials.
 - 5. Others as directed by Owner.
- B. Tie down covers with rope, and slope covering to prevent accumulation of water.

1.06 FULLY PROTECTED STORAGE

- A. Store all material and equipment not named in Articles 1.4 and 1.5 of this Section in on supports in buildings or trailers that have concrete or wooden flooring, roof, and fully closed walls on all

sides. Covering with Visqueen plastic sheeting or similar material in space without floor, roof, and walls is not acceptable. Comply with the following:

1. Provide heated storage for materials and equipment that could be damaged by low temperatures or freezing.
2. Provide air-conditioned storage for materials and equipment that could be damaged by high temperatures.
3. Protect mechanical and electrical equipment from being contaminated by dust, dirt, and moisture.
4. Maintain humidity at levels recommended by manufacturers for electrical and electronic equipment.

1.07 HAZARDOUS PRODUCTS

- A. Prevent contamination of personnel, storage area, and the Site. Comply with Laws and Regulations and manufacturer's instructions.

1.08 MAINTENANCE OF STORAGE

- A. On scheduled basis, periodically inspect stored materials and equipment to ensure that:
 1. State of storage facilities is adequate to provide required conditions.
 2. Required environmental conditions are maintained on continuing basis.
 3. Materials and equipment exposed to elements are not adversely affected.
- B. Mechanical and electrical equipment, requiring long-term storage shall have complete manufacturer's instructions for servicing each item, with notice of enclosed instructions shown on exterior of container or package.
 1. Comply with manufacturer's instructions on scheduled basis.
 2. Space heaters that are part of electrical equipment, shall be connected and operated continuously until equipment is placed in service and permanently connected.

1.09 MICROPROCESSORS, PANELS, AND INSTRUMENTATION STORAGE

- A. Microprocessor-based equipment, store panels, electronics, and other devices subject to damage or decreased useful life because of temperatures below 40 degrees F or above 100 degrees F, relative humidity above 90 percent, or exposure to rain or exposure to blowing dust in climate-controlled storage space.
- B. Requirements:
 1. Owner and Engineer have the right to inspect materials and equipment during normal working hours.

2. Placed inside each panel or device a desiccant, volatile corrosion inhibitor blocks (VCI) moisture indicator, and maximum-minimum indicating thermometer.
 3. Check panels and equipment at least once per month. Replace desiccant, VCI, and moisture indicator as often as required, or every six months, whichever occurs first.
 4. Certified record of daily maximum and minimum temperature and humidity in storage facility shall be available for inspection by Owner and Engineer. Certified record of monthly inspection, noting maximum and minimum temperature for month, condition of desiccant, VCI, and moisture indicator, shall be available for inspection by Owner and Engineer.
- C. Costs for storing climate-sensitive materials and equipment shall be paid by Contractor. Replace panels and devices damaged during storage, or for which storage temperatures or humidity range has been exceeded, at no additional cost to Owner. Delays resulting from such replacement are causes within Contractor's control.
- D. Do not ship panels and equipment to the Site until conditions at the Site are suitable for installation, including slabs and floors, walls, roofs, and environmental controls. Failure to have the Site ready for installation shall not relieve Contractor from complying with the Contract Documents.

1.10 RECORDS

- A. Keep up-to-date account of materials and equipment in storage to facilitate preparation of Applications for Payment, if the Contract Documents provide for payment for materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing.

END OF SECTION

SECTION 01 71 33

PROTECTION OF PROPERTY AND WORK

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. Contractor shall be responsible for the preservation and protection of property adjacent to the work site against damage or injury as a result of his operations under this contract. Any damage or injury occurring on account of any act, omission or neglect on the part of the Contractor shall be restored in a proper and satisfactory manner or replaced by and at the expense of the Contractor to an equal or superior condition than previously existed.
- B. Contractor shall comply promptly with such safety regulations as may be prescribed by the Owner or the local authorities having jurisdiction and shall, when so directed, properly correct any unsafe conditions created by, or unsafe practices on the part of his employees. In the event of the Contractor's failure to comply, the Owner may take the necessary measures to correct the conditions or practices complained of, and all costs therefor will be deducted from any monies due the Contractor. Failure of the Engineer to direct the correction of unsafe conditions or practices shall not relieve the Contractor of his responsibility hereunder.
- C. In the event of any claims for damage or alleged damage to property as a result of work under this Contract, the Contractor shall be responsible for all costs in connection with the settlement of or defense against such claims. Prior to commencement of work in the vicinity of property adjacent to the work site, the Contractor, at his own expense, shall take such surveys as may be necessary to establish the existing condition of the property. Before final payment can be made, the Contractor shall furnish satisfactory evidence that all claims for damage have been legally settled or sufficient funds to cover such claims have been placed in escrow, or that an adequate bond to cover such claims has been obtained.

1.02 PROTECTION OF WORK AND MATERIAL

- A. During the progress of the work and up to the date of final payment, the Contractor shall be solely responsible for the care and protection of all work and materials covered by the Contract.
- B. All work and materials shall be protected against damage, injury or loss from any cause whatsoever, and the Contractor shall make good any such damage or loss at his own expense. Protection measures shall be subject to the approval of the Engineer.

1.03 BARRICADES, WARNING SIGNS AND LIGHTS

- A. The General Contractor shall provide, erect and maintain as necessary, strong and suitable barricades, danger signs and warning lights along all roads accessible to the public, as required by the authority having jurisdiction, to ensure safety to the public. All barricades and obstructions along public roads shall be illuminated at night and all lights for this purpose shall be kept burning from sunset to sunrise.

- B. Each Contractor shall provide and maintain such other warning signs and barricades in areas of and around their respective work as may be required for the safety of all those employed in the work, the Owner's operating personnel, or those visiting the site.

1.04 EXISTING UTILITIES AND STRUCTURES

- A. The term existing utilities shall be deemed to refer to both publicly-owned and privately-owned utilities such as electric power and lighting, telephone, water, gas, storm drains, process lines, sanitary sewers and all appurtenant structures.
- B. Where existing utilities and structures are indicated on the Drawings, it shall be understood that all of the existing utilities and structures affecting the work may not be shown and that the locations of those shown are approximate only. It shall be the responsibility of the Contractor to ascertain the actual extent and exact location of existing utilities and structures. In every instance, the Contractor shall notify the proper authority having jurisdiction and obtain all necessary directions and approvals before performing any work in the vicinity of existing utilities.
- C. Prior to beginning any excavation work, the Contractor shall, through field investigations, determine any conflicts or interferences between existing utilities and new utilities to be constructed under this project. This determination shall be based on the actual locations, elevations, slopes, etc., of existing utilities as determined in the field investigations, and locations, elevation, slope, etc. of new utilities as shown on the Drawings. If an interference exists, the Contractor shall bring it to the attention of the Engineer as soon as possible. If the Engineer agrees that an interference exists, he shall modify the design as required. Additional costs to the Contractor for this change shall be processed through a Change Order as detailed elsewhere in these Contract Documents. In the event the Contractor fails to bring a potential conflict or interference to the attention of the Engineer prior to beginning excavation work, any actual conflict or interference which does arise during the Project shall be corrected by the Contractor, as directed by the Engineer, at no additional expense to the Owner.
- D. The work shall be carried out in a manner to prevent disruption of existing services and to avoid damage to the existing utilities. Temporary connections shall be provided, as required, to ensure the non-interruption of existing services. Any damage resulting from the work of this Contract shall be promptly repaired by the Contractor at his own expense in a manner approved by the Engineer and further subject to the requirements of any authority having jurisdiction. Where it is required by the authority having jurisdiction that they perform their own repairs or have them done by others, the Contractor shall be responsible for all costs thereof.
- E. Where excavations by the Contractor require any utility lines or appurtenant structures to be temporarily supported and otherwise protected during the construction work, such support and protection shall be provided by the Contractor. All such work shall be performed in a manner satisfactory to the Engineer and the respective authority having jurisdiction over such work. In the event the Contractor fails to provide proper support or protection to any existing utility, the Engineer may, at his discretion, have the respective authority to provide such support or protection as may be necessary to ensure the safety of such utility, and the costs of such measures shall be paid by the Contractor.

END OF SECTION

SECTION 02 41 00

DEMOLITION

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
1. American National Standards Institute (ANSI): A10.6, Safety and Health Program Requirements for Demolition Operations.
 2. Occupational Safety and Health Administration (OSHA), U.S. Code of Federal Regulations (CFR) Title 29 Part 1926—Occupational Safety and Health Regulations for Construction.
 3. Environmental Protection Agency (EPA), U.S. Code of Federal Regulations (CFR), Title 40:
 - a. Part 61—National Emission Standards for Hazardous Air Pollutants.
 - b. Part 82—Protection of Stratospheric Ozone.
 - c. Part 273—Standards for Universal Waste Management.

1.02 DEFINITIONS

- A. ACM: Asbestos-containing material.
- B. Demolition: Dismantling, razing, destroying, or wrecking of any fixed building or structure or any part thereof.
- C. Modify: Provide all necessary material and labor to modify an existing item to the condition indicated or specified.
- D. Relocate: Remove, protect, clean and reinstall equipment, including electrical, instrumentation, and all ancillary components required to make the equipment fully functional, to the new location identified on the Drawings.
- E. Renovation: Altering a facility or one or more facility components in any way.
- F. Salvage/Salvageable: Remove and deliver, to the specified location(s), the equipment, building materials, or other items so identified to be saved from destruction, damage, or waste; such property to remain that of Owner. Unless otherwise specified, title to items identified for demolition shall revert to Contractor.
- G. Universal Waste Thermostat: A temperature control device that contains metallic mercury in an ampule attached to a bimetal sensing element, and mercury-containing ampules that have

been removed from these temperature control devices in compliance with the requirements of 40 CFR 273.

1.03 REGULATORY AND SAFETY REQUIREMENTS

- A. Comply with federal, state, and local hauling and disposal regulations. Contractor's safety requirements shall conform to ANSI A10.6.

1.04 USE OF EXPLOSIVES

- A. Use of explosives for demolition is not permitted.

1.05 ENVIRONMENTAL PROTECTION

- A. Prior to beginning demolition Contractor shall establish temporary erosion and sediment control, in accordance with Section 31 25 00, Erosion and Sediment Control.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXISTING FACILITIES TO BE DEMOLISHED OR RENOVATED

A. Facilities:

1. Buildings and adjacent designated areas scheduled for complete demolition are as shown on the Drawings.
2. Portions of buildings and other areas scheduled for selective demolition, partial demolition, and renovation work are as shown on the Drawings.

B. Utilities and Related Equipment:

1. Notify Owner or appropriate utilities to turn off affected services at least 48 hours before starting demolition or renovation activities.
2. Remove existing utilities as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by Owner.
3. When utility lines are encountered that are not indicated on the Drawings, notify Owner prior to further Work in that area.
4. Remove meters and related equipment and deliver to a location as determined by the Owner.
5. Excavate and remove utility lines serving buildings to be demolished to a distance of 10 feet beyond the outside perimeter of the demolition.

6. Provide a permanent leak-proof closure for water and gas lines.
 7. For lines less than 8 inches in diameter, plug sewer lines with concrete to a minimum plug length of 2 feet to prevent groundwater infiltration. For lines 8 inches and larger, or for all pipes abandoned under roadway, completely fill the abandoned line with controlled low strength material (CLSM) as specified in Section 31 23 00, Excavation and Fill.
- C. Paving and Slabs:
1. Provide neat saw cuts at limits of pavement removal as indicated.
- D. Masonry: Sawcut and remove masonry so as to prevent damage to surfaces to remain and to facilitate the installation of new work. Where new masonry adjoins existing, the new work shall abut or tie into the existing construction as indicated.
- E. Concrete: Saw concrete along straight lines to a depth of not less than 2 inches. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete, provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete. Where new concrete adjoins existing, the new work shall abut or tie into the existing construction as indicated.
- F. Patching:
1. Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair to match adjacent finished surfaces as to texture and finish.
 2. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work.
 3. Patching shall be as specified and indicated, and shall include:
 - a. Fill holes and depressions left as a result of removals in existing surfaces with an approved patching material, applied in accordance with the manufacturer's printed instructions.
- G. Electrical:
1. Cut off concealed or embedded conduit, boxes, or other materials a minimum of 3/4 inch below final finished surface.
 2. When removing designated equipment, conduit and wiring may require rework to maintain service to other equipment.
 3. Rework existing circuits or provide temporary circuits as necessary during renovation to maintain service to existing lighting and equipment not scheduled to be renovated. Existing equipment and circuiting shown are based upon limited field surveys. Verify existing conditions, make all necessary adjustments, and record the Work on the Record Drawings. This shall include, but is not limited to, swapping and other adjustments to

branch circuits and relocation of branch circuit breakers within panelboards as required to accomplish the finished work.

4. Reuse of existing luminaires, devices, conduits, boxes, or equipment will be permitted only where specifically indicated.
5. Raceways and cabling not scheduled for reuse.
6. Inaccessibly Concealed: Cut off and abandon in place.
7. Exposed or Concealed Above Accessible Ceilings: Remove.
8. Raceways and Cabling Scheduled for Future Use: Cap/seal and tag.
9. Relocating Equipment: Extend existing wiring or run new wiring from the source.
10. Where the existing raceway is concealed, the outlet box shall be cleaned, and a blank cover plate installed.
11. Where the concealed raceway is uncovered remove raceway (or extend to new location if appropriate).
12. Provide new typewritten panelboard circuit directory cards.

3.02 PROTECTION

A. Dust and Debris Control:

1. Prevent the spread of dust and debris to occupied portions of the building and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.
2. Vacuum and dust interior work areas daily.
3. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to vehicular traffic.

B. Traffic Control Signs: Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights.

C. Existing Work:

1. Survey the site and examine the Drawings and Specifications to determine the extent of the Work before beginning any demolition or renovation.

2. Take necessary precautions to avoid damage to existing items scheduled to remain in place, to be reused, or to remain the property of Owner; any Contractor-damaged items shall be repaired or replaced as directed by Owner.
 3. Provide temporary weather protection during interval between removal of existing exterior surfaces and installation of new to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
 4. Ensure that structural elements are not overloaded as a result of or during performance of the Work. Responsibility for additional structural elements or increasing the strength of existing structural elements as may be required as a result of any Work performed shall be that of the Contractor. Repairs, reinforcement, or structural replacement must have Owner approval.
 5. Do not overload pavements to remain.
- D. Weather Protection: For portions of the building scheduled to remain, protect building interior and materials and equipment from weather at all times. Where removal of existing roofing is necessary to accomplish the Work, have materials and workmen ready to provide adequate and temporary covering of exposed areas so as to ensure effectiveness and to prevent loss.
- E. Trees: Protect trees within the Site that might be damaged during demolition and are indicated to be left in place, by a 6-foot-high fence. The fence shall be securely erected a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Any tree designated to remain that is damaged during the Work shall be replaced in kind, as approved by the Owner.
- F. Facilities:
1. Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.
 2. Floors, roofs, walls, columns, pilasters, and other structural elements that are designed and constructed to stand without lateral support or shoring and are determined by Contractor to be in stable condition, shall remain standing without additional bracing, shoring, or lateral support until demolished, unless directed otherwise by the Owner.
 3. Protect all facility elements not scheduled for demolition.
 4. Provide interior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities.
- G. Protection of Personnel:

1. During demolition, continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site.
2. Provide temporary barricades and other forms of protection to protect Owner's personnel and the general public from injury due to demolition work.
3. Provide protective measures as required to provide free and safe passage of Owner's personnel and the general public to occupied portions of the structure.

3.03 BURNING

- A. The use of burning at the Site for the disposal of refuse and debris will not be permitted.

3.04 RELOCATIONS

- A. Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Clean all items to be relocated prior to reinstallation, to the satisfaction of Owner. Repair items to be relocated which are damaged or replace damaged items with new undamaged items as approved by Owner.

3.05 BACKFILL

- A. Do not use demolition debris as backfill material.

3.06 TITLE TO MATERIALS

- A. All equipment will be discarded, or may be salvaged, by the Contractor, unless specifically identified to remain the property of Owner in the Contract Documents.

3.07 DISPOSITION OF MATERIAL

- A. Do not remove equipment and materials without approval of Owner.
- B. Remove materials and equipment that are indicated and specified to be removed by Contractor and deliver to The Town of Dover facility specified by Owner.
- C. Remove salvaged items in a manner to prevent damage, and pack or crate to protect the items from damage while in storage or during shipment. Properly identify containers as to contents.
- D. Repair or replace, at the discretion of Owner, items damaged during removal or storage.
- E. Owner will not be responsible for the condition or loss of, or damage to, property scheduled to become Contractor's property after Owner's authorization to begin demolition. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.
- F. Owner will not be responsible for the condition or loss of, or damage to, such property after Owner's authorization to begin demolition.

- G. Store salvaged items as approved by Owner and remove them from Owner's property before completion of the Contract. Materials and equipment shall not be either viewed by prospective purchasers or sold on the Site.

3.08 REUSE OF MATERIALS AND EQUIPMENT

- A. Remove and store materials and equipment to be reused or relocated to prevent damage and reinstall as the Work progresses.
- B. Properly store and maintain equipment and materials in same condition as when removed.
- C. Store equipment and material designated to be reused in a location designated by Owner.
- D. Equipment and material designated to be reused shall be cleaned, serviced and checked for proper operability before being put back into service.
- E. Owner will determine condition of equipment and materials prior to removal.

3.09 UNSALVAGEABLE MATERIAL

- A. Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of by the Contractor at a facility permitted to receive the waste by the appropriate state, federal, or local authority.
- B. Combustible material shall be disposed of off the Site.

3.10 CLEANUP

- A. Debris and rubbish shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

END OF SECTION

SECTION 03 30 00
CAST IN PLACE CONCRETE

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

The work to be performed is shown on the drawings. It involves the selective demolition of existing concrete supports, and the installation of new concrete supports. Contractor shall submit marked up drawing of construction plans to Engineer to review placement of concrete supports.

1.02 QUALITY ASSURANCE

A. Codes and Standards:

1. ACI 301 "Specifications for Structural Concrete for Buildings".
2. ACI 302 "Guide for Concrete Floor and Slab Construction".
3. ACI 318 "Building Code Requirements for Reinforced Concrete".
4. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

- B. Provide special inspections and verifications for concrete construction in compliance with Section 1705.3 of the International Building Code, 2012 Edition, meeting the minimum requirements of Table 1705.3. A qualified special inspector, approved by the Architect, shall be retained by the Contractor. Payment for special inspector's services will be by Owner.

1.03 SUBMITTALS

- A. Product Data: Submit manufacturer's product data with application installation instructions for proprietary materials and items, including reinforcement, admixtures, patching compounds, curing compounds and others as requested.
- B. Shop Drawings: Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement.
- C. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test as specified. Material certificates may be submitted in lieu of laboratory test reports. Material certificates shall be signed by the manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Construct formwork for exposed concrete surfaces with plywood having integral liner, metal, or other acceptable panel type materials, to provide continuous, straight, smooth, exposed surfaces. Refer to architectural drawings for locations requiring special form liners.
- B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material.
- C. Form Coatings: Provide commercial formulation formcoating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Wire: ASTM A 82, plain, cold drawn, steel.
- C. Welded Wire Fabric: ASTM A 1064, welded steel wire fabric. Provide flat sheets. Rolled wire fabric will not be allowed.
- D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars in place. Use wire bar type supports complying with CRSI recommendations.

2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
 - 1. Use one brand of cement throughout project.
- B. Fly Ash: ASTM C 618, Class C.
- C. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.
 - 1. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used.
- D. Water: Potable.
- E. Air Entraining Admixture: ASTM C 260.
- F. Water Reducing Admixture: ASTM C 494, Type A.
- G. Water Reducing, Accelerator Admixture: ASTM C 494, Type C or E.

H. WaterReducing, Retarding Admixture: ASTM C 494, Type D.

1. Calcium chloride not permitted.

2.04 RELATED MATERIALS

A. Moisture Barrier: Provide moisture barrier cover over prepared base material polyethylene sheet not less than 10 mils thick.

B. NonShrink Grout: CRDC 621, Type D, nonmetallic, factory premixed grout

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - a. "Masterflow 713"; BASF or approved equal
 - b. "NS-Grout"; Euclid Chemical Co. or approved equal
 - c. "Five Star Grout"; Five Star Products or approved equal
 - d. "Duragrout"; L & M Const. Chemical Co. or approved equal

C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

D. MoistureRetaining Cover: One of the following, complying with ASTM C 171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylenecoated burlap.

E. Liquid MembraneForming Curing Compound: ASTM C309, Type I.

1. Products offered by manufacturers to comply with the requirements for membraneforming curing compounds include the following:
 - a. "Aqua-Cure VOX"; Euclid Chemical Corp. or approved equal
 - b. "Masterkure"; BASF. or approved equal
 - "Dress and Seal"; L & M Construction Chemicals. or approved equal

F. Epoxy Adhesive: 100% solids, two component material suitable for use on dry or damp surfaces.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

- a. "Sikadur 35 HiMod LV"; Sika Chemical Corp. or approved equal
 - b. "Eucopoxy"; Euclid Chemical Co. or approved equal
- G. Bonding Compound: Polyvinyl acetate, rewettable type.
- 1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - a. "Everbond"; L & M Construction Chemicals. or approved equal
 - b. "Euco Weld"; Euclid Chemical Co. or approved equal
 - c. "Daraweld C"; Grace Construction Products. or approved equal

2.05 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. The concrete mix design shall be at Contractor's expense.
- 1. Submit written reports to Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.
 - 2. Design mixes to provide normal weight concrete with the following properties, as indicated on the drawings.
 - a. 3000 psi 28-day compressive strength (Limit fly ash to not exceed 20% of cement content by weight)
 - b. 4000 psi 28-day compressive strength (Limit fly ash to not exceed 20% of cement content by weight)
- B. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect.
- C. Admixtures:
- 1. Use water reducing admixture in all concrete.
 - 2. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F.
- D. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps and Sloping Surfaces: Not more than 3".
2. Other Concrete: Not less than 2" and not more than 5".
3. Slump limits are before the addition of superplasticizers.

2.06 CONCRETE MIXING

- A. JobSite Mixing: Mix materials for concrete in appropriate drum type batch machine mixer. For mixers of one cu. yd., or smaller capacity, continue mixing at least 1 1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1 1/2 minutes of mixing time by 15 seconds for each additional cu. yd., or fraction thereof. Jobsite mixing shall be allowed for minor applications only.
- B. ReadyMix Concrete: Comply with requirements of ASTM C 94, and as herein specified.
 1. Maximum of 2 gallons of water per cubic yard may be added to the batch for material of insufficient slump.
 2. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.
 3. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1 1/2 hours to 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.01 FORMS

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position. Design and construction of formwork is the responsibility of the Contractor.
 1. Construct forms complying with ACI 347, to sizes shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
 2. Fabricate forms for easy removal without hammering or prying against concrete surfaces.
 3. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete.

4. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

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

1. Coat contact surfaces of forms with a form coating compound before reinforcement is placed.

3.02 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

1. Weld rebar only if specifically permitted by Structural Engineer. Accomplish welding per AWS "Recommended Practices for Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction".

D. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.03 JOINTS

A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Architect.

1. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints, unless noted otherwise.

B. Isolation Joints in Slabs on Ground: Construct isolation joints in slabs on ground at points of contact between slabs on ground and vertical surfaces, such as columns, walls, and elsewhere as indicated.

C. Contraction (Control) Joints in Slabs on Ground: Construct control joints in slabs on ground to form panels of patterns as shown. Use metal preformed keyway joints or saw cuts to 1/4 of slab depth, unless otherwise indicated.

1. Install metal keyway joints per manufacturer's instructions and as shown on drawings.

2. If contraction joints are formed by saw cutting, saw as soon as possible after slab finishing without dislodging aggregate.

3.04 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast in place concrete.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface.

3.05 CONCRETE PLACEMENT

- A. General: Comply with ACI 304, and as herein specified.
 1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.
- B. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
 1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.
 2. Do not use vibrators to transport concrete inside forms. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- C. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed. Bring slab surfaces to correct level with straight edge and strike off.
- D. Cold Weather Placing: Protect concrete work from freezing or low temperatures, in compliance with ACI 306 and as herein specified.
 1. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat water and aggregates before mixing to obtain a concrete temperature of not less than 50 degrees F, and not more than 80 degrees F at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- E. Hot Weather Placing: During hot weather, place concrete in compliance with ACI 305 and as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
 3. Wet forms thoroughly before placing concrete during hot weather.
 4. Use water reducing retarding admixtures (Type D) when required by high temperatures, low humidity, or other adverse placing conditions

3.06 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed to view, or that are to be covered with a coating material applied to concrete, or a covering material applied directly to concrete, such as waterproofing, damp proofing, painting or other similar system. This is as cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Smooth Rubbed Finish: Provide smooth rubbed finish to scheduled concrete surfaces, which have received smooth form finish treatment, not later than one day after form removal.

Moisten concrete surfaces and rub with carborundum brick or other abrasive until a uniform color and texture is produced. Do not apply cement grout other than that created by the rubbing process.

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

3.07 MONOLITHIC SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile and other bonded applied cementitious finish flooring material, and as otherwise indicated. After placing slabs, plane surface to a tolerance not exceeding 1/4" in 2' when tested with a 2' straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushed, brooms or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand bed terrazzo, and as otherwise indicated. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power driven floats, or both. Consolidate surface with power driven floats, or by hand floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 5/16" in 10' when tested with a 10' straight edge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view, and slab surfaces to be covered with resilient flooring, paint or other thin film finish coating system. After floating, begin first trowel finish operation using a power driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 3/16" in 10' when tested with a 10' straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.
- D. Non Slip Broom Finish: Apply nonslip broom finish to exterior concrete slabs, steps and ramps, and elsewhere as indicated. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route.

3.08 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
 - 1. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. Continue curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- B. Curing Methods: Perform curing of concrete by moist curing, by moisture retaining cover curing, by membrane curing, and by combinations thereof, as herein specified.
- C. Provide moist curing by following methods:

1. Keep concrete surface continuously wet by covering with water.
 2. Continuous water fog spray.
 3. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
- D. Provide moisture cover curing as follows: Cover concrete surfaces with moisture retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproofing tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- E. Provide curing compound to slabs as follows: Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
1. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, waterproofing, damp proofing, membrane roofing, painting, and other coatings and finish materials, unless otherwise acceptable to Architect. Use moisture cover curing for these surfaces.
- F. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- G. Curing Unformed Surfaces: Cure unformed flat surfaces by application of the specified curing compound or moisture cover curing.

3.09 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 7 days and until concrete has attained 85 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing cured specimens representative of concrete location or members.

3.10 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel troweling surfaces to a hard, dense finish with corners, intersections and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

3.12 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.
 - 1. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in on case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush coat the area to be patched with the specified bonding compound. Place patching mortar after bonding compound has dried.
 - 2. Correct high areas in unformed surfaces such as slabs by grinding, after concrete has cured at least 14 days.
 - 3. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to Architect.
 - 4. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete, apply bonding compound and allow bonding compound to dry. Mix patching concrete of same materials to provide concrete of same type

or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.

5. Repair isolated random cracks and single holes not over 1" in diameter by dry pack method. Groove top of cracks and cutout holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix drypack, consisting of one part Portland cement to 2 1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
6. Use epoxy based adhesive and/or mortar for structural repairs, where directed by Architect.

3.13 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. Materials and operations shall be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Owner for final acceptance.
 1. The Special Inspector described in Part 1.03 of this Specification section shall provide quality control testing. His testing firm shall meet the requirements of "Standard Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction", ASTM E329.
 2. The following testing services shall be performed by the testing firm and shall be paid by the Owner:
 - a. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
 - b. Slump: ASTM C 143, one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.
 - c. Air Content: ASTM C 173, volumetric method for lightweight concrete; ASTM C 231 pressure method for normal weight concrete; one for each set of compressive strength test specimens.
 - d. Concrete Temperatures: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens made.
 - e. Compressive Strength Tests: ASTM C 39; one set for each 50 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; one field cured and one laboratory cured specimen tested at 7 days, one field cured and two laboratory cured specimen tested at 28 days, and one laboratory cured specimen retained in reserve for later testing if required.
- B. When total quantity of a given class of concrete is less than 50 cu. yds., strength test may be waived by Architect if, in his judgment, adequate evidence of satisfactory strength is provided.

- C. When strength of field cured cylinders is less than 85% of companion laboratory cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in place concrete.
- D. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
1. To facilitate testing and inspection, Contractor shall:
 - a. Furnish labor to assist testing firm in obtaining and handling samples at the jobsite.
 - b. Advise testing firm in advance of operations to allow for the assignment of testing personnel.
 - c. Provide and maintain, for the use of the testing firm, adequate facilities for proper curing of concrete test specimens on the project site in accordance with ASTM C31.
- F. Test results will be reported in writing to Architect, Structural Engineer, and Contractor on same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7day tests and 28day tests.
- G. Additional Tests: The testing firm will make additional tests of in place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing firm may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

1. GENERAL PROVISIONS

a. General

(1) Work Included

Provide all materials, labor and equipment required to furnish and install a complete electrical system as indicated on plans and as specified herein. Electrical work includes but is not limited to the following:

- (a) Complete distribution system for power and controls including necessary panelboard, feeders and branch circuits.
- (b) Excavation, trenching and backfilling for conduit and/or cable.
- (c) Grounding.
- (d) Surge protection device.
- (e) Conduit rough-in and wiring for all equipment furnished under other Divisions.

This includes, but is not limited to, packaged pump control panel, telemetry panel and flow meter. Exact locations of outlets for equipment furnished under other Divisions shall conform with manufacturer's rough-in plans.

Alternators, power interlocks and control wiring for equipment furnished under above mentioned Divisions unless otherwise noted on Plans.

Control components furnished under other Divisions for this equipment shall be installed under this Division. Wire and connect controls complete and in working order, in accordance with schematic diagrams on Plans and as recommended by control equipment manufacturer.

It shall be the responsibility of the contractor to review all of the final installation instructions and shop drawings from the equipment suppliers and adjust all installations accordingly. Provide a complete and fully functional installation and system.

- (f) Supply and installation of temporary wiring for construction power and lighting for the project, in compliance with Article 590 of the National Electrical Code.
- (g) Removal of equipment as shown on plans. Cooperate with the general and subcontractors involved.

(2) Related Work

The following work shall be furnished under other Divisions of these Specifications.

- (a) Concrete foundations, curbs and pads.
- (b) Painting.
- (c) Cutting and patching.

(3) Definitions

Provide: As used shall mean "furnish, install and connect, and put in good working order."

Wiring: As used shall mean "wire and cable, installed in raceway with all required boxes, fittings, connectors, etc. complete.

Engineer: As used in various sections shall mean "Engineer of record whose seal is affixed to the Contract Specifications and/or Plans."

(4) Requirements of Regulatory Agencies

Equipment furnished shall be UL listed where such label is available. Installation shall conform to UL Standards where applicable.

Electrical work shall be installed in accordance with Plans and Specifications, edition of NEC in effect at project location, recommendations of NFPA, state and local electrical and building codes and special codes having jurisdiction over specific portions within complete installation. This includes, but is not limited to the following:

- (a) 2017 National Electrical Code.
- (b) 2021 International Building Code.

In event of conflict between Plans, Specifications and such codes, Engineer shall be notified in writing prior to bid. A ruling shall then be made by Engineer in writing.

Obtain permits and certificates of approval from all authorities having jurisdiction over installation and pay all permit and inspection fees required.

- (c) The Contractor shall make all necessary arrangements with the local Electric Utility Company concerning the electric service. The Contractor will be responsible for fees required for service modifications and extensions if and as required by the local Utility Company.

b. Products

(No products specified under this Section.)

c. Execution

(1) Submittals

- A. Refer to general conditions for general requirements of shop drawing submittals. There shall be a separate submittal section or brochure for each product listed below with all sections or brochures submitted at the same time in one package. First sheet in each product section or brochure shall summarize and list all components, manufacturer's name and catalog number. Submittals shall include but not be limited to the following:
- B. Submittals must be complete with all materials to be used on the project included. Partial submittals will be rejected. Submittals shall be checked by the Contractor and evidence of such checking shall be indicated thereon. **SUBMITTALS NOT BEARING THE CONTRACTOR'S MARK OF ACCEPTANCE AND APPROVAL WILL NOT BE REVIEWED BY THE ENGINEER.** The Contractor shall be completely responsible for the accuracy, completeness, compliance with Plans and Detailed Specifications and compatibility of all submittals, the Engineer's approval notwithstanding. All submittals reviewed more than twice will be billed per the Engineer's hourly rate schedule.
- C. Submittals shall include but not be limited to the following:
1. Panelboard.
 2. Conduit and device mounting support channels, fittings, and fasteners.
 3. Conduit and fittings.
 4. Pullboxes and junction boxes.
 5. Wire and cable.
 6. Low voltage shielded cable.
 7. Wiring devices and plates.
 8. Surge protection device.

(2) Site Visit

Visit job site prior to bid date to determine actual conditions under which work shall be done, to familiarize oneself with project and to verify total scope of work required. Failure to do so shall not constitute reason for extra change.

2. BASIC MATERIALS AND METHODS

a. General

(1) Quality Assurance

Qualifications of Manufacturer: Products used in work of this Section shall be produced by manufacturers regularly engaged in successful manufacture of similar items and with history acceptable to Engineer.

Qualifications of Installers: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of work of this Section.

b. Products

(1) Substitutions

Where "or equal" is included, Contractor may substitute equal products by another manufacturer subject to approval by the Engineer.

Substitution shall be approved by Engineer before purchase and/or installation. If unapproved materials are installed, work required to remove and replace unapproved items shall be done at Contractor's expense.

c. Execution

(1) Installation

Electrical plans are diagrammatic and shall not be scaled for exact sizes or locations. They are not intended to disclose absolute or unconditional knowledge of actual field conditions. This Section covers installation or relocation of outlets and miscellaneous devices shown on the Plans. Any outlet or device may be installed or relocated a maximum of 10 feet in any direction from locations shown on the Plans without additional charge to the owner.

All electrical equipment supports and conduit supports, anchors, bolts, locknuts, screws, washers, and mounting hardware including unistrut, angle iron, and structural members shall be Type 304 stainless steel.

Equipment shall be installed in accordance with manufacturer's recommendations.

Protect work and materials from damage by weather, entrance of water and dirt. Cap conduit during installation. Avoid damage to materials and equipment in place. Satisfactorily repair or remove and replace damaged work with new materials. Deliver equipment and materials to job site in original, unopened, labeled containers. Store ferrous materials to prevent rusting and finished materials and equipment to prevent staining and discoloring.

Failure to route conduit through building without interfering with other equipment and construction shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available spaces in building and shall not be introduced into building at such times and manner as to cause damage to structure.

Equipment requiring service shall be readily accessible.

(2) Testing and Equipment Servicing

Entire installation shall be free from improper grounds and short and open circuits. Make test on conductors as required before energizing circuit.

Make test to insure that entire system is in proper operating condition, and that adjustments and apparatus setting of circuit breakers, fuses, control equipment and apparatus have been made. Correct defects discovered during tests.

Equipment shall be turned over to Owner in lubricated condition. Instruction on further lubrication shall be included in operating instructions.

At termination of work under this Section, furnish Owner three complete bound sets of equipment catalog sheets, manufacturer's specifications and service and operating instructions on equipment furnished under this Section. Also instruct Owner on proper usage, care and maintenance of entire electrical system including all special systems or apparatus.

(3) Removal of Debris

Remove surplus materials and debris caused by, or incidental to, electrical work. Remove such debris at frequent intervals. Keep job clean during construction.

(4) Salvageable Materials

The electrical contractor shall be solely responsible for the disposition of waste material. The Owner shall have rights to all salvageable material.

(5) Cutting and Patching

The contractor shall so organize and execute his work so as to avoid all unnecessary cutting and patching of building surfaces. Preparatory work, including accurate installation of sleeves, wall and floor openings and construction of equipment foundations and supports shall be coordinated with the building progress. Cutting, patching and repairs to damaged building surfaces, as a result of the installation, shall be provided without additional cost to the Owner.

Certain work of a general construction nature related to the work under this section of the specifications will be provided by the contractor and will include preparation of building surfaces at points of raceway and duct penetrations, necessary masonry and concrete work, etc. The contractor shall be completely

responsible for the correct dimensions and general scope of all general construction requirements related to his work. All corrections to such related work, determined to be improperly executed due to the negligence of the contractor shall be made at the contractor's expense.

(6) Identification of Wire and Cable

All proposed power, control, and signal wire and cable shall be properly terminated and consistently numbered in all junction and pullboxes, panels, devices, and all locations where wire and cable leave raceways.

(7) Identification of Equipment

Identify the following electrical equipment with laminated plastic nameplates, engraved with 1/4" high letters.

All nameplates shall be black and white letters except nameplates for emergency panelboards and transfer switches, which shall be red with white letters. Nameplates shall be attached to metal enclosure with two screws. Nameplates attached with adhesive are not acceptable.

(a) Panelboards.

(b) Control panels furnished under other Divisions of these Specifications.

(8) Record Drawings

THE CONTRACTOR SHALL MAINTAIN ONE SET OF ELECTRICAL PRINTS ON SITE, MARKED TO SHOW ACTUAL AS CONSTRUCTED CONDITIONS AND INSTALLATIONS. PRINTS TO BE TURNED OVER TO ENGINEER AFTER JOB IS COMPLETE. Installed location of all exterior buried conduit shall be accurately shown and referenced to above ground structures.

(9) Temporary Lighting and Power

Provide, maintain and remove after construction is completed, temporary lighting adequate for workman safety and temporary power for all trades including any 3 phase power required with a minimum as shown on the plans.

Provide and maintain barricade lighting where required to adequately protect Owner against liability for damage to public or personnel. All lamps used in barricade shall be 70 watt red installed in weatherproof socket with wire guard. All wiring shall be approved for weatherproof installation.

(10) Power Outages

Coordinate all power outages with Owner and submit for approval proposed schedule of work indicating extent, number and length of outages required to perform work. All existing facilities must remain in operation during construction

of new facilities. Include in bid cost of overtime labor required for power outage to occur after Contractor's normal working hours.

(11) Other Materials

Work of this Section shall also include those items not specifically mentioned or described, but which are obviously necessary to conform to the design intent, applicable codes and to produce complete electrical system that functions properly. These materials shall be as selected by Contractor but subject to approval of Engineer.

(12) Guarantee-Warranty

Guarantee work to be free from defects of materials and workmanship for a period of one year from date of final acceptance of all work. Repair and replace defective work and other work damaged thereby which becomes defective during term of Guarantee-Warranty. Furnish Owner with three written copies of Guarantee-Warranty.

3. **CONDUIT**

a. General

(1) Work Included

- (a) Conduit
- (b) Fittings

b. Products

(1) Conduit

- (a) Rigid Galvanized Steel Conduit: Allied, Wheatland, Republic or equal.
- (b) Flexible Steel Conduit (Greenfield): Triangle, Anaconda, International Metal Hose or equal.
- (c) Liquidtight flexible metallic conduit (Sealtite): Triangle, Anaconda, International Metal Hose or equal.
- (d) Rigid Non-Metallic (PVC) Conduit: Carlon, Schedule 80, heavy wall or equal.

(2) Conduit Fittings

- (a) Galvanized Rigid Steel Couplings and Connectors: Raco, Thomas & Betts or equal.

- (b) Bushings: Raco, Thomas & Betts or equal.
- (c) Malleable Iron Straps and Hangers: Crouse Hinds, Appleton, Steel City or equal.
- (d) Group Pipe Supports: Unistrut, Kindorf or equal. **Refer to paragraph 2.C.(1) for material type.**
- (e) Expansion Fittings: O.Z. Type AX, Crouse-Hinds or equal.
- (f) Exposed Conduit Fittings: Crouse-Hinds, Efcor, condulets or equal.
- (g) Liquidtight flexible metallic conduit fittings: Raco, Thomas & Betts or equal.

c. Execution

(1) Conduit

In general, conduit installation shall follow layout shown on Plans. However, this layout is diagrammatic only and where changes are necessary due to structural conditions, other apparatus or other causes, such changes shall be made without cost to Owner. Offsets in conduits are not indicated and must be furnished as required.

Use rigid galvanized steel conduit throughout except as noted herein.

Use only rigid galvanized conduit for exposed turn-ups.

Use PVC Schedule 80 when run underground. Use only rigid galvanized when exposed. Use rigid galvanized steel or PVC Schedule 80 when run under ground floor concrete slabs and rigid galvanized steel in concrete slabs.

When PVC conduit is used, turn up with rigid galvanized elbows and provide equipment grounding conductor in accordance with NEC Article 250.

Use rigid galvanized steel factory elbows for bends in plastic conduit runs longer than 100 feet, or in plastic conduit runs, which have more than two bends regardless of length.

Coat metallic conduit placed in fill below concrete or underground with two heavy coats of asphaltum. Recoat any damage to asphaltum coating prior to backfilling. Support conduit and secure to forms when cast in concrete so that conduit will not be displaced during pouring of concrete. Stuff boxes and cork fittings to prevent entrance of water during concrete pouring and at other times during construction, prior to completion of conduit installation.

Route exposed conduit at right angles or parallel to walls of building.

Use proper sized tools for bending. Do not heat conduit. Dents and flat spots will be rejected. Cut and thread conduit so ends will butt in couplings. Make threads no longer than necessary and ream pipe free of burrs.

Minimum conduit size 3/4" unless otherwise shown on the drawings or required by system.

Leave one #10 or equivalent nylon pull wire in empty conduits.

Use short pieces, approximately 2' of liquid-tight flexible conduit to connect motors and other devices subject to motion and vibration. Use liquidtight flexible conduit where subject to water spray and installed outdoors.

(2) Conduit Fittings

Support conduit vertically and horizontally by straps or hangers. Do not exceed these intervals as described in NEC Section 344.30 for rigid metal conduit and in NEC Section 352.30 for PVC.

Use expansion fittings, properly bonded to assure ground continuity, across expansion joints in floors and ceilings. Use hubs at conduit entrance into all pullboxes, junction boxes, devices in exposed areas where knockout installations occur.

When connections are made to motors or other equipment, not near walls or columns, provide vertical conduit, minimum 3/4", attached to floor with floor flange bring wiring out of conduit by means of conulet and flexible conduit extending to equipment junction box.

4. WIRE AND CABLE

a. General

(1) Work Included

Wire and Cable

b. Products

(1) Materials

Wire and cable shall be 600 volt by Anaconda, General Cable, Habirshaw, Okonite, Rome, Triangle, Southwire or equal unless otherwise noted on Plans.

For line voltage control wiring, use #14 type THHN/THWN copper by one of the manufacturers listed above. For low voltage control wiring, use type wiring recommended by equipment manufacturer.

Use stranded copper type THHN/THWN for branch circuit wiring #10 and smaller. No conductor for branch circuit wiring shall be smaller than #12.

Use stranded copper, type THHN/THWN for feeder and power circuits #8 and larger.

Fixture wire shall be in accordance with Article 402 of the National Electrical Code.

Provide color coded wire and with a different color for each phase and neutral and ground as follows: 120/240 volts circuits-phases A, B and C: black, orange and blue respectively; neutral: white; ground: green; Approved color tape is acceptable for feeders. Also provide color coded wire for control circuits.

Use Scotchlok, Ideal or equal wire connectors for #14 through #18 conductors. Use Burndy, T&B or equal, compression connectors with crimpit cover, type CC, for #6-600 MCM conductors.

Where branch circuits homeruns exceed 70' in length for 120 volt and 150' in length for 240 volt, No. 10 wire shall be used to first outlet.

c. Execution

(1) Installation

Complete conduit system before pulling any wire or cable. Only approved cable lubricants (such as soaptone), shall be used as necessary.

Conductors shall be continuous from outlet to outlet or to branch circuit overcurrent devices. Make splices only in junction boxes. Splices shall not be made in panelboards. Sufficient slack shall be left at terminations to make proper connections.

Connect No. 10 wire and smaller with Type R, 3M Scotchlock or Ideal 400 Series tapeless connectors or equal.

Connect No. 8 wire and larger with Lock-Tite type silicon bronze type connectors, T&B Series 35000 or 54000, or equal. Insulate connections of No. 8 wire and larger with 3M #33, Scotch 33+ tape or equal.

5. **OUTLET AND JUNCTION BOXES**

a. General

(1) Work Included

(a) Outlet Boxes

(b) Junction Boxes

b. Products

(1) Outlet Boxes, Junction Boxes, and Wireways

Outlet boxes for lighting, switches and receptacles in areas with exposed conduit shall be cast metal condulets and unilets with threaded hubs, Type FS or FD.

All junction boxes, pull boxes, and wireways shall be NEMA 4X corrosion resistant stainless steel.

c. Execution

(1) Outlet Boxes

Use galvanized steel for concealed boxes. (All boxes shall be concealed wherever possible.) Use cast metal conduit fittings similar to "Condulets" and "Unilets" with threaded hubs for exposed boxes.

Outlet boxes shall be securely anchored, set true and plumb and no part of box or cover shall extend beyond finished wall or ceiling.

Select boxes according to intended use and type of outlet. Use minimum 4" diameter boxes for ceiling or wall mounted lighting fixtures. Use 4" square boxes to contain flush mounted outlets. Provide plaster or masonry rings for flush mounted outlets to conceal joint between box and wall finish material. Nongangable switch boxes may be used only for single gang switches.

Mount outlet boxes worked to nearest block course.

(2) Junction Boxes

Junction boxes shall be sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4-11/16" square and 2-1/8" deep. Provide screw covers for junction boxes.

Use corrosion resistant NEMA 4X stainless steel with clamp covers for pull boxes. Size pull boxes according to the NEC.

All junction boxes shall be corrosion resistant, NEMA 4X stainless steel.

Provide pull box every 100' of conduit run or where excessive number of bends necessitates a box for ease of wire installation.

(3) Wireways

All wireways and wiring troughs shall be NEMA 4X corrosion resistant stainless steel.

6. **WIRING DEVICES AND PLATES**

a. General

(1) Work Included

- (a) Switches
- (b) Receptacles
- (c) Plates

b. Products

(1) Materials

Wiring devices shall be Hubbell, Bryant or equal.

(2) Switches: Single pole 20 amp, 120/277 volt AC:

Single Pole	Hubbell #1221 or equal
Two Pole	Hubbell #1222 or equal
Three Way	Hubbell #1223 or equal

Install switches on lock side and clear of door frame a minimum of 3". Prior to rough-in, coordinate with Building Details on Plans to determine lockside of door.

(3) Time Switches: Paragon Electric Co., Inc. Electronic Time Control Series EC7000 or equal.

(4) Receptacles

General Purpose, Duplex, 20 Amp, 125 Volt: Hubbell #5362 or equal.

Corrosion Resistant, Duplex, 20 Amp, 125 Volt: Hubbell #53CM62 or equal.

Ground fault interrupter receptacles, Duplex, 20 Amp, 125 Volt: Hubbell #GF5362 or equal.

Special Receptacles: As indicated.

(5) Manual Motor Starting Switches

Square D Class 2510 or equal with thermal overload.

(6) Device Plates

Stainless Steel: Hubbell, Bryant or equal.

Use cast weatherproof heavy duty "while-in-use" type covers for outside duplex receptacles: Pass & Seymour, Hubbell or equal.

Provide properly designed plates and covers when devices are installed in exposed boxes or conduit fittings.

c. Execution

(1) Installation

Provide proper size outlet boxes for all wiring devices of types specified in outlet and junction box section of these specifications.

All receptacles installed outdoors shall be corrosion resistant.

7. **DISCONNECTS (MOTOR AND CIRCUIT)**

a. General

(1) Work Included

- (a) Disconnects
- (b) Fuses

b. Products

(1) Disconnects (Motors and Circuits)

Switches shall be Eaton or pre-approved equal.

- (a) All switches shall have interlocking cover.
- (b) Use heavy duty type, quick make, quick break.
- (c) Provide NEMA 4X stainless steel, corrosion resistant enclosure for installations throughout except as noted herein and as shown on the Plans.
- (d) Fusible switches if indicated on plans shall be equipped with Class 'R' fuse kits.
- (e) Provide equipment ground lug in each switch.
- (f) All disconnect switches used in motor circuits controlled by solid state reduced voltage (SSRV) motor starters or variable frequency drives (VFD) shall be equipped with auxiliary contacts wired back to the respective SSRV or VFD control circuit.

(2) Fuses

In fusible safety switches provide Bussman fuse-trons or equal, dual element, time delay fuses for motor loads and one time fuses for non-motor loads.

c. Execution

(1) Installation

Provide safety switches, enclosures and sizes as indicated on Plans.

FILE/25032-260500

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

SECTION 260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

1. GENERAL PROVISIONS

a. General

(1) Work Included

- (a) Work included under this section shall consist of furnishing of all labor, materials, tools, equipment and supplies required to provide grounding as required by the National Electrical Code and as indicated by the plans and specifications.
- (b) Types of grounding specified in this section include the following:
 - 1. System and enclosure grounding for electrical distribution systems.
 - 2. Grounding for separately derived electrical systems.
 - 3. Enclosures grounding.
 - 4. Equipment grounding.
- (c) Requirements of this section apply to electrical grounding work specified elsewhere in these specifications.
- (d) Comply with NEC requirements as applicable to materials and installation of electrical grounding systems, associated equipment, and wiring. Provide grounding products which are UL listed and labeled.
- (e) Comply with applicable requirements of UL Standards No. 467 and No. 869 pertaining to electrical grounding and bonding.
- (f) Comply with applicable requirements of IEEE 837 for all grounding materials installed outside of the building in earth.
- (g) Provide all grounding for the electrical system in accordance with requirements of all local codes and the 2017 edition of the National Electrical Code.

(2) Grounding Electrode System

- a. Metal underground water pipe.
- b. Electrical service entrance.
- c. Metal fencing.
- d. Building concrete reinforcing steel.

- e. Rod electrodes.

(3) Performance Requirements

- a. Grounding System Resistance: 5 ohms.

2. **PRODUCTS**

a. Grounding Systems

(1) Work Included

- (a) Except as otherwise indicated, provide electrical grounding systems indicated with assembly of materials including, but not limited to: cables/wires, connectors, terminals, (compression type lugs), grounding rods, bonding jumper braid, and additional accessories needed for complete installation. Where materials or components are not indicated, provide products complying with NEC, UL, and IEEE Standard 837 for applications indicated.
- (b) Unless otherwise indicated, provide copper electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC.
- (c) Copper braided tape, constructed of 30 gauge bare copper wire and properly sized for indicated applications.
- (d) Ground Rods: Steel copper exterior, 5/8" dia. x 8' or 3/4" dia. X 10' as specified.
- (e) Exothermic connections: Cadweld or approved equal.

3. **EXECUTION**

a. Installation

(1) Work Included

- (a) Coordinate with other electrical work, as necessary, to interface installation of electrical grounding system with other work.
- (b) Install electrical grounding systems where shown, in accordance with applicable portions of NEC, with NECA "Standard of Installation", and in accordance with recognized industry practices to ensure that products comply with requirements and serve intended functions.

- (c) Furnish and install system, enclosure and equipment grounding for all electric wiring for the building in full compliance with the requirements of the NEC. All grounding conductors shall be copper.
- (d) Ground conductors to underground rods and to building structural steel.
- (e) Each dry type transformer installation shall have system and enclosure grounding in accordance with the requirements of Article 250.26 of NEC. A bonding jumper, sized in accordance with Article 250.79 (c) of the NEC, shall be used to connect the neutral and enclosure of the secondary side of the transformer at the XO terminal. A separate grounding conductor shall then be provided from this connection to the building structural steel and bonded to the steel by means of thermit welding, or by an approved grounding clamp.
- (f) Where short lengths of flexible conduit are used to supply motors, the conduit and connectors shall be of a type approved by UL as a bonded grounding enclosure or, in lieu thereof, a separate bonding conductor and approved ground clamps shall be provided to assure a continuous ground return path around the flexible conduit and its associated connectors.
- (g) At all metal conduit terminations at panelboards, junction boxes, transformers, or other enclosures, the conduit shall be properly bonded to the enclosure or ground bus, as required by codes.
- (h) The service equipment, conduit system, supports, cabinets, other equipment and neutral conductor shall be grounded in accordance with Article 250 of the National Electrical Code, and Local Utility District requirements.
- (i) All ground connections shall have clean contact surfaces and shall be made with approved fittings. Where flexible metal conduit is used a separate conductor shall be provided, securely grounded on each side of the flexible section.
- (j) All feeder and branch circuits shall have insulated green grounding conductor sized per Article 250 of NEC.
- (k) Bond building water piping system per NEC if piping is metallic.
- (l) Field Welding: Comply with AWS Code for procedures, appearance, quality of welds, and methods used in correcting welding work. Provide welded connections where grounding conductors connect to underground grounding rods and to building steel; Cadweld, or approved equal.
- (m) All metal, non-current carrying parts of the electrical system shall be grounded in accordance with the latest specifications of the National Electrical Code and further in accordance with the requirements as shown on the drawings.

- (n) The Electrical Contractor shall perform or have performed by a testing laboratory a test on the ground systems. Testing shall be done in accordance with the IEEE Green Book Test Procedures. Provide copies of test results to the Owner and Designer.

FILE/25032-260526

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

SECTION 262416 – PANELBOARDS

1. GENERAL PROVISIONS

a. General

(1) Work Included

Provide all materials, labor and equipment required to furnish and install a complete electrical system as indicated on Plans and as specified herein.

(2) Products

a. Panelboards

120/240 volt, 3 phase, 4 wire as indicated on Plans: Eaton, Square D or approved equal.

Panelboards shall be factory assembled, dead front type with copper bus, lugs, finish trim and thermal-magnetic molded case circuit breakers of frame and trip ratings shown on the Plans.

Provide single door with spring latch lock. Key panel locks alike.

Circuit breakers shall be HACR rated as required.

120/240 volt AC, 3 phase, 4 wire and 480 volt AC, 3 phase, 3 wire S/N, Branch Circuit Panelboards shall be Eaton type POW-R-LINE, Square D Company or approved equal equipped with bolt on thermal-magnetic circuit breakers. Breakers shall be 1, 2 or 3 pole with integral crossbar to assure simultaneous opening of all poles in multipole circuit breakers. Bolt on circuit breakers shall be able to be installed in the same panelboard without requiring additional hardware. Circuit breakers shall be rated 120/240 volt AC (single pole 15-50 ampere) or 240 volt AC (2 and 3 pole, 15-50 amperes) with continuous current ratings as noted on the plans. Interrupting rating shall be coordinated with power company's available fault current. Single pole 15 and 20 ampere circuit breakers shall carry the SWD marking and H.I.D. rated. Each panelboard shall be equipped with a bare uninsulated equipment grounding bar for use in terminating separate equipment grounding conductors. Panelboards shall be equipped with full or 200 percent neutral bars as scheduled.

(3) Execution

a. Panelboard

Provide typewritten directory cards listing location of circuit controlled. Insert with plastic cover into directory frame on door.

Provide identification indicating voltage, phase, device designation, source fed from and other required marking per NEC Article 110.21.

Provide arc flash marking for panelboards and control panels per NEC Article 110.16.

2. **PRODUCTS**

a. **General**

(1) **Work Included**

- a. Service system
- b. Distribution system
- c. Grounding

(2) **Products**

a. Materials

Furnish service entrance conduit and cable and miscellaneous hardware required.

(3) **Execution**

a. Service and Distribution System

System service shall commence at pole mounted transformer bank and continue thru meter base to service entrance rated panelboard, feeder circuits and branch circuits to wiring devices, appliances, apparatus and other utilization equipment.

Service shall be 120/240 volt, three phase, four wire provided by the Power Company.

FILE/25032-262416

SECTION 264313 – SURGE PROTECTION DEVICE

1. GENERAL PROVISIONS

a. General

(1) Surge Protection Devices (SPD)

Competitive products submitting against this specification must provide a single impulse surge current test report issued by a nationally recognized testing facility. The test report should demonstrate that the competitive surge protection device (SPD) can withstand, in its installed configuration, the specified value surge current without failure of any internal component (MOV's, wiring, printed circuit board and disconnect).

- (a) Furnish and install integrated surge protection device at the entrance of the power supply into panelboard "A". This unit shall be suitable for installation on a three phase 120/240 VAC, four wire plus ground type service. Surge protection device (SPD) shall be of a passive parallel, thermal stress reducing design with a response time of less than or equal to one nanosecond. The unit shall be UL 1449 Third Edition and CSA listed, and it shall have a full fifteen (15) year non-limited warranty. SPD shall have a peak surge current rating of no less than 100,000 amps per phase (L-N + L-G). The UL 1449 Third Edition let through voltage, line-to-neutral, shall not exceed 1,000 volts peak when the unit hit with an ANSI/IEEE 62.41 Category B 6,000 volt, 4,000 amp impulse hit.

Surge protection device shall be Eaton SPD Series or equal.

FILE/25032-264313

SECTION 31 23 00
EXCAVATION AND FILL

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. Furnish all labor, equipment and materials required to complete all work associated with excavation, including off-site borrow excavation, dewatering, backfill, drainage layers beneath and around structures, foundation and backfill stone, filter fabric, embankments, stockpiling topsoil and any excess suitable material in designated areas. In place compaction of embankments, backfill and subgrades beneath foundations and roadways, excavation support, disposing from the site all unsuitable materials, providing erosion and sedimentation control grading, site grading and preparation of pavement and structure subgrade, and other related and incidental work as required to complete the work shown on the Drawings and specified herein.
- B. All excavations shall be in conformity with the lines, grades, and cross sections shown on the Drawings or established by the Engineer.
- C. It is the intent of this Specification that the Contractor conduct the construction activities in such a manner that erosion of disturbed areas and off-site sedimentation be minimized.
- D. All work under this Contract shall be done in conformance with and subject to the limitations of the latest editions of the Tennessee Department of Transportation (TDOT) Standard Specifications for Roads and Structures and the Tennessee Erosion and Sediment Control Planning and Design Manual.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 31 22 00 Grading
- B. Section 31 23 00 Excavation and Fill
- C. Section 31 25 00 Erosion and Sedimentation Control

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Contractor shall comply with the applicable requirements of the following documents. All referenced codes and standards refer to the edition referenced in the code adopted by the Project.
 - 1. Tennessee Department of Transportation Standard Specifications for Roads and Structures, latest edition.
 - 2. American Society for Testing and Materials (ASTM):

ASTM C 127	Test for Specific Gravity and Absorption of Coarse Aggregate.
ASTM C 136	Test for Sieve Analysis of Fine and Coarse Aggregates.
ASTM D 422	Particle Size Analysis of Soils.
ASTM D 423	Test for Liquid Limit of Soils.
ASTM D 424	Test for Plastic Limit and Plasticity Index of Soils.
ASTM C 535	Test for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
ASTM D 698	Standard Method of Test for the Moisture-Density Relations of Soils Using a 5.5 lb. (2.5 kg) Rammer and a 12-inch (305 mm) Drop.
ASTM D1556	Test for Density of Soil in Place by the Sand-Cone Method.
ASTM D1557	Test for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lbs. (4.5 kg) Rammer and 18-inch (457 mm) Drop.
ASTM D2049	Test Method for Relative Density of Cohesionless Soils.
ASTM D2167	Test for Density of Soil in Place by the Rubber-Balloon Method.
ASTM D2216	Test for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.
ASTM D2487	Test for Classification of Soils for Engineering Purposes.
ASTM D2922	Test for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.04 SUBSURFACE CONDITIONS

- A. Supplemental documents for existing conditions have been made available to the Contractor in the Appendices to these Specifications. This data is furnished for information only, and it is expressly understood that the Owner and Engineer will not be held responsible for any interpretations or conclusions drawn therefrom.
- B. It shall be noted that there may be water pipes, storm drains and other utilities located in the area of proposed excavation. Contractor shall take necessary means to identify below grade, in service utilities and avoid disruption of service. Contractor shall perform all repairs to same in the event that excavation activities disrupt service.

1.05 SUBMITTALS

- A. In accordance with the procedures and requirements set forth in Section 01 33 00, Submittals the Contractor shall submit the following:
1. Name and location of all material suppliers.
 2. Certificate of compliance with the standards specified above for each source of each material.
 3. List of disposal sites for waste and unsuitable materials and all required permits for use of those sites.
 4. Plans and cross sections of open cut excavations showing side slopes and limits of the excavation at grade.
 5. Product data for such products as may be required by these specifications, including geotextile filter fabric, underdrain piping, geogrid, etc.
 6. Other submittals as required by Related Work Specified Elsewhere.

1.06 PRODUCT HANDLING

- A. Soil and rock material shall be excavated, transported, placed, and stored in a manner so as to prevent contamination, segregation and excessive wetting. Materials which have become contaminated or segregated will not be permitted in the performance of the work and shall be removed from the site.

1.07 USE OF EXPLOSIVES

- A. The use of blasting or explosives shall not be allowed under this project.

PART 2 PRODUCTS

2.01 GENERAL

- A. Where excavated material does not meet requirements for select fill, Contractor shall furnish off-site borrow material meeting the specified requirements herein. Determination of whether the borrow material will be paid for as an extra cost will be made based on Article 4 of the General Conditions, as amended by the Supplementary Conditions. When the excavated material from required excavations is suitable for use as backfill, bedding, or embankments, but is replaced with off-site borrow material for the Contractor's convenience, the costs associated with such work and material shall be borne by the Contractor.

2.02 SELECT FILL

- B. Soils from the excavations meeting requirements stipulated herein with the exceptions of topsoil and organic material may be used as select fill for general backfilling and constructing embankments, except as otherwise required.
- C. Select fill used as an embankment or soil cap shall be a silty or clayey soil material with a Maximum Liquid Limit (LL) of 50 and a Plasticity Index (PI) between 7 and 20.
- D. Select fill used for backfilling shall be as specified herein or approved by the Engineer.

2.03 STONE FILL

- A. Stone fill shall be a coarse aggregate material meeting the gradation requirements of #57 aggregates in accordance with ASTM C-33 or approved equal.
- B. Stone fill shall be used under all structural foundations and against all below grade walls, unless indicated otherwise.

2.04 TOPSOIL

- A. Topsoil shall be considered the surface layer of soil and sod, suitable for use in seeding, sodding, and planting. It shall contain no mixture of refuse or any material toxic to plant growth.

PART 3 EXECUTION

3.01 GENERAL

- A. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards and to avoid slides that will cause disturbance of the subgrade or damage of adjacent areas. Comply with local regulations and with the provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc., OSHA, and other applicable safety requirements.
- B. The Contractor shall control grading in a manner to prevent surface water from running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water flow can be uninterrupted in existing gutters, other surface drains, or temporary drains.

3.02 STRIPPING OF TOPSOIL

- A. In all areas to be excavated, filled, paved, or graveled the topsoil shall be stripped to its full depth and shall be deposited in storage piles on the site, at locations designated by the Owner or Engineer, for subsequent reuse. Topsoil shall be kept separated from other excavated materials and shall be piled free of roots and other undesirable materials.

3.03 EXCAVATION

- A. All material excavated, regardless of its nature or composition, shall be considered UNCLASSIFIED EXCAVATION. Excavation shall include the removal of all soil, rock, weathered rock, rocks of all types, boulders, conduits, pipe, and all other obstacles encountered or shown to be removed within the limits of excavation shown on the Drawings or specified herein. The cost of excavation shall be included in the Lump Sum Bid Price and no additional payment will be made for the removal of obstacles encountered within the excavation limits shown on the Drawings and specified herein.
- B. All suitable material removed in the excavation shall be used as far as practicable in the formation of embankments, subgrades, and shoulders, and at such other places as may be indicated on the Drawings or indicated by the Engineer.
- C. The Engineer and/or Materials Testing Agency will designate material that are unsuitable for use. The Contractor shall remove all unsuitable material, as directed by the Engineer, dispose of the material off-site, and replace it with thoroughly compacted select fill, and/or stone fill.
- D. All excavations shall be made in the dry and in such a manner and to such widths as will give ample room for properly constructing and inspecting the structures and/or piping they are to contain and for such excavation support, pumping and drainage as may be required. Excavation shall be made in accordance with the grades and details shown on the Drawings and as specified herein.
- E. No rock or boulders shall be left in place which protrude more than 1 foot within the typical section cut slope lines. All protruding roots and other objectionable vegetation shall be removed from slopes.
- F. Foundations for a structure shall bear on similar materials. Should excavation for a foundation bearing on earth be partially in rock, the Contractor shall undercut that portion of the rock and bring the excavation to bearing elevation with compacted stone fill. The thickness of the compacted stone fill shall be as indicated on the Drawings and uniform under the structure.
- G. All cuts shall be brought to the grade and cross section shown on the Drawings, prior to final inspection and acceptance by the Engineer.
- H. Slides and overbreaks which occur due to negligence, carelessness or improper construction techniques on the part of the Contractor shall be removed and disposed of by the Contractor as indicated by the Engineer at no additional cost to the Owner. If grading operations are suspended for any reason whatsoever, partially completed cut and fill slopes shall be brought to the required slope and the work of seeding and mulching or other required erosion and sedimentation control operations shall be performed.

3.04 EXCAVATION SUPPORT

- A. The Contractor shall furnish, place, and maintain such excavation support which may be required to support sides of excavation or to protect pipes and structures from possible damage and to provide safe working conditions. The Contractor shall be responsible for the adequacy of all

supports used and for all damage resulting from failure of support system or from failure to install and maintain it.

3.05 REMOVAL OF EXCESS AND UNSUITABLE MATERIALS

- A. The Contractor shall remove and dispose of all excess and unsuitable materials off-site.
- B. The Contractor shall be compensated for the removal of unsuitable materials, which are beyond the excavation limits required by the Contract Documents, as directed by the Engineer and in accordance with Section 01 29 00 Measurement and Payment.
 - 1. No payment will be made for excavation beyond the limits required by the Contract Documents without prior approval by the Engineer.
 - 2. Removal of unsuitable materials within the excavation limits required by the Contract Documents shall be considered Unclassified Excavation.
- C. All unsuitable materials shall be disposed of in locations and under conditions that comply with federal, state and local laws and regulations.
- D. The Contractor shall obtain an off-site disposal area prior to beginning demolition or excavation operations.
- E. All excess and unsuitable materials shall be hauled in trucks of sufficient capacity and tight construction to prevent spillage. Trucks shall be covered to prevent the propagation of dust.
- F. When all excess and unsuitable material disposal operations are completed, the Contractor shall leave the disposal sites in a condition acceptable to the Owner and Owner(s) of the disposal site(s).

3.06 PROTECTION OF SUBGRADE

- A. To minimize the disturbance of bearing materials and provide a firm foundation, the Contractor shall comply with the following requirements:
 - 1. Use of heavy rubber-tired construction equipment shall not be permitted on the final subgrade unless it can be demonstrated that drawdown of groundwater throughout the entire area of the structure is at least 3 feet below the bottom of the excavation (subgrade). Even then, the use of such equipment shall be prohibited should subgrade disturbance result from concentrated wheel loads.
 - 2. Subgrade soils disturbed through the operations of the Contractor shall be excavated and replaced with compacted select fill or stone fill at the Contractor's expense as indicated by the Engineer.
 - 3. The Contractor shall provide protection against penetration of frost into materials below the bearing level. This protection may consist of a temporary blanket of straw or salt hay covered with a plastic membrane or other acceptable means.

3.07 DEWATERING

- C. The Contractor shall perform all dewatering as required for the completion of the work. Procedures for dewatering proposed by the Contractor shall be submitted to the Engineer for review prior to any earthwork operations. All water removed by dewatering operations shall be disposed of in accordance with the Tennessee Department of Environment and Conservation and as required by the Owner.
- D. The dewatering system shall be of sufficient size and capacity as required to control groundwater or seepage to permit proper excavation operations, embankment construction, subgrade preparation, and to allow concrete to be placed in a dry condition.
 - 1. The system shall include a sump system or other equipment, appurtenances and other related earthwork necessary for the required control of water.
 - 2. The Contractor shall draw-down groundwater to at least 2-feet below the bottom of excavations (subgrade) at all times in order to maintain a dry and undisturbed condition.
- E. The Contractor shall be solely responsible for proper design, installation, proper operation, maintenance, and any failure of any component of the system.
- F. The Contractor shall be responsible for and shall repair without cost to the Owner, any damage to installed work and the excavation, including damage to the subgrade or fill materials. The Contractor shall be responsible for damages to any other area or structure caused by his failure to maintain and operate the dewatering system.
- G. The Contractor shall take all the steps that he considers necessary to familiarize himself with the surface and subsurface site conditions, and shall obtain the data that is required to analyze the water and soil environment at the site and to assure that the materials used for the dewatering systems will not erode, deteriorate, or clog to the extent that the dewatering systems will not perform properly during the period of dewatering.
- H. Copies of the geotechnical report are made available to the Contractor in the Appendices to these Specifications. This data is furnished for information only, and it is expressly understood that the Owner and Engineer will not be held responsible for any interpretations or conclusions drawn therefrom.
- I. Prior to the execution of the work, the condition of the existing structures shall be documented in accordance with Section 01 32 33 Photographic Documentation.

3.08 PROOF ROLLING

- A. After stripping of topsoil, excavation to subgrade, and prior to placement of fills, the exposed subgrade shall be carefully inspected by the materials testing consultant by probing and testing as needed. Any topsoil or other organic material still in place, frozen, wet, soft, or loose soil, and other undesirable materials shall be removed prior to probing and testing.
- B. The subgrade of all structures and all areas that will support pavements or fill shall be proof rolled.

- C. The exposed subgrade shall be proofrolled with at least six (6) passes by a heavily loaded tandem-wheeled dump truck or similar vehicle, in the presence of the Engineer, to check for soft or unsuitable bearing material.
- D. Any depressions due to soft soils which develop during proof rolling shall be filled with fill material and proof rolled smooth and level.
 - 1. If subgrade still contains depressions, the area of soft soils shall be undercut, backfilled, and proof rolled to achieve a suitable subgrade, unless otherwise directed by the Engineer.
- E. Any unsuitable materials, as identified by the Engineer, shall be removed and replaced with an approved compacted fill material, as specified herein.

3.09 BACKFILL

- A. It is the intent of these Specifications that all structures shall bear on stone fill placed to the thickness shown on the Drawings, as specified in these Specifications, or not less than 6-inches. Bedding for process piping shall be as specified in Section 40 05 00, Common Work Results for Process Interconnections, or as shown on the Drawings.
- B. The backfill shall be deposited in successive, uniform, approximately horizontal layers not exceeding compacted depth indicated for the full width.
- C. Stones or fragmentary rock larger than 4-inches in their greatest dimension will not be allowed within the top 12-inches of finished grade nor within 6 inches of pipes. No stone or fragmentary rock larger than 12-inches in their greatest dimension will be allowed for any portion of backfill.
- D. For backfill against below grade walls, a wedge of stone fill shall be provided the full height of the wall, except that the top 12-inches shall consist of a soil cap and topsoil, pavement, or concrete slab, as required by the Drawings. The top of the wedge of stone fill shall extend outward away from the wall at least half the height of the wall.

3.10 COMPACTION

- A. The Contractor shall compact embankments, backfill, crushed stone, aggregate base, and in place subgrade in accordance with the requirements.
- B. Soils shall be compacted at a moisture content not more than 1% below nor more than 4% above the optimum moisture content for the particular material tested in accordance with the ASTM D698.
- C. The densities specified herein refer to percentages of maximum dry density as determined by the noted test methods.

	Density Std. Proctor (D698)	Density Mod. Proctor (D1557)	Max. Lift Thickness as Compacted
Embankments Beneath Structures*	98%	95%	8"
Other Embankments	95%	92%	8"
Backfill Against walls of Structure	95%	92%	8"
Backfill in Pipe Trenches	95%	92%	8"
Stone Fill Beneath Structures	98%	95%	12"
Aggregate Base Course (ABC) Beneath Pavements	--	98%	8"
In place Subgrade Beneath Structures	98%	95%	Top 12-inches

* Embankments beneath structures shall include a zone 10 feet beyond the limits of the foundation of the structure and extend down to the natural grade on a 45° slope.

** The aggregate shall be compacted to a degree acceptable to the Engineer by use of a vibratory compactor and/or crawler tractor.

D. Testing will be performed by a material testing consultant retained by the Owner.

1. Field density tests will be performed in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922, as determined by the Engineer and materials testing consultant, to determine if the specified densities have been achieved, and these tests shall be the basis for accepting or rejecting the compaction.
2. The Contractor shall notify material testing consultant in advance when density testing will be required and coordinate access with the material testing consultant.
3. One in-place density test shall be performed for each 400 cubic yards of backfill placed, with a minimum of one test performed each day that backfill is placed.
4. Failure to achieve the specified densities shall require the Contractor to re-compact the material or remove and replace it, as deemed appropriate by the Engineer.
5. Retesting for in-place density of fill, which was previously tested and failed to meet the requirements of these specifications, shall be paid for by the Contractor.

E. The Contractor shall, if necessary, increase his compactive effort by increasing the number of passes, using heavier or more suitable compaction equipment, or by reducing the thickness of the layers. The Contractor shall adjust the moisture contents of the soils to bring them within the optimum range by drying them or adding water as required.

END OF SECTION

SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 THE REQUIREMENTS

- A. The Contractor is responsible for implementing Best Management Practices (BMPs) to prevent and minimize erosion and resultant sedimentation in all cleared and grubbed areas during and after construction. This item covers the work necessary for the installation of infrastructure and measures for the prevention of soil erosion and control of sedimentation. The Contractor shall furnish all material, labor and equipment necessary for the proper installation, maintenance, inspection, monitoring, reporting, and removal (where applicable) of erosion prevention and sediment control measures and, if applicable, to cause compliance with all local permits and the State of Tennessee National Pollutant Discharge Elimination System (NPDES) General Permit TNR100000 for Discharges of Stormwater Associated with Construction Activities for any land disturbance or construction activity of one (1) acre or more, under this Section 31 25 00.
- B. Any land disturbance as the result of modifications to a site's drainage features or topography requires protection from erosion and sedimentation.
- C. It is the intent of this Specification that the Contractor conducts the construction activities in such a manner that erosion of disturbed areas and offsite sedimentation be absolutely minimized.
- D. All work under this Contract shall be done in conformance with and subject to the limitations of the Tennessee Department of Environment and Conservation (TDEC), Division of Water Pollution Control, Erosion & Sediment Control Handbook (ESCH, Fourth Edition, August 2012) and in accordance with the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101).
- E. All work under this Contract shall be done in conformance with and subject to the limitations of the Tennessee NPDES General Permit TNR100000 for Discharges of Stormwater Associated with Construction Activities.
- F. The following excerpts from the regulations are particularly important:
 - 1. Pursuant to the Tennessee General NPDES Permit for Discharges of Stormwater Associated with Construction Activities, Permit No. TNR100000, Section 4.1.3, Stabilization of disturbed areas must, at a minimum, be initiated immediately whenever any clearing, grading, excavating or other earth-disturbing activities have temporarily or permanently ceased on any portion of the site and will not resume for a period exceeding fourteen (14) calendar days.
- H. Due to the nature of the work required by this Contract, it is anticipated that the location and nature of the erosion and sediment control devices will be adjusted on several occasions to

reflect the current phase of construction. The construction schedule adopted by the Contractor will impact the placement and need for specific devices required for the control of erosion. The Contractor shall develop and implement such additional techniques as may be required to minimize erosion and off-site sedimentation. The location and extent of erosion and sedimentation control devices shall be revised at each phase of construction that results in a change in either the quantity or direction of surface runoff from constructed areas. All deviations from the erosion and sedimentation control provisions shown on the Contract Drawings shall have the prior acceptance of the Engineer and shall be completed at no additional cost to the Owner.

- I. Erosion and sedimentation controls applicable to this project shall be as shown on the Contract Drawings, as specified herein, as indicated by the Engineer and as detailed in the TDEC, Erosion & Sediment Control Handbook.
- J. The Contractor shall provide temporary or permanent ground cover adequate to restrain erosion on erodible slopes or other areas that will be left unworked for periods exceeding fourteen (14) calendar days.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- B. Section 31 23 00 – Excavation and Fill

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

- A. Without limiting the generality of other requirements of these specifications, all work hereunder shall conform to the applicable requirements of the referenced portions of the following documents, to the extent that the requirements therein are not in conflict with the provisions of this Section.
 - 1. Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101)
 - 2. TDEC, Erosion & Sediment Control Handbook, latest edition.
 - 3. Tennessee NPDES General Permit TNR100000 for Discharges of Stormwater Associated with Construction Activities, for any land disturbance or construction activity of one (1) acre or more.

1.04 SUBMITTALS

- A. Prior to the start of the work, the Contractor shall prepare and submit a plan for implementing the temporary and permanent erosion and sedimentation control measures. Construction work shall not commence until the schedule of work and the methods of operations have been reviewed and approved.
- B. The Contractor shall perform inspections of erosion and sedimentation control measures and stormwater discharge outfalls and prepare inspection reports as described in Part 3 of this Section. Copies of the inspection reports shall be submitted to the Engineer on a monthly basis.

C. In accordance with the procedures and requirements set forth in the General Conditions Division 1 and Section 01 33 00 - Submittals, the Contractor shall submit the following:

1. Name and location of all material suppliers.
2. Certificate of compliance with the standards specified above for each source of each material.
3. List of disposal sites for waste and unsuitable materials and evidence of all required permits for use of those sites.

1.05 GUARANTEE

- A. All restoration and re-vegetation work shall be subject to the one-year guarantee period of the Contract as specified in the General Conditions.

PART 2 PRODUCTS

2.01 GENERAL

- A. Materials. All erosion and sediment control materials used by the Contractor shall comply with TDEC standards.

PART 3 EXECUTION

3.01 EROSION AND SEDIMENT CONTROL INSPECTIONS AND REPORTING

- A. The Contractor will complete inspections of the site and implement necessary Best Management Practices as required for conformance to the General Permit TNR100000

END OF SECTION

SECTION 33 01 30.11

TELEVISION INSPECTION OF SEWER PIPELINES

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. National Association of Sewer Service Companies (NASSCO): Pipeline Assessment Certification Program (PACP).
2. Occupational Safety and Health Act (OSHA).

1.02 SUBMITTALS

A. Action Submittals:

1. Catalog and manufacturer's data sheets for television equipment.
2. Acceptance Standard closed-circuit television (CCTV) video; two copies.

B. Informational Submittals:

1. References: Contact names and telephone numbers.
2. List of staff and equipment to be used on Project.
3. Crew chief qualifications.
4. Crew chief contact information: name, mobile telephone number.
5. Schedule: 7-day look-ahead; weekly.
6. Public notification flyer.
7. CCTV inspection:
 - a. Initial first day's CCTV inspection external hard drives (HD) within 24 hours after first day's work is completed.
 - b. Subsequent work products/documentation deliverables on routine basis every week.
 - c. Include the following with each inspection submitted:
 - i. Inspection media.
 - ii. Inspection database.

iii. Inspection reports.

8. Log of cable footage counter calibration checks.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Contractor: Performed work successfully for at least three other projects, within last 5 years, with pipe lengths and pipe diameters similar to this Project.
2. Crew Chief: Minimum of 5 years' experience on projects similar to this Project and experienced using proposed equipment for this Project. If experience level cannot be met because of new equipment or technology proposed for Project, submit training and experience information for Owner's consideration.

B. Pre-startup Meeting: At least 5 days prior to beginning CCTV inspection work, schedule with Owner and Owner to review proposed temporary sewer flow diversion plan, traffic control plans, cleaning, and inspection methods.

C. Acceptance Standard CCTV Video:

1. HD format showing example quality of work that Contractor proposes for Project.
2. Submittal shall also include examples that demonstrate camera advancement speeds, picture clarity, environment condition, lighting, panning as well as focus on defects, title frame, and screen labels for images, and sample stills.
3. Examples shall include a minimum of four manhole to manhole segments and combinations of sizes with at least one 48-inch diameter or greater and at least a brick and clay pipe material.
4. Picture quality and definition shall be to satisfaction of Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

1. Complete closed-circuit television (CCTV) inspection for pipe segments as indicated on Drawings.
 1. Label assets and structures in their inspection records using same identification nomenclature as listed on pipe inventory.
 2. If pipe or structure is not shown or listed, identify by downstream structure with letter

designation added starting with "A" for each unidentified structure on each pipe segment. Subsequent upstream structures will be identified by adding "B", "C", and so on; include revisions on corrected field map.

- B. Complete applicable Work specified in Section 01 57 28, Temporary Flow Control, and Section 02 95 30 Gravity Sewer Pipeline Cleaning, prior to starting CCTV inspection work.
- C. Record GPS latitude and longitude (decimal degrees) coordinates using portable global positioning system (GPS) device in field for manholes and pipeline access locations used during inspection; include them in inspection information in database and summary report.
- D. Look-Ahead Schedule: Prepare and submit at least 7 days in advance, identifying areas to be investigated during coming week. Schedules shall include structure numbers, street locations, and dates.
- E. Traffic Control:
 - 1. Conform to requirements of Section 01 50 00, Temporary Facilities and Controls.
 - 2. Notify Owner at least 7 days in advance of Work starting, of areas where Work will be conducted, and submit traffic control plan.
- F. Measure and record flow depths and times of measurement at a sufficient number of locations to indicate flow depths that could be expected during inspection work. A minimum of one flow depth measurement shall be recorded for each line section.

3.02 NOTIFICATIONS

A. Public:

- 1. Provide flyer in English to each residence and business a minimum of 2 working days prior to CCTV operations in area.
 - a. Flyer shall inform occupants of purpose of the Work, what might possibly occur, and telephone numbers to call in case of questions or problems.
 - b. Prior to distribution, date stamp flyers.
- 2. On daily basis, document distribution of flyers. Documentation, at a minimum, shall include:
 - a. Maps showing areas notified.
 - b. Date distributed.
 - c. Name of person distributing flyers.
- 3. Provide flyer distribution information to Owner and Owner on a daily basis.
- 4. Schedule work to be completed within 5-working day window established by distribution

of public notices. If the Work is unable to be completed in notified area before end of the 5 working days, renotify area prior to resuming Work.

B. Owner and Owner:

1. A minimum of 5 days prior to the anticipated commencement of inspections in any one area and 24 hours in advance of actual start.
2. When obstruction, restricting flow in pipeline, is discovered.
3. If depth of flow in pipeline exceeds 25 percent of pipe diameter.
4. If conditions for CCTV inspection are found to be unsafe or impractical.
5. Pipe configuration in field is different than shown on maps, include diagram clearly indicating location of structure in relation to immediately adjacent structures.
6. If a disgruntled citizen or news media representative engages Contractor concerning Project.

3.03 EQUIPMENT

A. Inspection Vehicle:

1. Equipped with monitoring equipment specifically compatible with sewer inspection equipment.
2. Equipped with a safety backup alarm and traffic warning flashers.
3. Clearly marked with the inspection company name and phone number.

B. Inspection Equipment:

1. Inspection equipment that fails to produce satisfactory inspection quality shall be removed from the Work.
2. Monitoring Studio:
 - a. Equipped with independent power source.
 - b. Equipped with lights.
 - c. Temperature controlled.
 - d. Size: Sufficient to allow seating for a minimum of two people in addition to operating technician.
 - e. Television Monitor:
 - i. Locate in monitoring studio.

- ii. Capable of producing high quality color picture.
 - iii. Resolution: No less than 350 lines.
 - iv. Continuous display during survey.
3. Transport Platform:
- a. Self-propelled, mounted on skid, or mounted on float.
 - b. Sized for each pipe diameter in accordance with manufacturer's recommendations.
 - c. Cables: 1,000 feet long, minimum.
 - d. Equipped with tag line suitable for pulling camera backwards.
 - e. Equipped with winch, power winch, TV cable, powered rewind, or other devices used to move camera through pipe.
 - i. When powered and controlled winches are used to pull television camera through line, provide telephones, radios, or other means of communication between the two manholes to ensure communications exist between crewmembers.
 - f. Remote Reading Footage Counter:
 - i. Accuracy: 0.20 feet over length of section being inspected.
 - ii. Counter display located in monitoring studio.
 - iii. Marking on cable will not be allowed.
 - iv. Calibration: Perform each day prior to setup.
 - g. Secure cable chains, and other devices used with camera so as not to obstruct camera view or otherwise interfere with proper documentation of sewer conditions.
4. Television Camera:
- a. Closed-circuit color television camera.
 - b. Sufficient for pipe diameters in accordance with manufacturer's recommendations.
 - c. Mounted on transport platform.
 - d. Operative in 100 percent humidity conditions without lens fogging.
 - e. Operative in hazardous and corrosive environment and specifically designed for pipeline inspection.

- f. Camera Lighting:
- i. Mounted on and turned in direction of camera head.
 - ii. Light Sensitivity: Greater than 1.5 lux minimum.
 - iii. Minimize reflective glare.
 - iv. Remote variable intensity control.
 - v. Provide clear, in-focus picture of entire inside periphery of pipe.
 - vi. Ability to achieve proper balance of tint and brightness.
- g. Resolution:
- i. Horizontal Resolution: 460 lines minimum.
 - ii. Vertical Resolution: 400 lines minimum.
 - iii. Meet or exceed monitor resolution.
- h. Rotation: 360 degrees.
- i. Pan and Tilt: 270 degrees, with adjustable supports designed for operation in connection with pipe inspection.
- j. Viewing Angle: 65 degrees, minimum.
- k. Focus and Iris Controls:
- i. Automatic or remote.
 - ii. Remote control adjustment for focus and iris shall be located in monitoring studio.
- l. Focal Distance: Adjustable through range from 6 inches to infinity.
- m. Zoom: Capable of 40:1 (10x optical, 4 times digital).
- C. Inspection Software:
- 1. Inspection equipment shall utilize software capable of providing complete survey reports, inspection database, and linked media files.
 - 2. Coding system shall be certified by NASSCO in accordance with their Pipeline Assessment and Certification Program (PACP).

3.04 INSPECTION

A. Video Recording:

1. CCTV inspection is represented by one manhole-to-manhole pipe segment or other access-to-access point; not multiple manhole-to- manhole segments.
2. Prior to beginning CCTV inspection, complete initial screen text step and position camera at center of manhole and with axis at centerline of pipe.
3. Before camera enters pipe, inspection shall provide internal video of manhole. Video recording shall begin by facing pipe segment to be televised and then pan/tilt/zoom as necessary to point camera up towards manhole opening.
4. Show continuous footage reading on inspection image. Place on screen where it is clearly visible (if black font, do not place on dark background, if white font, do not place on light background).
5. Viewing shall be in direction of flow, except while camera is being used in a reverse setup. Inspection shall proceed from upstream to downstream, unless prohibited by obstruction.
6. If during inspection operation television camera will not pass through entire line segment due to obstruction, set up equipment so inspection can be performed from opposite manhole.
7. If upstream (reverse) setup, is required, establish new inspection run separate from downstream (normal) setup.
8. Keep camera lens clean and clear. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with recording operation.
9. Camera lens shall remain above visible water level and may submerge only while passing through clearly identifiable line sags or vertical misalignments. If flow exceeds 25 percent of diameter such that camera lens becomes obscured, stop inspection until flow subsides. If necessary, reschedule CCTV operation. Surcharging and flooding of camera lens is not an excusable condition if it has been artificially created upstream (for example, placement of flow plugs or freshwater flushing in pipe).
10. Record inside of each lateral and connection of lateral to pipeline.
11. Recordings shall clearly show defects and observations, and their severity, in addition to obvious features (such as, laterals and joints).
12. Immediately report to Owner obstructions that restrict flow and cause inspection to be interrupted. Document condition with still photographs, and begin inspections of other pipelines.
13. Camera Operation:

- a. Speed: 30 feet per minute, maximum, during inspection.
- b. Stop, for a minimum of 5 seconds, at every lateral, or other defect or adversity.
- c. Pan entire diameter or area of pipe at each defect and lateral connection.
- d. Readjust lens, lighting, and focus in order to ensure clear, distinct, and properly lighted image of defect.
14. Loss of color or severe red or green color will be cause for rejection of inspection.
15. Recordings shall be without distortion or outside interference.
16. Televising line segments from structure-to-structure on same HD in continuous run.
- a. Video shall clearly show camera starting and ending at structure, unless defects do not allow it.
- b. Do not perform partial televising on one HD and then complete run on another HD.
- c. If line is partially televised, as a result of an excusable condition, (for example, collapsed line), televised length shall be viewed by Owner for acceptability.
- d. If portion of line is unacceptable, entire segment shall be deemed unacceptable and shall be re-televised.
17. Owner may accept physical inspection that does not adhere to minimum standards if adverse conditions are encountered and re-inspection is not advised. In such a case, enough data shall be provided to permit accurate assessment.
- B. Measurement:
1. Record in English units.
2. Obtain pipe diameter by physical measurement in upstream (or downstream) access structure.
3. Verify pipe material (such as, RCP, VCP, CMP) and surface lengths between manholes.
4. Use calipers or measuring rod to determine diameter of inlet and outlet pipe.
5. Footage measurements shall begin at the beginning of the pipe at the interface with the manhole, unless Owner approves otherwise.
6. Continuous Footage Readings:
- a. Use to identify location of defects.
- b. Accurate to within plus or minus 0.20 foot tolerance.

- c. Defect identifications are to be called out and recorded to nearest 0.10 foot.
 - d. Line segment recording will be unacceptable if continuous footage meter is inaccurate, or identified defects or features leave doubt as to accuracy of locations or total length.
7. Measurement shall be zeroed after each segment inspected.
 8. Check accuracy of measurement meters daily by use of walking meter, roll-a-tape, or other suitable device.

3.05 RECORDING OF DOCUMENTATION

A. Upon completion of CCTV inspection, transfer inspection data to external hard drive (HD) of sufficient capacity and compatibility with Owner's equipment; include code required for proper playback of video file.

1. Labeling:

a. Provide printed label on outside of HD that indicates the following:

- i. Name of Owner.
- ii. Project title.
- iii. Date(s) of inspection.
- iv. Inspection company.
- v. Deliverable number.

B. Media:

1. Video:

a. Inspections completed, with a unique filename per inspection.

b. Encoded in .WMV, .MPG, or .AVI format.

c. Opening Screen: The following is an example of required on- screen text display fields:

- i. Date and Time: (YYYY/MM/DD), (military time hh:mm).
- ii. Surveyor's Name/Company: John Doe/ABC Company.
- iii. Project Name: XYZ project.
- iv. Location: 1 Example Street.

- v. Location Code: B – Example Highway.
 - vi. Upstream MH No: ### (Feature_ID or Facility_ID).
 - vii. Upstream MH depth: ##.# (nearest tenth of a foot).
 - viii. Downstream MH No: ### (Feature_ID or Facility_ID).
 - ix. Pipe Segment Ref. ##### (Feature_IDs).
 - x. Starting Footage: ###(nearest tenth of foot).
 - xi. Inspection Direction: Downstream or upstream.
 - xii. Pipe Material: Example, ductile iron.
 - xiii. Pipe Diameter/Height/Width: Diameter: ##/Height: ##/Width: ## (as measured in field).
 - xiv. Weather: Example, snow.
 - xv. Pre-cleaning: Example, jetting.
 - xvi. Additional Information: Additional important information/comments.
- d. Continuous View: Following is list of required on-screen text display fields:
- i. Inspection date and time.
 - ii. Continuous forward and reverse readout of cameral distance from center of manhole reference (tape counter footage).
 - iii. Pipe structure identification number.
 - iv. Defect/Observation code(s) (when encountered).

2. Audio:

- a. Embedded in video file.
- b. Operator shall include description of inspection setup, including related information from log form and unusual conditions.
- c. Operation changes (for example, remove roots and restart inspection at footage prior to root removal).
- d. Verbal description and location of each defect.
- e. Verbal description and location of each service connection.

3. Still Photographs:
- a. Provide digital photographs showing inspection image whenever observation or defect is recorded.
 - b. Each with unique filename.
 - c. Encoded in .JPEG format.
 - d. Minimum 640 by 480 resolution.
 - e. Provide label on front of photograph with structure identification number, footage (if not visible on photograph), and defect code.
- C. Database:
1. Include all inspections. Creating a database per inspection is not acceptable.
 2. Provide database of collected data including:
 - a. Asset information.
 - b. Inspection information, where each inspection includes no more than one manhole-to-manhole segment.
 - c. Defect codes and scores.
 - d. Start and stop footages for continuous defects.
 3. File Type: MSAccess, .MDB, .ACCDB.
 4. Database Format: NASSCO PACP data shall be exported into standard PACP Exchange database. CUES GraniteXP data shall be exported into standard MS Access database format.
 5. List inspection media names in corresponding asset/inspection/defect information field within database.
- D. Inspection Reports:
1. Provide PDF inspection reports including:
 - a. Summary of inspections completed.
 - b. Pipe graphs of each inspection showing asset information and defects/observations.

2. Field Maps:

- a. Corrected to reflect actual field conditions.
- b. Illustrate changes in pipe routing that differ from anticipated network. Are not necessary for pipe segments whose routing is as indicated on Drawing or on maps provided by the Owner.
- c. Neatly strike out wrong data using green pencil and clearly mark in correct data, using red pencil. Show notes that clarify changes in blue pencil.

3.06 FIELD QUALITY CONTROL

- A. Review videos and reports to resolve inconsistent and conflicting data and to improve accuracy of data prior to submittal.
- B. If minimum level of accuracy is not met between videos and reports after review by Owner, perform re-inspection of pipes that do not meet requirements.
- C. Quality control procedures shall be in accordance with method attached as a supplement at the end of this section.

END OF SECTION

SECTION 33 01 30.72
CURED-IN-PLACE PIPE (CIPP)

PART 1 GENERAL

1.01 INTENT

- A. It is the intent of this specification to provide for the reconstruction of pipelines and conduits by the installation of a resin-impregnated flexible tube, which is tightly formed to the original conduit. The resin is cured using either hot water under hydrostatic pressure or steam pressure within the tube. Ultraviolet light curing systems are not approved and shall not be allowed. The Cured-In-Place Pipe (CIPP) shall be continuous and tight fitting.

1.02 REFERENCED DOCUMENTS

- A. This specification references standards from the American Society for Testing and Materials, such as: ASTM F1216 (Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube), ASTM F1743 (Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)), ASTM D5813 (Cured-in-Place Thermosetting Resin Sewer Pipe), ASTM D790 (Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials), and D2990 (Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics) which are made a part hereof by such reference and shall be the latest edition and revision thereof. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

PART 2 PRODUCTS

2.01 PRODUCT, MANUFACTURER/INSTALLER QUALIFICATION REQUIREMENTS

- A. Since sewer products are intended to have a 50-year design life, and in order to minimize the Owner's risk, only proven products with substantial successful long-term track records will be approved. All trenchless rehabilitation products and installers must be pre-approved prior to the formal opening of proposals.
- B. Products and installers seeking approval must meet all of the following criteria to be deemed Commercially Acceptable:
1. For a Product to be considered Commercially Proven, a minimum of 1,000,000 linear feet of successful wastewater collection system projects of a similar size and scope of work shall be performed in the U.S. within the past 5 (five) years and documented to the satisfaction of the Owner to assure commercial viability. In addition, a minimum of (300,000) linear feet of the above wastewater collection system projects must have been installed and in service in the state of (Tennessee) for at least the past 5 years to the satisfaction of the Owners.

2. For an Installer to be considered as Commercially Proven, the Installer must satisfy all insurance, financial, and bonding requirements of the Owner, and must have at least 5 years of current, consecutive and active experience in the commercial installation of the as-bid product. In addition, the Installer must have successfully installed at least 1,000,000 linear feet of the as-bid CIPP product in wastewater collection systems in the United States. The Installer must also have successfully installed at least 50,000 linear feet of 24-inch diameter and larger of the as-bid CIPP product in wastewater collection systems. Acceptable documentation of these minimum installations must be submitted to the Owner. Installer's crew superintendent must have a minimum of 5 years of CIPP installation experience and must be on-site throughout the duration of the installation of the CIPP product. The superintendent's or any other crew member's installation experience shall not be counted or recognized as acceptable Installer experience.
3. Sewer rehabilitation products submitted for approval must provide third-party test results supporting the structural performance (short-term and long term) of the product and such data shall be satisfactory to the Owner. No product will be approved without independent third-party testing verification.
4. For a product and installer to be Commercially Proven, the installer must own and operate a permanent facility to impregnate the CIPP tubes. To ensure the Owner all installed products will meet the minimum product quality control standards set forth by the manufacture, all CIPP liners shall be impregnated by the approved product's licensed installer that is performing the work. No pre-impregnated CIPP products will be accepted from a third-party vendor.
5. Installer's CIPP manufacturing, wet out and installation processes shall operate under a quality management system which is third-party certified to ISO 9001 or equal standards. Proof of certification shall be required for approval.
6. Proposals must be labeled clearly on the outside of the proposal envelope, listing the product name and installer being proposed. Only proposals using pre-approved products and installers will be opened and read. Proposals submitted on products and/or from installers that have not been pre-approved will be returned unopened.
7. The owner authorizes the use of proven materials that serve to enhance the pipe performance specified herein. Proven materials have passed independent laboratory testing, not excluding long-term (10,000 hour) structural behavior testing, and have been successfully installed to repair failing host pipes in the U. S. for at least 4 years. In addition to the aforementioned, the owner may require that the contractor demonstrate that the enhancements proposed exceed the specifications herein, prior to the installation of the enhanced material systems. This section in no way shall be interpreted as authorization to deviate from the minimum standard practices set forth herein.
- C. Documentation for products and installers seeking pre-approved status must be submitted no less than two weeks prior to proposal due date to allow time for adequate consideration. The Owner will advise of acceptance or rejection a minimum of three days prior to the due date. All required submittals must be satisfactory to the Owner.

2.02 MATERIALS

- A. Tube - The sewn Tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F1216, Section 5.1 or ASTM F1743, Section 5.2.1 or ASTM D 5813, Sections 5 and 6. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections.
1. The wet out Tube shall have a relatively uniform thickness that when compressed at installation pressures will equal or exceed the calculated minimum design CIPP wall thickness.
 2. The Tube shall be manufactured to a size that when installed will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during installation.
 3. The outside layer of the Tube shall be coated with an impermeable, flexible membrane that will contain the resin and allow the resin impregnation (wet out) procedure to be monitored.
 4. The Tube shall contain no intermediate or encapsulated elastomeric layers. No material shall be included in the Tube that may cause de-lamination in the cured CIPP. No dry or unsaturated layers shall be evident.
 5. The wall color of the interior pipe surface of CIPP after installation shall be a relatively light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
 6. Seams in the Tube shall be stronger than the non-seamed felt material.
 7. The Tube shall be marked for distance at regular intervals along its entire length, not to exceed 5 ft. Such markings shall include the Manufacturers name or identifying symbol. The tubes must be manufactured in the USA.
- B. Resin - The resin system shall be a corrosion resistant polyester or vinyl ester system including all required catalysts, initiators that when cured within the tube create a composite that satisfies the requirements of ASTM F1216, ASTM D5813 and ASTM F1743, the physical properties herein, and those which are to be utilized in the submitted and approved design of the CIPP for this project. The resin shall produce a CIPP that will comply with the structural and chemical resistance requirements of this specification.

2.03 STRUCTURAL REQUIREMENTS

- A. The CIPP shall be designed as per ASTM F1216, Appendix X.1. The CIPP design shall assume no bonding to the original pipe wall.
- B. The Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed by his Company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. This is a

performance test of the materials (Tube and Resin) and general workmanship of the installation and curing as defined within the relevant ASTM standard. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. Retention values exceeding 50% of the short-term test results shall not be applied unless substantiated by qualified third party test data to the Owner's satisfaction. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.

- C. The Enhancement Factor 'K' to be used in 'Partially Deteriorated' Design conditions shall be assigned a value of 7.
- D. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If the layers separate during field sample testing, new samples will be required to be obtained from the installed pipe. Any reoccurrence may cause rejection of the work.
- E. The cured pipe material (CIPP) shall conform to the structural properties, as listed below.

MINIMUM CIPP PHYSICAL PROPERTIES

<u>Property</u>	<u>Test Method</u>	<u>Cured Polyester Composite</u>	
		<u>min. per ASTM F1216</u>	<u>Enhanced Resin</u>
Modulus of Elasticity	ASTM D790	250,000 psi	400,000 psi
Flexural Stress	ASTM D790	4,500 psi	4,500 psi

- F. The required structural CIPP wall thickness shall be based, as a minimum, on the physical properties in Section 5.5, or greater values if substantiated by independent laboratory testing and in accordance with the design equations in Appendix X1. Design Considerations of ASTM F1216, and the following design parameters:

- 1. Design Safety Factor (typically used value) = 2.0
- 2. Retention Factor for Long-Term Flexural Modulus to be used in Design = 50% - 75%
(As determined by long-term tests described in section 5.2 and approved by the Owner)
- 3. Ovality* (calculated from (X1.1of ASTM F1216) = 2%
- 4. Enhancement Factor, K = See Section 5.3
- 5. Groundwater Depth (above invert of existing pipe)* = ft.
- 6. Soil Depth (above crown of existing pipe) * = ft.
- 7. Soil Modulus** = psi
- 8. Soil Density** = pcf
- 9. Live Load** = H20 Highway
- 10. Design Condition (partially or fully deteriorated) *** = ***

- * Denotes information, which can be provided here or in inspection videotapes or project construction plans. Multiple lines segments may require a table of values.
- ** Denotes information required only for fully deteriorated design conditions.
- *** Based on review of video logs, conditions of pipeline can be fully or partially deteriorated.
(See ASTM F1216 Appendix) The Owner will be sole judge as to pipe conditions and parameters utilized in design.

- G. Any layers of the tube that are not saturated with resin prior to insertion into the existing pipe shall not be included in the structural CIPP wall thickness computation.

2.04 TESTING REQUIREMENTS

- A. Chemical Resistance - The CIPP shall meet the chemical resistance requirements of ASTM F1216, Appendix X2. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction. It is required that CIPP samples with and without plastic coating meet these chemical-testing requirements.
- B. Hydraulic Capacity - Overall, the hydraulic cross-section shall be maintained as large as possible. The CIPP shall have a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.
- C. CIPP Field Samples - When requested by the Owner, the Contractor shall submit test results from field installations of the same resin system and tube materials as proposed for the actual installation. These test results must verify that the CIPP physical properties specified in Section 5.5 have been achieved in previous field applications. Samples for this project shall be made and tested as described in Section 10.1.

PART 3 EXECUTION

3.01 INSTALLATION RESPONSIBILITIES FOR INCIDENTAL ITEMS

- A. It shall be the responsibility of the Owner to locate and designate all manhole access points open and accessible for the work, and provide rights-of-access to these locations. If a street must be closed to traffic because of the orientation of the sewer, the Owner shall institute the actions necessary to provide access during this for the mutually agreed time period. The Owner shall also provide free access to water hydrants for cleaning, installation and other process related work items requiring water.
- B. Cleaning of Sewer Lines - The Contractor, when required, shall remove all internal debris out of the sewer line that will interfere with the installation of CIPP. The Owner shall also provide a dumpsite for all debris removed from the sewers during the cleaning operation. Unless stated otherwise, it is assumed this site will be at or near the sewage treatment facility to which the debris would have arrived in absence of the cleaning operation. Any hazardous waste material encountered during this project will be considered as a changed condition.
- C. Bypassing Sewage - The Contractor, when required, shall provide for the flow of sewage around the section or sections of pipe designated for repair. Plugging the line at an existing upstream

manhole and pumping the flow into a downstream manhole or adjacent system shall make the bypass. The pump(s) and bypass line(s) shall be of adequate capacity to accommodate the sewage flow. The Owner may require a detail of the bypass plan to be submitted.

- D. Inspection of Pipelines - Inspection of pipelines shall be performed by experienced personnel trained in locating breaks, obstacles and service connections using close circuit television (CCTV) inspection techniques. The pipeline interior shall be carefully inspected to determine the location of any conditions that may prevent proper installation of CIPP. These shall be noted and corrected. A videotape and suitable written log for each line section shall be produced for later reference by the Owner.
- E. Line Obstructions - It shall be the responsibility of the Contractor to clean the line of obstructions such as solids and roots that will prevent the insertion of CIPP. If pre-installation inspection reveals an obstruction such as a protruding service connection, dropped joint, or a collapse that will prevent the installation process, that was not evident on the pre-bid video and it cannot be removed by conventional sewer cleaning equipment, then the Contractor shall make a point repair excavation to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the Owner's representative prior to the commencement of the work and shall be considered as a separate pay item.
- F. Public Notification - The Contractor shall make every effort to maintain sewer service usage throughout the duration of the project. In the event that a connection will be out of service, the longest period of no service shall be 8 hours. A public notification program shall be implemented, and shall as a minimum, require the Contractor to be responsible for contacting each home or business connected to the sanitary sewer and informing them of the work to be conducted, and when the sewer will be off-line. The Contractor shall also provide the following:
 - 1. Written notice to be delivered to each home or business the day prior to the beginning of work being conducted on the section, and a local telephone number of the Contractor they can call to discuss the project or any potential problems.
 - 2. Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.
- G. The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing the CIPP.

3.02 INSTALLATION

- A. CIPP installation shall be in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6, with the following modifications:
 - 1. Resin Impregnation - The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the potential loss of resin during installation through cracks and irregularities in the original pipe wall, as applicable.

2. Tube Insertion – The wet out tube shall be positioned in the pipeline using either inversion or a pull-in method as defined within relevant ASTM standards previously stipulated. If pulled into place, a power winch or its equivalent should be utilized and care should be exercised not to damage the tube as a result of pull-in friction. If inverted, either pressurized air or water shall be utilized. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.
3. Temperature gauges shall be placed between the tube and the host pipe's invert position to monitor temperatures during the cure cycle.
4. Curing shall be accomplished by utilizing hot water under hydrostatic pressure or steam pressure in accordance with the manufacturer's recommended cure schedule. Curing by ultraviolet light shall not be permitted. A cool-down process shall be conducted that complies with the resin manufacturer's specification.

3.03 REINSTATEMENT OF BRANCH CONNECTIONS

- A. It is the intent of these specifications that branch connections to buildings be re-opened without excavation, utilizing a remotely controlled cutting device, monitored by a CCTV. The Contractor shall certify a minimum of two complete functional cutters plus key spare components are on the job site before each installation or are in the immediate area of the jobsite and can be quickly obtained. Unless otherwise directed by the Owner or his authorized representative, all laterals will be reinstated. No additional payment will be made for excavations for the purpose of reopening connections and the Contractor will be responsible for all costs and liability associated with such excavation and restoration work.

3.04 INSPECTION

- A. CIPP samples shall be prepared for each installation designated by the owner/engineer or approximately 20% of the project's installations. Pipe physical properties will be tested in accordance with ASTM F1216 or ASTM F1743, Section 8, using either method proposed. The flexural properties must meet or exceed the values listed in the table on page 4 of this specification, Table 1 of ASTM F1216 or the values submitted to the Owner/engineer by the contractor for this project's CIPP wall design, whichever is greater.
- B. Wall thickness of samples shall be determined as described in paragraph 8.1.6 of ASTM F1743. The minimum wall thickness at any point shall not be less than 87½% of the submitted minimum design wall thickness as calculated in paragraph 5.6 of this document.
- C. Visual inspection of the CIPP shall be in accordance with ASTM F1743, Section 8.6.

3.05 CLEAN-UP

- A. Upon acceptance of the installation work and testing, the Contractor shall restore the project area affected by the operations to a condition at least equal to that existing prior to the work.

END OF SECTION

SECTION 33 01 30.82

STRUCTURAL EPOXY LINING FOR SANITARY SEWER MANHOLES

PART 1 GENERAL

1.01 DESCRIPTION

A. SCOPE:

A manufacturer certified Applicator shall provide all labor, materials, equipment, incidentals, and quality requirements for concrete for surface preparation, repair or resurfacing, and ultra-high build, Structural Epoxy lining work to the entire interior surfaces of the structures as shown on drawings and specified herein.

This Section's intent is to provide minimum requirements of an installation of an ultra-high build, high strength, structural epoxy system; and the lining of newly installed, existing, and/or defective specified concrete/masonry structures and surfaces exposed to municipal sanitary sewage by an applied and bonded application of high performance, 100% solids, ultra-high build, structural grade, applied fiber-reinforced-polymer (FRP) epoxy coating/lining system (Structural Epoxy).

This Section's intent is for concrete and/or other masonry structures which are exposed to or in contact with municipal sanitary sewage; constituting municipal sanitary sewage from collection systems (sanitary sewer and/or stormwater), where sewage contact and exposure to hydrogen sulfide are present. Not intended for non-sewage applications or industrial waste.

Structural Epoxy minimum film thickness specified herein is designed and intended for applied and bonded coating/lining, delivering barrier protection with high mechanical strength with a reinforced film to bridge and seal against low pressure forces of effective lateral earth pressure, moisture vapor transmission (MVT), hydrostatic head pressure, and inflow and infiltration (I&I) once cured; while protecting from effluent and H₂S. Design thickness herein also accounts for long term performance; as unintentionally there may be circumstances that may prevent bonding in certain areas that an engineered Structural Epoxy is designed to bridge (with limitations), whereas non-structural coatings may not. Not intended: excessive or high-pressure forces and loading, or other force considerations for full structural reinstatement without a qualified assessment with calculated, verified and adjusted structural thickness calculations performed and certified by a registered Professional Engineer (film or system thicknesses may change depending on types of forces, force values and other variables, engineering assessments and calculations).

Types of Structural Epoxy lining for concrete Work required include but are not necessarily limited to the following:

1. Hydraulic water plug
2. Chemical grout

3. Cementitious repair mortar
4. Epoxy cementitious resurfacer
5. Structural epoxy lining
6. Manhole chimney joint sealant
7. Miscellaneous materials

B. COORDINATION

8. Coordinate surface preparation of substrates to avoid later difficulty or delay in performing the Work of this Section.
9. Review installation procedures under other Sections and coordinate the installation of items that must be installed prior to application of the Structural Epoxy lining.
10. The Contractor shall coordinate with Engineer regarding the availability of work areas, completion times, safety, access, and other factors which can impact plant operations.

C. Related Sections:

1. Section 03 02 00, Cast-in-Place Concrete
2. Section 03 41 00, Precast Concrete

1.02 REFERENCES

- A. This Section contains references to the governing standards and documents listed below. They are a part of this Section as specified and modified; the current version shall apply unless otherwise noted. In case of conflict between the requirements of this section and those of the listed documents, the more stringent of the requirements shall prevail.

American Concrete Institute, (ACI)

1. ACI 301 – Specifications for Structural Concrete

ASTM International, (ASTM)

2. ASTM C 868 – Standard Test Method for Chemical Resistance of Protective Linings
3. ASTM C 1583/1583M – Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)
4. ASTM D 4060 – Standard Test Method for Abrasion Resistance of Organic Linings by the Taber Abraser
5. ASTM D 4285 – Standard Test Method for Indicating Water or Oil in Compressed Air
6. ASTM D 4414 – Standard Practice for Measurement of Wet Film Thickness by Notch Gages
7. ASTM D 7682 – Standard Test Method for Replication and Measurement of Concrete Surface Profiles Using Replica Putty

8. ASTM F 2414 – Standard Practice for Sealing Sewer Manholes Using Chemical Grouting
9. ASTM C 1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill

International Concrete Repair Institute, (ICRI)

10. Guideline No. 310.1R – Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion
11. Guideline No. 310.2 – Selecting and Specifying Concrete Surface Preparation for Sealer, Linings, and Polymer Overlays

Association for Materials Performance and Protection (AMPP) Formerly NACE and SSPC

12. NACE SP0188 – Standard Practice for Discontinuity (Holiday) Testing of Protective Linings
13. NACE No. 6/SSPC-SP13 – Surface Preparation of Concrete
14. SSPC-SP13/NACE No. 6 – Surface Preparation of Concrete
15. SSPC-Guide 12 – Guide for Illumination of Industrial Painting Projects

Occupational Safety and Health Administration, (OSHA)

16. Safety and Health Standards (29 CFR 1910/1926)

- B. Unless otherwise specified, references to documents shall mean the documents in effect at the time of receipt of Bids. If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents, the last version of the document before it was discontinued.

1.03 SUBMITTALS

- A. In accordance with the procedures and requirements set forth in the General Conditions and Section 01300 entitled "Submittals", the Contractor shall submit all required information as specified herein.
- B. Shop Drawings: Submit for approval prior to commencing any Work:
1. Manufacturer's project reference lists with coating systems specified herein, stating project location, Owner contact information, Engineer contact information, Installer contact information, containing a minimum of 10 projects of similar capacity with a minimum of 5 years of satisfactory service.
 2. Product Data Sheets: Copies of current technical data for each component specified and applied as outlined in this Section.
 3. Safety Data Sheets: Copies of current SDS for any materials brought on-site including all clean-up solvents, repair or resurfacing mortars and lining materials.
 4. Qualification Data: Approved Installer Certification from manufacturer.
 5. Performance Testing Reports: Copies of test data for the entire physical, chemical, and permeation properties listed herein and as outlined within this Section.

6. Installation Instructions: Manufacturer's written installation instructions for the materials specified in this Section.
- C. Product Substitution: The specified corrosion protection system is the minimum standard of quality for this project. Equivalent materials of other manufacturers may be substituted only by approval of Engineer. Requests for material substitutions shall be in accordance with requirements of the project specification.
1. All Contractors must provide pricing based on the compliant system of Epoxytec Company in the Base Bid. Other approved coating manufacturer system, if provided, will be shown in the Bid Schedule as Additive Bid Item as an ADD or DEDUCT to overall Base Bid.
 2. Manufacturers of "or equal" products shall provide direct property comparison with the materials specified in addition to complying with all other requirements of these Specifications. "Or equal" products shall employ the same generic materials and system components as the Structural Epoxy lining specified and shall provide same intent by description and equivalent performance as the specified Structural Epoxy lining to protect against H₂S corrosion and seal from I&I.
 3. "Or equal" products' manufacturer must provide documentation supporting product's success and history in severe wastewater environments for at least ten (10) years; must also provide samples of cured material covering at least one (1) square foot of surface, at the specified thickness; and must provide written repair instruction and a list of materials should a repair be needed in the future.
 4. Bidders desiring to use linings other than those specified shall submit proposed system with their proposal at the time of bid, together with the information required herein, and indicate the sum which will be deducted from the base bid should alternate materials be accepted.
- D. Jobsite Reports: Submit at the completion of Work
1. Daily Reports: Include surface preparation, substrate conditions, ambient conditions application procedures, lining materials applied, material quantities, material batch number(s), description of work completed and location thereof.
 2. Quality Control Reports: Include all quality control testing and physical specimens.
 3. Contractor shall maintain a copy of records until the expiration of the specified warranty period.

1.04 QUALITY ASSURANCE

A. Applicator Qualifications:

1. Contractor shall be a certified Applicator by the Structural Epoxy manufacturer prior to bid date. Submit proof of Applicator certification by manufacturer to Engineer.
2. Installation equipment shall be acceptable to the Structural Epoxy manufacturer. If spraying Structural Epoxy, Applicator must utilize equipment approved by Structural Epoxy manufacturer.
3. Applicator shall establish quality control procedures and practices to monitor phases of surface preparation, storage, mixing, application, and inspection throughout the duration of

the project. Contractor to provide a fulltime, on-site person whose dedicated responsibilities will include quality control of the Structural Epoxy linings and completed manufacturing certification training.

4. Applicator's quality control procedures and practices must include the following items:
 - a. Training of personnel in the proper surface preparation requirements.
 - b. Training of personnel in the proper storing, mixing, and application and quality control testing of the Structural Epoxy linings.
 - c. If spraying, training of personnel with the spray equipment to ensure proper film build, film quality, and ratio control.

B. Mock-Ups:

1. Prior to the installation of the Structural Epoxy lining and auxiliary system components, but after Engineer's approval of the Samples and Shop Drawings, install 150 square foot (14 square meters) stepped-back mock-ups of the systems showing surface preparation and each system component in an area selected by Engineer to show representative installation of the Work.
2. Engineer shall approve the mock-up before the start of Work.
3. Retain and protect mock-ups during construction as one standard for judging completed corrosion protection lining Work. Do not alter mock-ups after approval by Engineer.
4. Contractor shall build as many mock-ups as required to achieve Engineer's acceptance of the corrosion protection lining.
5. The approved mock-up shall be considered the acceptable minimum standard of quality.
6. Any corrosion protection lining Work that proceeds without approved mock-ups will not be accepted by the Engineer and removed at no cost to the Owner.

C. Pre-Installation Conference:

1. Before erecting mock-ups Contractor, Installer and technical representative of the corrosion protection lining manufacturer shall meet on-site with Engineer to discuss approved products and workmanship to ensure proper application of the corrosion protection lining components and substrate preparation requirements.
2. Review foreseeable methods and procedures related to the Structural Epoxy lining of coating Work including but not necessarily limited to the following:
 - a. Review Project requirements and the Contract Documents.
 - b. Review required submittals, both completed and yet to be completed.
 - c. Review status of substrate Work, including approval of surface preparations and similar considerations.
 - d. Review requirements of on-Site quality control testing and requirements for preparing Site Quality Control Report as specified herein.

- e. Review availability of materials, tradesmen, equipment and facilities needed to make progress and avoid delays.
- f. Review required inspection and testing.
- g. Review environmental conditions, other Project conditions, and procedures for coping with unfavorable conditions.
- h. Review regulations concerning code compliance, environmental protection, health, safety, fire and similar considerations.
- i. Review procedures required for the protection of the Structural Epoxy lining during the remainder of the construction period.
3. Record the discussions of the Pre-Installation Conference and the decisions and agreements or disagreements reached and furnish a copy of the minutes to each party attending. Record any revision or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them.
4. Reconvene the conference at the earliest opportunity if additional information must be developed in order to conclude the subjects under consideration.
- D. Performance Criteria: Structural Epoxy lining shall be capable of withstanding under constant exposure to raw wastewater, permeation from hydrogen sulfide and other sewer gases, and attack from organic acids generated by microbial sources with no adverse effects; cured film at specified thickness must withstand negative side film forces from inflow and infiltration. Products must have sufficient field history and accelerated laboratory testing to substantiate product viability for these exposures.
- E. Source Quality Control: Provide each component of Structural Epoxy lining produced by a single manufacturer, including recommended repair mortar, repair overlay (resurfacer), joint sealant, lining (coating) materials.
- F. Reference Standards: Comply with applicable provisions and recommendations of all standards listed in Section 1.2 except as otherwise shown or specified.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials:

1. Deliver material in manufacturer's original, unopened and undamaged packages.
2. Clearly identify manufacturer's, brand name, contents, color, batch number, and any personal safety hazards associated with the use of or exposure to the materials on each package.
3. Packages showing indications of damage that may affect condition of contents are not acceptable.

B. Storage of Materials:

1. Materials shall be stored in accordance with manufacturer's recommendations in enclosed structures and shall be protected from weather and adverse temperature conditions. Flammable materials shall be stored in accordance with state and local codes. Materials exceeding storage life as defined by the manufacturer shall be removed promptly from the site. Store all materials only in area or areas designated by the Engineer solely for this purpose.
 2. Store in original packaging under protective cover and protect from damage.
 3. Stack containers in accordance with manufacturer's recommendations.
- C. Handling of Materials: Handle materials in such a manner as to prevent damage to products or finishes.

1.06 JOB CONDITIONS

A. Environmental Requirements:

1. Proceed with Work only when temperature and moisture conditions of substrates, air temperature, relative humidity, dew point and other conditions comply with the Structural Epoxy lining manufacturer's written recommendations and when no damaging environmental conditions are forecasted for the time when the material will be vulnerable to such environmental damage. Record all such conditions and include in final Site Quality Control Report.
2. Maintain substrate temperature and ambient temperature before, during and after installation above 45°F (8°C) and rising in accordance with Structural Epoxy lining material manufacturer's instructions.
3. Provide adequate ventilation during instillation and full curing periods of the Structural Epoxy lining.
4. Structural Epoxy lining shall not be applied when ambient air temperature is within 5°F (3°C) of the dew point.
5. Structural Epoxy lining shall not be applied when relative humidity is outside of material manufacturer's recommendations. Do not prepare surfaces or apply materials in rain, snow, fog, mist, or otherwise inclement weather as per material manufacturer's instructions.

- B. Dust and Contaminants: Protect work and adjacent areas from excessive dust and airborne contaminants during Structural Epoxy lining application and curing. Schedule Work to avoid excessive dust and airborne contaminants.

1.07 WARRANTY

- A. Structural Epoxy lining Manufacturer shall warranty its products as free from material defects for a minimum period of ten (10) years. Provide associated Warranty Certificate.
- B. Contractor shall warranty the installed Structural Epoxy lining system as free from workmanship defects for a minimum period of ten (10) years.

PART 2 PRODUCTS

2.01 MATERIALS

A. Products and Manufacturer:

1. Materials specified are those that have been evaluated for the specific service. Products of Epoxytec LLC (a Tnemec company, www.tnemec.com, +1-800-863-6321) www.epoxytec.com are specified as a standard of quality and basis of design. The specified basis of design is intended to provide the longest service life possible, lowest life cycle cost, and most sustainable solution. All Contractors must provide pricing based on the compliant system of Epoxytec in the Base Bid.
2. Or Engineer Approved Equal. Materials specified herein shall not preclude consideration of equivalent or superior materials. Alternate materials shall include the following:
 - a. Shown in the Bid Schedule as Additive Bid Item as an ADD or DEDUCT to overall Base Bid.
 - b. Completion of Appendix A of this Section. The burden of proof of performance equality is the responsibility of the Party requesting a substitution in materials. Standardized industry test methods in Appendix A shall be used in part for comparison.
 - c. Materials must have a proven track record of successful installation. Provide Manufacturer's project reference lists with coating systems specified herein stating project location, Owner contact information, Engineer contact information, Installer contact information, containing a minimum of 10 projects of similar capacity with a minimum of 5 years of satisfactory service.
 - d. The owner will decide which Bid Item to accept.

B. Contractor shall provide all accessory components, as specified or recommended by the manufacturer for optimal application of the Structural Epoxy lining system's adhesion to substrate and long-term service performance.

C. Hydraulic Water Plug:

1. Active leak control materials are to be utilized for I&I abatement, to stop leaks, running water, infiltration, and other water stop needs. Material must be a quick setting, hydraulic cement compound designed for minor patching, and as a leak stopper and water plug which stops running water and/or seepage through concrete. Materials must be designed to set rapidly, in dry powder form, with no prior mixing of water needed (if necessary), to apply directly to active leaks under hydrostatic pressure in manholes or related structures, in accordance with the manufacturer's recommendations.

D. Chemical Grout:

1. Depending on the specific application Urethane Based Grout shall be furnished. The type of grout to be used shall be in accordance with the manufacturer's recommendation for the specific application area of the project. Chemical grout sealant solution containing principal chemical sealant constituent, initiator (trigger) and catalyst specifically recommended for the purpose of sealing leaks in manholes. Chemical sealant constituent, initiator (trigger) and catalyst shall be compatible when mixed. Solution shall have ability to tolerate dilution and

react in moving water. After final reaction, it shall be a stiff, impermeable, yet flexible gel. The grout proportions shall be such that dilute aqueous solutions, when properly catalyzed will form stiff gels. Materials provided shall gel in a predetermined time period when exposed to normal groundwater pH ranges, and be capable of formula adjustments to compensate for changing conditions. Final reaction shall produce a continuous, irreversible, impermeable stiff Gel and shall not be rigid or brittle. The cured material must be impervious to water penetration and withstand submergence in water, without degradation and must not be biodegradable.

E. Cementitious Repair Mortar:

1. Rapid-setting, cementitious repair mortar when concrete is deteriorated greater than a depth of 1/2-inch (12.7 mm) and when recommended by the Manufacturer to rehabilitate and restore concrete and provide level substrate for application of the protective lining. Cementitious repair mortar shall be a rapid-setting, non-shrinking resurfacing material capable of spray-transfer. Material shall have similar CLTE properties as concrete.

F. Epoxy Cementitious Resurfacer:

1. Epoxy cementitious resurfacer shall be an epoxy-modified, aggregate reinforced material with for surfacing, patching and filling voids and bugholes in concrete. The material shall be suitable for the application down to 1/16 inch (1.6 mm) thickness and be capable of spray-transfer.
2. Epoxy cementitious resurfacer shall exhibiting high bond strength and high mechanical strengths. Initial set time occurs early (4 hours @ 77F) to allow for Structural Epoxy coating. The Epoxy cementitious resurfacer shall not require for any further preparation or conditioning within 36 hours (at 77F) to accept epoxy top coats.

G. Structural Epoxy Lining:

1. Structural Epoxy shall be available in both trowel-version and spray-version to assist with various application needs or applications in limited access areas or perform any touch-ups.
2. Structural Epoxy shall be 100% solids, highly thixotropic microfiber-reinforced, applied epoxy polycyclic polymer protective barrier material specifically designed to protect concrete and masonry surfaces in severe wastewater environments, including H₂S attack, while sealing inflow and infiltration (I&I).
3. Structural Epoxy is to provide protection from H₂S corrosion and seal from I&I with applied and bonded high build Structural Epoxy; Structural Epoxy film thickness specified herein is designed and intended for applied and bonded coating, delivering barrier protection lining with high mechanical strength and a reinforced film to bridge and seal against moisture vapor transmission (MVT), hydrostatic head pressure, fine root intrusion, and seal inflow and infiltration (I&I).
4. Structural Epoxy lining must be a verified technology of US Environmental Protection Agency's, Environmental Technology Verification Program for Infrastructure Rehabilitation Technologies (EPA ETV).

5. Structural Epoxy lining shall be capable of achieving up to 375 mil. (3/8 inch) sag resistance vertical and overhead.
 6. Structural Epoxy lining must have a long open recoat window without the need for abrasive or mechanical preparation for simple repair requirements.
 7. Structural Epoxy lining must be self-priming, able to be applied direct-to-concrete (DTC), requiring no primer.
 8. Structural Epoxy lining must be able to bond to saturated-surface-dry (SSD) concrete, with moisture and relative humidity tolerances up to 85% and capable to fully cure underwater.
- H. Manhole Chimney Joint Sealant:
1. Manhole chimney joint sealant is an applied polymer elastomer designed to prevent leakage of water into the manhole through the frame joint area and the area above the manhole cone including all extensions to the chimney area. Extensions shall include but are not limited to lifting rings, brick and/or block material that may have been used to achieve grade. The polymer chimney seal material shall be corrosion resistant to H₂S. The sealing system shall line the interior of the adjustment area from the cone top of the manhole and onto the inside of the casting.

PART 3 EXECUTION

3.01 GENERAL

- A. All work shall be in strict accordance with the specifications and recommendations including mixing, handling, storage, and application of all products as required and in accordance with manufacturer's published technical instructions, safety data sheets, including manufacturer's published PDS, design guidelines, and/or other written specifications.
- B. Contractor shall provide, erect, and maintain all required hoists, scaffolding, staging and planking, and perform all access related hoisting work required to complete the Work of this Section as specified.
- C. Contractor shall cover or otherwise protect finish work or other surfaces not being coated within the scope of this Section. Contractor shall erect and maintain protective tarps, enclosures and/or masking to contain debris, including dust or other airborne particles from surface preparation or application activities. This may include the use of dust or debris collection apparatus as required at no additional cost to Owner.

3.02 EXAMINATION

- A. Contractor shall examine the areas and conditions under which the Structural Epoxy coating Work is to be performed in accordance with SSPC-SP13/NACE No. 6, and notify ENGINEER in writing of conditions detrimental to the proper and timely completion of the Work.
- B. Commencement of the Work of this Section shall indicate that the substrate and other conditions of installation are acceptable to the Contractor and his Applicator and will produce a finished

product meeting the requirements of the Specifications. All defects resulting from accepted conditions shall be corrected by Contractor at his own expense.

- C. Stopping Active Leaks: After surface cleaning, any visible leaks or other water ingress shall be reported to the Engineer. Any water infiltration through minor leaks must be stopped using specified hydraulic cement water stop; should flows be aggressive, a chemical grout method shall be used in accordance with Section 03640. Surface and grouting material may require additional surface preparation prior to application of Structural Epoxy lining.
- D. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated. Where varying surface temperatures do exist, coating installation should be scheduled when the temperatures are falling versus rising.

3.03 PREPARATION

- A. Concrete surfaces to receive Structural Epoxy coating shall be cast with a Smooth Form Finish in accordance with ACI 301. Surfaces shall not be rubbed, sacked, troweled or otherwise finished in any manner that will obscure or cover the parent concrete surface with materials other than materials as specified in this Section.
- B. Allow cast-in-place concrete to cure for a minimum of 28 days at 75°F (24°C) and with adequate air movement before installing the corrosion protection lining system.
- C. All surface washing, abrasive blasting, waterjetting, grinding, patching, filling and preparation shall be completed by the Applicator in accordance with the Structural Epoxy lining Manufacturer's recommendations.
- D. Substrate: Concrete surfaces to be coated shall be free of curing compounds and form release agents, laitance and foreign particles that may inhibit bonding. Prior to start of Structural Epoxy coating systems application, pre-clean as required, and inspect the substrate in accordance with SSPC-SP13/NACE No. 6, Severe Service. Surface preparation procedures shall be in accordance with NACE No. 6/SSPC-SP13 and ICRI Guideline No. 310.2. Surface preparation shall expose aggregate and obtain a uniform surface texture resembling the minimum recommended concrete surface ICRI-CSP profile.
- E. Level or grind concrete substrates to produce a uniform and smooth surface, including removal of all sharp edges, ridges, form fins, and other concrete protrusions.
- F. Surface preparation of the substrate must be achieved immediately prior to utilizing any repair material and/or coating/lining material that will require bond to the substrate, re-inspection and/or subsequent surface preparation may need to be repeated should conditions change after initial preparation.
- G. Surface preparation will be required on existing and new concrete.
- H. The objective of surface preparation is to produce a surface that is suitable for application and adhesion of the specified repair materials and coating/lining material. Surfaces therefore are to

be free of contaminants and loosely adhering or unsound concrete, and should provide a dry, sound, uniform substrate suitable for the application of repair and coating/lining material.

- I. Structures to receive Structural Epoxy lining system must be capable of withstanding imposed loads. All oil, grease, waste and chemical contaminants must be removed from the surface of the concrete prior to preparation in accordance with NACE No. 6/SSPC-SP13. Concrete surfaces must be sound and capable of supporting the Structural Epoxy Lining system as determined by the engineer. Surface preparation requirement is to expose a sound, uniform surface texture confirming to the minimum recommended ICRI-CSP amplitude. The appropriate cementitious repair mortar or epoxy cementitious resurfacer material shall be applied to the entire, prepared surface to level surface suitable for coating.
- J. Metal Application: Remove all visible contaminants per SSPC-SP1. Prepare the surfaces in accordance with SSPC/NACE surface preparation standards per the Manufacturer's instructions.

3.04 APPLICATION

- A. Structural Epoxy lining systems shall be installed when ambient air and surface temperature is above 45°F. The substrate temperature shall be at least 5°F (3°C) above the dew point. Condition the material between 70-80°F (21-27°C) for 24 hours prior to use. Application when temperatures outside of this range will require written instruction from the Manufacturer and approval of the Engineer.
- B. Application in direct sunlight and/or with rising surface temperatures is not advised, as this may result in blistering of the materials due to expansion of entrapped air or moisture in the concrete (induced outgassing). In such cases, it will be necessary to postpone the application until later in the day when the temperature of the substrate is falling or take precautionary steps as recommended by the Manufacturer. Concrete surfaces that have been in direct sunlight should be shaded for at least 24 hours prior to application. Consult the Manufacturer for application schedule guidelines specific to temperature conditions and possible sealer application recommendations to reduce outgassing.
- C. Hydraulic Water Plug: Epoxytec Mortartec Hydrxx-1 or Hydrxx-3 hydraulic cement water plug shall be used for low pressure active leak stopping.
 1. Cure – Press firmly pre-mixed paste or dry material into place, maintaining pressure until the material begins to harden and the leak is stopped. Continue until all active leaks cease.
- D. Chemical Grout: Sanitary sewer grade chemical grouts shall be urethane-based, and formulated specifically for use in grouting pre-cast barrel joints, brick and CMU structures, and/or pipe penetrations and pinholes to stop aggressive flowing leaks.
 1. Cure – Mixing and handling of all the chemical grout materials shall be in accordance with chemical grout manufacturer's recommendations. Application of materials shall be by injection method according to chemical grout manufacturer recommendation and industry defined standard ASTM F 2414, using appropriate pressure to ensure no damage to the structure.
 2. Re-Blast - All excess chemical grout must be removed from the surface by mechanical means.

- E. Cementitious Repair Mortar: Epoxytec Mortartec Silicate or Tnemec Series 217 MortarCrete cementitious repair mortar shall be used for structural repairs or surface repairs exceeding a depth 1/2 inch (12.7 mm) in accordance with Manufacturer's written instructions as outlined in the product data sheet and application guide.
1. Thickness – Minimum ½ inch as required to re-establish original plane.
 2. Cure – Ensure that the mortar while curing will remain moist, covered from direct sunlight, and if needed, covered by damp coverings to avoid mortar dry-out and to optimize curing.
 3. Re-blast – Clean and profile the surface to remove the laitance layer and to uniformly profile the surface to produce a minimum ICRI CSP 6 surface profile amplitude.
- F. Epoxy Cementitious Resurfacer: Epoxytec Mortartec Ceramico epoxy cementitious resurfacer shall be used for filling voids, bugholes, static cracks and joints, and for general concrete patching, and to provide a uniform, void free surface for Epoxy Lining application.
1. Thickness – Epoxy lining shall be applied to a minimum thickness of 1/16 inch (1.6 mm) to the entire surface.
 2. Cure - Ensure that the mortar while curing will remain moist, covered from direct sunlight, and if needed, covered by damp coverings to avoid mortar dry-out and to optimize curing.
- G. Structural Epoxy Lining: Epoxytec CPP Sprayliner MH or Epoxytec CPP Trowel-Liner epoxy lining. Structural Epoxy coating shall be applied and in accordance with Manufacturer's written instructions as outlined in the product data sheet and application guide.
1. Thickness – Epoxy lining shall be applied to a minimum thickness of 125 mils (1/8" inch) dry film thickness.
- H. Manhole Chimney Joint Sealant: Applied polymer elastomer sealant, Epoxytec Uro Seal 45V shall be applied and in accordance with Manufacturer's written instructions as outlined in the product data sheet and application guide. Applied polymer elastomer material is applied after Structural Epoxy lining material is installed and cured.
1. Thickness – Manhole chimney joint sealant shall be applied to a minimum thickness of 250 mils (1/4" inch) dry film thickness.
 2. Re-blast – Lightly abrade and clean the surface of the Structural Epoxy liner when applying manhole chimney joint sealant beyond the recoat window of the Structural Epoxy.

3.05 FIELD QUALITY CONTROL, INSPECTION AND TESTING

- A. Contractor to perform the quality control procedures listed below in conjunction with the requirements of this Section.
- B. Inspect all materials upon receipt to ensure that all are supplied by the approved Manufacturer.

- C. Surface pH Testing: The pH of substrate will be measured using pH indicating paper or pH meter. Acceptable pH values shall be a minimum 9.0 as measured using color indicating pH paper with readable color calibrations and a scale at whole numbers or pH meter.
- D. Surface Profile: Inspect and record substrate profile (anchor pattern) at least once every 5 vertical feet or every 100 square feet (9.3 square meters). If applying Structural Epoxy direct-to-concrete (DTC), surfaces shall be profiled equal to the CSP 4 amplitude as recommended by the coating manufacturer in accordance with ICRI Guideline 310.2 and SSPC-SP13/NACE No. 6; for Cementitious Repair Mortar work, surfaces shall be profiled equal to the CSP 6.
- E. Provide verification of correct mixing of coating materials in accordance with the Manufacturer's instructions.
- F. Inspect and record that the "pot life" of coating materials is not exceeded during installation.
- G. Verify curing of the coating materials in accordance with the Manufacturer's instructions.
- H. Dry-Film Thickness:
1. Wet-Film Thickness shall be taken every two vertical feet (2 vf) or every 25 square feet (2.3 square meters) in accordance with ASTM D 4414 and recorded.
 2. The Dry-Film Thickness can be determined using a surface area calculation for material consumption.
- I. High-Voltage Holiday (Spark) Testing: Upon full cure, the installed lining system shall be checked by high voltage spark detection in accordance with NACE SP0188 and the Manufacturer's printed application guide to verify a pinhole-free surface. Areas which do not pass the spark detection test shall be corrected at no cost to the Owner.
- J. Contractor is responsible for keeping the Engineer informed of all progress so that Engineer may provide additional quality control at his discretion.
- K. Inspection by the Engineer or others does not absolve the Contractor from his responsibilities for quality control inspection and testing as specified herein or as required by the Manufacturer's instructions.

3.06 ACCEPTANCE CRITERIA

- A. All surfaces shall be prepared, applied, and tested in accordance with the specification and referenced standards herein.
- B. Where specified if the entire manhole including invert and pipe penetrations is rehabilitated monolithically then a Vacuum Test may be performed according ASTM F 1244. If vacuum test fails then the contractor shall spray entire manhole with a soap solution and retest to determine where air is entering the manhole. Inspector shall determine if failure was due to improper rehabilitation or poor pipe condition or improperly seated plugs. If inspector determines that the failure is due to improper rehabilitation then the Contractor shall repair manhole according to manufacturer recommendations and retest until a successful vacuum test is achieved. If inspector determines that the failure was due to poor condition of the pipes, or annular space between the pipe and its

liner, or the inability to seat the plugs properly and that there are no visible defects in the applied product then it will be determined that the manhole has passed.

3.07 ADJUSTMENTS AND CLEANING

- A. At the completion of the Work, Contractor shall remove all materials and debris associated with the Work of this Section.
- B. Clean all surfaces not designated to receive Structural Epoxy coating. Restore all other work in a manner acceptable to Engineer.
- C. All finished Structural Epoxy coating shall be protected from damage until Final Acceptance of the Work. Structural Epoxy coating damaged in any manner shall be repaired or replaced at the discretion of Engineer, at no additional cost to Owner.

END OF SECTION

SECTION 33 05 19

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. American Association of State Highway and Transportation Officials (AASHTO): T099-15-UL, Standard Method of Test for the Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.
2. American Society of Mechanical Engineers (ASME):
 - a. B16.21, Nonmetallic Flat Gaskets for Pipe Flanges.
 - b. B16.42, Ductile Iron Pipe Flanges and Flanged Fittings Classes 150 and 300.
3. American Water Works Association (AWWA):
 - a. C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
 - b. C105/A21.5, Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - c. C110/A21.10, Ductile-Iron and Gray-Iron Fittings.
 - d. C111/A21.11, Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - e. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Flanges.
 - f. C116/A21.16, Protective Fusion-Bonded Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.
 - g. C150/A21.50, American National Standard for Thickness Design of Ductile-Iron Pipe.
 - h. C151/A21.51, American National Standard for Ductile-Iron Pipe. Centrifugally Cast, for Water.
 - i. C153/A21.53, American National Standard for Ductile-Iron Compact Fittings for Water Service.
 - j. C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - k. C606, Grooved and Shouldered Joints.
4. ASTM International (ASTM):

- a. A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rods 60,000 psi Tensile Strength.
 - b. A563, Standard Specification for Carbon and Alloy Steel Nuts.
 - c. D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting
 - d. D1330, Standard Specification for Rubber Sheet Gaskets.
 - e. D1922, Standard Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method.
 - f. D2000, Standard Classification System for Rubber Products in Automotive Applications.
 - g. D4976, Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.
5. International Organization for Standardization (ISO): 9001, Quality Management Systems – Requirements.

1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Marking plan and details of standard pipe section showing dimensions, pipe joints, fitting and special fitting pressure rating and thickness, size, coating and lining data.

B. Informational Submittals:

1. Field Hydrostatic Testing Plan: Submit at least 15 days prior to testing and at minimum, include the following:
 - a. Testing dates.
 - b. Piping systems and section(s) to be tested.
 - c. Method of isolation.
 - d. Method of conveying water from source to system being tested.
2. Certifications of Calibration: Approved testing laboratory certificate if pressure gauge for hydrostatic test has been previously used. If pressure gauge is new, no certificate is required.
3. Test documentation form and results.

1.03 QUALITY ASSURANCE

- A. Pipe manufacturer shall be ISO 9001 registered or provide the services of an independent inspection agency.
- B. Prior to start of manufacturing, manufacturer not meeting or having ISO registration requirements shall submit name of at least two independent inspection agencies for approval.
 - 1. Independent inspection agency shall be responsible, on a daily basis, for sample monitoring of chemical and mechanical tests, sample visual inspection of quality assurance tests performed on in-process pipe and fittings and sample visual and dimensional inspection on finished products.

PART 2 PRODUCTS

2.01 MATERIALS

A. General:

- 1. Ductile iron pipe shall be manufactured, lined, coated, and tested domestically in the United States of America.
- 2. Ductile iron fittings shall be manufactured, lined, coated, and tested domestically or for fittings produced outside of the United States of America they shall bear the name of the domestic manufacturer supplying the pipe.
- 3. Pipe manufacturer shall certify source manufacturing facility has been producing ductile iron pipe of the specified diameters, pressure, dimensions and standards for a period of not less than 10 years.
- 4. Ductile iron pipe and fitting shall be supplied by a single manufacturer.
 - a. Mixing of components and sources is not permitted.
 - b. Fitting from outside the United States of America shall be produced in a facility with a minimum of 5 years' documented experience manufacturing, coating, testing, and delivery of size and type specified to projects in the United States of America.

5. Manufacturers:

- a. American Cast Iron Pipe Company
- b. McWane Ductile
- c. U.S. Pipe.

B. Pipe:

1. General:
- a. Pipe shall be new and recently manufactured. Refurbished pipe shall not be provided.
 - b. Lined and coated as specified.
2. Meet requirements of AWWA C150/A21.50, AWWA C151/A21.51, and AWWA C111/A21.11.
3. Centrifugally cast, grade 60-42-10 iron.
4. Minimum pressure rating of pipe by diameter unless otherwise noted on the Drawings shall be:
- a. 12-inch and Smaller: 350 psi.
 - b. 14-inch to 24-inch: 250 psi.
 - c. 30-inch and larger: 250 psi.
5. Ductile iron pipe is required for all water lines 12" and larger.
- C. Joints:
1. Push-On Joint: Rated at minimum working pressure equal to pipe material design.
- a. Manufacturers and Products:
 - i. American Cast Iron Pipe Company, Fastite
 - ii. McWane Ductile, Tyton
 - iii. U.S. Pipe, Tyton and NXT
2. Restrained Joint:
- a. Manufactured proprietary joint that mechanically restrains pipe to adjoining pipe.
 - b. Manufacturers and Products:
 - i. American Cast Iron Pipe: Fastite Pipe with Fast-Grip Gaskets; Flex-Ring; Field Flex-Ring; Lok Ring
 - ii. McWane Ductile: Tyton Pipe with Locking Gaskets; TR Flex
 - iii. U.S. Pipe: Tyton Pipe with Locking Gaskets; TR Flex; HP Lok

3. Mechanical Wedge Action Type Joint:
 - a. Use only in areas where adjoining to fixed points where laying length is determined in field.
 - b. Prior to purchase and installation, type and application of this joint shall be approved by Owner.
 - c. Manufacturers and Products: Grip Ring Pipe Restrainers by Romac.
4. Use of set screws for restraint shall not be allowed.

D. Fittings:

1. Fittings shall be new and recently manufactured. Refurbished fittings will not be accepted.
2. Mechanical, Push-On, Flanged, or Restrained Joint: In accordance with the following table:

Minimum Pressure Ratings for AWWA C110/A21.10 and C115/A21.15 Ductile Iron Fittings

Diameter (inches)	Rubber Gasket Joints (Push-on, Mechanical, Restrained) (psi)	Flanged Joints (psi)
3 to 24	350	350
30 to 48	250	250

Minimum Pressure Ratings for AWWA C153/A21.53 Ductile Iron Fittings

Diameter (inches)	Rubber Gasket Joints (Push-on, Mechanical, Restrained) (psi)	Flanged Joints (psi)
3 to 24	350	Not included in C153/A21.53 (refer to the C110/A21.10 Standard)
30 to 48	250	Not included in C153/A21.53 (refer to the C110/A21.10 Standard)
54 to 64	250	250

3. Rubber Gasket Joints Including Mechanical Joints, Push-On Joints, and Flanged Joints: In accordance with AWWA C111/A21.11.

4. Mechanical Joint Fittings: In accordance with AWWA C110/A21.10 and AWWA C153/A21.53.
5. Use of compact fittings manufactured in accordance with AWWA C153/A21.53 is typical. Only use full body AWWA C110/A21.10 and C115/A21.10 when specifically shown on the Drawings, or with Owner approval.
- E. Welded Outlet: Only weld to pipe in manufacturer's shop.
- F. Lining:
1. Pipe and fittings for clean water applications shall be cement-lined and asphaltic seal coated as recommended by manufacturer in accordance with AWWA C104/A21.4.
 2. For sewer applications, 40-mil nominal lining in one or more coats of Series 431 Perma-Shield PL by Tnemec, or Owner approved equal is required.
- G. Coating: Asphaltic type, 1 mil thick, in accordance with AWWA C151/A21.51, AWWA C115/A21.15, AWWA C110/A21.10, and AWWA C153/A21.53.
- H. Polyethylene Encasement:
1. Virgin polyethylene raw material conforming to requirements of ASTM D4976.
 2. Elongation: 800 percent, minimum, in machine and transverse direction (ASTM D882).
 3. Tensile Strength: 3,600 psi, minimum.
 4. Dielectric Strength: 800V per mil-thickness, minimum.
 5. Propagation Tear Resistance: 2,550-gram force (gf), minimum, in machine and transverse direction (ASTM D1922).
 6. Tube Form: Conform to AWWA C105/A21.5.
 7. Film: 0.008 inch (8 mil) combined thickness, minimum.
 8. Number of Film Layers: Three.
 9. Inside surface of polyethylene wrap in contact with pipe exterior shall be infused with antimicrobial biocide.
- I. Bolting:
1. Flanged Connection Bolts: Carbon steel, ASTM A307, Grade A hex bolts and ASTM A563, Grade A hex head nuts.

J. Gaskets:

1. Flat Faced Flange Gaskets:

- a. Pipe Smaller Than 54 Inches: Rated for working pressure 150 psi to 250 psi, 1/8 inch thick, red rubber (SBR), hardness 80 (Shore A), rated to 200 degrees F, conforming to ASME B16.21, AWWA C207, and ASTM D1330, Grade 1 and Grade 2.
- b. Pipe 54 Inches and Larger: Rated for working pressure greater than 250 psi; shall be Toruseal gaskets as manufactured by American Ductile Iron Pipe or Flange-Tyte gaskets as manufactured by U.S. Pipe.

K. Manufacturers: Sigma or approved equal.

2.02 SOURCE QUALITY CONTROL

A. Factory Tests:

1. General:

- a. Tests shall be performed on pipe with metal thickness equal to that specified.
- b. Only pipe that passes leak test shall be shipped.

2. Hydrostatic Proof Test:

- a. All Pipe: Perform at 500 psi for a minimum duration of 10 seconds.
- b. Pipe 30 Inches and Larger: Additionally test to 75 percent of minimum yield strength during test duration which shall not be less than 15 seconds.
- c. Record each test cycle on a strip chart.
- d. Each test cycle for 30-inch and larger pipe shall be marked by pipe number.
- e. Inspect each pipe during testing for leaks.
- f. Pipe which shows evidence of leaks shall be scrapped.
- g. Repair welding of leaks is not permitted.

3. Perform a 15-psi air test on welded-on outlet pipe.

4. Pipe ends (spigot end, bell and socket) shall be gauged with suitable gauges at sufficiently frequent intervals to ensure compliance to standard dimensions of AWWA C151/A21.51.

- a. In addition, each socket and spigot shall be inspected in a well-lighted area for injurious defects which could affect the joint performance.

- b. Remove defects by cutting of pipe ends.
 - c. Pipe with injurious defects in the bell shall be scrapped.

 - d. Manufacturer shall have a recommended ovality tolerance for pipes 18 inches inch and larger.

 - e. Each end of each 18-inch and larger pipe shall be measured and approved by manufacturer's quality assurance inspector to meet tolerances.
5. Submit a certified inspection report from the independent agency of witnessed tests within 10 days of the inspection.
- a. Test results shall show restrained joints in the sizes specified have been successfully tested to at least twice the specified pressure rating of the joint without leakage or failure.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Inspect pipe and fittings to ensure no cracked, broken, or otherwise defective materials are being used.

3.02 PREPARATION

A. Trench Grade:

- 1. When specified, grade bottom of trench by hand to specified line and grade with proper allowance for pipe thickness and pipe base. Trench bottom shall form a continuous and uniform bearing and support for pipe between bell holes.

- 2. Before laying each section of pipe, check grade and correct irregularities found. Grade may be disturbed for removal of lifting tackle.

- B. Bell (Joint) Holes. At each joint, dig bell holes of ample dimensions in bottom of trench, and at sides where necessary, to permit joint to be made properly and to permit easy visual inspection of entire joint.

3.03 INSTALLATION

A. General:

- 1. Provide and use proper implements, tools, and facilities for safe and proper prosecution of the Work.

- 2. Lower pipe, fittings, and appurtenances into trench, piece by piece, by means of a crane, slings, or other suitable tools and equipment, in such a manner as to prevent damage to pipe materials, protective coatings and linings.

3. Do not drop or dump pipe materials into trench.
- B. Cleaning Pipe and Fittings:
1. Remove lumps, blisters, and excess coal tar coating from bell and spigot ends of each pipe. Wire brush outside of spigot and inside of bell and wipe clean, dry, and free from oil and grease before pipe is laid.
 2. Wipe ends of mechanical joint pipe and fittings and of rubber gasket joint pipe and fittings clean of dirt, grease, and foreign matter.
- C. Laying Pipe:
1. Direction of Laying: Lay pipe with bell end facing in direction of laying. For lines on an appreciable slope, face bells upgrade at discretion of Owner.
 2. Mechanical Joint, Push-On Joint and Restrained Joint Pipe: After first length of pipe is installed in trench, secure pipe in place with approved backfill material tamped under and along sides to prevent movement. Keep ends clear of backfill. After each section is jointed, place backfill as specified to prevent movement.
 3. Take precautions necessary to prevent floating of pipe prior to completion of backfill operation.
 4. When using movable trench shield, take necessary precautions to prevent pipe joints from pulling apart when moving shield ahead.
 5. Do not allow foreign material to enter pipe while it is being placed in trench.
 6. Close and block open end of last laid section of pipe to prevent entry of foreign material or creep of gasketed joints when laying operations are not in progress, at close of day's work, or whenever workers are absent from job.
- D. Joining Push-On Joint Pipe and Mechanical Joint Fittings:
1. Join pipe with push-on joints and mechanical joint fittings in accordance with manufacturer's recommendations.
 2. Provide special tools and devices, such as, special jacks, chokers, and similar items required for installation.
 3. Lubricate pipe gaskets using lubricant furnished by pipe manufacturer. No substitutes will be permitted.
 4. Clean ends of fittings of dirt, mud, and foreign matter by washing with water and scrubbing with a wire brush, after which, slip gland and gasket on plain end of pipe. If necessary, lubricate end of pipe to facilitate sliding gasket in place, then guide fitting onto spigot of pipe previously laid.

E. Cutting Pipe:

1. General: Cut pipe for inserting valves, fittings, or closure pieces in a neat and workmanlike manner without damaging pipe or lining and so as to leave a smooth end, at right angles to axis of pipe.
2. Pipe: Cut pipe with milling type cutter or saw. Do not flame cut.
3. Dressing Cut Ends: Dress cut end of mechanical joint pipe to remove sharp edges or projections, which may damage rubber gasket. Dress cut ends of push-on joint pipe by beveling, as recommended by manufacturer.

F. Field Welding:

1. Use of field welded outlets will not be allowed. Welding for outlets shall be performed only in pipe manufacturer's shop.
2. Field installed outlets may be installed with saddle approved by Owner. Opening in pipe shall be machined cut and not with cutting torch.
3. Field welding of bars for restrained joint systems will not be allowed. Welding shall be performed in pipe manufacturer's shop.

G. Line and Grade:

1. Minimum Pipe Cover: 3 feet, unless otherwise indicated.
2. No high points will be allowed between air valves.
3. Maintain pipe grade between invert elevations to provide minimum clearance at air valve locations of 4 feet from existing ground surface to top of pipe.
4. Install air valves as shown and field verify intervening low points. When field conditions warrant, exceptions may be made upon approval of Owner.
5. Deviations exceeding 6 inches from specified line or 1 inch from specified grade will not be allowed without express approval of Owner.
6. Pipeline sections that are not installed to elevations shown or installed as approved by Owner shall be reinstalled to proper elevation.

H. Thrust Restraint:

1. At a minimum, provide joint restraint at every pipe fitting. Additional restraint shall be provided where indicated on the Drawings, based on restraint length calculations.
2. Primary method of joint restraint shall be thrust blocking. Restrained joint pipe shall be used where detailed on Drawings and as approved by Owner as additional restraint.

I. Polyethylene Encasement:

1. Encase pipe, fittings, and valves where specified on the Drawings in accordance with AWWA C105/A21.5, Method A.
2. Cut polyethylene tube approximately 2 feet longer than pipe length.
3. Slip tube around pipe, centering to provide 1-foot overlap on each adjacent section.
4. Pull encasement to take out slack and wrap snug around pipe.
5. Secure overlap in place and fold at quarter points of pipe length.
6. Wrap and tape encasement snug around fittings and valves.
7. Encasement within sections of pipe installed in steel casings is not required.

3.04 HYDROSTATIC TESTING

- A. Reference Section 33 01 13 – Disinfection & Testing of Water Utilities for all hydrostatic testing & disinfection of Ductile Iron Pipe for potable water applications.
- B. Reference Section 33 01 31 – Testing of Sewer Utilities for all testing of Ductile Iron Pipe for sanitary sewer applications.
- C. Allowable Leakage: Allowable leakage is zero.

END OF SECTION

SECTION 33 05 33

POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS

PART 1 GENERAL

1.01 REFERENCES

- A. The following is a list of standards which may be referenced in this section.
1. American Water Works Association (AWWA):
 - a. C110, Ductile-Iron and Gray-Iron Fittings.
 - b. C153, Ductile-Iron Compact Fittings.
 - c. C605, Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
 - d. C900, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. through 12 In. (100 mm through 300 mm), for Water Transmission and Distribution.
 - e. C905, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. through 48 In. (350 mm through 1,200 mm) for Water Transmission and Distribution.
 - f. C907, Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4 In. through 12 In. (100 mm through 300 mm), for Water, Wastewater, and Reclaimed Water Service.
 2. ASTM International (ASTM):
 - a. D2241, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
 - b. D2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 - c. D2466, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
 - d. D2467, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
 - e. D2672, Standard Specification for Joints for IPS PVC Pipe Using Solvent Cement.
 - f. D2855, Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings.

- g. D3139, Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

- 3. NSF International (NSF).

1.02 SUBMITTALS

- A. Action Submittals: Drawings showing pipe diameter, pipe class, and fitting details.

- B. Informational Submittals:

- 1. Hydrostatic Testing Plan: Submit at least 15 days prior to testing and at minimum, include the following:
 - a. Testing dates.
 - b. Piping systems and section(s) to be tested.
 - c. Method of isolation.
 - d. Method of conveying water from source to system being tested.
- 2. Certification of Calibration: Approved testing laboratory certificate if pressure gauge for hydrostatic test has been previously used. If pressure gauge is new, no certificate is required.
- 3. Test report documentation.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Solvent Cement: Store in accordance with ASTM D2855.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Pipe:

- 1. For typical applications (less than 100 psi working pressure); PVC, conforming to requirements of ASTM D2241, PR 200 (SDR 21).
- 2. For low-lying or high-pressure areas (greater than or equal to 100 psi); PVC, conforming to requirements of ASTM D2241, PR 250 (SDR 17).
- 3. PVC shall not be used for water lines larger than 10" in diameter.
- 4. Pipe to be used for potable water conveyance shall be manufactured from National Sanitation Foundation (NSF) approved compounds.

B. Joints:

1. Rubber gasketed.
2. Solvent cement is only permitted for sewer not larger than 4-inches. Solvent cement is not permitted for potable water.
3. Conform to ASTM D3139.

C. Fittings:

1. Smaller than 3-inches in diameter; PVC conforming to ASTM D2466 or ASTM D2467, unless approved for larger diameter pipe by Owner.
2. 3-inches and larger: Ductile iron, conforming to AWWA C110 or AWWA C153. Use of AWWA C153 fittings is only permitted where specifically detailed on the Drawings, or when approved by Owner. Fittings for wastewater applications shall be lined with 40-mil ceramic epoxy.

D. Service Saddles:

1. Bronze 2-piece hinged.
2. Minimum Pressure Rating: same as pipe.
3. Type of Thread in Service Saddle Outlet: AWWA Taper Thread.
4. Manufacturers and Models: Mueller, S-13000 Series or equivalent.

E. Restrained Joints:

1. Pipe restraint, where indicated on Drawings, shall be provided by system using wedges or gripper rings. System shall be specifically recommended for use on PVC pipe.
2. Minimum Pressure Rating: same as pipe.
3. Manufacturers and Products:
 - a. Sigma, One-Lok or equal for wedges;
 - b. Romac, GripRing GRAP-IP or equal for gripper rings.

PART 3 EXECUTION

3.01 INSTALLATION

- A. In accordance with AWWA C605 and AWWA Manual 23.

- B. Solvent Cement used for joints as recommended by the manufacturer.
- C. Joints:
1. Rubber Gasketed: In accordance with manufacturer's written instructions.
 2. Solvent Cemented: In accordance with ASTM D2855.
 3. Restrained Joint Systems: In accordance with manufacturer's written instructions.
- D. Thrust Restraint:
1. At a minimum, provide joint restraint at every pipe fitting. Additional restraint shall be provided where indicated on the Drawings, based on restraint length calculations.
 2. Primary method of joint restraint shall be thrust blocking. Restrained joint pipe shall be used where detailed on Drawings and as approved by Owner as additional restraint.
- E. Pipe Bending for Horizontal or Vertical Curves:
1. Bending of pipe barrels larger than 12 inches in diameter is not allowed.
 2. Radius of curves shall not exceed 75 percent of manufacturer's recommended values.
 3. Use blocks or braces at pipe joints to ensure axial deflection in gasketed or mechanical joints does not exceed allowable deflection.
- F. Maximum Joint Deflection 75 percent of manufacturer's recommended values.

3.02 INSPECTION AND HYDROSTATIC TESTING

- A. Reference Section 33-01-13, Disinfection & Testing of Water Utilities for all hydrostatic testing & disinfection of Ductile Iron Pipe for potable water applications.
- C. Allowable Leakage: Allowable leakage is zero.

END SECTION

SECTION 33 32 13

WASTEWATER PUMPING STATION

PART 1 GENERAL

1.01 GENERAL

- A. Contractor shall furnish all labor, material, equipment and incidentals required to provide cCSAus Listed solids handling submersible centrifugal sewage pump(s) as specified herein.

PART 2 PRODUCTS

2.01 MANUFACTURER

- A. Shall be Zoeller Engineered Products, Model ZM2350 (62 HD Series) Submersible Solids-Handling Pump, or approved equal.

2.02 OPERATING CONDITIONS

- A. Each pump shall be rated for the horsepower, voltage, phase, frequency, and total dynamic head (TDH) shown on the Drawings.
- B. Operating speed: 1750 RPM.
- C. Pumps shall operate continuously, whether submerged or unsubmerged, without damage to motor or seals.
- D. Each unit shall have a non-overloading performance curve throughout its operating range and a minimum service factor of 1.20.
- E. Each pump shall be capable of passing a 3-inch spherical solid.
- F. Discharge: 4-inch or 6-inch horizontal flanged discharge, as indicated.
- G. Pump Manufacturer or system integrator shall supply a pump controls in accordance with Section 40 63 00 – Pump Control System and Equipment
- H. Pump Control Panel:
 - a. Individual disconnects shall be provided to completely isolate individual motors starting equipment from incoming power. Control panel shall be housed in a NEMA 3R enclosure with integral latches. All internal components shall be mounted and secured to the removable back plate assembly with rigid steel brackets. Motor starters and overloads shall be NEMA rated, 240V, 3ph properly sized for pump motors. Each pump control shall be equipped with hand-off-auto selector switches and “running” pilot lights. The automatic section of each pump shall be controlled from a SCADA input. Provide a properly sized circuit breaker for each of the duplex pumps. Provide a properly sized 120V

circuit breaker for pump controls. Each motor starter shall be equipped with two(2) N.O auxiliary contacts for SCADA communication and local controls. The circuit breaker for the voltage for the control panel shall be sized properly to feed power to the panel. Each circuit breaker should have a through-the-door latches. Each pump shall have a pilot light. All alternation and running indication shall be indicated and controlled by SCADA. Provide all necessary output contacts in the control panel for SCADA connection. A submersible pump moisture and temperature sensing relay module shall be provided for each pump. Seal leakage shall be detected by float switch or conductive probes. Temperature shall be detected by normally closed low temperature switch or RTD.

I. Controls and Enclosure:

- a. The control panel with controls shall be built in accordance with the NEC, and shall comply with UL standards.

J. Training:

- a. After the station startup has been completed, but before the technician leaves the job site, a training session shall be given to the owner or to the owner's representative, familiarizing that person (operator) with the pumping system operation, maintenance and adjustments (if needed).

K. Warranty:

- a. Provided that proper maintenance has been performed by the operator or user during warranty period, and a component failure occurs, the manufacturer shall provide the replacement part or component. Repairs done at manufacturer's expense must be pre-authorized.

2.03 CONSTRUCTION

- A. Pump type: Close-coupled submersible, solids-handling centrifugal pump.
- B. Pump and motor housings: Epoxy-coated Class 30 cast iron with integral cooling fins for heat dissipation.
- C. Motor housing: Oil-filled for continuous duty operation and superior heat transfer; capable of unsubmerged operation.
- D. Sealing: All external mating parts shall be machined and sealed with Buna-N square rings.
- E. Fasteners exposed to liquid: 300 series stainless steel.
- F. Lifting lugs: Cast iron, integrally cast into the pump housing.
- G. Optional high-temperature construction shall allow pumping of liquids up to 175 °F.

2.04 POWER CORD

- A. Each pump shall be supplied with a minimum 25-foot SO-type multiconductor power cable suitable for continuous submergence.
- B. Cable entries shall use compression-type sealing glands providing water sealing and strain relief.
- C. Each conductor shall be individually sealed to prevent wicking.
- D. Junction chamber shall be isolated from the motor housing and equipped with moisture detection probes that activate an alarm signal upon liquid entry.

2.05 MOTOR

- A. Type: Oil-filled, Class F insulated, NEMA Design B motor rated for continuous duty.
- B. Maximum winding temperature: 250 °F unsubmerged.
- C. Motor protection:
 - 1. Thermal sensors in the housing to protect against overheating.
 - 2. Moisture detection in upper junction chamber and lower seal cavity.
- D. Optional inverter-duty motor shall be available for VFD applications (30–60 Hz variable speed).

2.06 BEARINGS AND SHAFT

- A. Bearings: Upper and lower ball bearings of high-carbon chromium steel, rated for all thrust and radial loads.
- B. Shaft: Type 416 stainless steel, minimum 1.5-inch diameter, machined for precise alignment.

2.07 SEALS

- A. Seal configuration: Dual mechanical seals mounted in tandem.
- B. Lower seal: Silicon carbide / silicon carbide faces.
- C. Upper seal: Carbon / ceramic faces.
- D. Elastomers: Buna-N.
- E. Springs: 316 stainless steel.
- F. Design equivalent to Crane Type 21 configuration.
- G. Common-spring double seals shall not be acceptable.
- H. Seal chamber: Oil-filled and equipped with moisture detection probes to activate an alarm signal upon leakage.

2.08 IMPELLER

- A. Type: Fully balanced, semi-open, non-clog design, capable of passing 3-inch spherical solids.
- B. Material: Ductile iron.
- C. Back shroud: Pump-out vanes to keep debris clear of the seal area.
- D. Mounting: Keyed and bolted to the shaft.
- E. Coated impellers shall not be permitted as a substitute for efficiency.

2.09 COATING

- A. Exterior surfaces: Corrosion-resistant powder-coated epoxy finish.
- B. Optional coating: Double-epoxy finish for enhanced protection of submerged components.

2.10 SUPPORT AND INSTALLATION ACCESSORIES

- A. Each pump shall be furnished with cast-iron support legs allowing freestanding operation and minimum clearance for solids passage.
- B. Optional installation accessories (when shown on Drawings):
 - 1. Guide-rail system with stainless-steel guide brackets and base elbow.
 - 2. Dry-pit elbow assembly for non-submersible applications (5–15 BHP only).

2.11 TESTING

- A. Each pump shall undergo a 20- to 30-minute operational test prior to shipment with the pump fully submerged.
- B. Test results shall confirm proper operation, current draw, efficiency, and power consumption at various performance points.
- C. Optional certified testing shall be available in accordance with Hydraulic Institute or SWPA standards.

2.12 SERVICE AND SUPPORT

- A. Components such as mechanical seals and bearings shall be of non-proprietary design and available through local industrial suppliers.
- B. No special tools shall be required for disassembly or repair.
- C. Authorized service facilities shall be available nationwide.

2.13 WARRANTY

- A. Standard warranty shall extend 18 months from date of manufacture or 12 months from date of installation, whichever occurs first.
- B. Upon submission and approval of a completed startup report, an extended prorated warranty for permanent municipal wastewater lift station installations shall be provided for up to 60 months or 10,000 hours of operation, whichever occurs first.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install pumps in accordance with the manufacturer's instructions and project drawings.
- B. Verify power, voltage, and controls prior to connection.
- C. Mount pumps securely and ensure free movement of solids through suction and discharge passages.

3.02 FIELD TESTING AND STARTUP

- A. Start-up and operational verification shall be performed by an authorized representative of the manufacturer.
- B. The start-up report shall be completed in the presence of the installer and submitted to the Engineer for review.

END OF SECTION

SECTION 40 05 51

COMMON REQUIREMENTS FOR PROCESS VALVES

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. The Contractor shall furnish and install, complete with all assemblies and accessories, all valves shown on the Drawings and specified herein including all fittings, appurtenances and transition pieces required for a complete and operable installation.
- B. All valves shall be constructed of first quality materials which have strength, wearing, and corrosion resistance characteristics entirely suitable for the types of service for which the individual valves are designated. Unless noted otherwise, valves shall conform to the latest revision of the following AWWA Standards, or other AWWA standard applicable to that valve type:

AWWA Standard	Valve type
C512	Air Release, Air/Vacuum, and Combination Air Valves
C507	Ball Valves
C504	Butterfly Valves - Rubber Seated
C510	Double Check Backflow Prevention Assembly
C511	Reduced Pressure Backflow Prevention Assembly
C509	Gate Valve - Resilient Seated
C500	Gate Valves - Metal Seated
C530	Pilot Operated Control Valves
C517	Plug Valves, Eccentric - Resilient Seated, Cast Iron
C508	Swing Check Valves
C518	Swing Check Valves - Dual Disc

- C. Cast iron valve bodies and parts shall meet the requirements of the latest revision of ASTM Designation A-126, "Standard Specifications for Gray Iron Castings for Valves, Flanges, and Pipe Fittings, Class B."
- D. All valve body castings shall be clean, sound, and without defects of any kind. No plugging, welding, or repairing of defects will be allowed.
- E. Valves shall have flanged ends for exposed service and mechanical joint ends for buried service, unless otherwise shown on the Drawings or specified herein. Flanged ends shall be flat-faced, with same or greater pressure rating as the adjacent piping. American Standard unless otherwise shown or specified in accordance with ANSI B16.1. All bolt heads and nuts shall be hexagonal of American Standard size. The Contractor shall be responsible for coordinating connecting piping. Valves with screwed ends shall be made tight with Teflon tape. Unions are required at all screwed and solvent welded joint valves.

- F. Where possible, valves shall be installed with stems vertically above pipe, except the following shall be installed with stems horizontal: butterfly valves, aboveground gate valves, globe valves, ball valves, angle valves, and plug valves with gear operators.
- G. Interior non-working surfaces of all valves (except for bronze or stainless steel) shall be lined (in the shop) with fusion bonded epoxy or high solids epoxy (2 coats, 10 mils minimum thickness each) as compatible with service. Exterior of all exposed valves shall be shop primed and field coated per Section 09 90 00. Exterior of all buried valves shall be coated with two coats of coal tar epoxy. Coatings and preparation shall be as specified in Section 09900. If adjoining buried pipe is specified to be wrapped in polyethylene, also wrap valve. All linings and coatings shall be rated for valve service temperature. Internal linings shall also meet requirements of NSF/ANSI Standard 61. Epoxy shall meet AWWA C550 requirements.

1.02 SUBMITTALS

- A. The Contractor shall furnish to the Owner, through the Engineer, a Performance Affidavit where required in individual valve specifications, utilizing the format specified in 40 05 00. Performance tests shall be conducted in accordance with the latest revision of AWWA C500 and affidavits shall conform to the requirements of the Specifications
- B. Shop Drawings conforming to the requirements of Section 01 33 00, Submittals, are required for all valves, and accessories. Submittals shall include all layout dimensions, size and materials of construction for all components, information on support and anchoring where necessary, pneumatic and hydraulic characteristics and complete descriptive information to demonstrate full compliance with the Documents and as specified in Section 40 05 57. Shop Drawings for electrically operated/controlled valves shall include all details, notes, and diagrams which clearly identify required coordination with the electrical power supply and remote status and alarm indicating devices. Electrical control schematic diagrams shall be submitted with the Shop Drawings for all electrical controls. Diagrams shall be drawn using a ladder-type format in accordance with JIC standards. Shop Drawings for pneumatically operated/controlled valves shall include all details, notes, and diagrams which clearly identify required coordination with the compressed air (service air) system and electrical controls.
- C. Operation and maintenance manuals and installation instructions shall be submitted for all valves and accessories in accordance with the Specifications. The manufacturer(s) shall delete all information which does not apply to the equipment being furnished.

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor shall provide the services of a qualified representative of the manufacturer(s) of the equipment named below to check out and certify the installation(s), to supervise the initial operation, and to instruct the Owner's operating personnel in proper operation and maintenance procedures in accordance with the following schedule:

Item	Valve/Operator Type	Minimum On-Site Time Requirements
1.	Automatic Control Check Valve	One (1) 8-hour day

Item	Valve/Operator Type	Minimum On-Site Time Requirements
2.	Surge Anticipators	One (1) 8-hour day
3.	Motor Operated Modulating Valves	One (1) 8-hour day
4.	Motor Operated Open-Close Valves (required only if manufacturer is other than for Item 3 above)	One (1) 8-hour day
5.	Pneumatic Hydraulic Cylinder Operated Valves	One (1) 8-hour day

- B. Any additional time required to achieve successful installation and operation shall be at the expense of the Contractor. The manufacturer's representative shall sign in and out at the office of the Engineer's Resident Project Representative on each day he is at the project.
- C. A written report covering the representative's findings and installation approval shall be submitted to the Engineer electronically covering all inspection and outlining in detail any deficiencies notes.
- D. The times specified are exclusive of travel time to and from the facility and shall not be construed as to relieve the manufacturer of any additional visits to provide sufficient service to place the equipment in satisfactory operation.

PART 2 PRODUCTS

2.01 CORPORATION STOPS

- A. Corporation stops shall be of bronze alloys CDA 89520 or CDA 898333 containing no more than 0.25% lead with tapered male iron pipe threads on inlets and outlets. Terminal outlets shall have screwed bronze hex head dust plugs or caps. Unions shall be used on all corporation stop outlets with connecting piping. Corporation stops shall have a minimum working pressure rating of 250 psi and shall be as manufactured by Mueller Co., Hays Mfg. Div. of Zurn Industries, or equal.

2.02 STRAINERS

- A. Y-Strainers shall be Y-pattern cast iron body, flanged or screwed ends with stainless steel or Monel, 20 mesh strainers. Strainers shall be 200 psi, cold-water service strainers, as manufactured by WATTS, Crane Co., Zurn, or equal.
- B. Stainless steel Y-strainers shall be provided as shown on the drawings. Strainers shall be full port-full flow design manufactured of 304 stainless steel body. Y-strainers shall be furnished with flanged ends. The strainer screen shall be 1/32-inch perforation, easily removable, manufactured of the same material as the valve body.
- C. PVC and CPVC y-strainers shall be provided in PVC and CPVC piping and as shown on the Drawings. Strainer shall be provided with PVC or CPVC body and end cap, EPDM or Viton seal as required for the chemical service, and 20 mesh screen. Temperature rating shall be 30°F to 140°F, and pressure rating shall be 150 psi @ 70°F, non-shock. PVC and CPVC y-Strainers shall be as manufactured by Asahi/America, Hayward, or equal.

2.03 DOUBLE CHECK BACKFLOW PREVENTERS

- A. Backflow preventer shall be the size shown on the Drawings and shall be of the double check valve principle. Backflow preventer installation shall include isolation valves and four test cocks, furnished as an assembly. For backflow preventers less than 2-1/2", the installation assembly also shall include a strainer. Isolation valves for backflow preventers shall be ball valves, except for size 2-1/2" and larger which shall be resilient seat gate valves. Test cocks shall be located as recommended by the manufacturer to facilitate functional testing of the assembly. Backflow preventers 3-inch and larger shall have flanged connections (to match rating of pipe), and less than 3-inch shall have screwed connections. The backflow preventer shall be a WATTS LF709 or approved equal.

2.04 REDUCED PRESSURE BACKFLOW PREVENTERS

- A. Reduced pressure backflow preventer shall be the size shown on the Drawings and shall consist of a pressure differential relief valve located in a zone between two positive seating check valves and captured springs. Back siphonage protection shall include provision to admit air directly into the reduced pressure zone via a separate channel from the water discharge channel. Isolation valves for backflow preventers shall be ball valves, except for size 2-1/2" and larger which shall be non-rising stem (NRS) resilient seat gate valves. Test cocks shall be located as recommended by the manufacturer to facilitate functional testing of the assembly. Backflow preventers 3-inch and larger shall have flanged connections (to match rating of pipe), and less than 3-inch shall have threaded connections. The assembly shall meet the requirements of ASSE Std. 1013; AWWA Std. C511-92; and CSA B64.5. The assembly shall be a Watts Series LF909 or approved equal.

2.05 AIR RELEASE VALVES

- A. Unless otherwise specified, air/vacuum valves 3 inches and less shall have ASTM A126 cast iron body and cover, Type 316 stainless steel float and internal linkage, and replaceable seat. Valves shall have a minimum 360 psi non shock cold water pressure rating and shall be as manufactured by Golden Anderson Figure 930-T or approved equal.

2.06 IDENTIFICATION AND TAGGING

- B. Valves shall be marked in accordance with MSS SP-25 and shall bear an identification tag securely attached using stainless steel wire. Identification tags shall be 1.5-inch minimum diameter, made of brass. The service, valve identification number shown on the Valve Schedule1 attached at the end of this specification, the manufacturer's name, and the valve model number shall be displayed.
- C. Buried valves shall be installed with a valve identification disc attached to the surface of the concrete placed around the valve box. A valve extension stem and floor box shall also have a valve identification disc installed on the concrete floor adjacent to the floor box. Valve identification discs shall be 2-inch diameter, 1/8-inch thick bronze discs with etched lettering and be attached to the concrete in the manner shown on the drawings:

- 1. Line content or function
- 2. Valve number as listed in the Valve Schedule or shown on the Drawings
- 3. Arrow mark indicating the direction of rotation to open, with the word OPEN beside it.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Except where noted otherwise herein, all valves shall be installed and tested in accordance with the latest revision of the applicable AWWA standard (see Paragraph 1.01.B of this section for reference). Before installation, all valves shall be lubricated, manually opened and closed to check their operation and the interior of the valves shall be thoroughly cleaned. Valves shall be placed in the positions shown on the Drawings. Joints shall be made as directed under the Piping Specifications. The valves shall be so located that they are easily accessible for operating purposes and shall bear no stresses due to loads from the adjacent pipe. The Contractor shall be responsible for coordinating connecting piping.
- B. All valves shall be tested at the specified test pressure. Any leakage or "sweating" of joints shall be stopped, and all joints shall be tight. All motor operated and cylinder operated valves shall be tested for control operation as directed by the Engineer.
- C. Provide valves in quantity, size, and type with all required accessories as shown on the Drawings.
- D. Install all valves and appurtenances in accordance with manufacturer's instructions. Install suitable corporation stops at all points shown or required where air binding of pipelines might occur. Install all valves so that operating handwheels or wrenches may be conveniently turned from operating floor but without interfering with access, and as approved by Engineer. Unless otherwise approved, install all valves plumb and level. Valves shall be installed free from distortion and strain caused by misaligned piping, equipment or other causes.
- E. Valve boxes shall be set plumb and centered with the bodies directly over the valves so that traffic loads are not transmitted to the valve. Earth fill shall be carefully tamped around each valve box to a distance of 4 feet on all sides of the box, or to the undisturbed trench face, if less than 4 feet.

3.02 SHOP AND FIELD TESTING

- A. Shop and field testing of valves shall be as follows:
 1. Certified factory testing shall be provided for all components of the valve and operator system. Valves and operators shall be shop tested in accordance with the requirements in the latest revision of the applicable AWWA standard (see Paragraph 1.01.B of this Section for reference), including performance tests, leakage test, hydrostatic tests, and proof-of-design tests. The manufacturer through the Contractor shall submit certified copies of the reports covering the test for acceptance by the Engineer.
 2. Shop testing shall be provided for the operators consisting of a complete functional check of each unit. Any deficiencies found in shop testing shall be corrected prior to shipment. The system supplier through the Contractor shall submit written certification that shop tests for the electrical/pneumatic system and all controls were successfully conducted and

that these components provide the functions specified and required for proper operation of the valve operator system.

3. The Contractor shall conduct field tests to check and adjust system components, and to test and adjust operation of the overall system. Preliminary field tests shall be conducted prior to start-up with final field tests conducted during start-up. The factory service representative shall assist the Contractor during all field testing and prepare a written report describing test methods, and changes made during the testing, and summarizing test results. The service representative shall certify proper operation of the valve operator system upon successful completion of the final acceptance field testing. Provide minimum three weeks advanced notice for all witnessed testing.
4. Preliminary and final field tests shall be conducted at a time approved by the Engineer. The Engineer shall witness all field testing.
5. All costs in connection with field testing of equipment such as energy, light, lubricants, water, instruments, labor, equipment, temporary facilities for test purposes, etc. shall be borne by the Contractor. The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.
6. Preliminary field tests shall be conducted prior to start-up and shall include a functional check of the entire valve operator system and all system components. Preliminary field tests shall demonstrate that the valve operator system performs according to specifications and that all equipment, valves, controls, alarms, interlocks, etc., function properly. The preliminary field test report must be approved by the Engineer prior to conducting final field acceptance tests. Based on results of preliminary field tests, the Contractor shall make any adjustments required to settings, etc., to achieve the required valve closing time and operation specified or otherwise directed by the Engineer.
7. Final field acceptance tests shall be conducted simultaneously with the start-up and field testing of the pumps, air compressors, process air blowers, etc. Field tests shall be conducted for the full range of operating modes and conditions specified and as directed by the Engineer. Each of the valves shall be tested at minimum, maximum, and normal head/flow conditions, and under all specified conditions of opening and closing. Performance of pneumatic valves and compressed air system under normal operating conditions and during simulated power failures shall be checked.
8. Field testing shall include optimization of opening and closing times of the valves. The Contractor shall provide the means for accurate measurement of pipeline pressures as directed by the Engineer. Valve opening and closing times shall be adjusted based on process requirements to optimize operation of the valves. Final valve opening and closing times as determined by field tests shall be approved by the Engineer prior to final acceptance of the system.

END OF SECTION

SECTION 40 05 62

PLUG VALVES

PART 1 GENERAL

1.01 THE REQUIREMENT

- A. Reference Section 40 05 00, Common Work Results for Process Interconnections and Section 40 05 51, Common Requirements for Process Valves.

1.02 REFERENCES

- A. ANSI B16.1 – Pipe Flanges and Flanged Fittings
- B. ASTM A536 – Standard Specifications for Ductile Iron Castings
- C. ASTM B1000-15 – Standard Practices for Casting Preparation and Test Procedure of Porcelain Enamel-lined Pipe, Fittings and Valves for Use in the Municipal Wastewater, Sewage, and Water Treatment Industry
- D. AWW C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- E. AWWA C517 – Resilient-Seated Cast-Iron Eccentric Plug Valve
- F. AWWA C606 – Standard for Grooved and Shouldered Joints

PART 2 PRODUCTS

2.01 PLUG VALVES

- A. All plug valves shall be eccentric plug valves unless otherwise specified and shall be Owner standard. Where Owner's standard requirements differ than the requirements specified herein, the Owner's standards shall take precedence.
- B. Plug valves shall be of the non-lubricated, eccentric seating plug type with synthetic rubber-faced plugs. Flanged plug valves shall be manufactured by DeZURIK Company (Sartell, MN), Pratt (Aurora, IL) or approved equal.
- C. Plugs shall be solid one piece, cast of ASTM A126 Class B cast iron. All valves shall be provided with limit stops and rotate 90° from fully open to fully shut. The minimum working pressure for all valves shall be 150 psi, and the test pressure shall be at least 270 psi for valves up through 12-inch and at least 230 psi for valves 14-inch and larger. The port area of valves shall be at least 100 percent of full pipe area for valves less than 24-inches and 70 percent for valves 24-inches and larger.
- D. The body materials shall be cast of ASTM A126 Class B cast iron. Seats shall have a 1/8" welded overlay of 90 percent pure nickel and machined to a finish containing no stress cracks. The raised

surface shall be completely covered with nickel to ensure that the resilient plug face contacts only the nickel seat. Plug facings shall be of Hycar, or equal and completely suitable for use with domestic sewage grit slurry.

- E. Valves shall have sleeve type metal bearings and shall be of sintered, oil impregnated permanently lubricated Type 316 ASTM A743 Grade CF-8M. Non-metallic bearings shall not be acceptable.
- F. Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable and repackable without removing the bonnet or actuator from the valve under pressure. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.
- G. Unless otherwise specified or shown in the drawings, all valves in vaults and exposed valves 4-inches in diameter and larger shall have flanged ends conforming to ANSI B16.1-125/150-pound standard with face-to-face dimensions of standard plug valves. Valves smaller than 4-inches in diameter shall have screwed ends, unless otherwise noted.
- H. Valves 8-inches in diameter and larger shall be handwheel or floor stand operated where required or indicated on the Drawings through totally enclosed worm gear actuators, unless otherwise specified or shown on the Drawings. Actuators shall be enclosed in a cast iron housing, with outboard seals to protect the bearing and other internal components. The actuator shaft and gear quadrant shall be supported on permanently lubricated bronze bearings. Input shaft and fasteners shall be stainless steel. Actuator mounting brackets shall be totally enclosed. Valves 6-inches in diameter and smaller shall have lever operators, unless otherwise specified or noted on the Drawings. Manual operators for plug valves mounted above 6 feet from the operating floor shall be equipped with worm gear chainwheel actuators.
- I. The manufacturer shall certify that the plug valves are capable of operating in continuous duty service under these pressures and flow conditions.
- J. Each valve shall be given a hydrostatic and seat test. Copies of the hydrostatic and leakage test certification and certification of conformance shall be submitted to the Engineer prior to shipment.
- K. All internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two coats (10 mils min. dry film thickness) of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.
- L. All exposed bolts, nuts, and washers for buried or submerged valves shall be cadmium or zinc plated in accordance with ASTM B 633, Type II unless specified otherwise.

PART 3 EXECUTION

3.01 INSTALLATION

- A. All plug valves for wastewater applications, or where the flow through the valve contains suspended solids, shall be properly installed to prevent solids from packing into the valve body and restricting the plug movement. Unless otherwise recommended by the valve manufacturer, plug valves shall

be installed in a horizontal alignment with the flow against the face of the plug in the closed position and the valve on its side with the plug rotating to the top of the pipeline in the open position.

- B. For pump isolation applications, install the plug valve with the seat downstream from the pump and the plug rotating to the top of the pipeline in the open position.
- C. Mounting plug valves in the vertical position shall only be allowed if recommended by the valve manufacturer and approved by Engineer.

END OF SECTION

TO BID, CONTRACTOR MUST OBTAIN DOCUMENTS FROM ISSUING OFFICE

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SECTION 40 63 00

PUMP CONTROL SYSTEM AND EQUIPMENT

PART 1 GENERAL

1.01 SCOPE

- A. Work includes: A new Pump Control System/Remote Terminal Unit (PCS/RTU) with hardware as required to monitor and control the pumps at the pump station.
- B. Provide 10 HP Variable Frequency Drives or as required for the supplied pumps and application.
- C. The PCS/RTU shall be supplied with a non-proprietary PLC and local Operator Interface Terminal for local monitoring, data logging, adjustments and control.
- D. Provide a non-proprietary cellular modem for Ethernet communications to the SCADA System.
- E. Provide Ethernet communication to the VFD's and the PLC.
- F. PCS/RTU shall have provision for future connectivity to the City's Fiber Optic or Wifi Network.
- G. Provide additions/modifications to the SCADA System, PLC and HMI server programs located at the existing WWTP to accommodate proper polling and monitoring of the new remote site.
- H. Provide additions/modifications to the existing SCADA System HMI's. Provide all graphics, trending, historical collection and reporting to match the existing pump stations at the WWTP and the I/O specified herein.
- I. Field Instrumentation.
- J. Operations Training, Hardware & Software Maintenance Training.
- K. SCADA, I&C O&M Manuals.

1.02 RELATED WORK

- A. The following listing of related sections may also apply and be required for proper performance of this work.
 - 1. Section 260500 – Common Work Results for Electrical
 - 2. Section 260526 – Grounding and Bonding for Electrical Systems

1.02 REFERENCE STANDARDS

- A. NFPA 70 - National Electrical Code (NEC)
- B. ISA-S5.4 - Instrumentation Society of America (ISA)
- C. UL-508A - Underwriters Laboratory Industrial Control Panel Certification
- D. UL-698A - Underwriters Laboratory Industrial Control Panel Certification

1.03 QUALITY ASSURANCE

- A. The SCADA System, Control Panels, Instrumentation, communication panels, VFDs and Pump/Process Controls as specified in this section shall be integrated systems and shall be provided by a single supplier that is responsible for the proper operation of the entire system.
- B. For standardization and quality purposes the following CSIA Certified System Integrators are pre-approved for the hardware integration portion: Lord & Company of Fort Mill, SC 803-802-0060, www.lordandcompany.com, but shall be able to use any company capable of performing the work.
- C. The following criteria must be met by all approved System Suppliers without any exceptions. Claims stating equality but do not meet the required criteria listed below will not be accepted. For prequalification, proof of the requirements below including copies of the required submittals and O&M's must be submitted three weeks prior to the bid opening date and approved within two weeks of the bid opening date. Being pre-approved does not eliminate or discount any of the following requirements (no exceptions or substitutions will be taken):
 - 1. A minimum of Ten (10) years' experience providing similar operational systems of which a listing shall be requested. Two (2) previous projects submittals, O&M's and drawings that meet the requirements specified herein in detail must be submitted as proof of prior experience. References, from the consulting engineer and end user, for the same projects must be provided.
 - 2. Shall have been in business a minimum of Ten (10) years operating under the same company name with a minimum of ten full time design personnel specifically for SCADA Systems, Pump Control Systems and Instrumentation.
 - 3. Shall have registered professional engineers, design engineers, service engineers and technicians that are full time employees of the System Supplier. No contract or part time employees shall be used for any portion of the project.
 - 4. Shall employ a full time registered professional engineer.
 - 5. Shall employ at least one full time registered Project Management Professional "PMP" to manage the project.

6. Shall employ at least one full time IT Professional that has been trained and "Certified" for ISA/IEC 62443 Standards for Cybersecurity for Industrial Automation and Control Systems. Level of certification shall be "Expert" which requires success completion of:
- a. Certificate 1: Cybersecurity Fundamentals Specialist
 - b. Certificate 2: Cybersecurity Risk Assessment Specialist
 - c. Certificate 3: Cybersecurity Design Specialist
 - d. Certificate 4: Cybersecurity Expert
7. To establish quality and standards, the System Supplier shall be CSIA "Certified" by the Control System Integrators Association, utilizing the "Best Practices and Benchmarks" process to provide performance standards in seven critical business areas for Control System Integrators and have passed all CSIA audits. CSIA Membership only is not acceptable nor is it considered equal to being "Certified".
8. To ensure proper practices and required experience with Allen-Bradley PLC's the System Supplier shall be a Certified Rockwell Automation Partner listed on the Rockwell website.
9. Must have a full-time control panel assembly shop in-house that is UL-508A and UL-698A certified. Only having UL-508A certification is not acceptable. Third party control panel assembly shops will not be acceptable.
10. Must have a full-time field engineer for support within 100 miles of the project site.
11. Be certified and factory trained by Rockwell Software FactoryTalkView.
12. Have a minimum surety bonding capacity of \$8,000,000.
- D. Must be able to provide all hardware and software specified herein with all required and specified collateral services in connection with the system such as testing, calibration, start-up, operation and maintenance manuals, and operator training without additional cost to the Owner.
- E. System Supplier shall be responsible for coordinating with the contractor to obtain all necessary data from individual process equipment manufacturers supplied controls to determine the necessary transition for operation, control and/or monitoring from the manufacturer's equipment.
- F. All materials, equipment sizes, and capacities shall conform to the requirements of the NEC, the National Electric Manufacturer's Association, and to applicable regulations of the local electric codes.
- G. All materials and equipment must be UL listed and Control Panels must be UL-508A certified or UL-698A certified for all control panels with intrinsic safety barriers or in hazardous locations.

1.04 RESPONSIBILITY FOR COMPLETE SYSTEM

- A. The System Supplier shall be responsible for and shall provide for the design, supply, delivery, certification, calibration and adjustment, software configuration, testing and start-up, of a complete, coordinated system. A single supplier shall provide the SCADA System including all motor controls, variable frequency drives, instrumentation and software. No contract, third party or part time employees shall be used for any portion of the project.
- B. The SCADA System Supplier shall design and furnish a complete, integrated, and functionally operational system, warranted to perform the intended functions as herein specified.
- C. Include any cost increases, labor and material for the entire duration of the project, and all costs incurred shall be the General Contractor's responsibility and shall be incorporated into the Bid.

1.05 SUBMITTALS

- A. Submit shop drawings and product data in accordance with Section 01 00 00 – General Requirements.
- B. Provide in a PDF file format on a USB drive. Also provide a cloud-based service for download and upload for approval and upload after review.
- C. Will have a detailed index and easy to use tabs and bookmarks for BOM's, PLC I/O lists, drawings, Equipment Data Sheets, software or equipment manufacturer's literature, etc.
- D. For all hardware and software, include manufacturer's technical published data descriptive literature with product specifications with a cover called an Equipment Data Sheet. The Equipment Data Worksheet is to be developed by the SI to show the exact part or model number with descriptive breakdown of the model number and specific information like supply voltage, size, options, etc. All pertinent information for the equipment or software shall be included on the Equipment Data Sheet.
- E. Submit manufacturer's schematics and system layout drawings which shall include the following:
- F. Hardware Submittals:
 - 1. Provide a block diagram and description of the system configuration showing all components and their interconnections etc. Label each diagram and specify all external power and communications interfaces. All diagrams shall be 11 X 17 format and be developed in Autocad DWG file format, no exceptions.
 - 2. Provide an equipment list, bill with descriptive literature identifying component name, manufacturer, model number, a description of the operation, quantity supplied and any special characteristics.

3. Drawings of equipment to be supplied shall include, as a minimum, overall dimension details for each panel, console, etc., including internal and external arrangements and door mounted operator devices with nameplate designations. Elementary and wiring diagrams of equipment including field device connections shall be included with specific installation/wiring requirements identified. Provide detailed bills of materials with spare parts provided.

F. Control Panels, PLC/RTU Submittals:

1. System Network Diagram: Provide a diagram showing the system network of all PLC network components. Show the details of the cabling or wireless connections for the entire system. Show all fiber and copper terminations including spares in fiber patch panels, network hubs/switches, routers, modems, wireless repeaters, etc. and necessary routing between PLC's, OIT's and HMI workstations.
2. PLC System Diagram: Provide a diagram showing all PLC and network components in the Control Panel or PLC/RTU. Show the exact PLC rack layout with details of the actual modules used and filler plates for spare slots. Identify components by manufacturer and model number. Show interconnecting cables with pin out details or model numbers of PLC manufacturers cables.
3. Bill of Materials: A list of all components. Group components by type and include:
 - a. Component manufacturer, model number and part number.
 - b. Component description.
 - c. Quantity supplied.
 - d. Reference to tag on drawings.
4. Descriptive Information: Provide catalog information, descriptive literature, performance specifications, internal wiring diagrams, power and grounding requirements, power consumption, and heat dissipation for all the equipment. Clearly mark all options and features proposed for this project.
5. Interconnecting Wiring Diagrams: Provide diagrams shall show all PLC and control panel components, their interconnecting cables, wiring terminations, and terminations to all interacting elements and subsystems. Terminations shall be numbered.
6. Outline Drawings: Provide equipment drawings showing: external dimensions, enclosure materials, conduit connections, and installation requirements.
7. Installation Details: Provide any modifications or further details as may be required to supplement the Contract Documents and adequately define the installation of the Control Panel or PLC/RTU.
8. Input/Output List: Provide for each I/O point list point type, tag number of the source or final control element, equipment description, PLC/RTU number, terminal identification, and address.

G. Software Submittals:

1. Pre-submit sample process graphics screens and or charts with suggested colors for all piping and equipment, etc. to be displayed on the HMI's and or OIT's. Include in the pre-submittal; I/O lists, alarms lists including internally generated and diagnostics alarms and ranges of all variables.
2. Provide one (1) day for a software submittal meeting with the owner and engineer at the time that the graphics, code, reports, etc. for the submittal are at 90% completion. This will allow for owner preferences to be included prior to final submission. Final software submittal shall be within thirty (30) days after the meeting.
3. Submittal shall contain at a minimum but not limited to all color graphics, database, control faceplates, alarm levels, alarm summary, historical configuration, live and historical trends, reports, diagnostics and help screens, scripts, configuration, communications, etc. Provide submittal in pdf file format or other agreed upon media and a physical personal demonstration.

1.06 SCADA SYSTEM OPERATION & MAINTENANCE MANUALS

- G. Submit Operation & Maintenance Manuals in accordance with Section Section 01 00 00 – General Requirements.
- A. All O&M's will be provided in a PDF file format. Provide a cloud-based service for download and upload for and after review or provide a USB drive with the O&M's if that is the preferred method.
- B. Provide a complete Operation and Maintenance Manuals for the Control Panel/RTU in an open software format compatible with any PC. At a minimum the O&M shall include:
1. Component Manufacturers' O & M Manuals: Include manuals to cover installation, operations, maintenance, troubleshooting, and calibration.
 2. Operating instructions shall incorporate a functional description of the entire system, including the system schematics that reflect "as-built" drawings.
 3. Provide system architecture diagram showing network communications including but not limited to all PC's, PLC's, RTU's hubs, switches, cables, radio paths, etc.
 4. All Control Panel drawings.
 5. List of spare parts and expendables provided.
 6. Panel equipment, field devices, and instruments data sheets, including complete "Bill of Materials" of PLC's, RTU's, control panel devices, computers, printers, software, field equipment, etc.

7. Provide manufacturer's O&M literature and product specifications with a cover called an Equipment Data Sheet. The Equipment Data Worksheet is to be developed by the SI to show the exact part or model number with descriptive break down of the model number and specific information like supply voltage, options, etc. All pertinent information for the equipment or software shall be included on the Equipment Data Sheet.
8. Communication Network Cable Testing documentation with the actual tests of each fiber after terminations. All cable data shall be included on the form including but not limited to cable manufacturer, part number, cable tag and location, fiber number and color, testing procedures, test equipment utilized, actual readings and results, and personnel name with time and date the testing was performed.
9. Instrument Calibration Worksheets showing actual calibration procedures performed with reading and results signed and dated by the Service Technician or Engineer.
10. Provide a USB Drive containing final PC configuration, backups of system files, HMI application, RTU, PLC and OIT (Operator Interface Terminal) programs. Disks shall be professionally labeled for their content, purpose, date and version number. All will also be provided and organized in folders on the SCADA System Server(s) and Workstation(s).
11. Final copy of PLC/RTU programs on USB drive shall have descriptive documentation and explanation for each ladder rung or and sub-routine within ladder programs.
12. Complete operator instructions for all PC, HMI, PLC's and OIT's including download instructions and OIT menu map with details for functions and data entry.
13. Point lists for all PLC inputs/outputs. Identify point number (tag), point description, point type, range in engineering units (if analog point), PLC number, rack and slot number, and point address.
14. The complete record O&M shall be provided with an easy to use pdf file with a detailed index with tabs and bookmarks for BOM's, PLC I/O lists, drawings, Equipment Data Sheets, software or equipment manufacturers O&M literature, etc. A compact disk shall be provided with O&M files including the drawings, Equipment Data Sheets, software or equipment manufacturers O&M literature, etc. The Software O&M may be printed by the end user if desired. Clicking on an item on the index shall immediately display the Equipment Data Sheet and software or equipment manufacturers O&M for the item. Likewise clicking on a drawing shown on the index shall display the drawing. Other functions at a minimum shall include search, zoom and print page or selection features. All contents of the O&M may also be displayed with thumbnails. Clicking on the thumbnail shall immediately display the item, i.e. drawing, Equipment Data Sheet, instruction literature, etc.
15. The final O&M Manual(s) shall be loaded onto the SCADA System server or workstations and be accessible from the SCADA HMI with a designated button labeled O&M.

1.07 HMI & PLC PROGRAMS, AUTOCAD DRAWINGS AND DOCUMENTATION

- A. All programs and configuration files developed and utilized for the project shall be owned by the end user. All final programs and configuration files shall be provided to the end user in their documented form and in their native file format. This includes but is not limited to PLC's, HMI's, OIT's, Network switches, VFD's, instrumentation configurations, etc.
- B. PLC programs shall be documented. Each rung and sub-routine shall be described for its function.
- C. Provide all PLC I/O lists in a separate Excel XLSX file format.

1.08 SOFTWARE LICENSES

- A. Purchase any and all software packages (PLC Programming, HMI, OIT, Network Management, Report Generation, etc.) required for the system in the name of the authorized end user. All software shall be delivered to the owner with original disks or drives and in its original box and proof of license.

1.09 FACTORY TESTING WITH PROFESSIONAL ENGINEER APPROVAL AND SEAL

- A. The factory testing will be observed and certified by a registered Professional Engineer "PE" that is a full-time employee of the Hardware Systems Integrator.
- B. Develop and submit a test plan, testing documentation and QA/QC check lists specific to the project requirements and each control panel or PLC/RTU. Test all specific functions, I/O and control loops, etc. Test all specific functions including, but not limited to, the following:
 - 1. Failure mode and backup procedures: power failure, auto restart, disk backup and reload, retentive outputs.
 - 2. All network communications.
 - 3. Human Machine Interface (HMI), all functions.
 - 4. Operator Interface Terminal (OIT), all functions.
 - 5. Completely simulate all possible field conditions and run in full automatic and manual.
 - 6. Simulate all existing systems being interfaced to with new programs and configurations. System supplier must own or acquire all hardware required for the simulation.
 - 7. Provide certified factory testing documents showing all tests performed and results achieved.
- C. Submit the completed Professional Engineer "PE" certified factory testing documents showing all tests performed and results achieved plus all QA/QC check lists prior to shipment of the system, control panels and or PLC/RTU's. The documents will be "stamped" with the employee's PE's seal. The certified documents must be approved prior to shipment.

- D. Invite the General Contractor, Owner and Engineer to observe the factory testing of the system. A two-week notice of the testing date shall be provided.

1.10 PROCESS CONTROL STRATEGY DESIGN MEETING AND SUBMITTALS

- A. A one-day process control strategy design meeting shall be held with the Engineer and Owner's personnel to discuss specific details of the control strategies for the system. The meeting shall be held via a video conference, i.e. MS Teams.
- B. Prior to the meeting the System Supplier shall submit a detailed narrative for each of the proposed control strategies to the Engineer for review.

1.11 INSTALLATION ASSISTANCE AND INSTRUCTIONS

- A. The System Supplier shall provide a qualified service engineer to be onsite for One (1) day during the installation of the instrumentation, Control Panels and network for coordination and to assist and instruct the general contractor and electrical contractor in methods of proper installation of the equipment.

1.12 OPERATIONS TRAINING

- A. After the project substantial completion, provide 2 hours of training on site for the Owner's personnel in the operation of the System. Training shall include:
 - 1. Standard operational features of PC, HMI, OIT, PLC, RTU and VFD equipment provided.
 - 2. Operation of each function or mode: For example, AUTO/MANUAL control, control set point settings, control mode selection, alarm acknowledgment and Constant Speed modes.
 - 3. Interfaces with other controls and systems.
 - 4. Emergency procedures.
- B. The owner may video record the training sessions if they desire.
- C. Submit a training outline and agenda of specific topics and time to be used for each topic.

1.13 HARDWARE & SOFTWARE MAINTENANCE TRAINING

- A. After the project substantial completion, provide 2 hours of training onsite hardware training for the Owner's instrument technicians in the maintenance of the system hardware and software. Training shall include:
 - 1. Standard hardware features of the PC, HMI, PLC, RTU, OIT and field instrumentation, etc.
 - 2. Specific training for the actual hardware configuration provided.

3. Test, adjustment, and calibration procedures.
 4. Hardware troubleshooting, component removal and replacement, and periodic maintenance.
 5. Standard software features of all software provided, including but not limited to HMI, PLC, RTU and OIT programming software.
 6. Software troubleshooting, backups, restores, loading software and periodic maintenance.
 7. Software O&M functions and features.
- B. The owner may video record the training sessions if they desire.
- C. Submit a training outline and agenda of specific topics and time to be used for each topic.

1.14 INSTRUMENTATION CALIBRATION

- A. All instrumentation supplied by the System Supplier shall be placed into proper operation and calibrated to the specified ranges and requirements of the project.
- B. Documentation in the form of an Instrument Calibration Worksheet shall be provided to prove the actual calibration of all instrumentation. All instrument data shall be included on the worksheet including but not limited to make, model, tag, zero, span, range, service, process, calibration procedures with actual readings and results. Worksheet shall be signed and dated by the service technician or engineer that performed the calibration.
- C. The completed Instrument Calibration Worksheets shall be included in all forms of the O&M Manuals.

1.15 SERVICE REPORTS

- A. Service reports shall be provided for each day that a representative of the System Supplier is on site. The service reports shall include all tasks performed, settings make, instruments calibrated, issues, time on site including arrival and departure, individual's that are present while on site (i.e. EC, GC and owner), items to be addressed, etc.
- B. Instrument Calibration Worksheets shall be provided with the report for all instruments calibrated during the visit.
- C. Service reports will be provided in pdf file format.

1.16 WARRANTY

- A. Systems supplier shall furnish a one-year on site warranty for the system, providing for a 24-hour response time in normal working hours, five days per week for the length of a one-year warranty period. For any service visit during this period, provide the Owner and Engineer with a written report stating the reason for equipment failure and recommendations to prevent recurrence.

- B. At the end of the warranty period of one year, a maintenance contract proposal shall be made available to the Owner for the system.

1.17 COORDINATION WITH PUMP SUPPLIER/MANUFACTURER

- A. System Supplier shall provide coordination with the pump supplier for all requirements, sensors, motor temperature, seal failure, etc. and provide space and wiring inside the Pump Control Panel for the Pump Manufacturer provided monitors, etc. These sensors will be wired into the controls as recommended by the pump manufacturer.

PART 2 PRODUCTS

2.01 GENERAL

- A. All equipment and materials shall be new, unused and proven by previous use of similar products to be completely suitable for the service intended.
- B. All of the equipment shall be the manufacturer's latest and proven design. Specifications and drawings call attention to certain features but do not necessarily cover all details for the design of the System.
- C. Mount process indicators and Operator Interface Terminals (OIT) at eye level, 60" from floor to centerline of instrument.
- D. Panel wiring for all 4-20mA analog input signals shall be two-conductor, shielded cable with drain. Cable and connectors shall be Belden No. 8760, UL Style 2092, 20 AWG minimum, or equal. Single conductors shall be tinned copper with 600V insulation, gauge as required.
- E. PVC wiring duct shall be provided as required and shall have removable non-slip covers. Wiring duct shall contain 50% spare space. Wiring duct must be mounted with machine grade screws. Plastic and/or aluminum rivets are not acceptable. For consistency and standardization, wiring duct shall be by Panduit Corporation, no exceptions, color gray. All wiring in control enclosures not in wiring duct shall be bound with continuous type spiral windings or neatly bound with tie wraps not less than two inches apart consistently and shall not allow the shown wires to cross each other within the bundle.
- F. All equipment mounted within the PLC/RTU enclosure shall be mounted on the enclosure back panel, neatly organized, labeled with a tag as shown on engineer-approved control panel drawings and shall be in accordance with the manufacturer's recommendations.
- G. All fields wiring shall be mounted either at the bottom or side of the enclosure back panel, depending on where the I/O conduits penetrate the enclosure.
- H. The field wiring terminals and panel wires shall be clearly labeled and identified and shown on the panel drawings.

- I. Jumpers between adjacent terminal blocks shall be tinned copper jumper bars supplied by the terminal block manufacturer.
- J. Interconnection drawings shall be provided along with wire numbers, terminal numbers, equipment tag numbers and panel physical layout drawings.
- K. All systems and individual components, whether panel or field mounted units, that are located in different areas of the plant, one inside building to device outside of building, shall be protected from voltage and/or current surges.
- L. Provide surge protectors for 120VAC power Phoenix Contact, Model PT 2 –PE/S 120AC-ST. Units shall be DIN rail mounted with status LED.
- M. Provide surge protectors for analog 4-20mA signals as Surge Cop, Model SCSP-30VDC-20mA or equal by Phoenix Contact or Transtector. All components, MOV's, Transzorbs, Silicon Avalanche Diodes, RF chokes, and resistors in the unit shall be redundant. Units shall be DIN rail mounted.
- N. Control and instrumentation power supplies shall be adequately sized to provide 150% of that as required by the equipment served.
- O. The input and output of each separate DC power supply shall be individually fused with easily accessible DIN-rail mounted fused switch. Provide separate fused disconnects for each PLC, OIT, each DC power supply, etc.
- P. All power supplies shall be DIN Rail mounted and shall have screw terminals for all connections. Solder type connections will not be allowed. All screw terminal connections shall be finger safe.
- Q. All pushbuttons, selector switches, and pilot light units shall be heavy duty, 30.5mm, NEMA type 4/4X, corrosion resistant, bulletin 800H by Allen-Bradley.
- R. Terminal strips shall be mounted using DIN rails. Terminal strips shall be as manufactured by Wiedmueller, Phoenix, Entrelec, or approved equal.
- S. All digital inputs and outputs, including spares, shall be isolated from field wiring through terminal strips and 24 VDC, interposing mechanical relays.
- T. All mechanical control relays shall be DIN rail mounted. Minimum contact rating for mechanical control relays shall be 10 Amps at 250 VAC. All control and auxiliary relays shall have indicating LED's.
- U. For all field Instrumentation provide surge protectors for 120VAC power mounted in a NEMA 4X junction box. Surge protector shall be Surge Cop, Model SCSP-120VAC-10A or equal by Innovative Technologies or Transtector. All components, MOV's, Transzorbs, Silicon Avalanche Diodes, RF chokes, in the unit shall be redundant. Units shall be DIN rail mounted with status LED.

- V. For all field Instrumentation provide surge protectors for signals mounted in a NEMA 4X junction box. Surge protectors for analog 4-20mA signals shall be Surge Cop, Model SCSP-30VDC-20mA or equal by Innovative Technologies or Transtector. All components, MOV's, Transzorb's, Silicon Avalanche Diodes, RF chokes, and damping resistors in the unit shall be redundant. Units shall be DIN rail mounted.
- W. For Pump Control Panels with integral motor controllers provide a Main Circuit breaker for utility power service with a through the door handle and disconnect mechanism. Main circuit breaker shall be A-B 140U Molded Case Circuit Breaker or equal.
- X. For Pump Control Panels with integral motor controllers provide branch circuit protection/breaker for each motor as required by the motor controller and motor. The circuit protector shall provide individual circuit protection and means of an isolating disconnect for each motor starter, softstart or VFD. Branch circuit protector shall be A-B 140M or as required by devices.
- Y. Provide a physical "Hand-Off-Auto" selector switch, "Run" & "Fail" Status light for each pump on the control panel dead front.
- Z. If pump station does not have a separate 120VAC service, provide a 3KVA transformer inside the control panel with circuit protection and dedicated circuit for a 120VAC GFCI receptacle.
- AA. Provide Control Panel with UL-698A certification.

2.02 CONTROL PANEL ENCLOSURES

- A. Provide NEMA 3R rated enclosures with 3-point locking latch. For outdoor installations provide stainless steel rain shields and sun shields. Provide units as freestanding or wall mounted according to drawings and based on physical limitations. Enclosures shall be manufactured by Hoffman or equal.
- B. Sun shields shall be made of 0.125" stainless steel that extends at least 12" past exterior top and sides of enclosure.
- C. For outdoor enclosures with an operator interface terminal (OIT) provide a dead front panel for OIT and all switches and status indicators.
- D. For outdoor enclosures with a PLC and or an operator interface terminal (OIT): Provide sun shield to inhibit glare from sunlight and to promote better viewing of OIT and provide protection from the heat from the sun. Viewing hood shall be made of 304 stainless steel or aluminum and shall extend from the enclosure approximately 18" and shall shroud the top and sides of OIT viewing area.
- E. Mount process indicators and Operator Interface Terminals (OIT) at eye level, 60" from floor to centerline of instrument.

2.03 PUMP CONTROL SYSTEM/REMOTE TERMINAL UNIT (PCS/RTU)

- A. The PCS/RTU supplied for the Pump Station shall have a PLC compatible with the existing SCADA System at the WWTP. Provide provisions for a fiber optic or wi-fi or broadband modem compatible with the city's network.
- B. Programmable logic controllers shall be Allen-Bradley CompactLogix 1769-L33ER system provided with 2M of user memory, 1 GB of secure digital memory card, dualport Ethernet DLR and USB communication ports, and up to 16 Compact I/O modules and 32 Ethernet nodes. PLC must support DF1 full- and half-duplex protocols, DH-485 protocol, report-by-exception, and peer-to-peer data exchange. Provide Ethernet communications for the plant LAN. Provide communications with the motor control devices where applicable and utilize Auto Device Replacement (ADR) technology to A-B components. Replacement VFD's, SSRV's and intelligent motor starters shall be automatically configured, address and program, from the DeviceNet Scanner.
- C. PCS/RTU shall be provided with a 10" touchscreen Operator Interface Terminal "OIT". The OIT shall be capable of trending and logging data and storing historical data on a USB drive. Supply all programming software required to download programs and configuration.
- D. PLC Programming Software shall be provided for the maintenance personnel to download the program, develop ladder logic and/or reprogram the programmable logic controller (PLC) supplied under the scope of this project. Applicable if not already owned by the end user.

2.04 UNINTERRUPTIBLE POWER SUPPLY

- A. A DC UPS shall be supplied for each PLC, PCS/RTU or Communications Panel.
- B. The UPS shall rated for a minimum of 480 VA and provide continuous DC power for all the devices in the control panel.
- C. The DC Power UPS and batteries shall be DIN Rail mounted.
- D. The 24 VDC uninterruptible power system wide operational temperature range with an input voltage range of 22.5 to 30.0 VDC.
- E. The unit shall have screw terminations for all connections.
- F. The unit shall have an automatic self-test feature that checks the UPS and battery functions. Battery charging occurs automatically when input DC power is applied. When power fails, the DC UPS will switch to battery back-up. If the battery is no longer useful, the UPS will sound an alarm and an LED indicator will illuminate and provide a contact output to the PLC.
- G. UPS and DC Power System shall be by Sola SDN-P Power Supply, SDU 20-24 480 VA, 24V/20A DIN Rail DC UPS power module, SDU 24-BAT or SDU 24-BATEM 24V DIN Rail/Panel Mount Battery Module or SDU 24-BATEM as needed. Or equal by PULS or Phoenix Contact.

2.05 VARIABLE FREQUENCY DRIVES

- A. Acceptable Manufacturers: Danfoss VLT® AQUA Series VFD.
- B. VFD shall be NEMA 12 rated. VFD's are to be supplied and installed in the pump control panel with Danfoss' thru panel mount kit and stainless steel backplate. The VFD's will be installed in the pump control panel such that the rear heat sink fins of the VFD's shall protrude thru the back of the control panel enclosure to the ambient outside air. This mounting method eliminates the VFD's as a primary heat source in the control panel enclosure eliminating the need for air conditioning units or electric fans and louvers. Alternative mounting methods shall not be considered equal.
- C. Provide Six Year Factory Drive Protection Warranty and show capability and program associated with the warranty.
- D. General: Furnish complete VFD as specified herein or in the equipment schedule for loads designated to be variable speed. VFD's shall be both constant and variable torque rated.
- E. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC induction motors. The VFD shall be a six-pulse input design, and the input voltage rectifier shall employ a full wave diode bridge; VFD's utilizing controlled SCR rectifiers shall not be acceptable. The output waveform shall closely approximate a sine wave. The VFD shall be of a PWM output design utilizing current IGBT inverter technology and voltage vector control of the output PWM waveform.
- F. The VFD shall include a full-wave diode bridge rectifier and maintain a displacement power factor of near unity regardless of speed and load.
- G. The manufacturer of the VFD shall demonstrate a continuous period of manufacturing and development of VFD's for a minimum of 30 years. VFD's that are brand-labeled are not acceptable.
- H. The VFD shall produce an output waveform capable of handling maximum motor cable distances of up to 1,000 ft. (unshielded) without tripping.
- I. The VFD shall utilize VVCPLUS, an output voltage-vector switching algorithm, or equivalent, in both variable and constant torque modes. VVCPLUS provides rated RMS fundamental voltage from the VFD. This allows the motor to operate at a lower temperature rise, extending its thermal life. VFD's that cannot produce rated RMS fundamental output voltage or require the input voltage to be increased above motor nameplate value to achieve rated RMS fundamental output voltage are not acceptable. VFD's that utilize Sine-Coded PWM or Look-up tables shall not be acceptable.
- J. The VFD selected must be able to source the motor's full load nameplate amperage (fundamental RMS) on a continuous basis and be capable of running the motor at its nameplate RPM, voltage, current, and slip without having to utilize the service factor of the motor.

- K. A motor parameter that allows the total number of poles of a motor shall be programmed to optimize motor performance.
- L. The VFD will be capable of running either variable or constant torque loads. In variable torque applications, the VFD shall provide a CT-start feature and be able to provide full torque at any speed up to the base speed of the motor. In either CT or VT mode, the VFD shall be able to provide its full rated output current continuously and 110% of rated current for 60 seconds.
- M. An Automatic Energy Optimization (AEO) selection feature shall be provided in the VFD to minimize energy consumption in variable torque applications. This feature shall dynamically adjust output voltage in response to load, independent of speed. This feature shall incorporate power factor compensation. Output voltage adjustment based upon frequency alone is not acceptable for single motor VT configurations.
- N. For multi-motor variable torque configurations, user-selectable load profile curves including VT-High, VT-Medium, and VT-Low shall be provided to ensure easy commissioning and improved energy efficiency. VFD's requiring the operator to assign load torque data-points to create a V/Hz profile are not acceptable.
- O. An initial ramp function shall be available to provide a different beginning ramp time, up to 360 seconds, for applications requiring a faster or slower ramp than the normal ramp.
- P. An empty pipe fill mode shall be available to fill an empty pipe in a short period of time, and then revert to the PID controller for stable operation. Pipe fill mode shall have a programmable time to reduce water hammer in the system.
- Q. An embedded cascade pump controller shall be included to provide lead pump alternation, improved redundancy, and shall operate with unequal sized pumps.
- R. Switching of the input power to the VFD shall be possible without interlocks of damage to the VFD at a minimum interval of 2 minutes.
- S. Switching of power on the output side between the VFD and the motor shall be possible with no limitation or damage to the VFD and shall require no additional interlocks.
- T. An Automatic Motor Adaptation function shall measure motor stator resistance and reactance to optimize performance and efficiency. It shall not be necessary to spin the motor shaft or decouple the motor from the load to accomplish this optimization. Additionally, the parameters for motor resistance and motor reactance shall be user-programmable.
- U. The VFD shall have temperature controlled cooling fans for quiet operation, minimized internal losses, and greatly increased fan life.
- V. VFD shall provide full torque to the motor given input voltage fluctuations of up to $\pm 10\%$ of the rated input voltage. Additionally, sustained line voltage reductions up to 15% shall not cause the VFD to trip.
- W. Harmonics

1. The VFD shall provide dual built-in DC link reactors to minimize power line harmonics and to provide near unity power factor. **VFD's without a DC link reactor shall provide a 5% impedance line side reactor.**
 2. The VFD shall be provided with line-side harmonic reduction, as required, to insure that the current distortion limits, as defined in table 10.3 of IEEE 519-1992, are met. PCC1, defined as the low voltage side of the distribution transformer, is used for purposes of calculation and referred, by the turns ratio of the transformer, to the PCC defined by the IEEE Recommended Practices as the Consumer-Utility interface. The tables of limits set forth therein are with reference to the PCC (primary side of the main transformer).
 3. Harmonic solutions shall be designed to withstand up to 2% line imbalances with the maximum Current Distortion not to exceed 11% at 100% load.
 4. Harmonic solutions shall be capable of withstanding up to 2% ambient voltage distortion with the maximum Current Distortion not to exceed 12% at 100% load.
 5. To ascertain the harmonic contribution of the VFD's at the PCC and to show compliance with IEEE 519-1992, harmonic analysis shall be performed and submitted with the bid package, provided that the VFD vendor is in receipt of the below listed information 10 working days prior to the bid date.
 - a. kVA rating of the low voltage distribution transformer(s)
 - b. X/R Ratio of utility low voltage distribution transformer(s)
 - c. Primary voltage
 - d. Secondary voltage
 - e. Secondary %IZ (impedance)
 - f. Length, size, & number of conductors between transformer LV side and distribution panel
 - g. System Single line Diagram and electrical equipment list showing transformer and VFD detail
 - h. Total linear load kW to be connected to the distribution transformer
 - i. Anticipated maximum demand load (15 minute or 30 minute) on the distribution transformer (IEEE 519)
- X. Protective Features:
- Y. VFD shall have input surge protection utilizing MOV's, spark gaps, and Zener diodes to withstand surges of 2.3 times line voltage for 1.3msec.
 - Z. VFD shall include circuitry to detect phase imbalance and phase loss on the input side of the VFD.
 - AA. VFD shall offer the ability to have back-up 24V power to keep control logic powered in the event of a power failure. Back-up power shall keep communications and drive logic available until power is restored.

- BB. VFD shall auto-derate the output voltage and frequency to the motor if an input phase is lost if it is desirable to maintain operation without decreasing the life expectancy of the VFD. The use of this feature shall be user selectable and export a warning during the event.
- CC. Broken shaft detection shall be available to detect a low load situation in the brush aerators. Shall be functional in closed loop control or when controlled by an external signal. A timer shall prevent nuisance tripping.
- DD. Low CLR water detection shall be available to detect if the rotor blades are not submerged and trip the drive. A timer shall prevent nuisance tripping.
- EE. VFD shall include current sensors on all three-output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.
- FF. VFD shall auto-derate the output voltage and frequency to the motor in the presence of sustained ambient temperatures higher than the normal operating range, so as not to trip on an inverter temperature fault. The use of this feature shall be user-selectable and a warning will be exported during the event.
- GG. VFD shall auto-derate the output frequency by limiting the output current before allowing the VFD to trip on overload. Speed can be reduced, but not stopped.
- HH. The VFD shall have the option of an integral RFI filter. Enclosures shall be made of metal to minimize RFI and provide immunity.

II. Interface Features:

1. VFD shall provide an alphanumeric backlit display keypad which may be remotely mounted using standard 9-pin cable. VFD may be operated with keypad disconnected or removed entirely. Keypad may be disconnected during normal operation without the need to stop the motor or disconnect power to the VFD.
2. VFD shall display all faults in plain text; VFD's which can display only fault codes are not acceptable.
3. The keypad shall feature a 6-line graphical display and be capable of digitally displaying up to five separate operational parameters or status values simultaneously (including process values with the appropriate engineering unit) in addition to Hand/Off/Auto, Local/Remote, and operating status.
4. Two lines of the display shall allow "free text programming" so that a description, or the actual name, of the equipment being controlled by the VFD can be entered into the display.
5. Keypad shall provide an integral H-O-A (Hand-Off-Auto) and Local-Remote selection capability, and manual control of speed locally without the need for adding selector switches, potentiometers, or other devices.

6. All VFD's shall be of the same series, and shall utilize a common control card and LCP (keypad/display unit) throughout the rating range. The control cards and keypads shall be interchangeable.
7. VFD keypad shall be capable of storing drive parameter values in non-volatile RAM uploaded to it from the VFD, and shall be capable of downloading stored values to the VFD to facilitate programming of multiple drives in similar applications, or as a means of backing up the programmed parameters.
8. VFD Display shall have the Ability to display 5 different parameters about the VFD or load including: current, speed, DC bus voltage, output voltage, input signal in mA, or other values from a list of 92 different parameters.
9. VFD display shall indicate which digital inputs are active, and the status of each relay.
10. It shall be possible to toggle between three status read-out screens by pressing the [Status] key. Different Operating variables with different formatting can be shown in each status screen.
11. VFD display shall indicate the value of any voltage or current signal connected to the analog input terminals.
12. VFD display shall indicate the value of the current on the analog output terminals.
13. A red FAULT light, a yellow WARNING light and a green POWER-ON light shall be provided. These indications shall be visible both on the keypad and on the VFD when the keypad is removed.
14. Password protection shall be provided to prevent unauthorized changes to the programming of the VFD. The parameters can be locked via a digital input and/or the unit can be programmed not to allow an unauthorized user to change the parameter settings.
15. A quick setup menu with factory preset typical parameters shall be provided on the VFD to facilitate commissioning. Use of macros shall not be required.
16. A digital elapsed time meter and kilowatt hour meter shall be provided in the display.
17. VFD shall offer as standard an internal clock. The internal clock can be used for: Timed Actions, Energy Meter, Trend Analysis, date/time stamps on alarms, Logged data, Preventive maintenance, or other uses. It shall be possible to program the clock for Daylight Saving Time / summertime, weekly working days or non-working days including 20 exceptions (holidays etc.). It shall be possible to program a Warning in case clock has not been reset after a power loss. Clock feature shall offer, as an option, back-up power to keep time during power interruptions. Drives with real time clock built into keypad shall not be acceptable.
18. VFD shall provide full galvanic isolation with suitable potential separation from the power sources (control, signal, and power circuitry within the drive) to ensure compliance with

PELV requirements and to protect PLC's and other connected equipment from power surges and spikes.

19. All inputs and outputs shall be optically isolated. Isolation boards between the VFD and external control devices shall not be required.
20. There shall be six fully programmable digital inputs for interfacing with the systems external control and safety interlock circuitry. Two of these inputs shall be programmable as inputs or outputs.
21. The VFD shall have two analog signal inputs. Inputs shall be programmable for either 0 - 10V or 0/4-20 mA.
22. One programmable analog output shall be provided for indication of a drive status. This output shall be programmable for output speed, voltage, frequency, motor current and output power. The analog output signal shall be 0/4-20 mA.
23. The VFD shall provide two user programmable relays with 31 selectable functions. Two form 'C' 230VAC/2A rated dry contact relay outputs shall be provided.
24. The VFD shall have offer a relay option board that offers three additional Form 'C' 240V relays that are mounted inside the drive.
25. The VFD shall offer an I/O board as an option that adds 3-digital inputs, 2-digital outputs, 2-analog inputs, and 1-analog output.
26. Floating point control interface shall be provided to increase/decrease frequency in response to external switch closures.
27. The VFD shall accept a NO motor temperature over-temperature switch input, as well as possess the capability to accept a motor thermistor input.
28. The VFD shall store in memory the last 10 faults with time stamp and recorded data.
29. Run permissive circuit shall be provided to accept a "system ready" signal to ensure that the VFD does not start until isolation valves, seal water pumps or other types of auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.
30. The VFD shall be equipped with a standard RS-485 serial communications port and USB port utilizing either the Danfoss FC or ModBus RTU and also be capable of supporting the following communications protocols by the use of an integrally mounted, field-installable option board: Profibus DP, or DeviceNet.
31. The VFD shall be supplied with a standard RS-485 serial communications data port. A Windows® compatible software to display all monitoring, fault, alarm, and status signals

shall be available. This software shall allow parameter changes, storage of all VFD operating and setup parameters, and remote operation of the VFD.

JJ. Adjustments:

1. The VFD shall have an adjustable output switching frequency.
2. Four complete programming parameter setups shall be provided, which can be locally selected through the keypad or remotely selected via digital input(s), allowing the VFD to be programmed for up to four alternate control scenarios without requiring parameter changes.
3. In each programming set up, independent acceleration and deceleration ramps shall be provided. Acceleration and deceleration time shall be adjustable over the range from 0 to 3,600 seconds to base speed.
4. The VFD shall have four programmable "skip frequencies" with adjustable bandwidths to prevent the driven equipment from running at a mechanically resonant frequency.
5. VFD shall include an automatic acceleration and deceleration ramp-time function to prevent nuisance tripping and simplify start-up.
6. In each programming setup, independent current limit settings, programmable between 50% and 110% of the drives output current rating, shall be provided.
7. PID parameter settings shall be adjustable while the VFD is operating, to aid in tuning the loop at start up. The VFD will also be capable of simultaneously displaying set-point reference and feedback values with appropriate engineering units, as well as output frequency, output current, and run status while programming the PID function.
8. The VFD will include a "loss of follower" function to detect the loss of process feedback or reference signals with a live-zero value, with a user-selectable choice of responses (go to set speed, min speed, max speed, stop, stop and trip).
9. A Sleep Mode function shall be provided to reduce wear and heating of the pump and other equipment in periods where system demands are minimal. This function will operate in both open and closed loop modes:
10. In closed loop process control, when the output speed drops to a user-programmed minimum value ("sleep frequency") for a specified time ("sleep mode timer"), the drive will enter sleep mode and either go into standby or boost mode before entering standby. The drive shall automatically restart the motor once the output of the PID processor exceeds a programmable value "wake up frequency".
11. Boost mode shall prevent short-cycling of the motor by temporarily adjusting the set-point by a user programmable percentage. Upon reaching this valve, the unit will go into standby.

12. In open loop, the drive shall be capable of entering sleep mode if the input reference drops below a user programmable value. When the input reference increases above a programmable reference, the drive will automatically start.
- KK. An integral motor alternation function shall be provided to enable the drives output to alternate between two motors. The alternation interval shall be programmable in hours. The function shall operate relays as required to control the motor alternation sequence. A dwell time shall be integral to the function to prevent damage to the motor contacts.
- LL. The VFD will include a user selectable Reset function, which enables the selection of between zero and twenty restart attempts after any self-clearing fault condition (under-voltage, over-voltage, current limit, inverter overload and motor overload), or the selection of an infinite number of attempts. The time between attempts shall be adjustable from 0 through 600 seconds.
- MM. An automatic "on delay" function may be selected from 0 to 120 seconds.
- NN. The VFD will include a user-selectable Auto-Restart function that enables the VFD to power up in a running condition after a power loss, to prevent the need to manually reset and restart the VFD.
- OO. VFD shall catch a rotating motor operating either in forward or reverse at up to full speed.
- PP. Service Conditions:
1. Ambient Temperature of the VFD: 10 to 40°C (14 to 104°F)
 2. 0 to 95% relative humidity, non-condensing.
 3. Elevation to 1000 meters (3,300 feet) without derating.
 4. VFD's shall be rated for line voltage of 550 to 690VAC, 380 to 480VAC, or 200 to 240VAC; with $\pm 10\%$ variation. Line frequency variation of $\pm 2\%$ shall be acceptable.
 5. No side clearance shall be required for cooling of the units.
- QQ. Quality Assurance:
1. The manufacturer shall be both ISO-9001 and ISO-14001 certified.
 2. All products shall be CE marked; UL labeled, and meet the requirements of UL-508C.
 3. To ensure quality and minimize infantile failures on the jobsite, all VFD's shall be completely tested by the manufacturer. The VFD shall operate a dynamometer at full load and speed under elevated temperature conditions.
 4. All optional features shall be functionally tested at the factory for proper operation.

5. Factory test documentation shall be available upon request.
6. Provide Six Year Factory Drive Protection Warranty and show capability and program associated with the warranty.

2.06 SUBMERSIBLE PRESSURE SENSOR

A. Pressure Level Sensor:

1. By KPSI Model 750 or equal by PMC or Keller
2. 316 Stainless steel wetted materials
3. Non-Fouling Submersible Level Transducer
4. Wide Mouth Protective Cage
5. Non-Clogging 2.75" PTFE Coated Elastomeric Diaphragm
6. Provide termination kit with gortex filter for vent tube

2.10 FLOAT SWITCHES

- A. Float switches shall be direct acting type constructed of chemical resistant polypropylene casing with mercury switches operating when float is in a horizontal position. The switch shall be rated at 20 amps at 115 volts resistive. Cable shall be permanently assembled to switch and float. Float switch shall have built-in weight. Float switch shall be Rotofloat Type S (suspended) or Type P (pipe mounted) as required by Anchor Scientific.

PART 3 EXECUTION

3.01 GENERAL

- A. Indicator lights on the Control Panels and OIT/HMI Graphics shall conform to the following color convention:

Status / Alarm	Lens or Screen Color
Running or Open	Red
Ready, Stopped, Off or Closed	Green
Failure or Alarm	Amber
Generic Status	Blue or White

- B. All control by the System shall be distributed to the local PLC and shall be capable of operating in an automatic mode completely independent of the OIT or SCADA HMI. All accumulative total values (i.e. Flow Total) and runtimes shall reside and be computed in the PLC and "read" by the OIT/HMI.

- C. Running status shall be provided from auxiliary contacts provided with the motor contactors and/or Variable Frequency Drives or via remote type I/O for intelligent devices, VFD's RVSS and starters. Auto status shall be defined as H-O-A switch in the Auto position. Ready status shall be defined as in auto mode with all interlocks satisfied (no failure conditions present). Failed status shall be defined as motor overload, over temperature, seal water failure, VFD failure, failure to run, etc.
- D. Where setpoints, operating limits, and other control settings are provided by the functional descriptions, these settings shall be initial settings only and shall be used for assistance in the initial startup of the System and/or Pump Station. All such settings shall be fully adjustable and based on actual operating conditions.
- E. All setpoint control shall be by PID control algorithms when applicable. All PLC controlled equipment shall be provided with individual PID instructions in the RTU/PLC and all associated variables/parameters shall be cascaded or repeated for each PID instruction set as required. All setpoints, sequence times, sequence orders, dead bands, PID tuning parameters, internal timers, range limits shall be accessible and alterable, with proper code or password, from local Operator Interface Terminal "OIT" or the SCADA System Computer.
- F. Provide PLC programming standardization for communications, messages and data tables for addressing all discrete, analog signals and data from all remote and local plant PLC's.

3.02 PROJECT FUNCTIONAL DESCRIPTION

- A. The system monitors the following:
1. Instantaneous Wet Well Level
 2. Instantaneous Station Flowmeter (optional & selectable)
 3. Station flow totalizer: Flow Volume for Daily, Yesterday, Weekly, Last Week, Monthly, Last Month and Accumulative Total
 4. Station Discharge Pressure (optional & selectable)
 5. Rain Fall from rain gauge: 5-minute rate, Daily, Yesterday, Weekly, Last Week, Monthly, Last Month, Year Total
 6. High Level Sensor/Float Switch, backup emergency relay control
 7. Low Level Sensor/Float Switch, backup emergency relay control
 8. Status of Lead Pump Start control float switch
 9. Status of Lag Pump Start control float switch
 10. Status of Stop Pumps control float switch

11. Pumps Motor Run Status
 12. Pumps Motor Runtime: Last Run, Daily, Yesterday, Current Week, Last Week, Current Month, Last Month and Accumulative Total
 13. Pumps Motor Starts: Daily, Yesterday, Current Week, Last Week, Current Month, Last Month and Accumulative Total
 14. Pump Motor Failure Alarms (OL, fail to run, etc.) for each pump
 15. Motor Moisture/Seal Failure for each pump
 16. Motor High Temperature Monitoring for each pump
 17. H-O-A switch position for each pump
 18. RVSS or VFD status for each pump (if present)
 19. RVSS or VFD failure for each pump (if present)
 20. VFD Speed for each pump (if present)
 21. Loss of phase alarm for each pump
 22. Loss of Power alarm (Internal to PCS/RTU)
 23. Loss of Communication to RVSS, VFD, Smart OL (Internal to PCS/RTU)
 24. Loss of Communication to PCS/RTU from SCADA (Internal to PCS/RTU-set to 2 hours, default this feature is disabled)
- B. The system controls the following:
1. A selectable Duplex or Triplex Pump Station
 2. Each Pump
 3. Ability with standard selectable option from the OIT to control an Optional additional Standby VFD control. A third VFD for a duplex pump station and a fourth VFD for a triplex pump station. Upon failure of a pump motor VFD the standby VFD will be utilized for the motor. If this option is selected the required hardware will be shown in the equipment tables but the system will be capable as a standard and the hardware can be added at any time in the future.
 4. Alternation of pumps based on pump cycle or time (user configurable in hours)

- C. The system setup menu provides for the following:
1. Faceplate setup screen for entering pump start and stop setpoints.
 2. Faceplate setup screen for entering desired alternation method, lead pump cycle, or time based: enter number in hours
 3. Setup screen to select the alarms that will produce the remote audible and visual alarm.
- D. The system calculates and indicates the following: [NOT USED]
- E. The PLC, OIT and SCADA HMI shall provide the following minimum features:
1. Provide embedded programs and logic for PLC and OIT that will not require any programming or downloading of applications by the end user. Provide a menu driven question and answer end user setup from the OIT. If possible, programs will be compiled in a format that cannot be uploaded and utilized by others. Used password protection as needed.
 2. Graphical overview screen for pump station, etc. Direct link from overview to each sub-screen for a device, pump, etc.
 3. Selectable graphical overview screen for the type of pump station: Submersible, Wet/Dry Well, Suction Lift or Tabular Alpha/Numeric Text Only.
 4. Provide easy to use screen navigation throughout the OIT/HMI.
 5. Main graphic screen menu showing all graphical screens and sub-screens with clickable link to each.
 6. Historical and live trends of all variables, pump starts, wetwell fills, etc.
 7. The SCADA System and the local OIT will historically store all variables, runtimes and totalizers. The local OIT shall have enough memory for 3 months of data and the SCADA System shall be based on the specified hardware.
 8. Display Pumps and Generator Runtime, Last Run, Current Day, Yesterday, Current Week, Last Week, Current Month, Last Month and Total Runtime in hours and tens of hours. Runtimes are calculated, accumulated and stored in the PLC memory. The OIT/HMI will only display the values. Last Pump Runtime is displayed in minutes of the last run, it will begin when the pump starts, and hold after the pump stops, resetting when the pumps starts again.
 9. Display Flow Totalizer, Current Day, Yesterday, Current Week, Last Week, Current Month, Last Month and Cumulative Total Flow Totalizer for each monitored flow signal with a minimum of six (6) digits being displayed and multiplier as specified. All Flow Totalizers

- are calculated, accumulated and stored in the PLC memory. The OIT/HMI will only display the values.
10. Display Wetwell Level and Volume. Volumes are calculated and stored in the PLC memory. The OIT/HMI will only display the values.
 11. Alarm summary and history screen with silence of audible alarm and acknowledge of alarms.
 12. Password protection for entering vital set points.
 13. For redundant hardware; Instrumentation (wet well level transducers), PLC's, power supplies, networks, etc., continuously indicate status of primary and secondary units. Failure of a unit will create an alarm that can be silenced and will remain in the alarm summary until the failure is corrected or the unit is replaced.
 14. Pump Fault data (common fault) is also counted for each pump on Daily, Yesterday, Current Week, Last Week, Current Month, Last Month, and Accumulative Total.
- L. The Pumps shall be locally controlled manually/automatically at the Pump Station and remotely monitored and controlled from any System HMI Workstation at the Plant. Provide an OIT/HMI faceplate secure with administrative access only for Pump Control System setup. All setpoints shall be adjustable from the OIT at the Control Panel or any Plant HMI Workstation.
1. Automatic Level Control Mode
 - a. The PLC shall start and stop the one of the pumps as the Lead Pump and start and stop the second pump, as the Lag Pump respectively based on preset level setpoints entered at either of the HMI's or OIT and is compared to the actual wetwell level signal from the level transmitters (primary and backup) and vary the speed of the pumps/VFD's to maintain a preset and adjustable level setpoint.
 - b. The lead pump shall start at a preset and adjustable level setpoint and the speed varied to maintain the level in the wet well.
 - c. If a lag pumps is required, the initial speed shall be calculated based on the pump curves and onsite testing to create a pump station discharge flow to be slightly greater, approximately 5-10%, than a single pump at 100% speed. Both pumps shall always be paced at the same speed to maintain the wet well level setpoint.
 - d. With all pumps at minimum speed and if the wet well level is below a preset and adjustable "lag stop" setpoint which is set below the primary start level setpoint, the lag pump will be stopped and the lead pump will continue to operate to maintain the wet well level setpoint until the all pumps off setpoint is reached.

- e. The lead pump shall alternate after each run cycle and at a predetermined schedule that is adjustable from the Pump Station setup screen on the OIT or any Plant HMI Workstation with proper security levels.
- f. In the event that a pump failure alarm (O.L., O.T., O.V., Out of phase, high or low amps, High Motor Temp, VFD failure, etc.) occurs during a start or while in operation, an alarm shall be indicated and logged. The pump shall be locked out of the sequence until the alarm is manually cleared and reset by the operator. The PLC shall choose the next ready pump in the sequence as the lead or lag pump respectfully. The time and event shall be logged, etc.
- g. If a pump's auto status PLC input is not detected then the PLC shall select the next ready pump.
- h. A backup low level float switch shall stop all pumps and indicate a transducer/pump control failure alarm. The time and event shall be logged, etc.
- i. A backup high level float switch shall indicate a high, high level alarm and shall attempt to start all pumps, with a time delay between starts, and indicate a transducer/pump control failure alarm. The time and event shall be logged, etc.
- j. A pump is considered available when the HOA is in the Auto position and no failures are present.
- k. If the primary level transducer is out of range, the system shall automatically utilize the backup level transducer and shall indicate an alarm. The time and event shall be logged, etc.
- l. The operator shall be able to manually select the backup transducer at any time.
2. Manual Control Mode from OIT or HMI Workstation:
- a. The System shall allow for the pumps to be started in Hand from the HMI with proper security or locally from the OIT. If Hand control from the HMI is selected the control output from the PLC shall call for the pump to start. Hand status shall be displayed on all HMI's. Run or Fail status shall be displayed on all HMI's. The HOA selector switch on the Local Pump Station Control Panel will be in the Auto position for this control. The operator shall be able to adjust the speed of the VFD manually from the OIT.
- M. Upon replacement of a failed hardware, OIT or PLC, the system will have the ability to save and restore all pump station settings and setpoints.
- N. On the OIT and HMI menu we have a Technical Support button, it would list the Applications, PLC and OIT, Software Versions, PCS/RTU Model, Site ID, Site IP address, and "Contact Information for Repairs, Spare Parts and Additional Equipment".
- N. Provide the ability to automatically transfer historical data to a USB drive when connected to the OIT. The historical data log files will be in a format that can be opened and used by MS Excel or a MSSQL database.

3.03 EQUIPMENT SCHEDULES

TABLE A - Control Panels, PLC Control Panels, Network Comm Panels

Control Panels, PLC Control Panels, Network Communication Panels with construction, features, software and hardware as specified previously, shown on the drawings and I/O list, shall be provided to monitor and control at the specified locations:				
TAG	LOCATION	ENCLOSURE	PLC & COMMUNICATIONS	NOTES
LS # 1	S. Main Lift Station	Nema 4X SS with Dead Front Panel, 3pt latch and Stainless-Steel Sunshield	Allen-Bradley CompactLogix L33ER L&C 10" Color Touchscreen	120/240V, 3ph Power 10 HP VFD's with external cooling fins Filtered fan intake and exhaust

TABLE B – INSTRUMENTATION SCHEDULE

Instrumentation with construction, features, software and hardware as specified previously, shall be provided to monitor and control at the specified locations:				
TAG	LOCATION	SIZE/TYPE	CAL. RANGE	NOTES
LIT- 0001	Lift Station	Submersible Level Transducer	0–20Feet/PSI	Provide vent tube gor-tex moisture filter and 4-20mA surge protection in Separate NEMA 4X enclosure.
LSL-0001	PS Wetwell Level	Float Switch		Low Level Alarm
LSM-0001A thru 0001B	PS Wetwell Level	Float Switch		Backup Pump Controls
LSH-0001	PS Wetwell Level	Float Switch		High Level Alarm

END OF SECTION