

City of Caryville

Campbell County, Tennessee

Caryville-Jacksboro Utilities Commission

ARC 23 TN-21186

Ershell Collins Industrial Park Water Storage Tank

March 2024



LDA ENGINEERING



**CARYVILLE-JACKSBORO UTILITIES COMMISSION
CAMPBELL COUNTY, TENNESSEE
CONTRACT NUMBER TN-2118
ERSHELL COLLINS INDUSTRIAL PARK WATER TANK**

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Geotechnical Report

ADVERTISEMENT FOR BIDS

Project No. _____

_____ (Owner)

Separate sealed bids for _____ for

_____ will be received by _____

at the office of _____

until _____ o'clock ~~A.M.~~/P.M., ~~C.S.T.~~/E.S.T. _____, 20____, 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:

Copies may be obtained at the office of _____ located at _____ upon payment of \$ _____

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 \$ _____.~~ Payment for paper copies will not be refunded.

Electronic copies are available from the engineer at no charge.

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.

_____ April 12, 2024 _____ (Date) _____

INFORMATION FOR BIDDERS

1. Receipt and Opening of Bids

The _____ (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

_____ until _____ o'clock ~~A.M./P.M.~~,
~~C.S.T./E.S.T.~~, _____, 20____, and then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, addressed to _____ at _____ and designated as bid for _____.

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 contractors 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):

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 refusal 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 _____ consecutive calendar days thereafter. Bidder must agree also to pay as liquidated damages, the sum of \$ 500.00 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

_____ at _____
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.

_____ (L.S.)

Principal

Surety

SEAL

By: _____

BID FOR UNIT PRICE CONTRACTS

Place Caryville-Jacksboro Utilities Commission

Date _____

Project No. ARC TN-21186

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 Caryville-Jacksboro Utilities Commission (hereinafter called "Owner")

Gentlemen:

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

150,000 gallon elevated water storage tank and appurtenances, 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 270 consecutive calendar days thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages the sum of \$ 500.00 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 Ershell Collins Industrial Park Water Tank work described in the specifications and shown on the plans, for the following unit prices:

SEE ATTACHED BID SCHEDULE

(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.

BID SCHEDULE

CARYVILLE-JACKSBORO UTILITIES COMMISSION ERSHELL COLLINS INDUSTRIAL PARK WATER TANK ARC PROJECT # TN-21186					
ITEM	DESCRIPTION	QTY.	UNIT	UNIT COST	TOTAL COST
1	150,000 Gallon Elevated Tank Construction	1	LS	\$	\$
2	New Altitude Valve Vault Complete	1	LS	\$	\$
3	Yard Piping Including All DIP	1	LS	\$	\$
4	6-Inch SDR17 PVC Water Line	750	LF	\$	\$
5	8-Inch SDR17 PVC Water Line	1200	LF	\$	\$
6	4-Inch SDR17 PVC Water Line	650	LF	\$	\$
7	8-Inch Gate Valves	9	EA	\$	\$
8	6-Inch Gate Valves	4	EA	\$	\$
9	4-Inch Gate Valves	2	EA	\$	\$
10	2-Inch Blow-Off Valve	1	EA	\$	\$
11	New Fire Hydrant Assembly	1	EA	\$	\$
12	Connection to Existing and New Lines	3	EA	\$	\$
13	Connection to Existing Meter	1	LS	\$	\$
14	Site Fencing	1	LS	\$	\$
15	Erosion and Sediment Control	1	LS	\$	\$
16	Cleanup and Seeding	1	LS	\$	\$
TOTAL BID				\$	

TOTAL BID AMOUNT: Words: _____

_____ & _____ /100 Dollars (\$ _____).

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)

CLEARANCE OF LOREC NOTATIONS for P&S APPROVAL

Project Name _____

Contract Number _____

Agency, Date and Notation 1:

Response to Notation 1:

Agency, Date and Notation 2:

Response to Notation 2:

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 _____

Contract Number _____

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.

CLEARANCE OF LOREC NOTATIONS for P&S APPROVAL

Project Name _____

Contract Number _____

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

Date

This form must accompany Plans and Specifications sent to ECD.

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 erroneously 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: _____

<p>CERTIFICATION OF BIDDER REGARDING SECTION 3 AND SEGREGATED FACILITIES</p>

NAME OF PRIME CONTRACTOR: _____

PROJECT NUMBER: _____

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

DRUG-FREE WORKPLACE AFFIDAVIT

STATE OF _____

COUNTY OF _____

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

1. The undersigned is a principal officer of _____ (hereinafter referred to as the "Company"), and is duly authorized to execute this Affidavit on behalf of the Company.
2. The Company submits this Affidavit pursuant to T.C.A. § 50-9-113, which requires each employer with no less than five (5) employees receiving pay who contracts with the state or any local government to provide construction services to submit an affidavit stating that such employer has a drug-free workplace program that complies with Title 50, Chapter 9, of the Tennessee Code Annotated.
3. The Company is in compliance with T.C.A. § 50-9-113.

Further affiant saith not.

Principal Officer

STATE OF _____

COUNTY OF _____

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

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

Notary Public

My commission expires: _____

**CERTIFICATION BY PROPOSED SUBCONTRACTOR
REGARDING EQUAL EMPLOYMENT OPPORTUNITY**

NAME OF PRIME CONTRACTOR: _____

PROJECT NUMBER: _____

This certification is required pursuant to Executive Order 11246 (30 F. R. 12319-25). The implementing rules and regulations provide that any bidder or prospective contractor, or any of their proposed subcontractors, shall state as an initial part of the bid or negotiations of the contract whether it has participated in any previous contract or subcontract subject to the equal opportunity clause; and, if so, whether it has filed all compliance reports due under applicable instructions.

Where the certification indicates that the subcontractor has not filed a compliance report due under applicable instructions, such subcontractor shall be required to submit a compliance report before the owner approves the subcontract or permits work to begin under the subcontract.

SUBCONTRACTOR'S CERTIFICATION

Subcontractor Name: _____

Address: _____

City: _____ State _____ Zip _____

- | | | | |
|---|-----|----|-----------|
| 1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause. | Yes | No | |
| 2. Compliance reports were required to be filed in connection with such contract or subcontract. | Yes | No | |
| 3. Bidder has filed all compliance reports due under applicable instructions, including SF-100. | Yes | No | None Req. |
| 4. Have you ever been or are you being considered for sanction due to violation of Executive Order 11246, as amended? | Yes | No | |

Name: _____

Title: _____

Signature: _____

Date: _____

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

NAME OF SUBCONTRACTOR: _____

PROJECT NUMBER: _____

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

**IRAN DIVESTMENT
ACT**

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

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

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

Date	Signature of Bidder
	Company

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

1. The investment activities in Iran were made before July 1, 2016, the investment activities in Iran have not been expanded or reviewed on or after July 1, 2016, and the person has adopted, publicized, and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran; or
2. The **City/County of _____** makes a determination that the goods or services are necessary for the **City/County of _____** to perform its functions and that, absent such an exemption, the political subdivision will be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.



Department of
General Services

Central
Procurement 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 Iran 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.

Tennessee Tower, 3rd Floor • 312 Rosa L. Parks Avenue • Nashville, TN 37243
615-741-1035 • Fax: 615-741-0684 • tn.gov/generalservices

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 Afzar 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. Unipec (China International United Petroleum & Chemicals Co., Ltd.)
31. Zhuhai Zhenrong Co.

WAGE RATE DETERMINATION

Appropriate Wage Rates shall be inserted here.

"General Decision Number: TN20240122 01/05/2024

Superseded General Decision Number: TN20230122

State: Tennessee

Construction Type: Heavy
Including Water and Sewer Line Construction

Counties: Campbell, Claiborne, Clay, Cumberland, De Kalb, Fentress, Hancock, Jackson, Morgan, Overton, Pickett, Putnam and White Counties in Tennessee.

HEAVY CONSTRUCTION PROJECTS (including sewer/water construction).

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least \$17.20 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2024.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least \$12.90 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2024.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at <http://www.dol.gov/whd/govcontracts>.

Modification Number Publication Date
0 01/05/2024

ENGI0917-021 05/01/2017

	Rates	Fringes
Operating Engineers:		
Bulldozer and Crane.....	\$ 28.26	10.10

SUTN2009-121 12/02/2009

	Rates	Fringes
ELECTRICIAN.....	\$ 20.06	0.00
LABORER: Common or General.....	\$ 10.00 **	0.00
LABORER: Flagger.....	\$ 10.50 **	0.00
LABORER: Pipelayer.....	\$ 11.90 **	0.79
OPERATOR:		
Backhoe/Excavator/Trackhoe.....	\$ 16.48 **	0.48
TRUCK DRIVER: Dump Truck.....	\$ 11.63 **	0.81

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

=====
** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 (\$17.20) or 13658 (\$12.90). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at <https://www.dol.gov/agencies/whd/government-contracts>.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses

(29CFR 5.5 (a) (1) (iii)).

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

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than ""SU"" or ""UAVG"" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the ""SU"" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date

for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

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

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour National Office because National Office has responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

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

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

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

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

=====

END OF GENERAL DECISION"

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 20____, by and between _____, 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 _____ consecutive calendar days thereafter. The Contractor further agrees to pay, as liquidated damages, the sum of \$_____ for each consecutive calendar day thereafter as hereinafter provided 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)

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 _____ 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: _____

<p>Certification of Compliance with Minimum Standards for Accessibility by the Physically Handicapped</p>
--

Contract No. _____

Project Name: _____

Address: _____

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: _____

Legal Name and Address: _____

Registration Number: _____

Name: _____

Gary Steven Bostic

(Signature)

Date: _____

Local Government Official: _____

(Signature)

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

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 Schedules:

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 thereby 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, Subcontractor, 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 provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance and furnishing of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed or furnished by CONTRACTOR, 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 boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, 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 there from, 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 representatives, 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 10.4.

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

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

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 Documents 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 there from. 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 there from) 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:

13.13. If, instead of requiring correction or removal and replacement of *defective* Work OWNER (and, prior to ENGINEER's recommendation of final payment, also ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall 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 GC-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 at 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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1. ENUMERATION OF PLANS, SPECIFICATIONS AND ADDENDA

Following are the Plans, Specifications and Addenda which form a part of this contract, as set forth in Paragraph 1 of the General Conditions, "Contract and Contract Documents":

DRAWINGS

General Construction:	Nos.	_____
Heating and Ventilating:	"	_____
Plumbing:	"	_____
Electrical:	"	_____
_____	"	_____
_____	"	_____

SPECIFICATIONS:

General Construction	Page _____ to _____, incl.
	Page _____ to _____, incl.
Heating and Ventilating:	Page _____ to _____, incl.
Plumbing:	Page _____ to _____, incl.
Electrical:	Page _____ to _____, incl.
_____	Page _____ to _____, incl.
_____	Page _____ to _____, incl.

ADDENDA:

No. _____	Date _____	No. _____	Date _____
No. _____	Date _____	No. _____	Date _____

2. STATED ALLOWANCES

Pursuant to Article 11.8 of the General Conditions, the Contractor shall include the following cash allowances in his proposal:

- (a) For _____ (Page _____ of Specifications) \$ _____
- (b) For _____ (Page _____ of Specifications) \$ _____
- (c) For _____ (Page _____ of Specifications) \$ _____
- (d) For _____ (Page _____ of Specifications) \$ _____
- (e) For _____ (Page _____ of Specifications) \$ _____
- (f) For _____ (Page _____ of Specifications) \$ _____

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 to 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 there from, 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 \$ 2,000,000.

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 _____, _____ and _____.

See the Wage Rate Decision

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
4.5%	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 Campbell County, East Tennessee.
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)
 ARC Grant (Amount)

Appendix II to Part 200—Contract Provisions for Non-Federal Entity Contracts Under Federal Awards

In addition to other provisions required by the Federal agency or non-Federal entity, all contracts made by the non-Federal entity under the Federal award must contain provisions covering the following, as applicable.

(A) Contracts for more than the simplified acquisition threshold currently set at \$150,000, which is the inflation adjusted amount determined by the Civilian Agency Acquisition Council and the Defense Acquisition Regulations Council (Councils) as authorized by 41 U.S.C. 1908, must address administrative, contractual, or legal remedies in instances where contractors violate or breach contract terms, and provide for such sanctions and penalties as appropriate.

(B) All contracts in excess of \$10,000 must address termination for cause and for convenience by the non-Federal entity including the manner by which it will be effected and the basis for settlement.

(C) Equal Employment Opportunity. Except as otherwise provided under 41 CFR Part 60, all contracts that meet the definition of “federally assisted construction contract” in 41 CFR Part 60-1.3 must include the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, “Equal Employment Opportunity” (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, “Amending Executive Order 11246 Relating to Equal Employment Opportunity,” and implementing regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.”

(D) Davis-Bacon Act, as amended (40 U.S.C. 3141-3148). When required by Federal program legislation, all prime construction contracts in excess of \$2,000 awarded by non-Federal entities must include a provision for compliance with the Davis-Bacon Act (40 U.S.C. 3141-3144, and 3146-3148) as supplemented by Department of Labor regulations (29 CFR Part 5, “Labor Standards Provisions Applicable to Contracts Covering Federally Financed and Assisted Construction”). In accordance with the statute, contractors must be required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, contractors must be required to pay wages not less than once a week. The non-Federal entity must place a copy of the current prevailing wage determination issued by the Department of Labor in each solicitation. The decision to award a contract or subcontract must be conditioned upon the acceptance of the wage determination. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency. The contracts must also include a provision for compliance with the Copeland “Anti-Kickback” Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, “Contractors and Subcontractors on Public Building or Public Work

Financed in Whole or in Part by Loans or Grants from the United States”). The Act provides that each contractor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The non-Federal entity must report all suspected or reported violations to the Federal awarding agency.

(E) Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708). Where applicable, all contracts awarded by the non-Federal entity in excess of \$100,000 that involve the employment of mechanics or laborers must include a provision for compliance with 40 U.S.C. 3702 and 3704, as supplemented by Department of Labor regulations (29 CFR Part 5). Under 40 U.S.C. 3702 of the Act, each contractor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.

(F) Rights to Inventions Made Under a Contract or Agreement. If the Federal award meets the definition of “funding agreement” under 37 CFR §401.2 (a) and the recipient or subrecipient wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that “funding agreement,” the recipient or subrecipient must comply with the requirements of 37 CFR Part 401, “Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements,” and any implementing regulations issued by the awarding agency.

(G) Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387), as amended—Contracts and subgrants of amounts in excess of \$150,000 must contain a provision that requires the non-Federal award to agree to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251-1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).

(H) Debarment and Suspension (Executive Orders 12549 and 12689)—A contract award (see 2 CFR 180.220) must not be made to parties listed on the governmentwide exclusions in the System for Award Management (SAM), in accordance with the OMB guidelines at 2 CFR 180 that implement Executive Orders 12549 (3 CFR part 1986 Comp., p. 189) and 12689 (3 CFR part 1989 Comp., p. 235), “Debarment and Suspension.” SAM Exclusions contains the names of

parties debarred, suspended, or otherwise excluded by agencies, as well as parties declared ineligible under statutory or regulatory authority other than Executive Order 12549.

(I) Byrd Anti-Lobbying Amendment (31 U.S.C. 1352)—Contractors that apply or bid for an award exceeding \$100,000 must file the required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a member of Congress, officer or employee of Congress, or an employee of a member of Congress in connection with obtaining any Federal contract, grant or any other award covered by 31 U.S.C. 1352. Each tier must also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the non-Federal award.

NOTICE OF AWARD

Dated _____, **2024**

TO: _____
(BIDDER)

ADDRESS: _____

Contract: _____

You are notified that your Bid dated _____ for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a contract for the

The Contract Price of your Contract is _____.

4 copies of each of the proposed Contract Documents (except Drawings) accompany this Notice of Award

You must comply with the following conditions precedent within twenty-one (21) days of the date of this Notice of Award, that is by _____, **2024**.

1. Deliver to the OWNER **4** fully executed counterparts of the Contract Documents. Each of the Contract Documents must bear your signature on all required documents.
2. Deliver with the executed Contract Documents the Contract Security (Bonds) as specified in the Instructions to Bidders (Article 15) and General Conditions.]
3. (List other conditions precedent). NOT APPLICABLE

Failure to comply with these conditions within the time specified will entitle OWNER to consider your Bid in default, to annul this Notice of Award and to declare your Bid security forfeited.

*EJCDC No. 1910-22 (1996 Edition)
Prepared by the Engineers Joint Contract Documents Committee and endorsed by The Associated General Contractors of America and the Construction Specifications Institute.*

Within fifteen (15) days after you comply with the above conditions, OWNER will return to you one (1) fully executed counterpart of the Contract Documents.

Caryville – Jacksboro Utilities Commission
(OWNER)

BY _____
(AUTHORIZED SIGNATURE)

Executive Secretary
(TITLE)

Copy to ENGINEER
(Use Certified Mail,
Return Receipt Requested)

*EJCDC No. 1910-22 (1996 Edition)
Prepared by the Engineers Joint Contract Documents Committee and endorsed by The Associated General Contractors of America and the Construction Specifications Institute.*

NOTICE TO PROCEED

Dated _____, **2024**

TO: _____

ADDRESS: _____

Contract: Ershell Collins Industrial Park Water Tank



You are notified that the Contract Times under the above contract will commence to run on _____ 2024. By that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement the date of Substantial Completion is _____ and the date of readiness for final payment is _____.

Before you may start any Work at the Site, paragraph 2.05.C of the General Condition provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Also, before you may start any Work at the Site, you must:

- 1. **Submit a project schedule.**
- 2. **Submit shop drawings in accordance with Section 01340.**

Caryville-Jacksboro Utilities Commission
(OWNER)

BY: _____
(AUTHORIZED SIGNATURE)

Copy to ENGINEER

¹(Use Certified Mail, Return Receipt Requested)

(TITLE)

SECTION 00800

SPECIAL SUPPLEMENTAL CONDITIONS

These Supplementary Conditions amend or supplement the General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below. All provisions, which are not so amended or supplemented, remain in full force and effect.

The terms used in these Special Supplementary Conditions will have the meanings indicated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings indicated below, which are applicable to both the singular and plural thereof.

I. SC-4.2. Add the following new paragraph(s) immediately after paragraph 4.2.1.2:

4.2.1.3. In the preparation of Drawings and Specifications, Engineer relied upon the following report of exploration and tests of subsurface conditions at the Sites:

4.2.1.3.1 Geotechnical Exploration, Proposed Elevated Water Tank., Caryville, Tennessee; prepared by GEOServices, LLC.

4.2.1.4. Copies of reports and drawings itemized in SC-4.2.1.3. that are not included with Bidding Documents may be examined at the office of the Engineer during regular business hours. These reports and drawings are not part of the Contract Documents, and are provided for the Contractor's information only. Contractor is responsible for any conclusions drawn from the information provided. Contractor is not entitled to rely upon other information and data utilized by Engineer in the preparation of the Drawings and Specifications.

4.2.1.5. Neither OWNER nor ENGINEER makes any warranties or representations about any subsurface or physical conditions that may be encountered within the scope of the Work. The CONTRACTOR shall satisfy himself of such conditions that may be encountered by performing on-site inspections, core drilling, or other methods. The risk of encountering and correcting such subsurface and physical conditions shall be borne solely by the CONTRACTOR. The Contract Price shall include the cost of performing the Work complete in place within the Contract Time and in accordance with the terms and conditions of the Contract Documents.

II. SC-5.4. Add the following new paragraph immediately after paragraph 5.4.13.:

5.4.13. The limits of liability for the insurance required by paragraph 5.4. of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

5.4.13.1. Workers' Compensation and related coverages under paragraphs 5.4.1. and .2. of the General Conditions:

- | | | |
|----|---|-------------|
| a. | State: | Statutory |
| b. | Applicable Federal (e.g., Longshoreman's) | Statutory |
| c. | Employer's Liability | \$1,000,000 |

5.4.13.2. Contractor's General Liability under paragraphs 5.4.3. through .6. of the

General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody, and control of Contractor:

- d. General Aggregate \$2,000,000
- e. Products - Completed Operations Aggregate \$2,000,000
- f. Personal and Advertising Injury \$1,000,000
- g. Each Occurrence
 - (1) (Bodily Injury and Property Damage) \$1,000,000
- h. Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.
- i. Excess or Umbrella Liability
 - (1) General Aggregate \$1,000,000
 - (2) Each Occurrence \$1,000,000
- 5.4.13.3. Automobile Liability under paragraph 5.4.6. of the General Conditions:
 - j. Bodily Injury:
 - (1) Each Person \$ 500,000
 - (2) Each Accident \$1,000,000
 - k. Property Damage:
 - (1) Each Accident \$ 500,000
 - l. Combined Single Limit of: \$1,500,000
- 5.4.13.4. The Contractual Liability coverage required by paragraph 5.4.10. of the General Conditions shall provide coverage for not less than the following amounts:
 - m. Bodily Injury:
 - (1) Each Accident \$1,000,000
 - (2) Annual Aggregate \$1,000,000
 - n. Property Damage:
 - (1) Each Accident \$1,000,000
 - (2) Annual Aggregate \$1,000,000
- 5.4.13.5. The Contractor shall furnish the Owner with a Certificate of Insurance naming Owner as an additional insured on all casualty policies.

III. SC-5.6. Delete paragraph 5.6. in its entirety and insert the following in its place:

5.6. CONTRACTOR shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof. This insurance shall:

- 5.6.1. Include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them 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 and damage to the Work, temporary buildings, falsework, and materials and

equipment in transit and shall insure against at least the following perils or causes of loss: 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 or causes of loss 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. Allow for partial utilization of the Work by OWNER;
- 5.6.6. Include testing and startup; and
- 5.6.7. Be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR and ENGINEER with thirty (30) days written notice to each other additional insured to whom a certificate of insurance has been issued.
- 5.6.8. CONTRACTOR shall be responsible for any deductible or self-insured retention.
- 5.6.9. The policies of insurance required to be purchased and maintained by CONTRACTOR in accordance with this paragraph SC-5.06 shall comply with the requirements of paragraph 5.06.C of the General Conditions.

IV. SC-6.13. Add the following new paragraph immediately after paragraph 6.13.:

- 6.13.1 Contractor shall abide by all conditions of permits obtained including any additional insurance requirements requested by the permitting agency(s).

V. SC-10.2. Add the following new paragraph immediately after paragraph 10.2.:

- 10.2.1. Changes in Scope of Work:
 - 10.2.1.1. The Contract Documents outline a Scope of Work that reflects the intended size of the Project based on the best information available at the time of document preparation and Advertisement for Bids.
 - 10.2.1.2. The actual Scope of Work may vary once actual field conditions are encountered and addressed as the Work progresses.

10.2.1.3. The Owner reserves the right to increase up to ten (10%) percent or decrease up to twenty-five (25%) percent the Scope of Work without obligation to receive or to pay additional compensation from or to the Contractor beyond the contract unit prices, or to adjust the Contract Time as a penalty for the change in the Scope of Work.

10.2.1.4. All terms, conditions, Unit Prices and Schedule of Values in the Contract for Work within the original Scope of Work shall apply to all Work and to determine the value of all Work added to or deleted from the original Scope of Work.

10.2.1.5. Changes outside the stated limits for the revised Scope of Work shall be subject to applicable revisions of Article 10, 11, and 12 of Section 00700, General Conditions of the Construction Contract.

IV. SC-16. Add the following new paragraph immediately after paragraph 16.:

SC-16.1 Mediation

16.1.1. OWNER and CONTRACTOR agree that they shall submit any and all unsettled Claims or counterclaims, disputes, or other matters in question between them arising out of or relating to the Contract Documents or the breach thereof to mediation by the American Arbitration Association [prior to either of them initiating against the other a demand for arbitration pursuant to paragraph SC-16.2, unless delay in initiating arbitration would irrevocably prejudice one of the parties. The thirty (30) day time limit within which to file a demand for arbitration as provided in paragraphs SC-16.2.2 and 16.2.3. shall be suspended with respect to a dispute submitted to mediation within that time limit and shall remain suspended until ten (10) days after the termination of the mediation.] The mediator of any dispute submitted to mediation under this agreement shall not serve as arbitrator of such dispute unless otherwise agreed.

SC-16 Add the following new paragraph immediately after paragraph SC-16.1.

SC-16.2 Arbitration

16.2.1. All Claims or counterclaims, disputes, or other matters in question between OWNER and CONTRACTOR arising out of or relating to the Contract Documents or the breach thereof (except for Claims which have been waived by the making or acceptance of final payment as provided by paragraph 14.9) not resolved under provisions of paragraph SC-16.2 will be decided by binding arbitration in accordance with the Construction Industry Arbitration Rules then obtaining, subject to the limitations of this paragraph SC-16.2. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.

16.2.2. No demand for arbitration of any Claim or counterclaim, dispute, or other matter that is required to be referred to ENGINEER initially for decision in accordance with paragraph 9.9 will be made until the earlier of: (i) the date on which ENGINEER has rendered a written decision, or (ii) the 31st day after

the parties have presented their final evidence to ENGINEER if a written decision has not been rendered by ENGINEER before that date. No demand for arbitration of any such Claim or counterclaim, dispute, or other matter will be made later than thirty (30) days after the date on which ENGINEER has rendered a written decision in respect thereof in accordance with paragraph 10.5; and the failure to demand arbitration within said thirty (30) day period will result in ENGINEER's decision being final and binding upon OWNER and CONTRACTOR. If ENGINEER renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but will not supersede the arbitration proceedings, except where the decision is acceptable to the parties concerned.

16.2.3. Notice of the demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator(s) and a copy will be sent to ENGINEER for information. The demand for arbitration will be made within the thirty (30) day period specified in paragraph SC-16.2.2., and in all other cases within a reasonable time after the Claim or counterclaim, dispute, or other matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such Claim or other dispute or matter in question would be barred by the applicable statute of limitations.

16.2.4. Except as provided in paragraph SC-16.2.5., no arbitration arising out of or relating to the Contract Documents shall include by consolidation, joinder, or in any other manner any other individual or entity (including ENGINEER, and ENGINEER's Consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:

16.2.4.1. The inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and

16.2.4.2. Such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings; and

16.2.4.3. The written consent of the other individual or entity sought to be included and of OWNER and CONTRACTOR has been obtained for such inclusion, which consent shall make specific reference to this paragraph; but no such consent shall constitute consent to arbitration of any dispute not specifically described in such consent or to arbitration with any party not specifically identified in such consent.

16.2.5. Notwithstanding paragraph SC-16.2.4, if a Claim or counterclaim, dispute, or other matter in question between OWNER and CONTRACTOR involves the Work of a Subcontractor, either OWNER or CONTRACTOR may join such Subcontractor as a party to the arbitration between OWNER and CONTRACTOR hereunder. CONTRACTOR shall include in all subcontracts

required by paragraph 6.11 a specific provision whereby the Subcontractor consents to being joined in arbitration between OWNER and CONTRACTOR involving the Work of such Subcontractor. Nothing in this paragraph SC-16.2.5. or in the provisions of such subcontract consenting to joinder shall create any claim, right, or cause of action in favor of Subcontractor and against OWNER, ENGINEER, or ENGINEER's Consultants that does not otherwise exist.

16.2.6. The arbitration hearing or hearings shall be conducted in the County where the Project is located, or at such other location as may be mutually agreed upon by the parties of this Agreement.

16.2.7. There shall be three (3) arbitrators chosen, one by OWNER, one by CONTRACTOR, and those two shall select a third arbitrator. The arbitrators shall be either certified by the American Arbitration Association or shall be members in good standing of the Mediation Panel of the U.S. District Court having local jurisdiction.

16.2.8. The award rendered by the arbitrators will be final, judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal.

V. T.C.A. 66-11-144, Portion of Contract Price Held in Escrow

- A. Whenever, in any contract for the improvement of real property, a certain amount or percentage of the contract price is held back by the owner or contractor, that retained amount shall be deposited in a separate escrow account with a third party giving proper security for the performance of the obligation of the owner or contractor.
- B. As of the time of the deposit of the retained funds, such funds shall become the sole and separate property of the contractor, subcontractor, materialman, or laborer to whom they are owed.
- C. Upon satisfactory completion of the contract, to be evidenced by a written release by the owner or contractor, all funds accumulated in the escrow account together with any interest thereon shall be paid immediately to the contractor, subcontractor, materialman, or laborer to whom such funds and interest are owed.
- D. In the event the owner or contractor fails or refuses to execute the release provided for in subsection (c), then the contractor, subcontractor, materialman, or laborer shall seek any remedy in a court of proper jurisdiction and the person holding the fund as escrow agent shall bear no liability for the nonpayment thereof to the contractor, subcontractor, materialman, or laborer.

- E. In contracts to which the State of Tennessee or any department, board or agency thereof, including the University of Tennessee, is a party, interest shall be paid on such retained amounts at the same rate interest is paid on the funds of local governments participating in the local government investment pool established pursuant to § 9-4-704, for the contract period.
- F. The provisions of this section shall be applicable to the State of Tennessee, any department, board or agency thereof, including the University of Tennessee, and all counties and municipalities and all departments, boards or agencies thereof, including all school and education boards, and any other subdivision of the state.
- G. The provisions of this section shall be applicable to all contracts for the contract price is five hundred thousand dollars (\$500,000.00) or greater.
- H. Compliance with this section shall be mandatory, and may not be waived by contract.

VI. Independent Contractors:

- A. The parties acknowledge that the relationship created under this Contract is that of independent contracting parties and this Contract does not create a general agency, joint venture, partnership, employment relationship, or franchise between the parties. Neither party shall represent itself to be an agent of the other, nor shall it execute any documents or make any commitments to any contractual or other obligations with third parties.

VII. Drug Free Workplace Requirements

- 1. Pursuant to Tennessee Code Annotated § 50-9-113, an employer with no less than five (5) employees receiving pay who contracts with the State or any local government to provide construction services is required to submit an affidavit stating that such employer has a drug-free workplace program in place that complies with Title 50, Chapter 9 of the Tennessee Code. The affidavit form is included in this bid packet and must be returned with the bid proposal. Failure to return the affidavit, failure to complete the affidavit, or failure to comply with the drug-free workplace program requirements of Title 50, Chapter 9 of the Tennessee Code will result in the bidder being disqualified from consideration as State law prohibits a local government from entering into any contract for construction services with any employer who does not comply with the above.

END OF SECTION

TECHNICAL SPECIFICATIONS

2023 ARC ERSHELL COLLINS INDUSTRIAL PARK TANK

CITY OF CARYVILLE / CARYVILLE-JACKSBORO
UTILITIES COMMISSION

ERSHELL COLLINS INDUSTRIAL PARK

150,000 GALLON ELEVATED TANK

CONTRACT NUMBER TN-21186

Prepared by:

LDA Engineering, Inc.

110 Tyson Boulevard, Suite 200

Alcoa, Tennessee 37701

www.ldainc.com



LDA ENGINEERING



SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work consists of the construction of a 150,000 Gallon elevated water storage tank and appurtenances as shown on the plans and as specified herein. Work includes the following major components:
1. Design and construction of 150,000 Gallon welded steel elevated storage tank:
 - a. Overflow Elevation – 1,922.0 feet
 - b. Top of Slab Elevation – 1,764.0 feet
 - c. Bottom of Bowl Elevation – 1,889.0 feet
 - d. Inside Diameter – 28.0 feet
 2. 8'x6' precast concrete altitude valve vault and valves, including 6" altitude valve and 8" tilting disc check valve.
 3. Yard piping and appurtenances, including drains, overflow, and fill/draw lines.
 4. 750 linear feet of 6-inch SDR17 PVC water line.
 5. 1200 linear feet of 8-inch SDR17 PVC water line.
 6. 650 linear feet of 4-inch SDR17 PVC water line.
 7. (9) 8-inch gate valves, (4) 6-inch gate valves, and (1) 4-inch gate valve.
 8. (1) 2-inch blow off valve.
 9. (1) new fire hydrant assembly.
 10. Connection to the existing and new water lines.
 11. Connection to existing water meter.
 12. Site grading and drainage.
 13. Erosion control, cleanup, seeding, and fencing.
 14. Any necessary supporting work for the above to form a complete, functional installation.

1.02 RELATED REQUIREMENTS

- A. ARC Contract General and Supplemental Conditions
- B. Section 00800: Special Supplemental Conditions.
- C. Section 01150: Measurement and Payment.
- D. Section 01310: Construction Schedules.

1.03 CONTRACTS

- A. The Work for this Project will be performed under a single Unit Price Contract as
CJU305 01010 - 1

shown on the Bid Form for the welded steel elevated water tank and installation of water lines.

1.04 WORK SEQUENCE

- A. Coordinate all Work with the Owner and Engineer to ensure a successful Project. The schedule and actual construction operations must be approved by the Owner as described in, and/or referenced to Section 01310, including:
 - 1. All Contracts.
 - 2. Coordinate all water line tie-ins and temporary disruptions of service.
 - 3. Coordinate all operations in/and near active streets and roads.
 - 4. Rigidly adhere to Project Schedule.
- B. Execute Construction schedule to minimize disruption to the Owner's facilities, industrial park facility schedules, the public convenience and safety, and to maximize Project construction efficiency.
- C. Construct the work in stages to provide for public convenience.
 - 1. Do not close off public use of facilities until completion of one stage of construction will provide alternative usage.
 - 2. Stages will be monitored by the Owner's representative for compliance with the project schedule.
 - 3. Ensure that existing facilities remain operational as required to maintain water service to the Owner's customers.
- D. When the tank and water lines are to be flushed, cleaned and/or tested, the use of water shall be coordinated with the Owner.
 - 1. The work must be coordinated to accommodate the Owner's uninterrupted provision of water service to its customers.
- E. Connections to existing lines, meters, etc. may have to be scheduled at night or after normal working hours.

1.05 CONTRACTOR'S USE OF PREMISES

- A. Contractor shall limit use of the premises for Work and for storage, to allow for: industrial park operations, and other Contractors.
- B. Coordinate use of premises under the direction of Owner.
- C. Assume full responsibility for the protection and safekeeping of products under this Contract, stored on the site.
- D. Move any stored Products under Contractor's control, which interfere with operations of the Owner or separate Contractor.

- E. Obtain and pay for the use of additional storage or work areas needed for operations.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

END OF SECTION

SECTION 01045
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor shall be responsible for all cutting, fitting, and patching, including attendant excavation and backfill required to complete the Work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the Work to provide for installation and ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of Contract Documents.
 - 5. Remove samples of installed work as specified for testing.
 - 6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.

1.02 RELATED DOCUMENTS

- A. Section 01010: Summary of Work

1.03 SUBMITTALS

- A. Submit a written request to Engineer well in advance of executing any cutting or alteration which affects:
 - 1. Work of the Owner or any separate contractor.
 - 2. Structural value or integrity of any element of the Project.
 - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance, or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.
- B. Request shall include:
 - 1. Identification of the Project.
 - 2. Description of affected work.
 - 3. Necessity of cutting, alteration, or excavation.
 - 4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of Project.
 - 5. Description of proposed work.
 - a. Scope of cutting, patching, alteration, or excavation.
 - b. Trades who will execute the work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 - 6. Alternatives to cutting and patching.
 - 7. Cost proposal, when applicable.

- 8. Written permission of any separate contractor whose work will be affected.
- C. Should conditions of Work or the schedule indicate a change of products from original installation, Contractor shall submit request for substitution.
- D. Submit written notice to the Engineer designating the date and the time the work will be uncovered.

PART 2 - PRODUCTS

2.01 MATERIALS

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

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect existing conditions of Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of Products, or performance of work.
- C. Report unsatisfactory or questionable conditions to Engineer in writing; do not proceed with work until Engineer has provided further instructions.

3.02 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.
- B. Provide devices and methods to protect other portions of the Project from damage.
- C. Provide protection from elements for the portion of the Project which may be exposed by cutting and patching work and maintain excavations free from water.

3.03 PERFORMANCE

- A. Execute cutting and demolition by methods which will prevent damage to other work and will provide proper surfaces to receive installation of repairs.
- B. Execute cutting and backfilling by methods which will prevent settlement or damage to other work.
- C. Employ original Installer or Fabricator, to perform cutting and patching for:
 - 1. Weather-exposed or moisture-resistant elements.
 - 2. Sight-exposed finished surfaces.
- D. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

- E. Restore work which has been cut or removed; install new products to provide complete Work in accord with requirements of Contract Documents.
- F. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish the entire unit.

END OF SECTION

SECTION 01050
FIELD ENGINEERING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide and pay for field engineering services required for the Project.
 - 1. Survey work required in execution of Project.
 - 2. Civil, structural, or other professional engineering services specified, or required to execute contractor's construction methods.
- B. Owner's Representative will identify existing control points and property line corner stakes indicated on the drawings, as required.

1.02 RELATED REQUIREMENTS

- A. ARC Contract General and Supplemental Conditions
- B. Section 00800: Special Supplemental Conditions
- C. Section 01010: Summary of Work
- D. Section 01720: Project Record Documents

1.03 QUALIFICATIONS OF SURVEYOR OR ENGINEER

- A. Qualified engineer or registered land surveyor, acceptable to Contractor and Owner.
- B. Registered Professional Engineer of the discipline required for the specific service on the Project, if required, licensed in the State in which the project is located.

1.04 SURVEY REFERENCE POINTS

- A. Existing basic horizontal and vertical control points for the Project are those designated on drawings.
- B. Locate and protect control points prior to starting site work and preserve all permanent reference points during construction.
 - 1. Make no changes or relocations without proper written notice to Engineer.
 - 2. Report to Engineer when any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations.
 - 3. Require surveyor to replace project control points which may be lost or destroyed.
 - a. Establish replacements based on original survey control.

1.05 PROJECT SURVEY REQUIREMENTS

- A. Establish lines and levels, locate, and lay out, by instrumentation and similar appropriate means:

1. Site improvements;
 - a. Stakes for grading, fill and topsoil placement.
 - b. Utility slopes and invert elevations.
 2. Batter boards for structures.
 3. Pipeline routes and elevations.
- B. From time to time, verify layouts by same methods.

1.06 RECORDS

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

1.07 SUBMITTALS

- A. Submit name and address of Surveyor and Professional Engineer to Engineer.
- B. On request of Engineer, submit documentation to verify accuracy of field engineer work.
- C. Submit certificate signed by Registered Engineer or Surveyor certifying that elevations and locations of improvements are in conformance, or non-conformance, with Contract Documents.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01090

REFERENCE STANDARDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Abbreviations and acronyms used in Contract Documents to identify reference standards.

1.02 QUALITY ASSURANCE

- A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes establish stricter standards.
- B. Publication Date: The publication in effect on the date of issue of Contract Documents, except when a specific publication date is specified.

1.03 ABBREVIATIONS, NAMES, AND ADDRESSES OF ORGANIZATIONS

- A. Obtain copies of referenced standard direct from publication source, when needed for proper performance of Work, or when required for submittal by Contract Documents.

AASHTO
American Association of State Highway and
Transportation Officials
444 North Capital Street, Northwest
Washington, DC 20001

ACI
American Concrete Institute
Post Office Box 19150
Detroit, MI 48219
(313) 523-2600

ANSI, APS
American National Standards Institute, Inc.
10E 40th Street
New York, NY 10018

AREA
American Railroad Engineering Association
200 "L" Street, Northwest
Washington, DC 20036

ASCE
American Society of Civil Engineers
345 East 47th Street
New York, NY 10017

ASME
American Society of Mechanical Engineers
385 E. 47th Street
New York, NY 10017

ASTM
American Society for Testing and Materials
1916 Race Street
Philadelphia, PA 19103

AWWA
American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235

CRSI
Concrete Reinforcing Steel Institute
933 No. Plumb Grove Road
Schaumburg, IL 60173-4758

FHWA
Federal Highway Administration
Federal Building, U.S. Courthouses
Nashville, TN 37202

FS
Federal Specification
Superintendent of Documents
Government Printing Office
Washington, DC 20234

FSS
Federal Specification and Standards
General Services Administration
Specifications and Consumer Information Distribution
Section (WFSIS)
Washington Navy Yard, Building 197
Washington, DC 20407

TDOT
Tennessee Department of Transportation
James K Polk Building
505 Deaderick Street
Nashville, TN 37219

TDEC
Division of Water Supply
401 Church Street
L & C Tower - 6th Floor
Nashville, TN 37243-1549

WEF
601 Wythe Street
Alexandria, VA 22314-1994

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01150

MEASUREMENT AND BASIS OF PAYMENT

PART 1 - GENERAL

1.01 ITEMS INCLUDED

- A. Those items included in the proposal which have been installed in accordance with the Plans and Specifications and which have been approved by the Engineer shall be measured and paid for in the manner presented hereinafter. Payment shall be compensation in full for furnishing all materials and equipment and performing all labor and services necessary for constructing complete all of the work, ready for operations shown on the Plans and as specified herein. Any work specified but not included in the Proposal shall be considered incidental and shall not be a separate pay item.

1.02 RELATED REQUIREMENTS

- A. Agreement Between Owner and Contractor
- B. Bid Schedule
- C. Section 01152: Applications for Payment
- D. Section 01370: Schedule of Values
- E. Section 01700: Contract Closeout
- F. Funding Agency Requirements

1.03 MEASUREMENT AND BASIS OF PAYMENT

I. 150,000 GALLON ELEVATED TANK CONSTRUCTION – ITEM 1

- A. The general construction of the 150,000-gallon water storage tank shall be measured as a unit constructed (Lump Sum Payment), tested and accepted including all work specified herein and as shown on the Plans to be within the limits of the Contract. This work shall include the following major components:
 - a. 150,000 Gallon welded steel storage tank design and construction.
 - i. Overflow Elevation – 1,922.00 Feet.
 - ii. Top of Slab Elevation – 1,764.0 Feet.
 - iii. Inside Diameter – 28.0 Feet (Nominal).
 - b. Site grading, foundation design and construction, drainage, stone paving, and access improvements.

- c. Site clearing and grubbing.
- d. Vents, ladders, level indicator, manholes, hatches, painter rigging couplets, and other appurtenances as necessary.
- e. Coating of tank, piping, and disinfection.
- f. Fencing and gate.
- g. Electrical and instrumentation, including extension of power to the site, tank level sensor, and SCADA.
- h. Any necessary supporting work for the above to form a complete, functional facility.

II. NEW ALTITUDE VALVE VAULT COMPLETE – ITEM 2

- A. The general construction of the new altitude valve vault shall be measured as a unit constructed (Lump Sum Payment), tested and accepted including all work specified herein and as shown on the Plans to be within the limits of the Contract.
- B. Payment shall include a precast 8' x 6' valve vault, a 6" altitude valve, an 8" tilting disc check valve with outside lever and weight, an 8" dismantling joint, and a 6" dismantling joint and all piping and fittings within the vault.
- C. Payment shall also include excavation of all materials including rock, crushed stone bedding, backfill with appropriate material, hand hold, ladders, pipe supports, boots, access hatch with safety grate, vault drain, and other items as required for a complete, functional installation.
- D. Payment shall also include compensation for all labor and equipment for the complete, functional assembly.
- E. No additional payment shall be made for items incidental with the installation which are required to provide a complete, functional installation.

III. YARD PIPING INCLUDING ALL DIP – ITEM 3

- A. The general construction of the yard piping shall be measured as a unit constructed (Lump Sum Payment), tested and accepted including all work specified herein and as shown on the Plans to be within the limits of the Contract. This work shall include the following major components:
 - a. DIP fill/draw lines, under tank piping, tank and vault drain lines, fittings, and appurtenances.
 - b. Erosion control, cleanup, seeding, and fencing.
 - c. Pressure/leakage testing, disinfection, flushing, and Bac-T testing.
 - d. Any necessary supporting work for the above to form a complete,

functional piping system.

IV. PVC WATER LINE – ITEMS 4, 5, & 6

- A. Payment for furnishing and installing PVC water mains will be made at the Contract Unit Price per linear foot for the pipe in place and shall include all necessary labor, materials, and equipment for furnishing and laying of the pipe; fittings as required; dewatering if required; joint restraining gaskets or concrete kickers; clamps; harnessing; adapters; excavation of all material encountered including rock; compacted crushed stone backfill for suitable material where required, temporary fencing, other temporary controls and barricades; replacement of grass, sod, gravel or temporary asphalt paving for good shoulders, driveways, roadways and any other paved surfaces disturbed as required and other surface materials not specifically designated in the Bid Proposal; clean up; sterilization, and tests.
- B. Water mains included in this pay item shall be ASTM D2241, SDR17 PVC.
- C. Measurement of the pipe will be to the nearest foot along the centerline including the lengths of the valves and fittings.
- D. All crushed stone and concrete used on the project shall be included in the price of the pipe work unless paid for under another pay item.

V. GATE VALVES – ITEMS 7, 8, & 9

- A. Payment for gate valve assemblies will be made at the contract Unit Price for each such complete installation. Payment shall include compensation for all necessary materials, labor, and equipment required for a complete and functional installation.
- B. No additional payment shall be made for items incidental with these installations which are required to provide a complete, functional installation.
- C. Payment shall be compensation for excavation of all materials, including rock, crushed stone bedding, valve boxes, backfill with appropriate materials, valves, sleeves, restraint mechanisms, and all other items as required for a complete, functional installation.

VI. 2-INCH BLOW-OFF VALVE – ITEM 10

- A. Payment for 2-inch blow-off valve assemblies will be made at the contract Unit Price for each such complete installation. Payment shall include compensation for all necessary materials, labor, and equipment required for a complete and functional installation.
- B. No additional payment shall be made for items incidental with these installations

which are required to provide a complete, functional installation.

- C. Payment shall be compensation for excavation of all materials, including rock, crushed stone bedding, valve boxes, backfill with appropriate materials, valves, sleeves, restraint mechanisms, and all other items as required for a complete, functional installation.

VII. NEW FIRE HYDRANT ASSEMBLY – ITEM 11

- A. Payment for installing hydrant, restraint system, and other items as shown on the Typical Detail shall be made at the Contract Unit Price for each fire hydrant assembly in place.
- B. Payment shall also be compensation for tee, valve, pipe between main and hydrant, sleeves, other fittings, concrete kickers or mechanical restraints. Payment shall include compensation for all necessary labor, materials, and equipment required for a complete, functional installation.
- C. Additional fire hydrants (other than those shown on the plans) may be field located by the Owner's representative and shall be paid for at the Contract Unit Price.

VIII. CONNECTION TO EXISTING AND NEW LINES – ITEM 12

- A. Payment for Connections to Existing and New Lines shall be made at the Contract Unit Price per connection. The work includes, but is not limited to:
 - a. Furnishing and installing tapping saddles or stainless steel solid sleeves, as required.
 - b. Tapping the main or cutting in tees, removing existing fittings to facilitate connections as required or, as shown on the plans.
- B. Payment shall include all labor, materials, and equipment required for a complete, functional installation.

IX. CONNECTION TO EXISTING METER – ITEM 13

- A. Payment for making connections to existing water meters, where shown on the plans, will be made at the Contract Lump Sum Price for each complete connection. Payment shall include compensation for all necessary materials, labor, and equipment for a complete and serviceable installation.
- B. Materials shall include, but not be limited to, valves, fittings, pipe, any sleeves or couplings required, and any other required materials.

- C. No additional payment shall be made for items incidental with tie-ins, which are not specifically shown on the drawings.
- D. Payment shall also include testing, disinfection, backfill, and cleanup.

X. SITE FENCING – ITEM 14

- A. Site Fencing and appurtenances shall be measured as a unit constructed (Lump Sum Payment) and accepted including all work specified herein and as shown on the Plans to be within the limits of the Contract. This work shall include the following major components:
 - a. Fencing, posts, barbed wire, tension wires, bracing, and other appurtenances.
 - b. New double leaf chain link gate, gate keepers, truss rods, braces, post rests, and other appurtenances.
 - c. Excavation, backfill, and concrete for post installation.
 - d. Any necessary supporting work for the above.
- B. All other items relative to fencing installation to form a complete, functional fencing system.

XI. EROSION AND SEDIMENT CONTROL – ITEM 15

- A. Payment for Erosion and Sediment Control shall be made at the Contract Lump Sum Price for the erosion control system as shown on the drawings and/or, as required to prevent erosion and sediment transport to the adjacent properties and downstream drainage-ways. This work shall include the following major components:
 - a. All labor, material, and equipment required to install and maintain a functional erosion and sediment control system as detailed and/or dimensioned on the Plans. The final location of erosion control devices shall be as agreed upon by the Owner's representative and the contractor in the field.
 - b. Based on field conditions and the Contractor's operations, additional measures, other than those shown on the drawings, may be required to control erosion in the project area. No additional payment shall be made for additional measures required to prevent sediments from leaving the work area.
 - c. Removal of all erosion and sediment control devices after the disturbed

areas exhibit suitable vegetative cover and, repair of any areas disturbed during removal of the control devices.

XII. CLEANUP AND SEEDING – ITEM 16

- A. Payment for Cleanup and Seeding will be made at the Contract Lump Sum Price and shall include all necessary equipment, labor and materials for the furnishing and installation of topsoil, fertilizer, seed, and mulch in accordance with Section 02485 of the Specifications and the Plans.
- B. Price shall also include cleanup of all areas of the Work and fine grading and seeding all disturbed areas with appropriate seeding types for the areas and seasons as appropriate as the Work progresses. All areas where poor vegetative cover has been noted by April 1st of the year following the initial seeding shall be fine graded and re-seeded at no additional cost to the owner.
- C. Due to the previous land use being for strip mining operations, soil conditioning such as lime addition for pH adjustment will be necessary.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

(Not used)

END OF SECTION

SECTION 01152

APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit Applications for Payment to Engineer in accordance with the schedule established by Conditions of the Contract and Agreement Between Owner and Contractor.

1.02 RELATED REQUIREMENTS

- A. Agreement
- B. ARC Contract General and Supplemental Conditions
- C. Section 01700: Contract Closeout
- D. Funding Agency Requirements

1.03 FORMAT AND DATA REQUIRED

- A. Submit applications typed on the Application for Payment Form included herein, with itemized data typed on 8-1/2" x 11" white paper continuation sheets.
- B. Provide itemized data on continuation sheet:
 - 1. Format, schedules, line items, and values: Those of the Bid Form in a format accepted by Engineer.

1.04 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

- A. Application Form:
 - 1. Fill in required information, including that for Change Orders executed prior to date of submittal of application.
 - 2. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.
 - 3. Execute certification with signature of a responsible officer of contract firm.
- B. Continuation Sheets:
 - 1. Fill in total list of all scheduled component items of Work, with item number and schedule dollar value for each item.
 - 2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored.
 - 3. List each Change Order executed prior to date of submission, at the end of the continuation sheets.
 - a. List by Change Order Number, and description, as for an original component item of work.

1.05 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

- A. When the Owner or the Engineer requires substantiating data, Contractor shall submit suitable information, with a cover letter identifying:
 - 1. Project
 - 2. Application number and date
 - 3. Detailed list of enclosures
 - 4. For stored products:
 - a. Item number and identification as shown on application.
 - b. Description of specific material.
 - c. Copies of invoices for materials stored.
- B. Submit one (1) copy of data and cover letter for each copy of application.

1.06 PREPARATION OF APPLICATION FOR FINAL PAYMENT

- A. Fill in Application Form as specified for progress payments.
- B. Use continuation sheet for presenting the final statement of accounting as specified in Section 01700 - Contract Closeout.

1.07 SUBMITTAL PROCEDURE

- A. Submit Application for Payment to Engineer at the times stipulated in the Agreement.
- B. Number: Five (5) copies of each Application.
- C. When Engineer finds Application properly completed and correct, he will transmit certificate for payment to Owner, with copy to Contractor.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01153
CHANGE ORDER PROCEDURES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Promptly implement change order procedures:
 - 1. Provide full written data required to evaluate changes.
 - 2. Maintain detailed records of work done on a time-and-material/force account basis.
 - 3. Provide full documentation at the Engineer's request.
- B. Designate in writing the member of Contractor's organization:
 - 1. Who is authorized to accept changes in the Work.
 - 2. Who is responsible for informing others in the Contractor's employ of the authorization of changes in the Work.
- C. Owner will designate in writing the person who is authorized to execute Change Orders.

1.02 RELATED REQUIREMENTS

- A. Agreement: The amounts of established unit prices.
- B. Conditions of the Contract:
 - 1. Methods of determining cost or credit to Owner resulting from changes in Work made on a time and materials basis.
 - 2. Contractor's claims for additional costs.
- C. Section 01152: Applications for Payment
- D. Section 01720: Project Record Documents
- E. Funding Agency Requirements

1.03 DEFINITIONS

- A. Change Order: See General Conditions
- B. Engineer's Supplemental Instructions: A written order, instructions, or interpretations, signed by Engineer making minor changes in the Work not involving a change in Contract Sum or Contract Time.

1.04 PRELIMINARY PROCEDURES

- A. Owner or Engineer may initiate changes by submitting a Proposal Request to Contractor. Request will include:
 - 1. Detailed description of the Change, Products, and location of the change in the Project.
 - 2. Supplementary or revised Drawings and Specifications.

3. The projected time span for making the change and a specific statement as to whether overtime work is or is not authorized.
 4. A specific period of time during which the requested price will be considered valid.
 5. Such request is for information only, and is not an instruction to execute the changes, or to stop Work in progress.
- B. Contractor may initiate changes by submitting a written notice to Engineer containing:
1. Description of the proposed changes.
 2. Statement of the reason for making the changes.
 3. Statement of the effect on the Contract Sum and the Contract Time.
 4. Statement of the effect on the work of separate contractors.
 5. Documentation supporting any change in Contract Sum or Contract Time, as appropriate.

1.05 DOCUMENTATION OF PROPOSALS AND CLAIMS

- A. Support each quotation for a lump-sum proposal, and for each unit price which has not previously been established, with sufficient substantiating data to allow Engineer to evaluate the quotation.
- B. On request, provide additional data to support time and cost computations:
1. Labor required.
 2. Equipment required.
 3. Products required.
 - a. Recommended source of purchase and unit cost.
 - b. Quantities required.
 4. Taxes, insurance, and bonds.
 5. Credit for work deleted from contract, similarly documented.
 6. Overhead and profit.
 7. Justification for any change in Contract Time.
- C. Support each claim for additional costs, and for work done on a time-and-material/force account basis, with documentation as required for a lump-sum proposal, plus additional information:
1. Name of the Owner's authorized agent who ordered the work, and date of the order.
 2. Dates and times work was performed, and by whom.
 3. Time record, summary of hours worked, and hourly rates paid.
 4. Receipts and invoices for:
 - a. Equipment used, listing dates, and times of use.
 - b. Products used, listing of quantities.
 - c. Subcontracts.

1.06 PREPARATION OF CHANGE ORDERS

- A. Engineer will prepare each Change Order.

- B. Form: Contract Change Order Form included herein.
- C. Change Order will describe changes in the Work, both additions and deletions, with attachments of revised Contract Documents to define details of the change.
- D. Change Order will provide an accounting of the adjustment in the Contract Sum and in the Contract Time.

1.07 LUMP-SUM/FIXED PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
 - 1. Engineer's Proposal Request and Contractor's responsive Proposal as mutually agreed between Owner and Contractor.
 - 2. Contractor's Proposal for a change, as recommended by Engineer.
- B. Owner and Engineer will sign and date the Change Order as authorization for the contractor to proceed with the changes.
- C. Contractor may sign and date the Change Order to indicate agreement with the terms therein.

1.08 UNIT PRICE CHANGE ORDER

- A. Content of Change Orders will be based on, either:
 - 1. Engineer's definition of the scope of the required changes.
 - 2. Contractor's Proposal for a change, as recommended by Engineer.
 - 3. Survey of completed work.
- B. The amounts of the unit prices to be:
 - 1. Those stated in the Agreement.
 - 2. Those mutually agreed upon between Owner and Contractor.
- C. When quantities of each of the items affected by the Change Order can be determined prior to start of the work:
 - 1. Owner and Engineer will sign and date the Change Order as authorization for Contractor to proceed with the changes.
 - 2. Contractor may sign and date the Change Order to indicate agreement with the terms therein.
- D. When quantities of the items cannot be determined prior to start of the work:
 - 1. Engineer or Owner will issue a construction change authorization directing Contractor to proceed with the change on the basis of unit prices, and will cite the applicable unit price.
 - 2. At completion of the change, Engineer will determine the cost of such work based on the unit prices and quantities used:
 - a. Contractor shall submit documentation to establish the number of units of each time and any claims for a change in Contract Time.
 - 3. Engineer will sign and date the Change Order to indicate their agreement with the terms therein.
 - 4. Order to indicate their agreement with the terms therein.

1.09 CORRELATION WITH CONTRACTOR'S SUBMITTALS

- A. Periodically revise Request for Payment forms to record each change as a separate item of Work and to record the adjusted Contract Sum.
- B. Periodically revise the Construction Schedule to reflect each change in Contract Time.
- C. Upon completion of work under a Change Order, enter pertinent changes in Record Documents.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Within twenty (20) days after the delivery of the executed Agreement and prior to commencing work on the project, the Contractor shall meet with the Engineer and the Owner for a Pre-construction Conference. The Engineer shall designate the time and place.
- B. As they see fit, the Engineer may periodically request that the Contractor meet with the Owner and the Engineer to discuss the progress of the Work. The Contractor shall attend such meetings. Meetings will typically be scheduled on a monthly basis.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract
- B. Section 00620: Notice of Award
- C. Section 01310: Construction Schedules

1.03 RECORD OF DISCUSSION

- A. The Engineer shall prepare a written record of the discussions conducted during such meetings and shall distribute a copy to each party in attendance or affected by the discussions.
- B. Any party whose understanding of a discussion or action differs from that presented by the Engineer in the written record shall promptly notify the Engineer of the difference.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01310
CONSTRUCTION SCHEDULES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Within ten (10) days after delivery of the Notice to Proceed, prepare and submit to Engineer estimated construction progress schedules for the Work, with sub-schedules of related activities which are essential to its progress.
- B. Submit revised progress schedules periodically.

1.02 RELATED REQUIREMENTS

- A. ARC Contract General and Supplemental Conditions
- B. Section 01010: Summary of Work
- C. Section 01200: Project Meetings
- D. Section 01340: Shop Drawings, Product Data, and Samples

1.03 FORM OF SCHEDULES

- A. Prepare schedules in the form of a horizontal bar chart.
 - 1. Provide separate horizontal bar for each trade or operation.
 - 2. Horizontal time scale: identify the first workday of each week.
 - 3. Scale and spacing: to allow space for notations and future revision.
 - 4. Minimum sheet size: 8-1/2" x 11".
- B. Format of listings: the chronological order of the start of each item of work.
- C. Identification of listings: by major specification section numbers.

1.04 CONTENT OF SCHEDULES

- A. Construction Progress Schedule:
 - 1. Show the complete sequence of construction by activity.
 - 2. Show the dates for the beginning and completion of each major element of construction. Where applicable, specifically list:
 - a. Mobilization
 - b. Site clearing
 - c. Pipeline Installation
 - d. Disinfection, Flushing, Testing
 - f. Restoration and Cleanup/Seeding
 - g. Substantial and Final Completion
 - 3. Show projected percentage of completion for each item, as of the first day of each month.
- B. Submittals Schedule for Shop Drawings, Product Data Samples. Show:
 - 1. the dates for Contractor's submittals, and
 - 2. the dates approved submittals will be required from the Engineer. Allow a

minimum of three (3) weeks.

- C. Prepare and submit subschedules for each separate stage of work specified in Section 01010.
- D. Provide subschedules to define critical portions of prime schedules.

1.05 PROGRESS REVISIONS

- A. Indicate progress of each activity to date of submission.
- B. Show changes occurring since previous submission of schedule:
 - 1. Major changes in scope.
 - 2. Activities modified since previous submission.
 - 3. Revised projections of progress and completion.
 - 4. Other identifiable changes.
- C. Provide a narrative report as needed to define:
 - 1. Problem areas, anticipated delays, and the impact on the schedule.
 - 2. Corrective action recommended, and its effect.
 - 3. The effect of changes on schedules of other prime contractors.

1.06 SUBMISSIONS

- A. Submit initial schedules within ten (10) days after Notice to Proceed.
 - 1. Engineer will review schedules and return review copy within fourteen (14) days after receipt.
 - 2. If required, resubmit within seven (7) days after return of review copy.
- B. Submit revised progress schedules with each application for payment.
- C. Submit the number of opaque reproductions which the contractor requires, plus three (3) copies which the Engineer will retain.

1.07 DISTRIBUTION

- A. Distribute copies of the reviewed schedules to:
 - 1. Job site files.
 - 2. Subcontractors
 - 3. Other concerned parties.
- B. Instruct recipients to report promptly to the contractor, in writing, any problems anticipated by the projections shown in the schedules.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit Shop Drawings, Product Data, and Samples required by Contract Documents.

1.02 RELATED REQUIREMENTS

- A. ARC Contract General and Supplemental Conditions
- B. Section 01310: Construction Schedules
- C. Section 01720: Project Record Documents
- D. Designate in the construction schedule, or in a separate coordinated schedule, the dates for submission and the dates that reviewed Shop Drawings, Product Data, and Samples will be needed.

1.03 SHOP DRAWINGS

- A. Drawings shall be presented in a clear and thorough manner.
 - 1. Details shall be identified by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.
- B. Minimum Sheet size: 8-1/2" x 11"

1.04 PRODUCT DATA

- A. Preparation:
 - 1. Clearly mark each copy to identify pertinent products or models.
 - 2. Show performance characteristics and capacities.
 - 3. Show dimensions and clearances required.
 - 4. Show wiring or piping diagrams and controls.
- B. Manufacturer's standard schematic drawings and diagrams:
 - 1. Modify drawings and diagrams to delete information that is not applicable to the work.
 - 2. Supplement standard information to provide information specifically applicable to the Work.

1.05 SAMPLES

- A. Office samples shall be of sufficient size and quantity to clearly illustrate:
 - 1. Functional characteristics of the product, with integrally related parts and attachment devices.
 - 2. Full range of color, texture, and pattern.

1.06 CONTRACTOR RESPONSIBILITIES

- A. Review Shop Drawings, Product Data, and Samples prior to submission.
- B. Determine and verify:
 - 1. Field measurements,
 - 2. Field construction criteria,
 - 3. Catalog numbers and similar data, and
 - 4. Conformance with specifications.
- C. Coordinate each submittal with requirements of the Work and of the Contract Documents.
- D. Notify the Engineer in writing, at time of submission, of any deviations in the submittals from requirements of the Contract Documents.
- E. Begin no fabrication or work which requires submittals until return of submittals with Engineer approval.

1.07 SUBMISSION REQUIREMENTS

- A. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the work, or in the work of any other contractor.
- B. Number of submittals required:
 - 1. Shop Drawings: Submit the number of opaque reproductions which the contractor requires, plus four (4) copies which will be retained by the Engineer. **Submittal of shop drawings and other submittals in color .pdf format is acceptable and is the preferred submittal method.**
 - 2. Product Data: Submit the number of copies which the Contractor requires, plus four (4) which will be retained by the Engineer.
 - 3. Samples: Submit the number stated in each specification section.
- C. Submittals shall contain:
 - 1. The date of submission and the dates of any previous submissions.
 - 2. The project title and number.
 - 3. Contract identification.
 - 4. The names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
 - 5. Identification of the project, with the specification section number.
 - 6. Field dimensions, clearly identified as such.
 - 7. Relation to adjacent or critical features of Work or materials.
 - 8. Applicable standards, such as ASTM or Federal Specification numbers.
 - 9. Identification of deviations from Contract Documents.
 - 10. Identification of revisions on resubmittals.
 - 11. An 8" x 3" blank space for Contractor and Engineer stamps.
 - 12. Contractor's stamp, initialed or signed, certifying to review of submittal,

verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work.

1.08 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in the submittals required by the Engineer and resubmit until approved.
- B. Shop Drawings and Product Data:
 - 1. Revise initial drawings or data, and resubmit as specified for the initial submittal.
 - 2. Indicate any changes which have been made other than those requested by the Engineer.
- C. Samples: Submit new samples as required for initial submittal.

1.09 DISTRIBUTION

- A. Distribute reproductions of Shop Drawings and copies of Product Data which carry the Engineer stamp of approval to:
 - 1. Job site file
 - 2. Record documents file
 - 3. Other affected contractors
 - 4. Subcontractors
 - 5. Supplier or fabricator
- B. Distribute samples which carry the Engineer stamp of approval as directed by Engineer.

1.10 ENGINEER DUTIES

- A. Review submittals with reasonable promptness and in accordance with schedule.
- B. Affix stamp and initials or signature, and indicate requirements for resubmittal, or approval of submittal.
- C. Return submittals to Contractor for distribution, or for resubmission.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01370

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Submit to the Engineer a Schedule of Values allocated to the various portions of the Work, within ten (10) days after award of contract, for lump sum contracts only.
- B. Upon request of Engineer, support the values with data which will substantiate their correctness.
- C. The Schedule of Values, unless objected to by the Engineer, shall be used only as the basis for the Contractor's Applications for Payment for lump sum contracts only.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract
- B. Section 01152: Applications for Payment

1.03 FORM AND CONTENT OF SCHEDULE OF VALUES

- A. Type schedule on 8-1/2" x 11" white paper; Contractor's standard forms and automated printout will be considered for approval by Engineer upon Contractor's request. **Submittal in color .pdf format is preferred.** Identify schedule with:
 - 1. Title of Project and location
 - 2. Engineer and project number
 - 3. Name and address of Contractor
 - 4. Contract designation
 - 5. Date of submission
- B. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Follow the table of contents of this Project Manual as the format for listing component items.
 - 1. Identify each line item with the number and title of the respective major section of the specification.
- D. For each major line item, list sub-values of major products or operations under the item.
- E. For the various portions of the Work:
 - 1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.

2. For items on which progress payments will be requested for stored material, break down the value into:
 - a. The cost of the materials delivered and unloaded, with taxes paid.
 - b. The total installed value.

1.04 SUBSCHEDULE OF UNIT MATERIAL VALUES

- A. Submit a subschedule of unit costs and quantities for:
 1. Products on which progress payment will be requested for stored products.
- B. The form of submittal shall parallel that of the Schedule of Values, with each item identified the same as the line item in Schedule of Values.
- C. The unit quantity of bulk materials shall include an allowance for normal waste.
- D. The unit values for the materials shall be broken down into:
 1. Cost of the material, delivered and unloaded at the site, with taxes paid.
 2. Installation costs, including Contractor's overhead and profit.
- E. The installed unit value multiplied by the quantity listed shall equal the cost of that item in the Schedule of Values.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 LABORATORY SERVICES

- A. Owner will employ and pay for services of an Independent Testing Laboratory, acceptable to the Engineer, to perform specified services. See respective specification sections for required services.
- B. Inspection, Sampling, and Testing are required for:
 - 1. Concrete mixing and placing.
 - 2. Steel erection.
 - 3. Site grading and foundation excavation.
 - 4. Other areas as specified elsewhere.

1.02 QUALIFICATION OF LABORATORIES

- A. Meet "Recommended Requirements for Independent Laboratory Qualifications", edition which is current when Agreement is signed by Owner and Contractor, published by American Council of Independent Laboratories.
- B. Meet basic requirements of ASTM E329-77 "Standards for Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction."
- C. Be licensed to operate in the State of the project.
- D. Have properly calibrated equipment, calibrated within the past twelve (12) months by devices of accuracy traceable to either:
 - 1. National Bureau of Standards.
 - 2. Accepted values of natural physical constants.

1.03 LABORATORY DUTIES

- A. Cooperate with Engineer and Contractor and provide qualified personnel promptly on notice.
- B. Perform specified inspections, sampling and testing of materials, and methods of construction.
- C. Comply with specified standards, ASTM, other recognized authorities, and as specified.
- D. Ascertain compliance with requirements of Contract Documents.
- E. Promptly notify Engineer and Contractor of irregularities or deficiencies in Work which are observed during performance of duties.
- F. Promptly submit three (3) copies of reports of inspections and tests to Engineer, and submit two (2) copies of those reports to Contractor at the project site, including:
 - 1. Date issued.

2. Project title, number, and location.
3. Testing laboratory name and address.
4. Name and signature of inspector.
5. Date of inspection and sampling.
6. Date of test.
7. Identification of product and specifications section.
8. Type of inspection or test.
9. Observations regarding compliance with Contract Documents.

1.04 LIMITATIONS OF AUTHORITY

- A. Laboratory is not authorized to:
 1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
 2. Approve or accept any portion of Work.
 3. Perform any duties of the Contractor.

1.05 CONTRACTOR'S RESPONSIBILITIES

- A. Cooperate with Laboratory personnel and provide access to Work.
- B. Provide the Laboratory representative samples of materials to be tested, in required quantities.
- C. Furnish copies of mill test reports.
- D. Furnish casual labor and facilities:
 1. To provide access to Work to be tested.
 2. To obtain and handle samples at the site.
 3. To facilitate inspections and tests.
 4. For Laboratory's exclusive use for storage and curing of test samples.
- E. Notify Laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests.
- F. Pay Laboratory travel and labor costs when Laboratory is notified that Work to be sampled will be in progress, and Laboratory personnel come to the site to perform their duties and that phase of the Work is not performed within a reasonable time.
- G. Pay for additional tests when initial tests indicate Work does not comply with Contract Documents.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01510
TEMPORARY UTILITIES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish, install, and maintain temporary utilities required for construction; remove on completion of Work.

1.02 RELATED REQUIREMENTS

- A. Section 01010: Summary of Work
- B. Section 01590: Field Offices and Sheds

1.03 REQUIREMENTS OF REGULATORY AGENCIES

- A. Comply with Federal, State, and local codes and regulations, and with utility company requirements.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Materials may be new or used but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate the requirements of applicable codes and standards.

2.02 TEMPORARY ELECTRICITY AND LIGHTING

- A. Arrange with utility company, provide service required for power and lighting, and pay all costs for service and for power used.
- B. Install circuit and branch wiring, with area distribution boxes located so that power and lighting is available throughout the construction by the use of construction-type power cords.
- C. Provide adequate artificial lighting for all areas of work when natural light is not adequate for work and for areas accessible to the public.

2.03 TEMPORARY HEAT AND VENTILATION

- A. Provide temporary heat and ventilation as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for the installation of materials, and to protect materials and finishes from damage due to temperature or humidity.
- B. Provide adequate forced ventilation of enclosed areas for curing of installed material, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
- C. Portable heaters shall be standard approved units complete with controls.

- D. Pay all costs of installation, maintenance, operation and removal, and for fuel consumed.

2.04 TEMPORARY TELEPHONE SERVICE

- A. Arrange with local telephone service company, provide direct line telephone service at the construction site for the use of personnel and employees. Service required:
 - 1. One direct line instrument in field office.
 - 2. Other instruments at the option of the Contractor, or as required by regulations.
- B. Pay all costs for installation, maintenance and removal, and service charges for local calls. Toll charges shall be paid by the party who places the call.

2.05 TEMPORARY WATER

- A. Arrange with utility service company, provide water for construction purposes; pay all costs for installation, maintenance and removal, and service charges for water used.
- B. Install branch piping with taps located so that water is available throughout the construction by the use of hoses. Protect piping and fittings against freezing.

2.06 TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities in compliance with laws and regulations.
- B. Service, clean, and maintain facilities and enclosures.
- C. Existing facilities may be used during the construction period.

PART 3 - EXECUTION

3.01 GENERAL

- A. Maintain and operate systems to assure continuous service.
- B. Modify and extend systems as work progress requires.

3.02 REMOVAL

- A. Completely remove temporary materials and equipment when their use is no longer required.
- B. Clean and repair damage caused by temporary installations or use of temporary facilities.
- C. Restore existing facilities, if any, used for temporary services, to specified or original condition.
- D. Restore permanent facilities, if any, used for temporary services to the specified condition.
 - 1. Prior to final inspection, remove temporary lamps and install new lamps.

END OF SECTION

SECTION 01520

CONSTRUCTION AIDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish, install, and maintain required construction aids, remove on completion of Work.

1.02 RELATED REQUIREMENTS

- A. Section 01010: Summary of Work

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Materials may be new or used, suitable for the intended purpose, but must not violate the requirements of applicable codes and standards.

2.02 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required by personnel and to facilitate execution of the Work, scaffolds, staging, ladders, stairs, ramps, runway, platforms, railings, hoists, cranes, chutes, and other such facilities and equipment.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Consult with Engineer, review site conditions and factors which affect construction procedures and construction aids, including adjacent properties and public facilities which may be affected by execution of Work.

3.02 GENERAL

- A. Comply with applicable requirements specified in sections of Divisions 2-16.
- B. Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements of Owner and other contractors employed at the site.

3.03 REMOVAL

- A. Completely remove temporary materials, equipment, and services:

1. When construction needs can be met by the use of permanent construction.
 2. At completion of Project.
- B. Clean and repair damage caused by installation or by use of temporary facilities.
1. Remove foundations and underground installations for construction aids.
 2. Grade areas of site affected by temporary installations to required elevations and slopes and clean the area.
- C. Restore existing facilities used for temporary purposes to the specified or to original condition.
- D. Restore permanent facilities, if any, used for temporary purposes to the specified condition.

END OF SECTION

SECTION 01530

BARRIERS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish, install, and maintain suitable barriers as required to prevent public entry, and to protect the Work, existing facilities, trees, and plants from construction operations; remove them when no longer needed, or at completion of the Work.

1.02 RELATED REQUIREMENTS

- A. Section 01010: Summary of Work
- B. Section 01520: Construction Aids

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

- A. Materials may be new or used, suitable for the intended purpose, but must not violate the requirements of applicable codes and standards.

2.02 FENCING

- A. Materials to Contractor's option, minimum fence height six (6') feet.

2.03 BARRIERS

- A. Materials to Contractor's option, as appropriate to serve required purpose.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install facilities of a neat and reasonably uniform appearance, structurally adequate for required purposes.
- B. Maintain barriers during entire construction period.
- C. Relocate barriers as required by progress of construction.

3.02 FENCES

- A. Prior to start of work at the Project site, install enclosure fence with suitably locked entrance gates for storage yard(s).

3.03 TREE AND PLANT PROTECTION

- A. Preserve and protect existing trees and plants at the site which are designated to remain, and those adjacent to site.
- B. Consult with Engineer and remove agreed-on roots and branches which interfere with construction.

1. Employ qualified tree surgeon to remove and to treat cuts.
- C. Provide temporary barriers to a height of six (6') feet, around each, or around each group of trees and plants.
- D. Protect root zones of trees and plants:
 1. Do not allow vehicular traffic or parking.
 2. Do not store materials or products.
 3. Prevent dumping refuse or chemically injurious materials or liquids.
 4. Prevent puddling or continuous running water.
- E. Carefully supervise excavating, grading, filling, and subsequent construction operations to prevent damage.
- F. Replace, or suitably repair, trees, and plants designated to remain which are damaged or destroyed due to construction operations.

3.04 REMOVAL

- A. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed and when approved by the Engineer.
- B. Clean and repair damage caused by installation, fill and grade areas of the site to required elevations and slopes, and clean the area.

END OF SECTION

SECTION 01540

SECURITY

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide a Project security program, to:
 - 1. Protect Work stored products and construction equipment from theft and vandalism.
 - 2. Protect premises from entry by unauthorized persons.
- B. Comply with local security requirements.

1.02 RELATED REQUIREMENTS

- A. Section 01510: Temporary Utilities
- B. Section 01530: Barriers

1.03 MAINTENANCE OF SECURITY

- A. Initiate security program in compliance with Owner's system, prior to job mobilization.
- B. Maintain security program throughout construction period, until Owner occupancy or Owner acceptance precludes the need for Contractor security.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01560
TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide and maintain methods, equipment, and temporary construction, as necessary to provide controls over environmental conditions at the construction site and related areas under Contractor's control; remove physical evidence of temporary facilities at completion of work.

1.02 RELATED REQUIREMENTS

- A. Section 01510: Temporary Utilities
- B. Section 01570: Traffic Regulations
- C. Section 01710: Cleaning
- D. Erosion and Sediment Control

1.03 DUST CONTROL

- A. Provide positive methods and apply dust control materials to minimize raising dust from construction operation and provide positive means to prevent airborne dust from dispersing into the atmosphere.

1.04 WATER CONTROL

- A. Provide methods to control surface water to prevent damage to the Project, the site, or adjoining properties.
 - 1. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff.
- B. Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface and groundwater.
- C. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site, or to adjoining areas.

1.05 DEBRIS CONTROL

- A. Maintain all areas under contractor's control free of extraneous debris.
- B. Initiate and maintain a specific program to prevent accumulation of debris at the construction site, storage and parking areas, or along access roads and haul routes.
 - 1. Provide containers for the deposit of debris as specified in Section 01710 - Cleaning.

2. Prohibit overloading of trucks to prevent spillages on access and haul routes.
 - a. Provide periodic inspection of traffic areas to enforce requirements.
- C. Schedule periodic collection and disposal of debris as specified in Section 01710 - Cleaning.

1.06 POLLUTION CONTROL

- A. Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere by discharge of noxious substances from construction operations.
- B. Provide equipment and personnel, perform emergency measures required to contain any spillage, and to remove contaminated soil or liquids.
 1. Excavate and dispose of any contaminated earth off-site and replace with suitable compacted fill and topsoil.
- C. Take special measures to prevent harmful substances from entering public waters.
 1. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.
- D. Provide systems for control of atmospheric pollutants.
 1. Prevent toxic concentrations of chemicals.
 2. Prevent harmful dispersal of pollutants into the atmosphere.

1.07 EROSION CONTROL

- A. Plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
 1. Hold the areas of bare soil exposed at one time to a minimum.
 2. Provide temporary control measures such as berms, dikes, drains, silt fences, check dams, filters, etc.
- B. Construct fills and waste areas by selective placement to eliminate surface silts or clays which will erode.
- C. Periodically inspect earthwork to detect any evidence of the start of erosion, apply corrective measures as required to control erosion.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01570

TRAFFIC REGULATIONS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Provide, operate, and maintain equipment, services, and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow on haul routes, at site entrances, on-site access roads, and parking areas.
- B. Remove temporary equipment and facilities when no longer required, restore grounds to original, or to specified conditions.
- C. Provide Traffic Control Plan and submit to appropriate agency for review and approval where road or lane closures are necessary.

1.02 RELATED REQUIREMENTS

- A. Section 01530: Barriers
- B. Section 01560: Temporary Controls

1.03 TRAFFIC SIGNALS AND SIGNS

- A. Provide and operate traffic control and directional signals required to direct and maintain an orderly flow of traffic in all areas under Contractor's control or affected by Contractor's operations in accordance with the Manual on Uniform Traffic Control Devices, and in accordance with local requirements.
- B. Provide traffic control, directional signs, and warning signs mounted on barricades or standard posts:
 - 1. At each change of direction of a roadway and at each crossroads.
 - 2. At detours.
 - 3. At parking areas.
 - 4. Well in advance of the work area toward oncoming traffic.

1.04 FLAGMEN

- A. Provide qualified and suitably equipped flagmen when construction operations encroach on traffic lanes, as required for regulation of traffic.

1.05 FLARES AND LIGHTS

- A. Provide flares and lights during periods of low visibility:
 - 1. To clearly delineate traffic lanes and to guide traffic.
 - 2. For use by flagmen in directing traffic.
- B. Provide illumination of critical traffic and parking areas.

1.06 CONSTRUCTION PARKING CONTROL

- A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations.
- B. Monitor parking of construction personnel's private vehicles.
 - 1. Maintain free vehicular access to and through parking areas.
 - 2. Prohibit parking on or adjacent to access roads, or in non-designated areas.

1.07 HAUL ROUTES

- A. Consult with governing authorities and establish public thoroughfares which will be used as haul routes and site access.
- B. Confine construction traffic to designated haul routes.
- C. Provide traffic control at critical areas of haul routes to expedite traffic flow to minimize interference with normal public traffic.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01590

FIELD OFFICES AND SHEDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Furnish, install, and maintain temporary field offices during entire construction period (contractor option).
- B. Furnish, install, and maintain storage and work sheds needed for construction.
- C. At completion of work, remove field offices, sheds, and contents.
- D. Should the Contractor elect not to place a field office on-site, a rain gauge and thermometer must be on-site for daily measurements.

1.02 RELATED REQUIREMENTS

- A. Section 01010: Summary of Work
- B. Section 01510: Temporary Utilities

1.03 OTHER REQUIREMENTS

- A. Prior to installation of offices and sheds, consult with Engineer on location, access, and related facilities.

1.04 REQUIREMENTS FOR FACILITIES

- A. Construction:
 - 1. Structurally sound, weathertight, with floors raised above ground.
 - 2. Temperature transmission resistance: compatible with occupancy and storage requirements.
 - 3. At the Contractor's option, portable or mobile buildings may be used.
 - a. Mobile homes, when used, shall be modified for office use.
 - b. Do not use mobile homes for living quarters.
- B. Offices and Facilities
 - 1. Size: As required for general use and to provide space for project meetings.
 - 2. Lighting and temperature control: Sufficient to maintain a comfortable, functional office.
 - 3. Telephone: One (1) direct line instrument.
 - 4. Furnishings in Meeting Area:
 - a. Table and Chairs for at least eight (8) people.
 - b. Racks and files for Project Record Documents in or adjacent to the meeting areas.
 - 5. Other furnishings: Contractor's option.
 - 6. One (1), ten (10") inch (250 mm) outdoor-type thermometer.

7. One (1) rain gauge.
- C. Storage Sheds:
1. To requirements of various trades.
 2. Dimensions: Adequate for storage and handling of products stored.
 3. Ventilation: Comply with specified and code requirements for products stored.
 4. Heating: Adequate to maintain temperatures specified in respective sections for the products stored.

PART 2 - PRODUCTS

2.01 MATERIALS, EQUIPMENT FURNISHINGS

- A. May be new or used, but must be serviceable, adequate for acquired purpose, and must not violate applicable codes and regulations.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Fill and grade sites for temporary structures to provide surface drainage.

3.02 INSTALLATION

- A. Construct temporary field offices and storage sheds on proper foundations, provide connections for utility services.
1. Secure portable or mobile buildings when used.
 2. Provide steps and landings at entrance doors.
- B. Mount thermometer at convenient outside location, not in direct sunlight.
- C. Mount rain gauge at convenient location to accurately measure rainfall.

3.03 MAINTENANCE AND CLEANING

- A. Provide periodic maintenance and cleaning for temporary structures, furnishings, equipment, and services.

3.04 REMOVAL

- A. Remove temporary field offices, contents, and services when no longer needed.
- B. Remove foundations and debris; grade site to required elevations and clean the areas.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Material and equipment incorporated into Work:
 - 1. Conform to applicable specifications and standards.
 - 2. Comply with size, make, type, and quality specified, or as specifically approved in writing by the Engineer.
 - 3. Manufactured and Fabricated Products:
 - a. Design, fabricate, and assemble in accordance with the best engineering and shop practices.
 - b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 - c. Two (2) or more items of the same kind shall be identical, by the same manufacturer.
 - d. Products shall be suitable for service conditions.
 - e. Equipment capacities, sizes, and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
 - 4. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract
- B. Section 01010: Summary of Work
- C. Section 01340: Shop Drawings, Product Data, and Samples
- D. Section 01710: Cleaning

1.03 REUSE OF EXISTING MATERIAL

- A. Except as specifically indicated or specified, materials and equipment removed from the existing structure, if any, shall not be used in the completed work.
- B. For material and equipment specifically indicated or specified to be used in the Work:
 - 1. Use special care in removal, handling, storage, and reinstallation, to assure proper function in the completed Work.
 - 2. Arrange for transportation, storage, and handling of products which require off-site storage, restoration, or renovation. Pay all costs for such work.

1.04 MANUFACTURER'S INSTRUCTIONS

- A. When Contract Documents require that installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two (2) copies to Engineer.

1. Maintain one (1) set of complete instructions at the job site during installation and until completion.
- B. Handle, install, connect, clean, condition, and adjust products in strict accordance with such instructions and in conformity with specified requirements.
 1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.
 2. Do not proceed with work without clear instructions.
- C. Perform work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

1.05 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of Product in accordance with construction schedules, coordinate to avoid conflict with work and conditions at the site.
 1. Deliver Products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 2. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals, and that Products are properly protected and undamaged.
- B. Provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

1.06 STORAGE AND PROTECTION

- A. Store Products in accordance with manufacturer's instructions with seals and labels intact and legible.
 1. Store Products subject to damage by the elements in weathertight enclosures.
 2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
- B. Exterior Storage:
 1. Store fabricated Products above the ground, on blocking or skids, prevent soiling or staining. Cover Products which are subject to deterioration with impervious sheet coverings, provide adequate ventilation to avoid condensation.
 2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
 3. Store in a manner to prevent contamination of products.
- C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored Products to assure that Products are maintained under specified conditions, and free from damage or deterioration.
- D. Protection after Installation:
 1. Provide substantial coverings as necessary to protect installed Products from

damage from traffic and subsequent construction operations. Remove when no longer needed.

1.07 SUBSTITUTIONS AND PRODUCT OPTIONS

- A. Products List:
 - 1. Within ten (10) days after contract Date, submit to Engineer a complete list of major Products proposed to be used, with the name of the manufacturer and the installing subcontractor.

- B. Contractor's Options:
 - 1. For Products specified only by reference standard, select any Product meeting that standard.
 - 2. For Products specified by naming several Products or manufacturers, select any one (1) of the Products or manufacturers named, which complies with the specifications.
 - 3. For Products specified by naming one (1) or more Products or manufacturers and stating "or equal," Contractor must submit a request for substitutions for any Product or manufacturer not specifically named.
 - 4. For Products specified by naming only one (1) Product and manufacturer, there is no option.

- C. Substitutions:
 - 1. Major Equipment Items
 - a. For a period of fourteen (14) days after the Bid opening, Engineer will consider written requests from Contractor for substitutions identified in the major equipment Schedule of the Bid Form.
 - 2. Other Products
 - a. For a period of thirty (30) days after Contract Date, Engineer will consider written requests from Contractor for substitutions on Products.
 - 3. Submit a separate request for each Product, supported with complete data, with drawings and samples as appropriate, including:
 - a. Comparison of qualities of the proposed substitution with that specified.
 - b. Changes required in other elements of the work because of the substitution.
 - c. Effect on the construction schedule.
 - d. Cost data comparing the proposed substitution with the Product specified.
 - e. Any required license fees or royalties.
 - f. Availability of maintenance service, and source of replacement materials.
 - 4. Engineer shall be the judge of the acceptability of the proposed substitution.

- D. Contractor's Representation:

1. The request for a substitution constitutes a representation that contractor:
 - a. Has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified.
 - b. Will provide the same warranties or bonds for the substitution as for the Product specified.
 - c. Will coordinate the installation of an accepted substitution into the work, and make such other changes as may be required to make the work complete in all respects.
 - d. Waives all claims for additional costs, under this responsibility, which may subsequently become apparent.
- E. Engineer will review requests for substitutions with reasonable promptness, and notify Contractor, in writing, of the decision to accept or reject the requested substitution.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

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

1.02 RELATED REQUIREMENTS

- A. Conditions of the contract: Fiscal provisions, legal submittals and additional administrative requirements:
- B. Section 01710: Cleaning
- C. Section 01720: Project Record Documents
- D. The respective sections of Specifications: Closeout Submittals Required of Trades.
- F. Funding Agency Requirements

1.03 SUBSTANTIAL COMPLETION

- A. When Contractor considers the Work is substantially complete, they shall submit to Engineer:
 - 1. A written notice that the Work, or designated portion thereof, is substantially complete.
 - 2. A list of items to be completed or corrected.
- B. Within a reasonable time after receipt of such notice, Engineer will make an inspection to determine the status of completion.
- C. Should Engineer determine that the Work is not substantially complete:
 - 1. Engineer will promptly notify the Contractor in writing, giving the reasons for Work not being substantially complete.
 - 2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Engineer.
 - 3. Engineer will reinspect the Work.
- D. When the Engineer finds that the Work is substantially complete, they will:
 - 1. Prepare and deliver to Owner a tentative Certificate of Substantial Completion of NSPE Form 1910-8-D with a tentative list of items to be completed or corrected before final payment.

2. After consideration of any objections made by the Owner as provided in Conditions of the Contract, and when Engineer considers the Work substantially complete, they will execute and deliver to the Owner and the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected.

1.04 FINAL INSPECTION

- A. When Contractor considers the Work is complete, they shall submit written certification that:
 1. Contract Documents have been reviewed.
 2. Work has been inspected for compliance with Contract Documents.
 3. Work has been completed in accordance with Contract Documents.
 4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
 5. Work is complete and ready for final inspection.
- B. Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should Engineer consider that Work is incomplete or defective:
 1. Engineer will promptly notify the Contractor in writing, listing the incomplete or defective Work.
 2. Contractor shall take immediate steps to remedy the stated deficiencies in the Work and send a second written certification to the Engineer that the Work is complete.
 3. Engineer will reinspect the Work.
- D. When the Engineer finds that the Work is acceptable under the Contract Documents, they shall request the Contractor to make closeout submittals.

1.05 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

- A. Evidence of compliance with requirements of governing authorities and Funding Agency.
- B. Project Record Documents: to requirements of Section 01720
- C. Evidence of Payment and Release of Liens: requirements of General and Supplementary Conditions.
- D. Certificate of Insurance for Products and Completed Operations, as applicable.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to Engineer.
- B. Statement shall reflect all adjustments to the Contract Sum:
 - 1. The original Contract Sum.
 - 2. Additions and deductions resulting from:
 - a. Previous Change Orders
 - b. Allowances
 - c. Unit Prices
 - d. Deductions for uncorrected work
 - e. Penalties and Bonuses
 - f. Deductions for liquidated damages
 - g. Deductions for reinspection payments
 - h. Other adjustments
 - 3. Total Contract Sum, as adjusted
 - 4. Previous payments
 - 5. Sum remaining due
- C. Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.07 FINAL APPLICATION FOR PAYMENT

- A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the conditions of the Contract.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01710

CLEANING

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Execute cleaning, during progress of the Work, and at completion of the Work, as required by General Conditions.

1.02 RELATED REQUIREMENTS

- A. Conditions of the Contract
- B. Section 01560: Temporary Controls
- C. Each Specification Section: Cleaning for specific Products or Work.

1.03 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property, and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by the manufacturer of the surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

- A. Execute periodic cleaning to keep the Work, the site, and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris, resulting from construction operations.
- B. Provide on-site containers for the collection of waste materials, debris, and rubbish.

- C. Remove waste materials, debris, and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.02 DUST CONTROL

- A. Clean interior spaces prior to the start of finished painting and continue cleaning on an as-needed basis until painting is finished.
- B. Schedule operations so that dust and other contaminants resulting from the cleaning process will not fall on wet or newly-coated surfaces.

3.03 FINAL CLEANING

- A. Employ skilled workmen for final cleaning.
- B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.
- C. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- D. Prior to final completion, or Owner occupancy, Contractor shall conduct an inspection of sight-exposed surfaces, and all work areas, to verify that the entire Work is clean.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Maintain at the site for the Owner one (1) record copy of:
 - 1. Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Change Orders and other Modifications to the Contract
 - 5. Engineer Field Orders or written instructions
 - 6. Approved Shop Drawings, Product Data and Samples
 - 7. Field test records

1.02 RELATED REQUIREMENTS

- A. Section 01340: Shop Drawings, Product Data, and Samples

1.03 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Store documents and samples in the Contractor's field office apart from documents used for construction.
 - 1. Provide files and racks for storage of documents.
 - 2. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with CSI/CSC format.
- C. Maintain documents in a clean, dry legible condition and in good order. Do not use record documents for construction purposes.
- D. Make documents and samples available at all times for inspection by Engineer.

1.04 MARKING DEVICES

- A. Provide felt tip marking pens for recording information in the color code designated by Engineer.

1.05 RECORDING

- A. Label each document "PROJECT RECORD" in neat large, printed letters.
- B. Record information concurrently with construction progress.
 - 1. Do not conceal any Work until required information is recorded.
- C. Contractor shall make necessary changes to the drawings (to reflect changes made in the field) in red ink in a legible manner and include the following:
 - 1. Water Line As-builts

- a. Valve Details (tied to permanent landmarks in at least two directions). Acceptable landmarks are catch basins, fire hydrants, manhole lids, head walls and end walls. Power poles are to be utilized only where the above are not within a reasonable distance of the valves.
 - b. Fire Hydrant Locations.
 - c. Water Line Size, Material, and Locations.
 - d. Meter Locations.
 - e. Tied down location of any special items such as tees, bends, reducers, blow-offs, air release valves, ends of casings, etc.
 - f. GPS locations are acceptable for these items. Red-lined drawings with dimensioned locations are required.
2. Booster Stations and Tanks:
- a. All yard piping and valves per 1 above.
 - b. Any alterations to structures or equipment shown on the plans.
 - c. All buried conduits and conductors.

1.06 SUBMITTAL

- A. Prior to submitting the final pay request, deliver Record Documents to Engineer for the Owner.
- B. Accompany submittal with transmittal letter in duplicate, containing:
 1. Date
 2. Project title and number
 3. Contractor's name and address
 4. Title and number of each Record Document
 5. Signature of Contractor or his authorized representative

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 01740

WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds.
- B. Submit to Owner for review.

1.02 RELATED REQUIREMENTS

- A. CDBG Contract General and Supplemental Conditions
- C. Section 00800: Supplementary General Conditions
- D. Section 01700: Contract Closeout.

1.03 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds, and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Number of original signed copies required: Two (2) each.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
 - 1. Product or Work item.
 - 2. Firm, with name of principal, address, and telephone number.
 - 3. Scope.
 - 4. Date of beginning of warranty, bond, or service and maintenance contract.
 - 5. Duration of warranty, bond, or service maintenance contract.
 - 6. Provide information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
 - 7. Contractor, name of responsible principal, address, and telephone number.

1.04 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8-1/2 in. x 11 in., punch sheets for standard 3-ring binder.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES

AND BONDS". List:

- a. Title of Project.
- b. Name of Contractor.

C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.05 SUBMITTALS REQUIRED

A. Submit warranties, bonds, service, and maintenance contracts as specified in respective sections of Specifications.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - EXECUTION

(NOT USED)

END OF SECTION

SECTION 02100

EROSION CONTROL

PART 1 - GENERAL

1.01 RELATED WORK

- A. Section 01050: Field Engineering
- B. Section 02210: Site Grading and Filling
- C. Section 02221: Trenching, Backfilling, and Compacting
- D. Section 02485: Seeding
- E. Section 02713: Water Lines, Valves, and Appurtenances

1.02 JOB CONDITIONS

- A. Excavation, trenching, backfilling, and grading operations to elevations as needed to meet the requirements shown on the Contract Documents, shall be done in such a manner as to cause the least amount of soil erosion and siltation.
- B. Appropriate management practices and control structures shall be in place prior to clearing of vegetation for necessary construction activities near streams, rivers, and lakes.
- C. Provisions required to maintain uninterrupted surface water flow shall be maintained during the work. Storm water flow in existing gutters, surface drains, and swales shall not be interrupted.
- D. The Engineer shall be notified of any unexpected subsurface or other unforeseen conditions. Work shall be discontinued until the Engineer provides notification to resume work.

1.03 PERMITS

- A. All conditions set forth in the Corps of Engineers 404 Permit, Tennessee Valley Authority 26A Permit (if applicable), and the Tennessee Department of Environment and Conservation Notice of Coverage (and Storm Water Pollution Prevention Plan (SWPPP)) shall be strictly adhered to. The Owner shall obtain the appropriate permit.

- B. The Contractor and his/her subcontractors will be required to sign the SWPPP and the Notice of Intent (NOI), thus binding them to the conditions outlined in the SWPPP and the Notice of Cover (NOC). The contractor shall be responsible for all fines and penalties arising from failure to adhere to the SWPPP, NOC, or proper erosion control practices.

PART 2 - PRODUCTS

2.01 PROTECTIVE MATERIALS

- A. Straw Bale Barriers
- B. Silt Fence and Stakes
- C. Sand Bags
- D. Stone Rip Rap
- E. Floating Boom
- F. Burlap
- G. Wattles

PART 3 - EXECUTION

3.01 PREPARATION

- A. Erosion and sediment control shall be in accordance with the Tennessee Water Quality Control Act of 1977, as amended, and the Federal Act P1 92-59.
- B. The Tennessee Department of Conservation Publication, Tennessee Erosion & Sediment Control Handbook, latest revision, shall be used as a guide for construction of projects that require erosion and sediment controls to protect adjoining property and waters of the state.

3.02 PERFORMANCE

- A. Whenever possible, a buffer strip of vegetation cover shall be kept adjacent to grading operations.
- B. Control measures shall be in place and functional before earth-moving operations begin and must be properly constructed and maintained during the construction period.
- C. Staked and entrenched straw bales or silt fence shall be installed along the base of all sloped cuts and fills, on the downhill sides of stockpiled soil, and along stream

banks.

- D. All surface water flowing toward the construction area shall be diverted around the area as much as possible to reduce erosion potential by using beams, channels, and/or sediment traps as necessary.
- E. Maintenance of erosion and sediment control methods shall be performed on a regular basis throughout the construction period and until a good vegetative cover is established over the entire disturbed area.
- F. A vegetation buffer strip shall be maintained between any stream and pipe trenching. Excavated material from the trench shall not be placed between the trench and stream.
- G. Trenches or pits shall be backfilled as soon as practicable to reduce erosion potential.
- H. Erosion control measures shall be removed when they have served their useful purpose. The disturbed soil shall be fine graded, top soiled, and planted with permanent vegetation as soon as the construction sequence allows to prevent further potential erosion and sedimentation. Any seeded areas which are eroded shall be reworked as soon as possible.

END OF SECTION

SECTION 02110
CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 RELATED WORK

- A. Section 01050: Field Engineering
- B. Section 01090: Reference Standards
- C. Section 01410: Testing Laboratory Services
- D. Section 01720: Project Records Documents
- E. Section 02100: Erosion Control
- F. Section 02260: Finish Grading
- G. Geotechnical Report

1.02 JOB CONDITIONS

- A. Clear, grub, remove, and dispose of vegetation, rocks, and debris within the limits of the work except items to remain as designated on the drawings.
- B. Excavate, backfill, compact, and grade the site to the elevations shown on the drawings, as specified herein, and as needed to meet the requirements of the construction shown in the Contract Documents.
- C. Existing utilities, poles, services lines, fences, structures, trees, shrubs, or other improvements encountered during the construction, whether above or below ground, shall be protected by the Contractor. Any item damaged or removed by the Contractor shall be repaired or replaced at the Contractor's expense to at least its original condition and to the satisfaction of the Owner. It shall be the Contractor's responsibility to locate any existing utilities in the path of construction.
- D. Notify the Engineer of any unexpected subsurface conditions. Discontinue work in area until the Engineer provides notification to resume work.

1.03 PROTECTION

- A. Protect living trees not marked for removal and outside the construction area. Treat cut or scarred surfaces of trees or shrubs with paint prepared especially for tree surgery.
- B. Protect benchmarks and existing structures, roads, sidewalks, paving, and curbs against damage from vehicular or foot traffic.
- C. Maintain designated temporary roadways, walkways, and detours for vehicular and pedestrian traffic.

PART 2 - PRODUCTS

(NOT USED)

PART 3 - PRODUCTS

3.01 PREPARATION

- A. Maintain benchmarks, monuments, and other reference points. Re-establish if disturbed or destroyed at no cost to Owner.

3.02 CLEARING AND GRUBBING

- A. Clear rights-of-way, borrow pit, and other stockpile areas of objectionable material to the ground surface except for trees and stumps.
- B. Cut trees and stumps outside the construction area marked for removal by the Engineer to within six (6") inches of the ground surface.
- C. Remove low hanging, unsound, or unsightly branches on trees or shrubs designated to remain.
- D. Grub construction area of protruding obstructions except sound undisturbed stumps and roots six (6") inches or less above the ground which will be a minimum of five (5') feet below subgrade or embankment slope provided undercutting, topsoil stripping, or other corrective measures are not stipulated.
- E. Grub borrow pit and stockpile areas of all objectionable material. Strip overburden over the material to be obtained in stockpile areas.
- F. Perform clearing and grubbing well in advance of construction or material removal activities.

3.03 BACKFILLING AND SURFACE PREPARATION

- A. Backfill and compact all depressions resulting from clearing and grubbing with suitable materials in accordance with Section 02260.
 - 1. Backfill embankment areas to natural ground elevation.
 - 2. Backfill excavation areas below finished subgrade to finish subgrade.
- B. Perform backfilling a satisfactory distance ahead of construction operations.
- C. Prepare areas designated on the drawings to receive erosion control matting to smooth surfaces that have been shaped, fertilized, and seeded.

3.04 DEBRIS REMOVAL

- A. Promptly remove cleared debris from site.
- B. Obtain permission from applicable regulatory authority for disposal of debris to waste disposal site.

3.05 MEASUREMENT AND PAYMENT

- A. Measurement of clearing and grubbing area will not be made.
- B. Payment for clearing and grubbing shown on the drawings or specified herein shall be included in the work with which they are associated.

END OF SECTION

SECTION 02210

SITE GRADING AND FILLING

PART 1 - GENERAL

1.01 RELATED WORK SPECIFIED ELSEWHERE:

- A. Section 01150: Measurement and Payment
- B. Section 01410: Testing Laboratory Services
- C. Section 01710: Cleaning
- D. Section 01720: Project Record Documents
- E. Section 02100: Erosion Control
- F. Section 02221: Trenching, Backfilling, and Compacting
- G. Section 02260: Finish Grading
- H. Section 13415: Multi-Column Elevated Water Storage Tank
- I. Geotechnical Report

1.02 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 - 1. Comply with requirements of the authority having jurisdiction for work done on controlled property.
 - 2. Obtain permits and notices, as required, for removal of walks and drives on controlled property.
- B. Testing Laboratory and Geotechnical Engineer:
 - 1. The Geotechnical Engineer's and Testing Laboratory's fee will be paid for by Owner except when the Geotechnical Engineer or Testing Laboratory personnel are notified by Contractor that work will be in progress, and they come to job site and work is not in progress. In that case, the Contractor shall pay for Geotechnical Engineer's or Testing Laboratory personnel's time and mileage. Contractor shall pay for retesting as specified below.
 - 2. Have earth borrow fill tested and approved by design Testing Laboratory before moving it to the job site.
 - 3. Soils compaction testing of in-place soil and filled and compacted areas will be performed by Testing Laboratory in accordance with ASTM D698-78 Standard Proctor as specified below.

1.03 PROTECTION

- A. Protect excavations and grounds from water ponding and water damage. Construct and maintain temporary drainage. Pump, if required, to keep excavations free of water. Maintain site in well drained condition at all times.
- B. Protect, maintain, and restore benchmarks, monuments, and other reference points affected by this work. If benchmarks, monuments, or other permanent reference points are displaced or destroyed, points shall be re-established and markers reset under supervision of a licensed surveyor who shall furnish Engineer with certification of his work.
- C. Protect Utilities and other construction designated to remain in place.
- D. Protect trees to remain in place.

1.04 LINES AND GRADES

- A. It is imperative that lines and grades established on drawings, except for allowance for installation of fill aggregate, concrete, and topsoil established below, be met when this work is completed.

1.05 SUBMITTALS TO ENGINEER

- A. Submit one (1) copy of permits and notices obtained from authority having jurisdiction before commencing work.
- B. Obtain and submit certification of adequacy of site grading and filling from Testing Laboratory, signed and sealed by a qualified Geotechnical Engineer, stating that work is in accordance with Contract Documents, and that soils are capable of supporting the structure to be constructed under the Contract.
- C. If benchmarks and other permanent reference points are displaced, obtain and submit certification, signed and sealed by a licensed surveyor, of proper re-establishment of benchmarks and reference points.

PART 2 - PRODUCTS

2.01 GRANULAR FILL

- A. Crushed stone conforming to Tennessee D.O.T. Specification 303D, Type A, Grading D or E, Mineral Aggregate Base in accordance with Section 903.05 of the Tennessee Department of Transportation (TDOT) specifications.

2.02 EARTH FILL

- A. Clean earth (free from organic material, cinders, ice and rocks over three (3") inches in their longest dimension) consisting of lean, silty clay having a plasticity index (PI) of less than thirty-five (35). Material should exhibit a standard proctor maximum dry density of at least 90 p.c.f. Optimum moisture content must be below the liquid limit.
- B. On-site earth removed during cutting operations may be used if it meets the above requirements.

2.03 OFF-SITE BORROW

- A. Off-site borrow may be utilized provided the Geotechnical Engineer approves its use.

PART 3 - EXECUTION

3.01 REMOVAL OF OBSTRUCTIONS

- A. Clean out cellars, wells, cisterns, septic tanks and drain fields, cesspools, catch basins, manholes, unsuitable subgrade material, and similar items to solid subgrade and break up masonry and/or concrete bottoms so that no pieces remain which are over twelve (12") inches in their largest dimension. Break out masonry and concrete sides of such construction to a depth of at least two (2') feet below bottoms of footings to be installed as part of this project or subgrade, as applicable.
- B. Stripping operations should extend 10' beyond the structure perimeter.
- C. Fill basements, cellars, walls, and other items enumerated above with specified granular fill and compact to 100 percent Standard Proctor Density.

3.02 DISPOSITION OF ABANDONED UTILITIES

- A. If abandoned underground utility lines and electric conduit are uncovered in the course of grading, then that part uncovered shall be removed and capped off at points of removal as well as at property lines.

3.03 REMOVAL AND STORAGE OF TOPSOIL

- A. Remove topsoil to its entire depth from areas within building lines and for a distance of ten (10') feet beyond, under pavements, or other areas to be excavated, filled, or graded.
- B. Mow grass, weeds and other annual-type growth, and brush close to ground.
- C. Scrape or rake area to remove brush, roots, loose grass, weeds, and rocks before stripping topsoil.
- D. Topsoil to be stored for reuse shall meet requirements established above.

- E. Store topsoil to prevent erosion and mixture with debris and other materials.

3.04 SITE EXCAVATION AND PROOF-ROLLING

- A. After this stripping is done, proof-roll these areas with a heavily loaded rubber-tired tandem axle dump truck. Operate the truck at a normal walking speed so that the Geotechnical Engineer may observe the ground while walking beside the truck.
- B. The Geotechnical Engineer will inspect the areas for soft spots.

3.05 REMEDIAL WORK

- A. During the course of proof-rolling and inspection, as the Geotechnical Engineer finds soft spots, they will direct cutting out of soft spots and backfilling with approved material.

3.06 GENERAL SITEWORK

- A. Before depositing fill material, remove vegetation, organic material, debris and other unsuitable materials. Do not place fill on a subgrade that contains frost, is muddy or frozen.
- B. Fill and grade to attain elevations indicated +/- 0.1' less allowance for placement of aggregate, concrete, walks, drives and parking areas, and topsoil.
- C. Inside of building lines, fill with specified earth fill and allow for placement of granular fill and concrete, unless noted otherwise on the Contract Drawings.
- D. Outside of building, in areas designated to receive topsoil, grade, or fill and compact specified earth, to bring areas to finished grade +/- 0.1' less six (6") inches for placing topsoil.
- E. Where exterior walks are indicated, allow for placement of granular fill and concrete and finish +/- 0.1'.
- F. Where drives are indicated to join the building, allow for placement of aggregated base and asphalt.

3.07 GRADING

- A. Grade to uniform levels and slopes, without abrupt changes. Make transitions from levels to slopes smooth and with large radius cuts.
- B. Finish areas to a reasonably true and even plane at required elevations, less allowances for items specified above.

- C. Along the lines indicating the limits of work, taper finish grade to the existing grade at a slope matching the natural contour. Perform all this work within the limit lines.

3.08 FILLING

- A. Where soft spots are taken out at the direction of the Geotechnical Engineer, backfill with specified earth fill or granular fill. Deposit fill in loose lifts not to exceed six (6") inches and thoroughly compact each lift before placing succeeding lifts.
- B. Within the building lines and for a distance of ten (10') feet outside of building lines, place specified earth fill in loose lifts not to exceed eight (8") inches and thoroughly compact each lift before placing succeeding lifts.
- C. When foundation walls have been constructed to a point above the surface which will contain granular fill, foundation backfilling inside the building has been placed, and utility lines have been placed and backfilled, place granular fill base for concrete slabs. Roll and tamp granular fill to thoroughly compact it. Coordinate this work with concrete trade so that concrete can be placed before rain, if a sand base is used.
- D. Outside of building in areas to be paved or covered by construction, fill as specified above for fill within building lines.
- E. Outside of building in areas where no construction or paving will be placed, place specified earth fill in loose lifts of twelve (12") inches and thoroughly compact.

3.09 COMPACTION DENSITIES

- A. For all compaction, except those areas where there will be no construction or pavement:
 - 1. If earth is used for filling, compact to a minimum density of 98 percent at +/- 2 percent of optimum moisture condition ASTM D698-78 Standard Proctor maximum dry density.
 - 2. If granular fill is utilized, compact to a minimum density of 98 percent at optimum moisture condition ASTM D698-78 Standard Proctor maximum dry density.
- B. For areas where no construction will be placed, compact to a density of 90 percent at optimum moisture condition ASTM D698-78 Standard Proctor.

3.10 COMPACTION TESTING

- A. While filling and compacting operations are in progress, Geotechnical Engineer will make density tests at random depths and at random locations to determine adequacy of compaction. If compaction tests do not meet specified densities, take action to compact to require densities and pay for retesting to prove compaction densities.

3.11 PLACING OF TOPSOIL

- A. Place topsoil in areas disturbed by construction and not covered by paving, buildings and other hard-surfaced materials.
- B. Scarify sub-grade to a depth of three (3") inches and spread topsoil uniformly to bring finished grade to elevations indicated after topsoil has been lightly compacted with roller. Topsoil shall be four (4") to six (6") inches thick.
- C. Level and slope topsoil as indicated so that finished grades are +/- 0.1' elevations indicated.

3.12 CLEAN-UP

- A. After all other work of this section is completed, leave area clean and free of any debris.

END OF SECTION

SECTION 02221

TRENCHING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.01 RELATED WORK

- A. Section 01050: Field Engineering
- B. Section 01150: Measurement and Payment
- C. Section 01530: Barriers
- D. Section 01570: Traffic Regulations
- E. Section 01720: Project Record Documents
- F. Section 02100: Erosion Control
- G. Section 02260: Finish Grading
- H. Section 02485: Seeding
- I. Section 02713: Water Lines, Valves, and Appurtenances

1.02 JOB CONDITIONS

- A. Provide for uninterrupted surface water flow during the work. Provide means whereby storm water can be uninterrupted in existing gutters and surface drains, or temporary drains.
- B. All pipe shall be installed in a dry trench. No extra compensation shall be allowed for trench dewatering.
- C. Immediately notify the Engineer of any unexpected subsurface or other unforeseen conditions. Discontinue work in area until Engineer provides notification to resume work.
- D. Existing utilities, poles, service lines, fences, structures, trees, shrubs, or other improvements encountered during the construction, whether above or below ground, shall be protected by the Contractor. Any item damaged or removed by the Contractor shall be repaired or replaced at the Contractor's expense to at least its original condition and to the satisfaction of the Owner. It shall be the Contractor's responsibility to locate any existing utilities in the path of construction.
- E. Adjacent structures which may be damaged by excavation work shall be underpinned or supported by other means.
- F. Excavations shall be protected by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave in or loose dirt from falling into excavation.

1.03 PERMITS

- A. Permits shall be obtained from authorities having jurisdiction prior to any explosives being brought to the site. The Contractor shall be responsible for providing such insurance that is required to hold the Owner harmless from any claims that may arise due to blasting operations at the site. The minimum insurance requirement will be that which is outlined in the General Conditions.
- B. All conditions set forth in the Corps of Engineers 404 Permit, Tennessee Valley Authority 26A Permit, railroad and right-of-way encroachment permits, and the project Stormwater Pollution Prevention Plan (SWPPP), shall be strictly adhered to. The Owner shall obtain the appropriate permit.

1.04 QUALITY ASSURANCE

- A. Adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for the proper performance of the work in this section shall be used.
- B. Equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner shall be used.

PART 2 - PRODUCTS

2.01 SANITARY SEWERS

- A. BEDDING MATERIAL
 - 1. Angular gravel, crushed gravel, or crushed limestone meeting the following gradation requirements set forth in ASTM 33 shall be used:

<u>SIEVE SIZE</u>	<u>PERCENT PASSING</u>
1"	100
3/4"	90 - 100
1/2"	20 - 55
3/8"	0 - 15
#4	0 - 5

- 2. Shall be used for bedding, haunching, and initial backfill of PVC pipe. (See Detail 1 at end of this section).
 - 3. Shall be used for bedding and haunching of Ductile Iron Pipe.
 - 4. Frozen materials shall not be used.
- B. BACKFILL MATERIALS
 - 1. Material excavated from the trench, free from large stones, clods, debris, or frozen lumps shall be used:
 - a. For final backfill of PVC pipe.
 - b. For initial and final backfill of Ductile Iron Pipe.

- C. CRUSHED STONE BACKFILL MATERIAL: UNDER ROADS OR AREAS TO BE PAVED
 - 1. Shall be used for final backfill for all pipe under roads and in areas indicated as future roads on the drawings.
 - 2. Material shall be approved by the Engineer.

2.02 WATER LINES

- A. BEDDING MATERIALS
 - 1. Angular gravel, crushed gravel, or crushed limestone, meeting the following gradation requirements set forth in ASTM 33:

<u>SIEVE SIZE</u>	<u>PERCENT PASSING</u>
1"	100
3/4"	90 - 100
1/2"	20 - 55
3/8"	0 - 15
#4	0 - 5

- 2. Material excavated from the trench, free from large stones (any dimension greater than one (1") inch). Clods, debris, or frozen lumps may not be used.
 - 3. Frozen materials shall not be used.
- B. CRUSHED STONE MATERIAL SHALL BE USED AS FOLLOWS:
 - 1. On road crossings, and in other areas where the pipe is installed within the roadway, where open cut installation is made, crushed stone shall be used for bedding, haunching, and backfill.
 - 2. In areas where rock excavation is required for installation of pipe, crushed stone shall be used for bedding, haunching, and initial backfill.
 - 3. In other areas as directed by the Owner or Engineer and not otherwise required by the Contract Documents, crushed stone shall be replaced at a cost per ton previously agreed by the Owner and Contractor. The quantity of excavation work anticipated to be replaced with crushed stone shall be mutually agreed to by the Contractor and the Engineer before excavation.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Line and grade for trench shall be established.
- B. Location of all underground utilities, existing and proposed shall be determined.
- C. Location of existing sewer laterals, manholes and service connections shall be located prior to commencement of trenching.
- D. Location of existing water services, meters, and appurtenances shall be located prior to commencement of trenching.

3.02 PERFORMANCE

- A. All earthwork and trenching operations shall comply with the requirements of OSHA Construction Standards for the construction industry (29 CFR part 1926).
- B. Unless otherwise shown on the drawings or required by the specifications or authorized by the Engineer, all work shall be done in open, vertical trenches. Any sheeting driven below the level of the top of the pipe shall not be disturbed or removed. The responsibility for assessing the need for sheeting and analyzing the stresses induced shall be the total responsibility of the Contractor.
 - 1. Trench sheeting left in place shall be backfilled to a level of twelve (12") inches above the top of the pipe. It shall then be cut off and the upper portion removed.
 - 2. Sheeting for structures shall be left in place until backfill has been brought to a level of twelve (12") inches above the top of the bottom footing. It shall then be cut off and removed.
- C. Clearing, including removal of surfacing and pavement, shall be done as necessary to carry on the construction in the proper manner. Material shall be removed only to the minimum width necessary to allow adequate construction area. Concrete and asphalt shall be saw cut.
- D. Trenches shall be excavated to such depth as required by the drawings. Trenches for water lines shall be excavated to such depth as required to provide a minimum of thirty-six (36") inches cover in all directions from the pipe wall, unless otherwise indicated. The maximum width of the trench at and below the top of the pipe shall not exceed the following widths.

PIPE SIZE	MAXIMUM WIDTH
6"	2' 6"
8"	2' 6"
10"	2' 6"
12"	2' 8"
15"	2' 10"
18"	3' 0"
21"	3' 3"
24"	3' 6"

- E. If rock is encountered in the trench, it shall be excavated in a manner approved by the Owner and as specified below:
 - 1. No separate payment for trench rock excavation will be made. Trench excavation shall be considered unclassified.
 - 2. Trench shall be over-excavated to provide one (1') foot minimum clearance to pipe in all directions where rock is in the trench and backfilled with

- crushed stone.
3. Drilling and blasting operations shall be conducted with due regard for the safety of persons and property in the vicinity and in strict conformity with requirements of all ordinances, laws, and regulations governing blasting and the use of explosives. Rock excavation near existing pipelines or other structures shall be conducted with the utmost of care to avoid damage.
 4. All drilling, blasting, and use of explosives shall be in strict accordance with OSHA standards for the construction industry (29 CFR part 1926).
- F. Excavated material suitable for backfilling shall be stockpiled no closer than two (2') feet from the edge of the trench and shall not obstruct crosswalks, sidewalks, or street intersections, and shall not cause unreasonable interference with travel on the streets by occupants of adjacent property. Gutters and other drainage facilities shall not be obstructed. Free access shall also be maintained to fire hydrants, mailboxes, sewer and water manholes, gas meters, or other municipal facilities.

3.03 BEDDING, HAUNCHING, AND BACKFILLING

- A. Pipe shall be installed as shown on the drawings.
- B. Bedding shall be shaped and compacted to 60 percent relative density, ASTM D2049, to provide uniform bearing of the pipe. Bell holes shall be excavated to allow for unobstructed assembly of the joint. Bell holes shall be made as small as practical. After the joint has been made, bell holes shall be filled with bedding material.
- C. After pipe is jointed and aligned, haunching material shall be installed and compacted to 60 percent relative density, ASTM D2049. Ensure material is worked under the haunch of the pipe to provide adequate side support. Precautions shall be taken to prevent movement of the pipe during placement and compaction of haunching material.
- D. Initial backfill shall be hand placed and compacted to provide cover over the pipe as detailed. Pipe shall be protected from large particles of backfill material.
- E. Balance of backfill shall be placed by a method which will not damage or displace the pipe, nor cause bridging action in the trench. Backfill material shall be compacted with earthmoving equipment as material is placed so that excessive settlement of the trench material will not occur. Material shall be neatly mounded over the trench. Trench and settled areas shall be maintained as they occur. Finish grade shall be completed to eliminate uneven areas.
- F. Where pavement is to be placed over the backfilled trench as indicated on the drawings, the backfill shall be crushed stone under the full trench depth. Under future roads, compaction will be required up to within one (1') foot of existing grade with remaining one (1') foot backfill as per paragraph 3.03. E above.

- G. Backfill underneath the tank and five (5') outside the tank foundation to be compacted crushed stone. Minimum compaction accepted shall be 95% Standard Proctor.

3.04 CREEK AND DITCH CROSSINGS

- A. Construct pipe encasement as shown on typical details. Concrete shall be placed in the dry. Concrete: ASTM C94, 2500 psi, at twenty-eight (28) days.
- B. Construction methods that will minimize siltation and erosion shall be utilized.
- C. All backfill shall be granular material as specified for embedment material or crusher run stone.
- D. Clean up, grading, seeding, and other restoration work shall begin immediately, and exposed areas shall not remain unprotected for more than seven (7) days.

3.05 TEST FOR DISPLACEMENT OF SEWERS

- A. A check of sewer pipe shall be made to determine whether displacement has occurred after the trench has been backfilled to above the pipe and has been compacted as specified.
- B. A light shall be flashed between manholes or between locations of manholes with a flashlight or sun reflecting mirror.
- C. If the pipe line shows poor alignment, displaced pipes, or any other defects, defects shall be corrected to the specified conditions at no additional cost to the Owner.

3.06 TESTING OF BACKFILL

- A. A testing laboratory shall verify compaction of the bedding and haunching material after placement and compaction.

END OF SECTION

SECTION 02260
FINISH GRADING

PART 1 - GENERAL

1.01 RELATED WORK

- A. Section 02100: Erosion Control
- B. Section 02221: Trenching, Backfilling, and Compacting

1.02 SITE COMPACTION TESTING

- A. Testing of compacted fill materials shall be performed by an independent testing laboratory appointed and paid for in accordance with Section 01410.
- B. When work of this section or portions of work are completed, notify the testing laboratory to perform density tests. Do not proceed with additional portions of work until the results have been verified.
- C. If, during the progress of the work, tests indicate that compacted materials do not meet specified requirements, remove defective work, replace, and retest at no cost to Owner.

1.03 SAMPLES

- A. Submit minimum ten (10 lb.) pound samples of each type of excavated fill material to be used. Forward samples to testing laboratory, packed tightly in containers to prevent contamination.
- B. If recent test results are available for fill materials to be used, disregard sample submission and submit such test results to the testing laboratory for approval. Such test results are to clearly indicate types of materials and composition, hardness, compactability, and suitability for proposed usage.

1.04 PROTECTION

- A. Prevent damage to existing fencing, trees, landscaping, natural features, benchmarks, pavement, utility lines, and structures. Correct damage at no cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Topsoil: Friable loam free from subsoil, roots, grass, excessive amount of weeds, stones and foreign matter; acidity range (pH) of 5.5 to 7.5; containing a minimum of four (4%) percent and a maximum of twenty-five (25%) percent organic matter. Use topsoil stockpiled on site if conforming to these requirements.

PART 3 - EXECUTION

3.01 SUB-SOIL PREPARATION

- A. Rough grade sub-soil systematically to allow for a maximum amount of natural settlement and compaction. Eliminate uneven areas and low spots. Remove debris, roots, branches, stones, and etc., in excess of three (3") inches in size. Remove sub-soil which has been contaminated with petroleum products.

- B. Cut out areas, to sub-grade elevation, which have been contaminated with petroleum products.
- C. Bring sub-soil to required levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.
- D. Slope grade away from buildings a minimum two (2") inches in ten (10') feet unless indicated otherwise on drawings.
- E. Cultivate sub-grade to a depth of three (3") inches where topsoil is to be placed. Repeat cultivation in areas where equipment used for hauling and spreading topsoil has compacted sub-soil.
- F. Compact sub-soil to the following:
 - 1. Under Topsoil: 85 percent Standard Proctor, ASTM D698-78.
 - 2. Under Streets, Drives, and Parking Areas: 98 percent Standard Proctor ASTM D698-78.
 - 3. Under Walks: 90 percent Standard Proctor, ASTM D698-78.

3.02 PLACING TOPSOIL

- A. Place topsoil in areas where seeding and planting is to be performed. Place to the following minimum depths, up to finished grade elevations.
 - 1. Three (3") to four (4") inches for seeded areas.
 - 2. Twenty-four (24") inches for shrub beds, landscape areas, and gardens.
- B. Use topsoil in relatively dry state. Place during dry weather.
- C. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of sub-grades.
- D. Remove stone, roots, grass, weeds, debris, and other foreign material while spreading.
- E. Manually spread topsoil around trees, plants, and buildings to prevent damage which may be caused by grading equipment.
- F. Lightly compact placed topsoil. Track with small dozer on slopes to minimize rivulets.

3.03 SURPLUS MATERIAL

- A. Remove surplus sub-soil and topsoil from site.
- B. Leave stockpile areas and entire job site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 02444

CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.01 RELATED

- A. Section 03300: Cast-in-Place Concrete

1.02 ERECTOR QUALIFICATIONS

- A. Completion of twenty (20) equivalent installations.

1.03 REFERENCES

- A. Chain Link Fence Manufacturers Institute (CLFMI) – Standard Guide for Chain Link Fence Installation.
- B. ASTM A123 - Zinc (Hot Dip-Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A392 – Zinc-Coated Steel Chain Link Fence Fabric
- D. ASTM F567 – Installation of Chain Link Fence
- E. ASTM F626 – Fence Fittings
- F. ASTM F668 – Poly Vinyl Chloride Coated Chain Link Fence Fabric
- G. ASTM F900 – Industrial and Commercial Swing Gates
- H. ASTM F 1043 – Strength and Protective Coatings on Steel Industrial Chain Link Fence and Framework
- I. ASTM A824 – Metallic Coated Steel Tension Wire
- J. ASTM A1083 - Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Fence Structures.

1.04 SHOP DRAWINGS AND PRODUCT DATA

- A. Submit shop drawings and product data in accordance with Section 01340.
- B. Clearly indicate plan layout, grid, spacing of components, accessories, fitments, and anchorage.
- C. Submit manufacturer's installation instructions and procedures, including standard details of fence and gate installation.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Framework: ASTM A1083; Schedule 40, butt weld, standard weight, hot dip galvanized to 2.0 oz/sq. ft coating.
- B. Mesh: FS RR-F-00191 Type I - Zinc-coated steel in accordance with CLFMI Standard Guide

2.02 CONCRETE MIX

- A. Concrete: ASTM C94, Portland Cement, 3,000 psi at twenty-eight (28) days, two (2") inch to three (3") inch slump.

2.03 COMPONENTS

- A. Line Posts: 2.375 inch diameter. Galvanized Steel tubing.
- B. Corner and Terminal Posts: 2.9 inch diameter. Galvanized Steel tubing.
- C. Gate Posts: 4.0 inch diameter. Galvanized Steel tubing.
- D. Top and Brace Rail: 1.90 inch diameter. Plain end, sleeve coupled.
- E. Gate frame: 1.90 inch diameter. Galvanized Steel tubing.
- F. Caps: Cast or pressed steel, or malleable iron, hot dip galvanized sized to post dimension, set screw retained.
- G. Extension arms: To accommodate three (3) strands of barbed wire sloped 45°.
- H. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings, steel galvanized.
- I. Fabric: Two (2") inch diamond mesh, interwoven, 9-gauge, .192" nominal diameter coated wire top selvage twisted tight, bottom selvage knuckle end closed. Use one (1") inch mesh, selvage knuckle end closed top and bottom for heights greater than eight (8') feet.
- J. Bottom Tension Wire: 6-gauge steel single strand, galvanized.
- K. Barbed Wire: 12-gauge wire three (3) strands, four (4) points at six (6") inches o.c., zinc coated steel.
- L. Gate Hardware: Gate center rest, three (3) pieces drop latch, chain gate holdbrace, gate hinge 180° male and female, fork latch and latch catch, drop bolt, hardware for padlock, three (3) per leaf.

- M. Provide gate stops for all gates.
- N. Provide keepers for each gate leaf over five (5') feet in width.

2.04 PVC COATING

- A. Provide thermally fused PVC coating on all fence components where shown in the details in the drawings.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install line posts, corner posts, top rails, post caps, barbed wire arms, fabric, and gates, to provide a rigid structure for fence. Use manufacturer's standard fittings, fasteners, and hardware. Slope barbed wire arms outward.
- B. Maximum spacing of posts: Equally spaced at maximum interval of ten (10') feet.
- C. Install line, corner, and terminal posts plumb, set in concrete footings as specified in CLFMA Standard. Also set terminal posts at abrupt changes in vertical and horizontal alignment.
- D. Set post in within six (6") inches from bottom of concrete footing. Slope top of concrete for water runoff. Set top of footing two (2") inches above finished grade.
- E. Position bottom of fabric two (2") inches above finished grade with tension wire stretched taut between posts.
- F. Pass top rail through line post tops to form continuous bracing. Install seven (7") inch long couplings midspan at pipe ends.
- G. Brace each gate and corner post back to adjacent line post with horizontal center brace rail. Install brace rail, one (1) bay from end and gate posts.
- H. Install center and bottom brace rail on corner and gate leaves.
- I. Fasten fabric to top rail, line posts, braces, and bottom tension wire with wire ties on maximum fifteen (15") inch centers.
- J. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.
- K. Stretch fabric between terminal posts or at intervals of 100 ft. maximum whichever is the least dimension.
- L. Install three (3) strands of barbed wire on arms, tensioned, and secured.

- M. Install gates using fabric and barbed wire overhand to match fence. Install three (3) hinges per leaf, latch, catches, and drop bolt.
- N. Provide concrete center rest and drop bolt retainers at center of double gate openings.

END OF SECTION

SECTION 02485

SEEDING

PART 1 - GENERAL

1.01 RELATED WORK

- A. Section 01310: Construction Schedules
- B. Section 01560: Temporary Controls
- C. Section 01700: Contract Closeout
- D. Section 02100: Erosion Control
- E. Section 02260: Finish Grading

1.02 QUALITY ASSURANCE

- A. Seeds shall meet the requirements of the Official Seed Analysis of North America.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed in original containers showing analysis of seed mixture, percentage or purse seed, year of production, net weight, date of packaging, and location of packaging. Damaged packages are not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 - PRODUCTS

2.01 FERTILIZER

- A. Commercial type, 10-20-10 grade, granular type.

2.02 SEEDS

- A. Vegetation and re-vegetation of lawn type areas where scheduled maintenance and upkeep are desired and will be necessary to preserve the quality and appearance of the mature ground cover.
 - 1. Type "A" mixtures of the following:
 - (a) Type "A-1" mixture as required to match existing vegetation
 - (b) Type "A-2" Mixture of turf type tall fescue and rye consisting of: 60% turf type tall fescue -(30% certified Rebel II)(30% certified Titan) 40% turf type perennial -Rye (Palmer)
 - 2. Purity: 98 percent
 - 3. Germination: 90 percent
 - 4. Weed Seed: Less than 0.5 percent
- B. General vegetation and re-vegetation of pipeline trenches, tank and pump station sites, pastures, and roadway slopes where minimum maintenance and upkeep are required.

1. Type "B" mixtures of the following:
 - (a) Type B-1, non-seasonal, mixture-KY-31 tall fescue-50%, annual rye -50%
 - (b) Type B-2, seasonal, shall consist of the following:

TIME OF YEAR	TYPE	_% (BY WEIGHT)
February-May	KY-31 Tall Fescue	80%
	English Rye	5%
	Korean Lespedeza	15%
June-September	KY-31 Tall Fescue	55
	English Rye	20
	Korean Lespedeza	15
	German Millet	10
October-January	KY-31 Tall Fescue	70
	English Rye	20
	White Clover	10
	Purity	90
	Germination	90
	Weed Seed	less than 1%

Phyter Tall Fescue (Fungus free) shall be used in all pasture applications, with Ky-31 Tall Fescue used in other applications.

- C. Vegetation and re-vegetation of slopes greater than 3:1 or as may be otherwise specified elsewhere in the contract documents where superior soil protection, erosion prevention, and minimum maintenance and upkeep are required.
 1. Type "C": Mixture of the following mixture:
 - (a) Type C-1, same as Type "B"
 - (b) Type C-2, preferred for slopes of 2:1 and greater, shall consist of the following:
 - Crown Vetch: 25%
 - Ky-31 Tall Fescue: 70%
 - English Rye: 5%
 2. Purity: 90%
 3. Germination: 90%
 4. Weed Seed: Less than 1.0 percent
 5. Type C-2 shall be applied with use of a TDOT approved soil inoculant to stimulate reproduction at the rate specified by the manufacturer of the produce selected.
 6. Phyter Tall Fescue (Fungus Free) shall be used in all pasture applications, with KY-31 tall Fescue used in other applications.

2.03 MULCH

- A. Non-toxic to vegetation and to the germination of seed, free from noxious seeds and weed seeds, and fresh.
 1. Hand or machine placement - Wheat, rye, or oat straw, air dried.

2. Hydro-placement - wheat, rye or oat straw; shredded newspaper or peanut hulls, or other as approved by the Engineer.

B. Asphalt Emulsion: SS-1.

2.04 LIME

- A. Agricultural ground limestone, minimum eighty (80%) percent passing No. 8 sieve, with a minimum 80 percent calcium carbonate equivalent.
- B. One (1) or both percentages greater than eighty (80) so that multiplication of the percent passing No. 8 sieve by the percent of calcium carbonate equivalent will be at least 0.72.

2.05 APPLICATION RATES

- A. Fertilizer: Ten (10 lb.) pounds per 1,000 sq. ft.
- B. Seeds:
 1. Type A 5.0 lbs/1000 sq. ft.
 2. Type B 5.5 lbs/1000 sq. ft.
 3. Type C 6.0 lbs/1000 sq. ft.
- C. Mulch: Two (2") inch thickness, loose measure.
- D. Asphalt Emulsion: 100 gallons per ton mulch.
- E. Lime: 75 lbs/1,000 sq. ft.

PART 3 - EXECUTION

3.01 PREPARATION

- A. When soil is in a tillable condition, cultivate to a depth of four (4") inches, reducing soil particles to a size no larger than two (2") inches for Type "B" and "C" seeding and one (1") inch for type "A" seeding.
- B. Assure seed bed is level and free of weeds, clods, stones, root, sticks, rivulets, gullies, crusting, and caking.
- C. Slopes greater than twenty (20%) percent shall be "raked" or "tracked" to produce horizontal grades following the surface contours to assist establishment of vegetation cover and reduce wash-off before germination.
- D. Preparation of areas designated for type "C" grassing. Disturbed area shall be:
 1. Brought to general contours three (3") inches below finished grades and prepared in accordance with 3.01, A and B.
 2. The surface shall be tightened by "tracking" using a single pass of a D-6 class track machine with a minimum of eighty (80%) percent pad depth, on earth tracks traveling vertically up and down the slope.
 3. Top soil shall be placed to a uniform depth at four (4") inches over the area to bring the site up to finished grade elevations.

4. Should seeding methods other than hydro-seeding be approved by the Engineer, lime and fertilizer shall be placed at this time.
5. The surface shall be tightened by "tracking" using a final single pass of a D-6 class track machine with a minimum of eighty (80%) percent pad depth, on earth tracks traveling vertically up and down the slope. Care should be taken to establish and protect a uniform "tracking" pattern over the entire surface to assist the establishment of vegetation cover and reduce wash-off before germination.
6. Areas that cannot be "tracked" as outlined in 3.01 - C-5 above shall be hand raked to establish horizontal lines following the surface contours.

3.02 FERTILIZING AND LIMING

- A. Fertilizer and lime placed mechanically shall be applied separately and mixed into the top two (2") inches of soil. Apply within forty-eight (48) hours of seeding.

3.03 MULCHING AND SEEDING

- A. Seed: Apply over the prepared area using methods that will produce a uniform application to the entire area.
- B. Mulch:
 1. Apply mulch uniformly over the area after seeding.
 2. Application shall be undertaken in a manner as to minimize bald and tightly clumped spots in the mulch that will adversely effect the seed germination and growth.
 3. Mulch shall be tacked with SS-1 or other methods as approved by the Engineer to hold mulch in place until development of the vegetation cover.
- C. Hydroseeding: Apply complete mix of fertilizer, lime, seed, and mulch uniformly over the entire area to produce a final application free of bald or weak spots and of the rates specified herein.

3.04 MAINTENANCE PERIOD

- A. Maintenance Period: Until final acceptance.

3.05 MAINTENANCE

- A. Maintain surfaces; supply additional topsoil and re-seed where necessary, including areas affected by erosion.
- B. Water the entire area to ensure uniform seed germination and re-water regularly to keep surface of soil damp and promote proper growth.
- C. Apply water slowly so that surface of soil will not puddle and crust.

3.06 ACCEPTANCE

- A. Seeded areas will be accepted at end of maintenance period when seeded areas are properly established and otherwise acceptable.

END OF SECTION

SECTION 02610

PAVING

PART 1 - GENERAL

1.01 RELATED WORK

- A. Section 02221: Trenching, Backfilling, and Compacting
- B. Section 02260: Finish Grading

1.02 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials.
- B. Federal Specifications - FS TT-P-115
- C. TDOT Construction Standards

1.03 QUALITY ASSURANCE

- A. The Owner will employ a Testing Laboratory to evaluate the materials delivered to and placed at the project site.
- B. Certificates of material compliance, signed by the material supplier and Contractor may be submitted in lieu of material testing when acceptable to the Engineer.

1.04 JOB CONDITIONS

- A. Do not apply prime and tack coats when temperature is below 50 degrees F or when base is wet. Apply asphalt concrete paving only when temperature is above 40 degrees F and when base is dry.
- B. The work shall be in conformity with the lines, grades, notes, and cross sections shown on the drawings or as directed by the Engineer.
- C. All suitable materials removed from the excavation shall be used as far as practicable in required fill areas.

PART 2 - PRODUCTS

2.01 MINERAL AGGREGATE BASE

- A. The mineral aggregate shall be crushed stone, crushed or uncrushed gravel and shall be of hard durable particles or fragments of stone, slag, gravel, and other finely divided mineral matter. Material shall be free of silt and clay.
- B. The crushed stone shall meet all the requirements of the Standard Specifications for aggregate for mineral aggregate base and surface courses.
- C. The mineral aggregate base shall be of composite gradation such that 100 percent by weight will pass the 1-1/2 inch sieve, with 50 percent retained on the No. 4

sieve.

- D. At the contractor's request, the Engineer will consider deviation from the specification but only if the request is made prior to approval of the job mix formula and at least ten (10) days prior to beginning of construction.

2.02 ASPHALT BASE COURSE

- A. The base course shall consist of coarse aggregate and sand, stone screenings, or a combination of sand and stone screenings, uniformly mixed with asphalt cement and shall be laid upon the prepared subgrade to finished thickness as indicated on the Drawings.
- B. In addition to the other requirements of these specifications, the composition of the mineral aggregate shall be such that, when combined with the required amount of bitumen, the resultant mixture will comply with the following Marshall method of test criteria:
 - 1. Stability (minimum): 1200 lb.
 - 2. Void Contents: three (3%) percent to seven (7%) percent
 - 3. Flow: eight (8) to fifteen (15)
- C. Composition of the mixtures: The bituminous base shall be composed of aggregate and bituminous materials. The portions by weight of the total mixture shall be as follows:
 - 1. Mineral aggregate: 94.0 to 97.7 percent
 - 2. Asphalt cement: 2.6 to 6 percent.

2.03 ASPHALTIC CONCRETE SURFACE COURSE

- A. The composition of the mineral aggregate shall be such that when combined with the required amount of bitumen the resultant mixture will comply with the following Marshall methods of test criteria:
 - 1. Stability (minimum): 1,200 lb.
 - 2. Void Content: three (3%) percent to seven (7%) percent
 - 3. Flow: eight (8) to fifteen (15)

PART 3 - EXECUTION

3.01 INSPECTION

- A. Paver must examine the areas and conditions under which paving is to be installed.
- B. Notify the Contractor in writing of conditions detrimental to proper and timely completion of the work.
- C. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the paver.

3.02 SUBGRADES

- A. Each six (6") inch layer of subgrade shall be compacted to a density of not less than ninety-five (95%) percent and an average of ninety-seven (97%) percent of the maximum density as determined by the AASHTO Method T180.
- B. After the subgrade has been prepared it shall be kept free from ruts, depressions, and any damage resulting from the hauling or handling of tools and equipment.

3.03 MINERAL AGGREGATE BASE COURSE

- A. Base material shall be dumped on the end of the preceding spread without dumping or hauling directly on the subgrade.
- B. Equipment for spreading and grading shall be as specified in the Standard Specifications.
- C. After the spreading is completed, the entire surface shall be scarified and then shaped to produce the required grade and cross section after compaction. Water shall be required to obtain the specified density.
- D. Compaction shall be by rolling with a combination of steel wheel and rubber tied rollers until an average density of ninety-eight (98%) percent of the maximum density is reached as tested under AASHTO method T180. Apply to minimum compact thickness of six (6") inches.
- E. Tests will be paid for by the Owner and retests paid for by the Contractor.

3.04 ASPHALT BASE BINDER COURSE

- A. Equipment and construction requirements including surface preparation, mixing, spreading, finishing, and compaction shall be as prescribed in the appropriate sections of the Standard Specifications.
- B. Base binder shall be bituminous plant mix base, hot mix asphalt spread with appropriate power propelled, self contained bituminous paver.
- C. Construction shall include a black base binder course compacted to minimum thickness as shown on the Drawings and placed on a prepared mineral aggregate base.

3.05 ASPHALTIC CONCRETE SURFACE COURSE

- A. Asphaltic concrete surface course shall consist of constructing a surface course on the prepared base course in accordance with these specifications and in conformity with specified tolerance with lines, grades, and typical cross sections shown on the drawings. Do not begin paving work until such conditions have been corrected and are ready to receive paving.
- B. Place asphaltic concrete mixture at not less than 225 degrees F, spread and strike

- off. Place inaccessible and small areas by hand.
- C. Follow Standard Specifications for general construction of the surface course as applicable to this project.
 - D. Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of asphalt concrete course.
 - E. Begin rolling when asphaltic concrete mixture will bear roller weight without excessive displacement.
 - F. Repair surface defects with hot asphaltic concrete material as rolling progresses.
 - G. Cut out and patch defective areas and roll to blend with adjacent satisfactory paving.
 - H. Continue rolling until maximum density is attained and roller marks are eliminated.
 - I. Protect paving from damage and vehicular traffic until asphaltic concrete mixture has cooled and attained its maximum degree of hardness.

3.06 PAVING TOLERANCES

- A. In place compacted asphaltic concrete paving will not be acceptable if exceeding the following tolerances:
 - 1. Thickness of base course - Not more than 1/2 inch plus or minus.
 - 2. Thickness of surface course - Not more than 1/4 inch plus or minus.
 - 3. Base course surface smoothness - Not more than 1/4 inch when measured with a ten (10') foot straightedge.
 - 4. Wearing course surface smoothness - Not more than 3/16 inch when measured with a ten (10') foot straightedge.

END OF SECTION

SECTION 02713

WATER LINES, VALVES, AND APPURTENANCES

PART 1 - GENERAL

1.01 RELATED WORK

- A. Section 01050: Field Engineering
- B. Section 01090: Reference Standards
- C. Section 01150: Measurement and Payment
- D. Section 01340: Shop Drawings, Product Data, and Samples
- E. Section 01530: Barriers
- F. Section 01570: Traffic Regulations
- G. Section 01720: Project Record Documents
- H. Section 02100: Erosion Control
- I. Section 02221: Trenching, Backfilling, and Compacting
- J. Section 02485: Seeding
- K. Section 13415: Multi-Column Elevated Water Storage Tank

1.02 QUALITY ASSURANCE

- A. The Contractor shall install, test, and disinfect water lines in accordance with regulations issued by the Tennessee Department of Environment and Conservation and the Caryville-Jacksboro Utilities Commission.
- B. The Contractor shall disinfect all potable water lines, fittings, valves, and appurtenances in accordance with regulations issued by the Tennessee Department of Environment and Conservation and Caryville-Jacksboro Utilities Commission.
- C. Adequate numbers of skilled workmen, who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this section shall be used.
- D. Equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner shall be used.

1.03 REFERENCES

- A. ASTM 2241: Poly (Vinyl Chloride) (PVC) Pipe (SDR-PR).

- B. AWWA C104: Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe and Fittings for Water.
- C. AWWA C110/C153 - Gray Iron and Ductile-Iron Fittings, 3 in. through 48 in. for Water and other Liquids.
- D. AWWA C111 - Rubber Gasket Joints for Cast-Iron and Ductile-iron Pressure Pipe and Fittings.
- E. AWWA C151 - Ductile-Iron Pipe Centrifugally Cast, in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- F. ASTM D2412: Standard Test Method For Determination of External Loading Characteristics of Plastic Pipe By Parallel-Plate Loading.
- G. ASTM D1784: Rigid PVC Compounds and Chlorinated PVC Compounds
- H. ASTM F477: Elastomeric Seals For Joining Plastic Pipe
- I. ASTM B88 - Seamless Type K Copper Water Tube.
- J. AWWA C500: Gate Valves
- K. AWWA C508: Swing Check Valves
- L. AWWA C700: Cold Water Meters - Displacement Type
- M. AWWA C701: Cold Water Meters - Turbine Type for Customer Service
- N. AWWA C901: Polyethylene Tubing
- O. AWWA C504: Butterfly Valves
- P. AWWA C502: Fire Hydrants
- Q. ASTM F877: Standard Specification for Cross-Linked Polyethylene Plastic (PEX) Hot and Cold Water Distribution Systems
- R. Other AWWA and ASTM Standards as referenced herein.

1.04 SUBMITTALS

- A. Submittals shall be submitted as specified in Section 01340, promptly and in accordance with the approved schedule, in such a sequence that no delay to the work, or to the work of other Contractors is caused.
- B. Product data shall be submitted as required.
- C. Certification signed by manufacturer and Contractor that pipe and fittings meet specification requirements shall be submitted.
- D. Submit all data for pipes, fittings, gaskets, restrainers, valves, saddles, and other components of the new water system.

- E. Five (5) certified copies of disinfection test results for potable water lines shall be submitted.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Ductile iron pipe shall be protected from damage to coating and lining.
- B. PVC piping shall be stored to protect from long-term exposure to direct sunlight and shall be stacked in suitable support systems to prevent buckling and deformation.
- C. Interior of pipe and fittings shall be cleaned of dirt and other foreign material immediately prior to lowering into the trench.
- D. Carefully examine each pipe and fitting for cracks and other defects while suspended above the trench immediately before installation.

1.06 JOB CONDITIONS

- A. Whenever pipe laying is not actively in progress, open ends of all installed pipe and fittings shall be fitted with a watertight plug.
- B. Separation of Water Mains and Sewers:
 - 1. The new water main has been located so that the proper horizontal and vertical separation from the existing sewers has been provided where the water line parallels a sewer line. However, in the event field conditions reveal that a horizontal separation of 10 feet cannot be obtained, the water line shall be laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer so that the bottom of the water main is at least 18 inches above the top of the sewer pipe.
 - 2. Whenever the water main crosses a sewer main, a minimum vertical distance of 18 inches shall be provided between pipes. This distance shall be provided whether the water main is above or below the sewer pipe. At crossings, one full length of water pipe must be located so both joints will be as far from the sewer line as possible. Special structural support for the water and sewer lines shall be provided.
 - 3. Water lines shall not pass through or come in contact with storm or sanitary sewer manholes.
- C. Inside pipe shall be properly supported and aligned in accordance with the plans.
- D. Air piping shall have proper expansion/contraction provisions.

PART 2 - PRODUCTS

2.01 GENERAL PIPING AND VALVE APPLICATIONS

- A. Unless otherwise depicted on the accompanying Drawings, the following piping and valve applications apply for this project.
1. All buried non-chemical piping four (4") inch through twelve (12") inch shall be Pressure Class 350 ductile iron pipe with mechanical joint or push-on joint ends or Polyvinyl Chloride Pipe (PVC) ASTM D-2241 SDR17, as specified on accompanying Drawings. Fittings shall be ductile iron with mechanical joint ends for pipe sizes forty-eight (48") inches and smaller and with push-on ends for pipe sizes fifty-four (54") inches and larger. Restrained joints shall be used where noted on the accompanying Drawings.
 2. All buried valves shall be as depicted on the accompanying Drawings.
 3. All interior and above-ground valves shall be as depicted on the accompanying Drawings.
 4. All buried ductile iron pipe and fittings shall be wrapped in V-Bio polyethylene encasement or approved alternate. Encasement shall meet the requirements of ANSI/AWWA C105/A21.5, be a minimum of 8 mils thick, and shall be installed in accordance with Modified Method A (single tube per length of pipe/fitting with a minimum 12-inch overlap at joints).

2.02 DUCTILE IRON PIPE AND FITTINGS

- A. General
1. Ductile iron pipe (DIP) shall be centrifugally cast meeting the requirements of ANSI/AWWA Standard C151/A21.51. Pressure Classes as described in ANSI/AWWA Standard C151 shall be used unless indicated otherwise on the Drawings.
 2. The manufacturer of the DIP shall furnish a sworn, notarized statement that the inspection and specified tests required under section 5.1.1.2 of AWWA /ANSI standard C151/A21.51 have been made and that all results thereof comply with this standard.
 3. One (1) copy of written transcripts of the results of the acceptance tests and low temperature impact tests on pipe manufactured for use in performing the scope of work described in these Specifications shall be furnished to the Engineer.
 4. The weight, class, or nominal thickness, and casting period for each length of ductile iron pipe shall be shown on each length of DIP. The manufacturer's mark, country where cast, year in which the pipe was produced, and the letters "DI" or "DUCTILE" shall be cast or metal stamped on the pipe. All required markings shall be clear and legible, and all cast or metal-stamped marks shall be on or near the bell.
 5. Approved Manufacturers:
 - a. U.S. Pipe Company

- b. American Ductile Iron Pipe Company
 - c. Griffin Pipe Products
 - d. McWane Ductile Iron Pipe Company
- B. DIP Piping Installed Outside Above-Ground and Inside Structures
- 1. All ductile iron pipe installed outside above ground and inside structures shall conform to the wall thickness requirements of Thickness Class 52 and shall be flanged and shall conform to the requirements of AWWA/ANSI Standard C151/A1.15. Unless otherwise shown, flanges shall be dimensioned for facing and drilling in accordance with ASME/ANSI Standard B16.1 Class 125 and meeting the dimensional and bolting requirements of AWWA Standard C110/A21.10, Table 14. Bolts, gaskets, and installation of flanged DIP and ductile iron fittings shall comply with the requirements of AWWA/ANSI Standard C111/A21.1, Appendix B.
 - 2. The outside of ductile iron pipe and fittings for installation outside above-ground or inside structures shall be provided to the job site prime coated as specified in Section 09910 of these Specifications.
 - 3. Buried DIP Piping
 - a. All buried ductile iron pipe shall conform to the wall thickness requirements of Pressure Class 350 and shall have mechanical joints or push-on joints in accordance with AWWA/ANSI Standard C111/A21.11.
 - b. The inside of all DIP for potable water service shall be cement mortar lined in accordance with AWWA/ANSI C104/A21.4
 - c. Fittings for all buried DIP shall be delivered to the project site with their exterior coated with asphaltic material at least one (1) mil thick that conforms to all appropriate requirements at AWWA/ANSI Standard C104/A21.4.
 - d. Fittings for all DIP installed outside above-ground or inside structures flanges shall be dimensioned for facing and drilling in accordance with ASME/ANSI Standard B16.1 Class 125 and meeting the dimensional and bolting requirements of AWWA Standard C110/A21.10, Table 14. Bolts, gaskets, and installation of flanged DIP and ductile iron fittings shall comply with the requirements of AWWA/ANSI Standard C111/A21.1, Appendix B. Fittings shall be delivered to the project site with their exterior prime coated as described at Section 09910 of these Detailed Specifications.
 - e. Fittings for buried DIP pipelines shall be ductile iron and furnished with ductile iron mechanical joint retainer glands suitable for a working pressure of 75 psi plus a surge allowance of 75 psi. Ductile iron mechanical joint retainer glands shall be manufactured by American Cast Iron Pipe Company, EBAA Iron Sales, Inc., or approved equal. All set screws on the retainer glands shall be tightened, in the presence of the Owner's Representative, using a torque wrench to the manufacturer's recommended torque. As an alternate to ductile iron mechanical joint fittings with ductile iron retainer glands, the contractor

may furnish ductile iron fittings with Field Lok™ gaskets manufactured by United States Pipe and Foundry Company, or Fast-Grip® gaskets manufactured by American Cast Iron Pipe Company, both suitable for a working pressure of 100 psi plus a surge allowance of 100 psi.

- f. Ductile iron fittings meeting the requirements of AWWA/ANSI Standard C110/A21.10 shall have distinctly cast on them the pressure rating, nominal diameters of openings, manufacturer's identification, the country where cast, and the number of degrees or fraction of the circle on all bends and the letters "DI" or "DUCTILE". Cast letters and figures shall be on the outside body of the fitting and shall have dimensions no smaller than the following:

Size (in.)	Height of Letters (in.)	Relief (in.)
Less than 8	As large as practical	As large as practical
8-10	$\frac{3}{4}$	$\frac{3}{32}$
12-48	1 $\frac{1}{4}$	$\frac{3}{32}$

- g. Ductile iron fittings meeting the requirements of AWWA/ANSI Standard C153/A21.53 shall have distinctly cast on the outside of the body AWWA/ANSI C153/A21.53; the pressure rating; nominal diameter of openings; manufacturer's identification; the country where cast; the letters "DI" or word "DUCTILE"; and the number of degrees or fraction of the circle.

2.03 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- A. General
 - 1. All polyvinyl chloride (PVC) pipe shall meet ASTM D2241, ASTM D1784 Cell Class 12454, with gaskets meeting ASTM F477 and joints meeting ASTM D3139 with an SDR of 17, unless otherwise specified.
 - 2. All pipe must meet a 250 psi working pressure rating and shall be IPS. Pipe shall be clearly marked with the manufacturer's name, nominal diameter, SDR, pressure rating, and NSF approval seal.
- B. Fittings
 - 1. All fittings shall be ductile iron, AWWA C10 or AWWA C115, pressure rating as required.
 - a. Fittings shall be flanged for inside work and mechanical joints for underground.
 - b. Lining shall be cement mortar, AWWA C104.
 - c. All piping shall be connected to fittings using a restrained system equal to:

1. Midco Perma-Grip Restrained Joint System as manufactured by Midland Manufacturing Company.
 2. Uni-Flange Series 1300 restraint for PVC Pipe as manufactured by Ford Meter Box Company.
- C. Joints
1. All joints shall be push-on joints with gaskets as recommended by the manufacturer for the application.
- D. See 2.01-A(4) above for fitting protection.

2.04 WATER SERVICE PIPE

- A. Water service lines 1-1/2" and smaller shall be PEX-a, certified to AWWA C904, rated for 160 psi.
- B. Pipe shall be approved for use with AWWA C800 fittings.
- C. Service pipe shall be used to connect the mains to the meter assemblies.
- D. Pipe shall be 3/4 inch, unless otherwise specified or shown on the plans.

2.05 CORPORATION VALVE

- A. Corporation valves shall comply with AWWA C800.
- B. Valves shall be watertight and individually tested for leaks.
- C. Valves shall be manufactured by Ford, Muller, or an approved alternative.

2.06 SERVICE SADDLE

- A. Outlet threads shall meet AWWA C800.
- B. Shell shall be 304 stainless steel.
- C. Gasket shall be made of NSF 61 certified nitrile butadiene rubber.
- D. Service saddle shall be Romac Style 304, or preapproved alternate.

2.07 TAPPING SLEEVE

- A. Tapping sleeves shall be stainless steel with removable bolts and 360-degree gasket.
- B. Tapping sleeves shall meet AWWA C223 requirements.
- C. Tapping sleeves shall be Muller H-304, Ford FTSS, Romac SST, or approved alternate.

2.08 RESILIENT - SEATED GATE VALVES

- A. Resilient-Seated Gate Valves shall be iron body, Resilient-Wedge design rated for 250 psi working pressure, non-rising stem turning clockwise to open. Valves shall meet the requirements of AWWA C-515. The wedge shall be of ductile iron encapsulated with EPDM rubber and shall seal in either direction of flow.
- B. Valves shall be furnished with standard operating nut for yard installations and operating hand wheel for all interior installations unless otherwise specifically noted.

Valves shall operate smoothly through the entire lift and shall have an unobstructed waterway with a diameter not less than a full nominal diameter of the valve.

- B. Valve boxes shall be standard design cast-iron with cover. Boxes shall have an outside diameter of not less than 4 inches with a minimum thickness of metal at any point of not less than 0.1875 inches. Boxes shall be set in a concrete pad of minimum dimensions 18" x 18" x 6" with 4, #4 bars at fourteen (14") inches long each centered in the pad.
- C. All Resilient-Seated Gate Valves shall be mechanical joint type for yard installations and flanged joint type for all interior installations unless otherwise specifically noted.
- D. Gate valves for two (2") inch and smaller water service shall be iron body, bronze trim, non-rising stem, with operating nut for underground installations and hand-wheel operated for above ground installation.

2.09 AIR RELEASE VALVES

- A. Air Valves shall be ARI Model S-050-C (1") or Model D-04C (2") with reinforced nylon body with a protective ductile iron shell and shall be furnished and installed as shown in the Typical Details. These valves will be field located by the Owner's Representative during construction.

2.10 STEEL AND RUBBER COUPLINGS

- A. Steel couplings, where shown on the Drawings, shall be Dresser or Smith Blair, steel couplings for the particular pipe material, or equal.
- B. See 2.01-A(4) above for protection of steel couplings.

2.11 RUBBER EXPANSION JOINT/COUPLINGS

- A. Where shown on the Drawings, these shall be suitable for the service pressure in the line where used and for normal temperatures. Rubber expansion joints shall be supplied complete with steel retaining rings and shall be drilled for coupling to the pipe flanges they are used with. Rubber expansion joints shall be standard single arch joints and shall be filled arch type when used for wastewater service.

2.12 FIRE HYDRANT

- A. Fire hydrant shall meet the requirements of AWWA C502 and shall be designed for 150 PSI working pressure. Valve opening shall be 5-1/4 inches.
- B. Hydrant shall be equipped with two 2-1/2 inch nozzles, with National Standard threads and one (1) 4 1/2 inch brass pumper nozzle with National Standard Fire Hose coupling screw threads together with caps fastened securely to each hydrant and threaded to fit nozzles.

- C. Hydrants shall have a safety "breakaway flange" section located above ground line. The distance from the finished ground line of the hydrant to the "breakaway flange" shall be not less than 2-inches or more than 6-inches.
- D. The waterways of hydrants shall be as free as possible of obstructions, sharp turns, corners, or other causes for resistance. The hydrant shall have a six (6") inch mechanical joint shoe.
- E. The hydrant main valve shall be of the compression type, closing with pressure. The valve shall be faced with heavy impregnated waterproof ballast or other approved material. The hydrant shall be "dry head type" and shall be equipped with harnessing lugs.
- F. After installation, exposed surfaces of hydrants shall be painted with two (2) coats of chrome enamel in a color as specified by the Owner to represent the flow available from the hydrant. Paint selection shall be approved by the Engineer.
- G. The hydrant operating and outlet nozzle cap nuts shall be pentagonal in shape. The pentagon shall measure 1-1/2 inches from point to flat at the base of the nut and 1-7/16 inches at the top. Nut faces shall taper uniformly, and the height of the nut shall be not less than 1-inch.
- H. The hydrant shall be opened by turning the operating nut counterclockwise. A clearly visible arrow and the word "open" shall be cast in relief on the top of the hydrant to designate the direction of opening.
- I. In the interest of standardization fire hydrants shall be "AWWA Improved Type" hydrant as manufactured by Mueller Company, Centurion, (American-Darling B-84-8 and M&H Fire Hydrant No. 129 equals are acceptable) except as outlined in "K" below.
- J. Fire Hydrants shall be U.L. listed and Factory Mutual approved.
- K. Fire Hydrants shall match existing hydrants and shall meet the approval of the governing Utility. The Engineer will assist the Contractor by furnishing information and coordinating approval.

2.14 SERVICE METERS

- A. Owner to supply new meter yokes and boxes, contractor responsible for fittings needed for connection. Solid copper only under asphalt, no joints or couplings except for connection to corporation stops.

2.15 DEAD END CAPS

- A. Dead end cap systems for connecting existing mains, flushing, and testing shall be rated for 350 psi. Usage of temporary caps must be planned ahead in order to install the proper number of restraining gaskets. See Mechanical Thrust Restraint Table in the contract drawings.

2.16 SUPPORTS, ANCHORS AND SEALS

- A. Supports, anchors and seals shall be furnished and installed in accordance with the plans.

2.17 CONCRETE MATERIALS

- A. Class A in accordance with Section 03300.

2.18 DISMANTLING JOINTS

- A. Dismantling joints shall be manufactured of ASTM A536 ductile iron meeting or exceeding Grade 65-45-12.
- B. The flanged spool shall be AWWA Class D Ring Flange compatible with ANSI Class 125 and 150 bolt circles. Pipe shall be standard weight class per ASTM A53.
- C. MJ gaskets shall be SBR compounded per AWWA C111 and flange gaskets shall be NBR, both in accordance with ASTM D2000.
- D. Bolts and nuts shall be Type 304 SST.
- E. Pressure rating shall be equal to the pressure rating of the flange.
- F. Joint shall be coated with fusion bonded epoxy, NSF certified.

2.19 COPPER PIPE AND TUBING

- A. Copper pipe shall be Type K, hard drawn (buried service) or Type L, soft drawn (interior applications). Copper tubing shall conform to ASTM B88 for seamless copper water tube with copper or brass fittings unless otherwise called for on the drawings.

2.20 SINGLE ACTING ALTITUDE VALVE

- A. VALVE DESIGN
 1. Altitude valve manufacturer shall have an ISO-9001 quality management system certified by an accredited body.
 2. The main valve shall be pilot controlled, hydraulically operated, differential piston actuated and full ported.
 3. The control valve shall be “self-contained” and incorporate a system of pilot controls, factory assembled to and tested with the main valve. The valve shall be operated by line pressure and utilize the pilot system to open, close or throttle the differential piston main valve to perform the specified function(s).
 4. Valve shall be capable of differential level (delayed opening) operation (valve will remain open until tank level drops below a preset level).

B. CONSTRUCTION

1. The main valve body shall be globe style, constructed of high-strength cast iron conforming to ASTM A126 Class B with integral flanges, faced and drilled per ANSI B16.1 Class 125.
2. The valve shall be “full-ported” so that when fully open the flow area through the valve is no less than the area of its nominal pipe size. Valve shall have an integral bottom pad or feet to permit support directly beneath the body.
3. The main valve shall operate on the differential piston principle such that the area on the underside of the piston is no less than the pipe area and the area on the upper surface is greater than that of the underside. There shall be no diaphragms or springs in the main valve.
4. The valve piston shall be fully guided on its outside diameter and all guiding and sealing surfaces shall be lead-free bronze. To minimize the consequences of throttling, throttling shall be by long, stationary vee-ports located downstream of the seat and not by the seat itself. Sawtooth attachments or other add-on devices are not permitted.
5. The valve shall be fully capable of operating in any position without the need of springs and shall not incorporate stems, stem guides or spokes in the waterway. A visual position indicator and NEMA 6P SPDT limit switch shall be provided.
6. The main valve shall be serviceable in the line through a single flanged top cover that provides easy access to all internal components.
7. The valve shall be shop coated with NSF-61 certified epoxy on internal surfaces in accordance with American Water Works Association Standard C550 (latest revision).

C. PILOT SYSTEM

1. The valve shall be operated by a system of pilot controls necessary to perform the specified function(s).
2. The pilot system shall be factory pre-piped, installed on the main valve and tested as an assembly.
3. The system shall incorporate a wye-strainer and opening and/or closing speed control valves.
4. Sufficient isolating valves and pipe unions shall be provided to facilitate removal and maintenance of the pilot system without disturbing the main valve.
5. Pilots, controls, piping and fittings shall be lead-free bronze, brass, or copper.

- D. MANUFACTURER
 - 1. Control valve shall be GA Industries differential piston design as manufactured by VAG USA, LLC.
 - 2. Alternate valve manufacturers will be considered by the Owner if submitted a minimum of 2 weeks prior to the Bid date. The Owner's decision relative to alternate valves will be final.

2.21 PRE-CAST STRUCTURES

- A. ASTM C-478 and ASTM C-913.
- B. The manufacturer shall be certified by the National Pre-cast Concrete Association's Plant Certification Program prior to and during the production of products for this project.
- C. Openings shall be provided for the required number and size of pipes and shall be marked to ensure installation at proper locations. Openings shall be placed in such a manner to all adjustments through 20 degrees.
- D. All pre-cast sections shall include non-penetrating lift inserts with locking feature for safe handling.
- E. Flexible Joint Sealants shall be butyl rubber based conforming to Federal Specification SS-S-210A, AASHTO M-198, Type B - Butyl Rubber and as follows: maximum of 1% volatile matter and suitable for application temperatures between 10 and 100 degrees F. Material shall be RV-30 as manufactured by RuVan Inc. (or approved equal) with a minimum cross section 1¼ inches.
- F. Epoxy Gels for interior patching of wall penetrations when used as approved by the Engineer shall be a 2-component, solvent-free, moisture-insensitive, high modulus, high-strength, structural epoxy paste adhesive meeting ASTM C-881, Type I and II, Grade 3, Class B and C, Epoxy Resin Adhesive.
- G. Precast Component Fabrication and Manufacture shall be as described in the following paragraph:
 - 1. Precast Manufacturing shall be in conformance with ASTM C478. Wall and inside slab finishes resulting from casting against forms standard for the industry shall be acceptable. Exterior slab surfaces shall have a float finish. Small surface holes, normal color variations, normal form joint marks, and minor depressions, chips and spalls will be tolerated. Dimensional tolerances shall be those set forth in the appropriate References and specified below.
 - 2. Joint Surfaces between Bases, Risers and Cones shall be manufactured to the joint surface design and tolerance requirements of ASTM C361 or AWWA C302. The maximum slope of the vertical surface shall be 2 degrees. The maximum annular space at the base of the joint shall be 0.10". The minimum height of the joint shall be four (4") inch.

3. Lift Inserts and Holes shall be sized for a precision fit with the lift devices, shall comply with OSHA 1926.704, and shall not penetrate through the manhole wall.
 4. Step Holes: Step holes shall be cast or drilled in the Bases, Risers and cones to provide a uniform step spacing of sixteen (16") inch. Cast step holes shall be tapered to match the taper of the steps.
 5. Where manholes and other precast sections are to be lined (interior), the following materials are pre-approved:
 - a. AQUATAPOXY Coating "A-6" as manufactured by American Chemical Corporation.
 - b. QR-304 as manufactured by QUADDEX, Inc.
 - c. Color to be white or other manufacturer's standard colors, to be selected by the Owner.
- G. Pre-cast Base Sections shall be cast monolithically without construction joints with integral floor and benching. Inverts shall be smooth and contoured for positive flow with a minimum of 1/10 foot fall between influent and effluent openings. The bottom step shall be a maximum of twenty-six (26") inches from the top of the base slab. The width of the base extensions on Extended Base Manholes shall be no less than the base slab thickness.
- H. Precast Riser Sections shall have a minimum lay length of sixteen (16") inches.
- I. Precast Concentric and Eccentric Cone Sections shall be a minimum of twenty-four (24") inches in height and shall have an inside diameter at the top of twenty-six (26") inches. The width of the top ledge shall be no less than the thickness required for the cone section. Concentric cones shall be used only for Shallow Manholes.
- J. Precast Transition Cone Sections shall provide an eccentric transition from sixty (60") inch and larger manholes to forty-eight (48") inch diameter risers, cones and flat slab top sections. The minimum slope angle for the cone wall shall be 45 degrees.
- K. Precast Transition Top Sections shall provide an eccentric transition from sixty (60") inch and larger manholes to forty-eight (48") inch diameter risers, cones and flat slab top sections. Transition Top sections shall be furnished with vents as shown on the manhole details. The maximum amount of fill over the transition top section shall be twenty (20') feet. Transition Tops shall not be used in areas subject to vehicle traffic.
- L. Precast Flat Slab Top Sections shall have a minimum thickness of six (6") inches (8" for 60" diameter and larger manholes) and shall have an inside diameter at the top of twenty-six (26") inches. They shall be designed for HS-20 traffic loadings as defined in ASTM C890. Items to be cast into Special Flat Slab Tops shall be sized to fit within the manhole ID and the top and bottom surfaces.
- M. Precast Grade Rings shall be used to adjust ring and covers to finished grade. No more than 10 vertical inches of grade rings will be allowed per manhole. Grade Rings shall conform to ASTM C478 and shall be no less than four (4") inches in

height, and twenty-four (24") inches internal diameter.

- N. Precast Inverts shall meet the following requirements.
1. Pipe openings shall provide clearance for pipe projecting a minimum of two (2") inches inside the manhole. The height of the transition from the pipe opening to the invert trough shall be equal to $\frac{1}{2}$ of the Opening ID minus Pipe ID, plus or minus $\frac{1}{4}$ ". The crown of small I.D. pipe shall be no lower than the crown of the outlet pipe. When the fall between the inlet and the outlet holes is greater than four (4") inches, the inlet end of the trough shall be below the inlet pipe invert and aligned horizontally within one (1") inch.
 2. Invert Troughs shall be formed and finished to provide a consistent slope from the pipe outlet to the inlets up to four (4") inch tall. The minimum fall shall be one-tenth (1/10') foot. A one-half inch ($\frac{1}{2}$ ") radius shall be provided at the intersection of 2 or more channels. The minimum concrete thickness from the bottom of the trough to the bottom of the base shall be seven (7") inches.
 3. Invert Benches shall have a float finish with a uniform slope. A $\frac{1}{4}$ " radius shall be provided at the edge of the bench and trough.
 4. Depressions, high spots, voids, chips, or fractured over $\frac{1}{4}$ inch in diameter or depth shall be filled with a sand cement paste and finished to a texture reasonably consistent with that of the formed surface.
- O. Precast Components and grade rings shall be sealed around the external perimeter as follows:
1. External Seals shall consist of a polyethylene backed flat butyl rubber sheet no less than 1/16" thick and 6" wide applied to the outside perimeter of the joint. Material to be RV-40-PW (or approved equal) as manufactured by RuVan, Inc.
 2. Internal Seals shall consist of plastic backed butyl rubber rope no less than 14 feet long and having a cross-sectional area no less than the annular space times the height of the joint. Double mastic joints are the only mastic joint acceptable.
- P. Lifting devices for handling Pre-cast Components shall be provided by the Pre-cast Manufacturer and shall comply with OSHA Standard 1926.704.

2.22 MANHOLE STEPS

- A. Steps shall be provided in Bases, Risers, Cones, Transition Cones, and Transition Top sections aligned vertically on sixteen (16") inch centers in accordance with ASTM C478. Steps shall be secured to the wall with a compression fit in tapered holes or cast in place. Steps shall not be vibrated or driven into freshly cast concrete or grouted in place.
- B. The steps shall be Copolymer Polypropylene Plastic reinforced with a $\frac{1}{2}$ " diameter grade 60 bar and have serrated tread and tall end lugs with red side reflectors equal to Lane International P-10938. Steps shall be capable of supporting 300 lbs. live

ASTM C497.

- C. Holes for steps must be mortared smooth following placement of the steps.

2.23 PIPE ENTRANCE COUPLINGS FOR STRUCTURES

- A. Pipe to Structure Connectors shall conform to ASTM C923, and to ASTM C-425. The location of the pipe connectors shall vary from the location shown on the Project Plans no more than 1/4 inch vertically and 5 degrees horizontally. Provide for control of the OD to within the tolerances of the connector on flexible pipes larger than twelve (12") inches.
- B. Rigid cement or synthetic type grouts are not acceptable as a seal between the manhole and entry pipe.
- C. The entrance coupling with the entry pipe shall be fitted with a Neoprene Boot insert, "KOR-N-SEAL", PSX, or approved equal.
- D. Other specially designed flexible products may be approved for use in adding a pipe entrance to an installed manhole and for other uses where available and where materials meet the requirements of ASTM C-923.
- E. Internal and external bands shall be Type 302 or 304 stainless steel meeting the requirements of ASTM C923.

2.24 PRE-CAST SECTION MARKINGS

- A. All sections shall be marked with the manufacturer name and date manufactured on the inside.
- B. All sections shall be marked with the project name, manhole designation (Letter/Number), size, specification, and product designation (MH,VV,WW,GW,MV) on the outside.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Install barriers and other devices to protect areas adjacent to construction.
- B. Protect and maintain all benchmarks and other survey points.
- C. Protect and maintain all pipe and equipment not scheduled for replacement, and/or all pipe and equipment scheduled for operation during the construction period of the new components.
- D. Prior to laying pipe, prepare a suitable bedding according to Section 02221.
- E. Before placing pipe in the trench, field inspect for cracks or other defect; remove

defective pipe from the construction site.

- F. Swab the interior of the pipe to remove all undesirable material.
- G. Prepare the bell end and remove undesirable material from the gasket and gasket recess.
- H. Establish line and grade for pipe and appurtenances. Verify location and elevation of other utilities and manholes for gravity sewers.

3.02 INSTALLATION

- A. Trenching and backfill shall meet the requirements of Section 02221.
- B. During pipe installation, Contractor shall take every precaution to prevent foreign material from entering the pipe or fittings. The contractor shall place a heavy, tightly woven canvas bag over each end of joint of pipe before lowering it into the trench.
- C. Jointing procedures, including cleaning of ends of pipe, and lubrication shall be in accordance with the manufacturer's recommendations. Pipe shall be laid with the bells pointing in the direction of laying.
- D. Field cutting of pipe shall be done according to the manufacturer's recommendations. Cut end shall be smooth and at right angles to the axis of the pipe. Field cuts shall be filed or trimmed to resemble the spigot end of the pipe as manufactured. Depth marks shall be placed on the pipe to assure pipe is inserted to the full depth when joint is made.
- E. Thrust blocking shall be provided at all bends (of 11-1/4 degrees or greater) and tees and valves. Blocking shall be poured against undisturbed earth, be a minimum of twelve (12") inches thick and constructed so that the pipe and fitting joints will be accessible for repairs. Install as shown in the Typical Details.
- F. All valves shall be installed plumb and true in a workmanlike manner.

3.03 PLACING DETECTION TAPE OR WIRE

- A. All buried, non-metallic water and sewer pipes shall be identified by buried detection tape and tracing wire.
- B. Tape shall be placed directly over the pipe between one foot and three feet below finished grade and at least one foot above the top of the pipe.
- C. A different color tape shall be used for each pipe carrying a different substance.
- D. Detection wire shall be placed just below or beside pipe. Wire shall be stubbed out of valve box a minimum of 6 inches.

3.04 FIELD TESTS

- A. All newly laid water lines shall be tested before being placed in service. Trenches may be backfilled as the pipe is laid, or where practicable and at the option of the Contractor, trenches or bell holes may be left open for visual inspection during tests. Prior to making tests, all air shall be expelled from the pipe. Contractor shall install taps at high points of the line for purpose of expelling air.
- B. Pressure Test: A two (2) hour test shall be made in accordance with AWWA C600 on the pipe line between valves or temporary plugs at a test pressure of at least 1.5 times the working pressure, but not less than 150 psi, except that the pressure rating of the pipe shall not be exceeded. Any open trench or bell holes over dry joints may be backfilled following this test. Where trenches have been backfilled prior to making the tests, any leaks evident at the surface shall be uncovered. All leaking joints disclosed by this test shall be remade and retested. All pipe, fittings, valves, and other materials found defective under this test shall be removed and replaced at the Contractor's expense.
- C. Leakage Test: A leakage test shall be made on the water line concurrent with the pressure test between valves or temporary plugs at a constant test pressure as specified in "B" above. The test shall be run in accordance with AWWA C600 except as modified below. Leakage in the test system shall be measured through a meter or approved measuring device. The allowable leakage shall not be greater than 0.67 gallons per hour per 1,000 feet of pipe. Should tests disclose leakage greater than the allowable amounts, the Contractor, at his expense, shall locate and repair defective joints until the leakage is within the specified tolerance.

3.05 DISINFECTING WATER LINES

- A. Disinfection of the completed lines shall be done in accordance with AWWA C651 and in a manner approved by the Tennessee Department of Environment and Conservation and, the Huntsville Utility District.
- B. Prior to chlorination, the main shall be flushed as thoroughly as possible with the water pressure and outlets available. Flushing shall be done after the pressure tests are made. After flushing, all valves shall be carefully inspected to see that the entire operating mechanism is in good condition.
- C. Following disinfection, all treated water shall be thoroughly flushed from the newly laid pipeline at its extremities until the replacement water throughout its length shall, upon test, be proved comparable to the quality of water served the public from the existing water supply system and approved by the Tennessee Department of Environment and Conservation. This quality of water delivered by the new main should continue for a period of at least two full days as demonstrated by laboratory examination of samples taken from a tap located and installed in such a way as to prevent outside contamination. Samples shall not be taken from an unsterilized hose or from a fire hydrant.

- D. Should the initial treatment fail to result in the condition specified in the preceding paragraph, the disinfection procedure shall be repeated until such results are obtained. The Contractor is responsible and shall obtain the approval of the Owner for the work performed under this section.
- E. Contractor shall submit a plan to treat/contain super chlorinated water flushed from new water main, branch, service etc. to prevent nearby stream contamination.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes all materials, labor, equipment, and services required for the installation of all plain and reinforced cast-in-place concrete (including formwork, reinforcement, reinforcement supports, embedded items detailed on the concrete drawings, joint fillers, joint sealers, and waterstops), and all related activities in accordance with the drawings, construction specifications, General Conditions, and other contract documents.

1.02 PUBLICATIONS REFERENCED HEREIN

- A. American Concrete Institute (ACI) as listed:
1. ACI 116R-90 - Cement and Concrete Terminology.
 2. ACI 301-96 - Specifications for Structural Concrete for Buildings.
 3. ACI 305R-91 - Hot Weather Concreting.
 4. ACI 306R-88 - Cold Weather Concreting.
 5. ACI 315-92 - Details and Detailing of Concrete Reinforcement.
 6. ACI 350R-89 - Environmental Engineering Concrete Structures.
- B. American Society for Test and Materials (ASTM) standards:
1. CRD-C 48 - Method of Test for Water Permeability of Concrete.
 2. Concrete Reinforcing Steel Institute, Manual of Standard Practice, 1992.
 3. Federal Specifications, TT-S-00227E (COM-NBS)-70, Sealing Compound, Elastomeric Type, Multi-Component.
 4. American Association of State Highway and Transportation Officials (AASHTO), Standard Specifications - Part II, T 260-82 Sampling and Testing for Total Chloride Ion in Concrete and Concrete Raw Materials.
 5. American Welding Society, Structural Welding Code - Reinforcing Steel (AWS D 1.4-79).

1.03 DEFINITIONS

- A. Embedded Items
1. All bolts, inserts, sleeves, conduit, fixtures, and other material placed so as to become anchored in cast-in-place concrete, as indicated and specified elsewhere in the contract documents.
- B. Testing Laboratory
1. An independent engineering testing laboratory engaged by the Owner (or as otherwise specified in the contract documents) to perform testing services required in this section not otherwise assigned.
- C. Concrete Design Mix
1. A concrete design mix in the quantities of specific ingredients which, when mixed, will yield one (1) cubic yard of concrete of a given strength, slump, and air content. Any variation in admixtures, cement or water content, or of any other ingredient, shall constitute a different design mix.

- D. Hydraulic Structures
 - 1. Cast-in-place structures which have as their primary purpose the containment, conveyance or processing of liquids without other materials to provide water tightness and are designed in accordance with ACI 350.
- E. Definitions of other terms used in this specification, not defined where used or elsewhere in the contract documents, shall be as given in ACI 116R.

1.04 SUBMITTALS

- A. General
 - 1. All submittals required by this specification shall be to the persons or parties identified in the contract documents.
- B. Concrete Design Mix Reports
 - 1. Design mix reports for each proposed concrete design mix shall be submitted. These submittals shall include the results of all tests performed to qualify the materials (including determination of chloride ion concentration) and to establish each design mix. No concrete shall be placed until the design mix for that concrete is accepted and approved by the Engineer.
- C. Concrete Permeability
 - 1. Certified test results, showing that the water permeability of concrete proposed for use in any hydraulic structure designed to contain liquids satisfies the requirements of Paragraph 3.16, shall be submitted prior to the placement of any such concrete.
- D. Mill Test Reports
 - 1. Certified test reports, showing compliance with the required standards, shall be submitted for any or all materials proposed for use on the project, as required by the Engineer. When so required, such test reports shall certify that the material tested is of the same quality as that proposed for use on this project.
- E. Reinforcing Steel Shop Drawings
 - 1. Reinforcing steel shop drawings shall be submitted for review prior to fabrication. They shall conform to the requirements of ACI 315 and shall include placement plans, bar details, and bills of materials. Fabrication shall not be started until the submitted shop drawings have been reviewed and marked "Released for Production" by the Engineer.
- F. Formwork Shoring
 - 1. The Contractor shall specify the type of forms that are to be used for the job and provide detailed drawings of formwork to ensure compliance with ACI 301, Section 2. No concrete pours will be made prior to approval of the proposed formwork and rebar placement.
- G. Production Concrete Testing
 - 1. The Contractor and the Testing Laboratory shall report the results of all tests and inspections immediately after they are performed. Reports on strength tests shall include, in addition to the information required by ASTM C 39, the following:

- a. Project name and project number.
- b. Air temperature and temperature of concrete at time of sampling.
- c. Slump of sample.
- d. Air content of sample, percent.
- e. Location where the concrete represented by the sample was deposited.
- f. Name of person who molded the test cylinders.
- g. Description of storage and curing conditions prior to testing.
- h. Batching information (amount of concrete, time loaded or mixed, concrete design mix designation, type and brand of cement and any admixtures, total mixing water, maximum aggregate size, weights of ingredients, and amount of added water).

PART 2 - PRODUCTS

2.01 QUALITY OF MATERIALS

- A. When selecting materials, the contractor shall confirm the availability of certified test reports showing compliance with all required standards. See Submittals, Paragraph D.1.

2.02 CEMENT

- A. All cement shall be Portland Cement conforming to ASTM C 150, Type I or Type II (normal or moderately sulfate resistant, respectively), and shall all be of one brand produced at a single cement manufacturing plant.

2.03 ADMIXTURES

- A. All admixtures shall be compatible with all other concrete mix ingredients and reinforcing steel, and with the intended use of the concrete. No admixtures shall be used without the consent of the Owner's representative.
- B. Admixtures to be used in concrete, when permitted, shall conform to the following specifications:
 - 1. Air entraining admixtures, ASTM C 260.
 - 2. Water-reducing, retarding, and accelerating admixtures, ASTM C 494.
 - 3. Pozzolanic admixtures (including fly ash), ASTM C 618, including the supplementary optional physical requirements.

2.04 WATER

- A. Mixing water shall meet the requirements of ASTM C 94 (subject to chloride limitations in Paragraph 2.06).

2.05 AGGREGATES

- A. Aggregates shall conform to the requirements of Section 4.2 of ACI 301.

2.06 CHLORIDE ION CONCENTRATION

- A. Unless otherwise specified, the maximum water soluble chloride ion concentration in hardened concrete at ages twenty-eight (28) to forty-two (42) days contributed from the

ingredients of the concrete including water, aggregates, cement, and admixtures shall not exceed 0.10% by weight of the cement. The water soluble chloride ion concentration in each proposed concrete design mix shall be determined by testing in accordance with AASHTO T260.

2.07 STORAGE OF MATERIALS

- A. The storage of cement, aggregates, and admixture materials shall conform with Section 4.1 of ACI 301. Reinforcing shall be stored clear of the ground and protected from formation of rust and other damage.

2.08 FORMWORK

- A. All formwork shall conform to the requirements of Section 2 of ACI 301.

2.09 REINFORCEMENT

- A. Reinforcement material shall conform to the requirements of Section 3 of ACI 301 (all reinforcing bars shall be Grade 60 unless noted otherwise on the drawings). No coated bars shall be accepted unless otherwise noted on the Drawings or approved in writing by the Engineer.

2.10 WIRE BAR SUPPORTS

- A. Wire bar supports shall be plastic coated when in contact with forms for concrete that is to be left exposed. Such bar supports shall be in accordance with Class 1, maximum protection, in Chapter 3 of Manual of Standard Practice by the Concrete Reinforcing Steel Institute. All other wire bar supports shall conform to Class 2, moderate protection (or to Class 1).

2.11 PRE-MOLDED EXPANSION JOINT FILLER

- A. Pre-molded expansion joint filler material shall conform to ASTM D 1752, Type I or II, or to ASTM D 1751.

NOTE: If ASTM D 1751 joint filler material is used, backer material compatible with the joint sealer shall be used between the joint sealer and the joint filler material. Such backer material must provide a complete permanent separation of the joint filler and the joint sealer.

2.12 JOINT SEALER

- A. Joint sealer shall be a self-leveling two (2) component polysulfide material conforming to Federal Specification TT-S-00227E, Type 1, Class A.

2.13 WATERSTOPS

- A. Waterstops shall be "Waterstop RX" as manufactured by American Colloid Company or approved equal.
- B. Products proposed as an equal to those specified shall be submitted to the Engineer for review. Submittals shall include sample, specifications, and list of various installations of similar applications.

2.14 CURING MATERIALS

- A. Waterproof sheet material (such as polyethylene film) shall conform to ASTM C 171.
- B. Membrane curing compound material shall conform to ASTM C 309, Type I-D with fugitive dye. Materials containing wax, silicones, or other ingredients detrimental to subsequent floor finishes, are not acceptable.
- C. Other suitable materials, which when saturated over a period of time will not stain the concrete or otherwise be detrimental to the work may be used if approved by the Owner's representative.

2.15 GROUT

- A. All grout shall be one (1) of the following non-shrink grouts and shall be in accordance with ASTM C827, ASTM C191 and ASTM C109: Crystex (L & M Construction Chemicals), Five Star (US Grout Corporation), or Masterflow 713 (Master Builders). The installation and curing of all grout shall be in accordance with the manufacturer's recommendations. All grout shall be submitted to the Engineer for approval prior to placement.

PART 3 - EXECUTION

3.01 GENERAL

- A. All concrete shall be of the specified quality and capable of being placed without excessive segregation. When hardened, concrete shall develop all characteristics required by these specifications and the contract documents.

3.02 STRENGTH

- A. The specified compressive strength of the concrete, f_c , shall be 4000 psi unless otherwise specified. Strength requirements shall be based on a twenty-eight (28) day compressive strength unless a different test age is specified.

3.03 WEIGHT

- A. Unless otherwise specified, the concrete shall be regular weight. When lightweight concrete is specified, the concrete proportions shall be selected to meet the specified limit on maximum air-dry unit weight as measured in accordance with ASTM C 567.

3.04 DURABILITY

- A. Air-entrainment and air content measurement for all concrete shall conform with ACI 301 (Section 4.2.2.4) requirements for concrete subject to potentially destructive exposure as follows:

Aggregate Size	Percent Air Content by Volume
#7 (1/2" max.)	5 to 9
#67 (3/4" max.)	4 to 8
#57 (1" max.)	3.5 to 6.5

- B. Measurement of air content shall conform to ASTM C 138, C 173, or C 231. Unless otherwise specified, ASTM C231 shall be used.

3.05 WATER-CEMENT RATIO

- A. Unless otherwise specified, all concrete for structures designated as hydraulic structures and or designed to contain liquids (such as chests), shall have a water-cementing material (cement plus any accepted pozzolans) ratio not to exceed 0.45 by weight. All other concrete shall have a water-cementing material ratio not to exceed 0.50 by weight.

3.06 MINIMUM CEMENT

- A. Unless otherwise specified, the minimum cementing material (cement plus any accepted pozzolans) content per cubic yard for all concrete shall be as follows (from ACI 301, Table 4.2.2.1):

Nominal Maximum Aggregate Size	Minimum Cement*
1" (#57 stone)	520 pounds/cubic yard (5.5 Bags/cu.yd.)
3/4" (#67 stone)	540 pounds/cubic yard (5.7 Bags/cu.yd.)
1/2" (#7 stone)	590 pounds/cubic yard (6.3 Bags/cu.yd.)

*Maximum 20% pozzolan by weight.

3.07 MINIMUM CEMENT FOR HYDRAULIC STRUCTURES

- A. Unless noted otherwise, the minimum cementing material (cement plus any accepted pozzolans) content per cubic yard for hydraulic structures shall be as follows (from ACI 350, Section 3.5.1, and ACI 301, Table 4.2.2.1):

Nominal Maximum Aggregate Size	Minimum Cement*
1" (#57 stone)	536 pounds/cubic yard (5.7 Bags/cu.yd.)
3/4" (#67 stone)	564 pounds/cubic yard (6.0 Bags/cu.yd.)
1/2" (#7 stone)	590 pounds/cubic yard (6.3 Bags/cu.yd.)

*Maximum 20% pozzolan by weight (fly ash).

3.08 SLUMP

- A. Unless otherwise specified, all concrete, except floor slabs with specified f'c of 4000 psi or greater, shall be proportioned and produced to have a slump of four (4") inches or less. Concrete for floor slabs with specified f'c of 4000 psi or greater shall be proportioned and produced to have a slump of three (3") inches or less.
- B. A tolerance of up to one (1") inch above the maximum is allowed for one (1) batch in any five (5) consecutive batches tested. Concrete of lower than usual slump may be used only if it is properly placed and consolidated. The slump shall be determined in accordance with ASTM C 143.

3.09 MAXIMUM SIZES OF COARSE AGGREGATE

- A. Unless noted otherwise, the maximum nominal size of the coarse aggregate shall not be more than that of #57 stone (one (1") inch), 1/5 of the narrowest width of beams or walls, 1/3 of the depth of slabs, nor 3/4 of the minimum clear spacing between reinforcing bars. Additionally, the maximum nominal size of the coarse aggregate shall not be less than that of #7 stone (1/2").

3.10 ADMIXTURES

- A. Admixtures used shall conform to the requirements in Paragraph 2.03 and shall be subject to the following limitations.
- B. Admixtures containing calcium chloride shall not be used.
- C. All admixtures shall be used in accordance with the manufacturer's instructions.

3.11 SELECTION OF PROPORTIONS

- A. Each concrete design mix (see Definitions, Paragraph C.1.) shall be proportioned in accordance with ACI 301 (Section 4 on the basis of previous field experience or laboratory trial mixtures).

3.12 PROPORTIONING ON THE BASIS OF PREVIOUS FIELD EXPERIENCE OR TRIAL MIXTURES

- A. The determination of the standard deviation shall be in accordance with ACI 301 (Section 4).
- B. The determination of the required average compressive strength shall be in accordance with ACI 301 (Section 4).
- C. The documentation of the average strength shall be in accordance with ACI 301 (Section 4). See Submittals, Paragraph A.1.

3.13 PROPORTIONING BASED ON EMPIRICAL DATA

- A. Unless otherwise specified, concrete shall not be proportioned based on empirical data.

3.14 REDUCTION OF THE REQUIRED AVERAGE STRENGTH

- A. After sufficient data becomes available during construction, the amount by which the average strength must exceed the specified minimum strength f_c may be reduced, subject to approval by the Owner's representative, in accordance with ACI 301 (Section 4.2).

3.15 LIGHTWEIGHT CONCRETE

- A. The ability of the selected proportions to meet the specified limits for air-dry weight shall be verified by tests made in accordance with ASTM C 567. The air-dry unit weight shall be correlated with the fresh unit weight of the same concrete to permit use of the latter as the basis for acceptance during construction.

3.16 HYDRAULIC STRUCTURE WATER PERMEABILITY

- A. The permeability of trial batch concrete proposed for use in any watertight structure indicated on the drawings shall not exceed ten (10) by ten (10) to the minus of twelve (12) when tested in accordance with CRD-C 48-73 (Method of Test for Water Permeability of Concrete).

PART 4 - PERFORMANCE OF WORK

4.01 FORMWORK

- A. The design and installation of all formwork shall be in accordance with ACI 301 (Section 2) except as otherwise specified (see Paragraph 4.13 for requirements pertaining to removal of forms).
- B. Chamfer strips, 3/4" x 45 degrees in size, shall be used at all edges of formed concrete to be left exposed, unless otherwise specified.
- C. Tolerances
 - 1. Unless otherwise specified, formwork shall be constructed so that the concrete surfaces will conform to the tolerances given to ACI 301 (Section 2.3).

- D. The preparation of form surfaces shall be in accordance with ACI 301 (Section 2.2) except as otherwise specified.
- E. The portion of the forms in contact with concrete surfaces to receive joint sealer shall be free of any substance which will remain on these surfaces and cause the adhesion between the surfaces and the sealer to be weakened.
- F. Form tie assemblies for hydraulic structures shall be of such type as to leave no metal or other material within 1 1/2" of the surface. The assembly shall provide a cone-shaped depression at the surface of the concrete at least one (1") inch in diameter and 1 1/2" deep to allow filling and patching.
- G. When a portion of single rod ties are to remain in a liquid retaining structure, the portion that is to remain shall be provided with a tightly fitted washer at midpoint.

4.02 REINFORCEMENT

- A. Reinforcing shall not be welded unless otherwise specified. When welding of reinforcement is specified all such welding shall conform to AWS D 1.4.
- B. If welding is specified for zinc-coated or epoxy-coated reinforcement, zinc coatings shall be repaired afterwards with a zinc-rich formulation conforming to ASTM A 767 and epoxy coatings shall be repaired with a patching material conforming to ASTM A 775. Such repairs shall conform to the material manufacturer's recommendations. All welds, and all steel splice members used to splice reinforcing bars, shall be coated with the material used for repair of coating damage.
- C. The fabrication of reinforcing steel shall conform to the requirements of ACI 301 (all reinforcement shall be cold bent unless otherwise specified).
NOTE: Fabrication shall not be started until the reinforcing steel shop drawings have been reviewed and marked "Released for Production," by the Engineer. See Submittals, Paragraph E.1.
- D. Tolerances for the fabrication of reinforcing steel shall conform to Figures 4 and 5 of ACI 315.
- E. Tolerances for the placing of reinforcing steel shall conform to the requirements of ACI 301 (Section 3.3).
- F. The placing of reinforcing steel shall conform to the requirements of ACI 301 (Section 3.3), except as otherwise specified.
- G. Positioning of wire mesh shall be done in a manner that will allow lifting it off of the subgrade at least as indicated, but not closer to the surface of the concrete than one (1") inch or closer than 1 1/2" to the ground.

4.03 CONSTRUCTION AND CONTROL JOINTS

- A. Joints allowed, but not indicated on the contract documents, shall be located and constructed to minimize the impact on the strength of the structure. All locations shall be approved by the Owner's representative. In general, joints, when necessary, shall be located as near as possible to the middle of the spans of slabs, beams, and girders. Joints, when necessary in columns and walls, shall be at the underside of beams, and girders, and at the top of footings. Beams, girders, brackets, column capitals, haunches, and deep panels shall be placed at the same time as slabs.
- B. In floor slabs on grade, unless otherwise indicated on the drawings, provide construction or control joints continuously on maximum spacing of fifteen (15') feet, unless otherwise specified, in a grid pattern which coincides with column centerlines whenever feasible, and as approved by the Owner's representative.
- C. Unless otherwise specified, control joints shall be completed while the concrete is still in the plastic state.

4.04 EXPANSION AND ISOLATION JOINTS

- A. Reinforcement or other embedded metal items bonded to the concrete (except dowels in slabs on grade, bonded on only one (1) side of the joint) shall not be permitted to extend continuously through any expansion joint.
- B. Provide 1/2" wide expansion joints continuously at edges of slabs on grade abutting walls, columns, foundations, and other construction, unless otherwise indicated. Joint filler material shall extend full depth of joint except for space at top required for joint sealer, and shall be securely positioned.
- C. Exposed corners with rough edges shall be smoothed with an abrasive tool prior to sealer installation. Immediately prior to sealer installation, concrete surfaces to receive the sealer shall be clean and dry.

4.05 WATERSTOPS

- A. The design and location of waterstops shall be as shown on the drawings. See Paragraph 2.13 for waterstop material (unless specified otherwise).
- B. Each piece of pre-molded waterstop shall be of the maximum practical length in order to reduce the number of required splices.
- C. Waterstop material shall be butted at all joints to form a continuous barrier. Joints shall develop water tightness equal to that of continuous waterstop material.

4.06 OTHER EMBEDDED ITEMS

- A. All trades whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to set and/or furnish embedded items before the concrete is placed.

- B. Embedded Items
 - 1. All embedded items in any section or area in concrete which is scheduled to be placed, including anchor bolts (free of oil and other foreign matter), shall be set true within 1/8" of position shown on the drawings or as otherwise indicated, securely installed, and shall be thoroughly checked by the Contractor before concreting for that section or area is started. Voids in these items shall be filled temporarily with readily removable material to prevent the entry of concrete into these voids.

4.07 PRODUCTION OF CONCRETE

- A. The production of all concrete shall conform to the requirements of ACI 301 (Section 4).
- B. The control of admixtures shall conform to the requirements of ACI 301 (Section 4.3).

4.08 TEMPERING AND CONTROL OF MIXING WATER

- A. Concrete shall be mixed only in quantities for immediate use. Concrete which has started to harden shall be discarded and shall not be re-tempered.
- B. When concrete arrives at the job site with slump below that suitable for placing, as indicated by the specifications, water may be added only as follows:
 - 1. If approved by the concrete manufacturer and the Owner's representative, water may be added, but only once at the rate of one (1) gallon per cubic yard, and only if neither the design mix water-cement ratio nor the maximum slump for the concrete mix is exceeded. If allowed an addition of water above that permitted by the water-cement ratio limitation shall be accompanied by addition of a quantity of cement sufficient to maintain the proper water-cement ratio.
 - 2. The additional water shall be incorporated into the mixture by mixing for a minimum of an additional thirty (30) drum revolutions in accordance with ASTM C 94. Immediately after such additional mixing, representative samples shall be taken for separate strength tests.

4.09 EXTREME WEATHER CONDITIONS

- A. During Hot Weather
 - 1. Whenever the job temperature is over, or likely to be over, 80° F, all mixing, placement, and finishing procedures shall be directed to keeping the concrete at a temperature not in excess of 85° F maintained reasonably uniform, and to maintain uniform moist conditions. Refer to ACI 305R Hot Weather Concreting.
- B. During Cold Weather
 - 1. When daily temperatures are generally below 40° F, the temperature of the concrete at the time of placing shall be above 50° F, but not higher than 85° F. Provisions shall be made for maintaining the placed concrete at a temperature above 50° F for a period of at least six (6) days. Refer to ACI 306R Cold Weather Concreting.

4.10 PREPARATION BEFORE PLACING CONCRETE

- A. General
 - 1. Immediately prior to concreting, the place of deposit and all mixing, transporting, conveying, and placing equipment shall be available for inspection. The Contractor shall give the Owner's representative twenty-four (24) hours notice before placing concrete. Access shall be provided by the Contractor to top and bottom of forms prior to inspection.
- B. The inner surfaces of conveying equipment shall be free of hardened concrete and foreign materials.
- C. Preparation of previously cast construction joint surfaces shall be completed. All laitance, soft mortar, dirt, form oil, or other foreign materials shall be removed. Except as otherwise specified, the preparation shall be as follows:
 - 1. The previously cast concrete shall be moistened thoroughly (damp but completely free of standing water or free moisture).
 - 2. The surfaces of all vertical construction joints cast against bulkheads shall be roughened to uniformly expose the aggregate, and then washed with clean water to remove all dust and loose particles.
 - 3. The surfaces of all horizontal construction joints in work designed to contain liquids (such as chests) shall be dampened (but not saturated) and then thoroughly covered with a two (2") inch thick (minimum) coat of cement grout of similar proportions to the mortar in the concrete. The fresh concrete shall be placed before the grout has attained its initial set.
 - 4. Surfaces specified to receive an adhesive (see Paragraph 2.16) shall be prepared and the adhesive applied in accordance with the manufacturer's recommendations.
- D. Formwork shall be completed; snow, ice, and water shall be removed; reinforcement shall be secured in place; expansion joint material, anchor bolts, and other embedded items shall be properly positioned.
- E. Reinforcement shall be free of dirt, loose scale, oil, ice, kinks, or bends not shown on the details, and free of rust which could be removed by moderate hand wiping.
- F. Preventing Cave-Ins
 - 1. Adequate means of preventing cave-ins of earth during placement of concrete shall be provided. All work shall conform to OSHA Standards.
- G. Preventing Absorption of Water
 - 1. Earth, against which concrete is placed, shall be sufficiently damp to prevent absorption of water from the concrete, without allowing water to stand.
- H. Grade under slabs shall conform to line and grade of slab bottom indicated.
- I. Concrete shall not be placed on frozen ground.
- J. The readiness of each place to receive concrete shall be approved by the Owner's representative before concreting is begun.

4.11 CONVEYING AND DEPOSITING CONCRETE

- A. General
 - 1. Conveying and depositing of concrete shall be in accordance with ACI 301 (Section 5) and the following additional requirements:
- B. Concrete shall be conveyed and deposited in such a manner as to prevent separation of ingredients and to minimize re-handling and flowing. In depositing concrete, the following requirements shall be observed:
 - 1. At free-fall heights of six (6') feet or less, concrete may be deposited without the use of a dropchute, if apparent separation of ingredients does not occur.
 - 2. For free-fall heights greater than six (6') feet, a dropchute shall be used.
 - 3. For hydraulic structures, the free-fall height shall not exceed four (4') feet.
- C. When concrete is placed against earth, care shall be taken to prevent mixing of earth and concrete during placing and consolidation.
- D. Concrete shall be properly consolidated at or near the place of deposit. Vibrators shall not be used to move the concrete to other parts of the form. Adequate reserve vibration equipment shall be on hand to ensure continuous consolidation of all freshly placed concrete.
- E. All concrete surfaces to receive grout, or an additional concrete pour, shall be roughened with a rake or coarse broom before the fresh concrete obtains final set.
- F. Unless otherwise specified, concrete shall not be deposited under water. If so specified, procedures for placing such concrete shall ensure that concrete enters the mass of previously placed concrete from within, causing water to be displaced with minimum disturbance at the surface of the concrete. Placing procedures and the concrete mix design shall be approved by the Engineer.

4.12 CURING AND PROTECTION

- A. Beginning immediately after placement, concrete shall be cured and protected in accordance with ACI 301 (Section 5) and as follows:
 - 1. Concrete surfaces to receive joint sealer shall be kept free of any substance which might cause the adhesion between these surfaces and the joint sealer to be weakened.
 - 2. After the concrete has been placed, anchor bolts shall be protected from corrosion by daubing the threads with grease, wrapping with burlap, and then covering bolts with wooden boxes or plastic protectors.
 - 3. Extra attention to water curing shall be given to concrete slabs exposed to the sun's rays throughout the curing period, especially on any day when the surface temperature reaches 80° F. Each surface shall be kept wet.
 - 4. Curing of floor hardened surfaces shall be in accordance with the recommendations of the manufacturer of the floor hardener.
 - 5. Housing, covering, or other protection used to maintain elevated temperature shall remain in place for at least twenty-four (24) hours after artificial heating is discontinued.

NOTE: ACI 301 requires that the curing of all concrete be continued for at least seven (7) days, except for high-early-strength concrete for which the minimum period is three (3) days. Alternately, ACI 301 permits terminating proper moisture retention measures when properly field-cured cylinders reach 70% of f_c , or when laboratory-cured cylinders reach 85% of f_c .

4.13 REMOVAL OF FORMS AND RESHORING

- A. The removal of forms and reshoring shall conform to ACI 301 (Section 2) and the following additional requirements.
- B. Unless otherwise specified, forms and shoring supporting the weight of elevated slabs, beams, columns, and load bearing walls shall remain in place until the concrete attains at least seventy-five (75%) percent of the specified compressive strength, f_c , but not less than 3000 psi.
- C. Unless otherwise specified, forms and shoring supporting the weight of all other concrete shall remain in place until the concrete attains at least fifty (50%) percent of the specified compressive strength, f_c , but not less than 2000 psi.
- D. Unless otherwise specified, construction loads plus dead load on elevated slabs, beams, columns, and walls shall not exceed fifty (50%) percent of the design live load and dead load until the specified compressive strength is attained, unless shoring, designed to carry the total load is in place.
- E. For the purpose of determining when form removal is allowed, the concrete will be presumed to have reached the specified strength when either of the following conditions have been met:
 - 1. When test cylinders, field cured along with the concrete they represent, have reached the strength specified for form removal. The cylinders shall be molded and tested in accordance with Paragraph 4.22 (Testing).
 - 2. When the concrete has been cured in accordance with Paragraph 4.12 (Curing and Protection), for the same length of time as the age at test of laboratory-cured cylinders which reach the strength specified for form removal. The length of time the concrete in the structure has cured shall be taken to be the cumulative time that the concrete has been dampened or thoroughly sealed against moisture loss and the temperature has been maintained above 50° F.
- F. Forms to be reused shall be cleaned immediately after removal.
- G. **No form shall be removed prior to 48 hours after completion of a concrete pour.**

4.14 REPAIR OF SURFACE DEFECTS

- A. Surface defects, including tie holes shall be repaired immediately after form removal in accordance with ACI 301 (Section 5), except as otherwise specified.
- B. Unless otherwise specified, all tie holes shall be plugged.

4.15 FINISHING OF FORMED SURFACES

- A. In cases of exposed concrete, all formed surfaces shall be rubbed locally to remove loosened surface particles, to reduce misalignments of forms to not over 1/16", and to provide a uniform surface texture, immediately after removal of forms and subsequent removal of any concrete fins and after completion of any patching.
- B. In liquid retaining structures, concrete shall be rubbed to one (1') foot below the minimum liquid level (as specified by the Engineer).
- C. In cases of unexposed concrete, no further work is required after the patching is completed.

4.16 FINISHING OF UNFORMED (TOP) SURFACES

- A. All unformed surfaces shown on the plans as level or sloping planes shall be finished to a Class B finishing tolerance (1/4" in ten (10') feet as determined by a ten (10') foot straightedge placed anywhere on the slab in any direction), unless otherwise indicated (see definition of each Class of Finishing Tolerances in ACI 301, Section 5).
- B. Any depressed surface shall be struck off to elevations noted on plans.
- C. Unless otherwise indicated, one (1) of the following finishes shall be provided, depending upon the use to which the surface will be subjected:
 - 1. Float Finish - Provide an even, level, dense surface by mechanical and/or hand floating to establish finished grades.
 - 2. Soft-Textured Broom Finish - The surface shall be thoroughly hand or mechanically floated as required for Float Finish. Following any trowelling required to meet the specified finishing tolerance, the surface shall be lightly brushed with a soft bristled broom to produce a uniform, slightly textured surface, with grooves at right angles to the direction of greater traffic.
 - 3. Rough-Textured Broom Finish - The surface shall be thoroughly hand or mechanically floated as required for Float Finish. Following any trowelling required to meet specified finishing tolerance, the surface shall be lightly brushed with a coarse bristled broom to produce a uniform roughly textured surface, with grooves at right angles to the direction of greater traffic.
 - 4. Trowel Finish - After thorough hand or mechanical floating, when no additional mortar or moisture can be drawn to the surface, and when the concrete is sufficiently hardened to bear a man's weight without imprint, the surface shall be steel trowelled smooth. Final trowelling by hand shall produce a ringing sound when the trowel is drawn across the surface. This requires a Class A finishing tolerance (1/8" in ten (10') feet as determined by a ten (10') foot straightedge placed anywhere on the slab in any direction).

4.17 METALLIC FLOOR HARDENER APPLICATION

- A. When application of a metallic floor hardener is specified on the drawings, the hardener material shall be applied to a float finished surface at the rate recommended by the manufacturer for the particular type of service to which the floor will be subjected, in accordance with procedure demonstrated in the preparation of a Floor Slab Test Panel. The finish shall match the texture and density of the Floor Slab Test Panel finish selected by the Owner's representative as the model for this work.

4.18 ARCHITECTURAL CONCRETE

- A. All concrete designated as architectural concrete on the drawings or elsewhere in the contract documents shall conform to the requirements of ACI 301 (Section 6) for architectural concrete.

4.19 MASSIVE CONCRETE

- A. All concrete with a least dimension greater than six (6') feet, or when designated on the drawings, shall be treated as mass concrete and the requirements of ACI 301 (Section 8) for massive concrete shall be satisfied.

4.20 PRECAST - PRESTRESSED CONCRETE

- A. Precast - Prestressed concrete shall be in accordance with Section 03413, Precast - Prestressed Concrete, of the construction specifications.

4.21 JOB-CAST, POST-TENSIONED, PRESTRESSED CONCRETE

- A. Job-cast, post-tensioned, prestressed concrete shall conform to the special provisions of Section 9 of ACI 301 in addition to all other applicable portions of the Cast-In-Place Concrete section of the specification.

4.22 TESTING

- A. Concrete testing procedures, except as otherwise provided, shall be as follows:
 - 1. Determining Air Content - ASTM C 173 (Test for Air Content of Freshly Mixed Concrete by the Volumetric Method), or other suitable method approved by the Owner's representative.
 - 2. Determining Slump - ASTM C 143 (Test for Slump of Portland Cement Concrete).
 - 3. Making, curing, and Shipment of Test Specimens - ASTM C 31 (Making and Curing Concrete Compressive and Flexural Test Specimens in the Field), with special attention to consolidation, prevention of water evaporation, temperature control and handling.
 - 4. Compression Testing of Strength Test Specimens - ASTM C 39 (Test for Compressive Strength of Cylindrical Concrete Specimens).
- B. Unused Concrete
 - 1. Concrete in samples removed from concrete trucks for testing purposes shall be wasted on the site as directed by the Owner's representative.

4.23 EVALUATION AND ACCEPTANCE OF CONCRETE STRENGTH AND STRUCTURE

A. General

1. The evaluation of test results, acceptance of concrete, core tests (if required), and acceptance of structure shall be in accordance with ACI 301 (Section 1.6 and 1.7), and the contract documents.

END OF SECTION

SECTION 09910

PAINTING

WATER AND WASTEWATER FACILITIES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. This specification covers preparation of surfaces, performance and completion of painting of all surfaces as required by the drawings and as specified herein.
- B. All Materials delivered to job site shall be in original sealed and labeled containers of the paint manufacture.
- C. Scope of Required Painting:
 - 1. Valve Vault and Exposed and Immersed Piping
 - a. All exposed piping, valves and fittings.
 - b. All new exposed electrical conduit.

1.02 ENVIRONMENTAL CONDITIONS

- A. Coatings shall be applied during good painting weather. Air and surface temperatures shall be within limits prescribed by the manufacturer for the coating being applied and work areas shall be reasonably free of airborne dust at the time of application and while coating is drying.

1.03 ENVIRONMENTAL REGULATIONS

- A. All materials specified herein meet the current VOC Regulations in effect for the State of Tennessee. Shop applied materials to meet current HAPS requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All materials specified herein are manufactured by the TNEMEC Co., Inc., North Kansas City, Missouri (615-333-1000). These products are specified to establish standards of quality and are approved for use on this project.
- B. Equivalent materials of other manufacturers may be substituted on approval of the engineer. Requests for substitution shall include Manufacturer's literature for each product giving the name, generic type, descriptive information, and evidence of satisfactory past performance. Submittals shall include the following performance data as certified by a qualified testing laboratory:
 - 1. ASTM B117 - Method of Salt Spray (Fog) Testing
 - 2. ASTM D149 - Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials of Commercial Power Frequencies
 - 3. ASTM D3359 - Method for Measuring Adhesion by Test Tape

4. ASTM D3363 - Method for Film Hardness by Pencil Test
 5. ASTM D4060 - Method for Abrasion Resistance of Organic coatings by the Taber Abraser
 6. ASTM D4541 - Method for Pull-Off Strength of Coats Using Portable Adhesion Testers
 7. ASTM 4585 - Practice for Testing the Water Resistance of Coatings Using Controlled Condensation
 8. ASTM G53 - Practice for Operating Light- and Water- Exposure of nonmetallic Materials
 9. AWWA D102 - Standard for Painting Steel Water Storage Tanks
 10. SSPC-SP6 - Commercial Blast Cleaning
 11. SSPC-SP10 - Near White Blast Cleaning
- C. Bidders desiring to use coatings other than those specified shall submit their proposal in writing to the engineer at least ten (10) days prior to the bid opening. Substitutions which decrease the film thickness, the number of coats applied, change the generic type of coating, or fail to meet the performance criteria of the specified materials will not be approved. Prime and finish coats of all surfaces shall be furnished by the same manufacturer.
- D. Colors, where not specified, shall be as selected by the Owner. All colors shall be certified lead free.
- E. Materials supplied by other manufacturers may be considered for substitution if the following prevailing conditions exist:
1. Performance criteria of the specified materials are exceeded by the submitted alternate materials as listed in paragraph 2.01 and detailed on the technical data sheets of each specified product.
 2. The submittal must compare the performance criteria of the specified material with that of the submitted material and be documented in a side-by-side manner for the Engineer\Owner to review.
 3. Substitute materials must be for complete systems and not individual products combined with the specified materials and the performance criteria for all products within a system must meet or exceed the specified materials.
 4. Only one alternate submittal will be received for this specification and must be accompanied by a detailed statement of the sum to be added or deducted from the base bid should alternate materials be accepted.
- F. Where existing structures, piping and other facilities are indicated to be recoated, samples of the existing coating are to be taken and analyzed by the new coating manufacturers. Based on this analysis the new coating manufacturer shall recommend a new coating system and precise application instructions for the surface and submit to the Engineer for review. No additional payment shall be made for the recommended system.

PART 3 - EXECUTION

3.01 APPLICATION

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- A. Materials shall be mixed, thinned and applied according to the manufacturer's printed instructions and in accordance with AWWA D 102-97.

3.02 SURFACE PREPARATION

- A. Prepare surfaces in accordance with coating system's specifications. Touch up welds, burned and abraded areas with specified primer before applying field coats.
- B. Allow each coat to dry thoroughly before applying next coat.
- C. Finish coats shall be uniform in color and sheen without streaks, laps, runs, sags or missed areas. Primer and finish coats shall be furnished from the same Manufacturer to ensure compatibility.

3.03 ACCEPTANCE OF WORK

- A. All Surface Preparation and repairs shall be approved by the Engineer/Owner before primer is applied.
- B. Request acceptance of each coat before applying next coat.
- C. Correct work that is not acceptable and request re-inspection.

3.04 SYSTEM INSPECTION AND TESTING

- A. After application of each coating in the specified system and its surface has cured, measure its thickness with a properly calibrated Nordson Microtest Dry Film Thickness Gauge, or equivalent. Follow standard method for measurement of dry paint thickness with magnetic gauges as outlined in Steel Structures Painting Council's SSPC-PA2.
- B. Make as many determinations as needed to ensure the specified thickness values in each typical area. To all surfaces having less dry film thickness than specified, apply additional coat(s) at no extra cost to Owner to bring thickness up to specifications.
- C. Structural metals in immersion service that receive a protective coating system shall be checked with a non-destructive holiday detector that shall not exceed 67 1/2 volts. All pinholes or defects shall be repaired in accordance with manufacturer's printed recommendations and then retested.
- D. Masonry, drywall, or other non-metallic surfaces shall be continuously checked with wet-film thickness gauges during application to ensure proper dry film thickness will be attained. Also, square feet coverage needs to be monitored to verify proper coverage rates.
- E. Painting contractor shall permit Owner's Representative and/or paint & coating manufacturer (as requested by owner) to inspect their work for conformance to this specification. Owner reserves the right to reject all work that does not comply with this specification.

3.05 CLEANUP

- A. Remove and dispose of all rubbish or other unsightly material, in a legal manner, leaving the premises in a clean condition.

3.06 PAINTING SCHEDULE

- A. Steel - Pipes and Equipment
1. Exterior, Non-Immersion
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
1st Coat: N69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
2nd Coat: 1074\1075-Color Endura-Shield at 2.0 - 3.0 mils DFT.
 2. Immersion, Potable or Non-Potable Water
Surface Preparation: SSPC-SP10 Near-White Blast Cleaning.
1st Coat: N69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
* Use Series N140 Pota-Pox Plus in Potable Water
 3. Vapor Phase and Liquid Fluctuation Level, Non-Potable water with high levels of Hydrogen Sulfide.
Surface Preparation: SSPC-SP5/NACE 1 White Blast Cleaning.
1st Coat: 435 Perma-Glaze at 15.0 - 20.0 mils DFT.
2nd Coat: 435 Perma-Glaze at 15.0 - 20.0 mils DFT.
* May be applied in one coat at 30.0 to 40.0 mils DFT
 4. Interior, Non-Immersion
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
1st Coat: N69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
 5. Metal Anchorage for Buried Piping
Surface Preparation: Shop Primed Materials - Clean and Dry Or SSPC-SP3 Power Tool Clean.
1st Coat: 46-465 H.B. Tnemecol at 8.0 -12.0 mils DFT.
 6. Miscellaneous Castings, Including Manhole Rings and Covers
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
1st Coat: 46H-413 Hi-Build Tneme-Tar at 12.0 - 16.0 mils DFT.
 7. Factory Primed
Surface Preparation: Surface shall be clean and dry.
Shop Primer: N69-1255 Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
Barrier Coat as Required: 1-1216 Omnithane at 2.5 to 3.5 mils DFT.
Finish Coat: See top coat for exposure. System 3.06 A 1,2, 4 or 6.
- B. Mill Coated Steel Pipe
1. Exterior of Pipe, Non-Immersion
Surface Preparation: SSPC-SP6 Commercial Blast Cleaning.
Surface shall be clean and dry, remove black coating.
1st Coat: N69-1255 Hi-Build Epoxoline III at 4.0 - 6.0 mils DFT
2nd Coat: 1074\1075-Color Endura-Shield at 2.0 -3.0 mils DFT.
- C. Ductile or Cast Iron: Pipe and Miscellaneous Fabrications
1. Exterior, Non-Immersion
Surface Preparation: Surface shall be clean and dry. Remove Black

Coating in accordance with NAPF 500-03.

1st Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.

2nd Coat: 1074/1075-Color Endura Shield at 3.0 - 5.- mils DFT.

2. Interior, Non-Immersion

Surface Preparation: Surface shall be clean and dry. Remove Black Coating in accordance with NAPF 500-03.

One Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.

3. Immersion, Potable or Non-Potable Water

Surface Preparation: Surface shall be clean and dry. Remove Black Coating in accordance with NAPF 500-03.

1st Coat: N69-1255 Hi-Build Epoxoline II at 3.0 - 5.0 mils DFT.

2nd Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.

* Use Series N140 Pota-Pox Plus in Potable Water

D. Concrete, Dense Masonry

1. Exterior, Non-Immersion

Surface Preparation: Surface shall be clean and dry.

One Coat: 180/181-Color W.B Tneme-Crete at 6.0 - 8.0 mils DFT.

2. Immersion or Interior Non-Immersion

Surface Preparation: Brush-Off Blast.

Filler Coat: Fill flush all bug holes and voids with TNEMEC 63-1500 Filler and Surfacer.

1st Coat: 104-Color H.S. Epoxy at 6.0 - 10.0 mils DFT.

2nd Coat: 104-Color H.S. Epoxy at 6.0 - 10.0 mils DFT.

* Use Series N140 Pota-Pox Plus in Potable Water

3. Interior, exposed to high levels of Hydrogen Sulfide and Sulfuric Acid Condensate.

Surface Preparation: Brush-Off Blast.

Surfacer: 218 (219 Mortar-Clad as required).

1st Coat (as required): 434 Perma-Shield H2S at 125 mils DFT as required.

2nd Coat: 435 Perma-Glaze at 30.0 – 40.0 mils DFT.

4. Fluoride Room, Floor & Walls

Surface Preparation: Brush-Off Blast.

1st Coat: 120-5002 Vinester(*) at 12.0 - 18.0 mils DFT.

2nd Coat: 120-5001 Vinester at 12.0 -18.0 mils DFT.

*Use 120-5003 Vinester Filler and Surfacer to fill bug holes and voids flush.

5. Chemical Storage, Containment Areas (Floor, Trench, Tank Pad, and 3'6" Band on Walls).

Surface Preparation: Brush-Off Blast.

1st Coat: 201 Epoxoprime applied at 6.0 - 8.0 mils DFT

2nd Coat: 275-Color Stranlok at 25.0 - 40.0 mils DFT.

3rd Coat: 282-Color Tneme-Glaze at 6.0 - 8.0 mils DFT.

6. Immersion or Non-Immersion, Dense Masonry – Clearwell, wetwells and secondary containment

Surface Preparation: Pressure Blast to achieve an open Capillary substrate.

1st Coat: Apply XYPEX Concentrate at 1.5 pounds per square yard.

2nd Coat: Apply XYPEX Modified at 1.5 pounds per square yard.
Admix C-1000 may be used at the batch plant as an admix.

7. Interior, pipe gallery walls - Clear:
Surface Preparation: Rub seams and irregular areas.
1st Coat: Chemprobe Series 660 Prima-A-Pell 200.
2nd Coat: Chemprobe Series 660 Prima-A-Pell 200.
8. Interior: pipe gallery walls - Colored
Surface Preparation: Surface shall be clean and dry.
1st Coat: 84-Color Ceramlon ENV at 6.0 – 8.0 mils DFT
2nd Coat: 84-Color Ceramlon ENV at 6.0 - 8.0 mils DFT.
9. Immersion: Potable or Non-Potable Water
Surface Preparation: Brush-Off Blast.
Filler Coat (As Required): Fill flush all bug holes and voids with TNEMEC 63-1500 Filler and Surfacer.
1st Coat: 104-Color H.S. Epoxy at 6.0 - 10.0 mils DFT.
2nd Coat: 104-Color H.S. Epoxy at 6.0 - 10.0 mils DFT.
* Use Series N140 Pota-Pox Plus in Potable Water
10. EQ Basin Floors
Surface Preparation: Cure 28 days. Abrasive blast per SSPC/NACE 6, ICRI CSP 2-4; Verify concrete dryness and prep concrete surfaces per NACE No. 6/SSPC-SP13 and ICRI Guidelines. Moisture vapor transmission should not exceed 3 lbs/1000 sq ft in 24 hours.
Primer Coat: TNEMEC N69/N69F Color Hi-Build Epoxoline II at 100 – 150 sq ft/ gallon.
Finish Coat: TNEMEC N69/N69F Color Hi-Build Epoxoline II at 6.0 – 8.0 mils DFT; Non-skip with 50-6- mesh washed silica sand, aluminum oxide, flint shot, or other approved non-skid agent per Owner/Engineer requirements.

E. Porous Masonry

1. Exterior
Surface Preparation: Surface shall be clean and dry. Stone rub to remove loose and small particles from surface.
1st Coat: 156-Color Enviro-Crete at 4.0 - 8.0 mils DFT.
2nd Coat: 156-Color Enviro-Crete at 4.0 - 8.0 mils DFT.
Note: Split face or ribbed block requires TNEMEC 130 Envirofill.
2. Interior
Surface Preparation: Surface shall be clean and dry. Stone rub to remove loose and small particles from surface.
1st Coat: 84-Color Ceramlon ENV at 80- 100 sq. ft. gal.
2nd Coat: 84-Color Ceramlon ENV at 6.0 - 8.0 mils DFT.
3. Exterior: Clear Sealer and/or Stain
Surface Preparation: Surface to be sound, dry and free of cracks, oils efflorescence, paint or other contaminates.
Sealer Coat: Apply TNEMEC Prima-Pell H₂O at 125 to 150 Sq. ft./gal
Stain Option: Apply Conformal Stain in accordance with manufacturers written application instructions at 75 to 125 sq.ft/gallon.

- F. Concrete Floors
 - 1. Interior
 - a. Pipe Gallery, Mechanical Rooms - Clear
Surface Preparation: See Product Data Sheet
2 coats: 629 CT Densifyer 201 at 300 to 350 sq. ft. per gallon.
 - b. Pipe Gallery, Mechanical Rooms – Colored
Surface Preparation: Acid Etch or Brush-Off Blast.
1st Coat: 205-ColorTerra-Traed FC at 3.0 - 5.0 mils DFT.
2nd Coat: 205-ColorTerra-Traed FC at 3.0 - 5.0 mils DFT.
3rd Coat (As Required): 290/291-Color CRU at 1.0 – 2.0 mils DFT.
Non-skid with 211 Glass beads.
 - c. Decorative - Lab area, Shower and Bathroom areas
Surface Preparation: Acid Etch or Brush-Off Blast.
1st Coat: 201 Epoxoprime at 6.0 - 8.0 mils DFT.
2nd Coat: 222-Color DECO-Tread at 1/16 inch (Double seed)
3rd Coat: 284 DECO-Clear seal coat(s).
- G. Concrete Structures.
 - 1. Below Grade
Surface Preparation: Brush-off Blast.
One Coat: 46H-413 Hi-Build Tneme-Tar at 12.0 - 16.0 mils DFT.
- H. Plaster and Wallboard
 - 1. Interior
Surface Preparation: Surface shall be clean and dry.
1st Coat: 51-792 PVA Sealer at 1.0 - 2.0 mils DFT.
2nd Coat: 113-Color H.B. Tneme-Tufcoat at 4.0 - 6.0 mils DFT.
- I. Wood
 - 1. Interior or Exterior
Surface Preparation: Surface shall be clean and dry
1st Coat: 6-Color Tneme-Cryl at 2.0 - 3.0 mils DFT.
2nd Coat: 6/28Color Tneme-Cryl at 2.0 - 3.0 mils DFT.
- J. Insulated Pipe
 - 1. Interior
Surface Preparation: Surface shall be clean and dry
1st Coat: 6-Color Tneme-Cryl at 2.0 - 3.0 mils DFT.
2nd Coat: 6/28-Color Tneme-Cryl at 2.0 - 3.0 mils DFT.
- K. PVC Pipe
 - 1. Interior
Surface Preparation: Surface shall be lightly sanded and be clean and dry.
One Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
- L. Non-Ferrous Metals
 - 1. Interior
Surface Preparation: SSPC-SP1 Solvent Cleaning and lightly scarify.

One Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.

2. Exterior
 Surface Preparation: SSPC-SP1 Solvent Cleaning and lightly scarify.
 1st Coat: N69-Color Hi-Build Epoxoline II at 4.0 - 6.0 mils DFT.
 2nd Coat: 1074/1075-Color Endura Shield at 2.0 – 3.0- mils DFT.

M. Brick

1. Exterior Sealer
 Surface Preparation: Surface to be sound, dry and free of cracks, oils, efflorescence, paint or other contaminants.
 Sealer Coat: Apply TNEMEC Prima-Pell H₂O at 125 to 150 Sq. ft./gal

3.07 COLOR CODE FOR PROCESSING EQUIPMENT

- A. Prior to beginning work verify colors for new equipment with Owner.
 1. System - OSHA:

	GENERIC COLOR	COLOR IDENTIFICATION
WATER		
Raw Water	olive green	110GN Clover
Settled or Clarified Water	aqua	GB36 Aqua Sky
Finished or Potable Water	Dark Blue	11SF Safety Blue
WASTEWATER		
Sewage Plant Effluent	day*	07RD Terra Cotta
Backwash Waste	light brown	68BR Twine
Sludge	dark brown	84BR Weathered Bark
Sewer (Sanitary or Other)	dark gray	GR28 Fossil
CHEMICAL		
Alum or Primary Coagulant	orange	04SF Safety Orange
Ammonia	white	11WH White
Carbon Slurry	black	35GR Black
Caustic	yellow with green band	02SF Safety Yellow with 09SF Safety Green
Chlorine (Gas and Solution)	yellow	02SF Safety Yellow
Fluoride	light blue with red band	25BL Fountain blue with 06SF Safety Red
Lime Slurry	light green	PA30 Daiquiri Ice
Ozone	yellow with orange band	02SF Safety Yellow with 04SF Safety Orange
Phosphate Compounds	light green with red band	PA30 Daiquiri Ice with 06SF Safety Red
Polymers or Coagulant Aids	orange with green band	04SF Safety Orange with 09SF Safety Green
Potassium Permanganate	violet	14SF Safety Purple
Soda Ash	light green with orange band	PA30 Daiquiri Ice with 04SFSafety Orange

	GENERIC COLOR	COLOR IDENTIFICATION
Sulfuric Acid	yellow with red band	02SF Safety Yellow with 06SF Safety Red
Sulfur Dioxide	light green with yellow band	PA30 Daiquiri Ice with 02SF Safety Yellow
OTHER		
Compressed Air	dark green	91GN Balsam
Gas Tile	red	28RD Monterrey
Other Lines	light gray	32GR Light Gray
Hoists/trolleys	yellow*	02SF Safety Yellow
Fire Protection	red*	06SF Safety Red

* These generic colors are not part of the Recommended Standards for Water Works.

END OF SECTION

SECTION 09915

COATING & PAINTING FOR NEW STEEL WATER STORAGE TANKS

PART 1 - GENERAL

1.01 SCOPE

- A. The work of this section includes the work of repainting all interior and exterior surfaces of the tank and associated piping.

1.02 REFERENCE SPECIFICATIONS AND STANDARDS

- A. Without limiting the general aspects of other requirements of these specifications, all surface preparation, coating and painting of interior and exterior surfaces and inspection shall conform to the applicable requirements of the Society for Protective Coatings, NACE International, ASTM (American Society for Testing and Materials), AWWA and the manufacturer's printed instructions.
1. **ASTM** (American Society for Testing and Materials)
 - ASTM D 520 Standard Specification for Zinc Dust Pigment
 - ASTM D 4417 Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
 - ASTM E 337 Standard Practice Test Method for Measuring Humidity with a Psychrometer
 - ASTM D2200 Standard Methods of Evaluating Degree of Rusting on Painted Surfaces
 2. **ANSI** (American National Standards Institute)
 - ANSI/ASC 29.4 Exhaust Systems Abrasive Blasting Operations – Ventilation and Safe Practice
 - ANSI/NSF/CAN Standard 61 Drinking Water Components
 - ANSI/NSF/CAN Standard 600
 3. **AWWA** (American Water Works Association)
 - AWWA D 102 Coating Steel Water Storage Tanks
 - AWWA C-652 Disinfection of Water-Storage Facilities
 4. **Consumer Product Safety Act, Part 1303**
 5. **NACE International**
 - NACE Publication TPC2 Coatings and Linings for Immersion Service: Chapter 1 Safety, Chapter Surface Preparation, Chapter 3 Curing, and Chapter 4 Inspection
 - NACE Standard SP0178 Standard Recommended Practice – Fabrication Details, Surface Finish

NACE Standard SP0188	Requirements and Proper Design Considerations for Tanks and Vessels to be Lined for Immersion Service Standard Recommended Practice – Discontinuity (Holiday) Testing of Protective Coatings
NACE Standard RP0287	Field Measurement of Surface Profile of Abrasive Blast-Cleaned Steel Surfaces Using a Replica Tape
NACE Standard RP0288	Standard Recommended Practice, Inspection of Linings on Steel and Concrete

6. **OSHA (Occupational Safety & Health Administration)**
1915.35 Standards – 29 CFR – Painting

7. **SSPC (Society for Protective Coatings)**
- | | |
|--------------------|---|
| SSPC-SP2 | Hand Tool Cleaning |
| SSPC-SP3 | Power Tool Cleaning |
| SSPC-SP11 | Power Tool Cleaning to Bare Metal |
| SSPC-PA-1 | Shop, Field and Maintenance Painting |
| SSPC-PA-2 | Measurement of Dry Film Thickness with Magnetic Gages |
| SSPC-PA-3 | Guide to Safety in Paint Application |
| SSPC-Guide 12 | Guide for Illumination of Industrial Painting Project |
| SSPC-VIS 1-89 | Pictorial Surface Preparation Standards for Painting Steel Surfaces |
| SSPC Paint Spec 36 | Two Component Weatherable Aliphatic Polyurethane Topcoat, Performance-Based |

8. **SSPC/NACE Joint Standards**

SSPC-SP5/NACE 1	White Metal Blast Cleaning
SSPC-SP6/NACE 3	Commercial Blast Cleaning
SSPC-SP7/NACE 4	Brush-Off Blast Cleaning
SSPC-SP10/NACE 2	Near-White Metal Blast Cleaning

9. **NAPF 500-03**
Surface Preparation Standard for Ductile Iron Pipe and Fittings In Exposed Locations Receiving Special External Coatings and/or Special Internal Linings.

- B. The Engineer's decision shall be final as the interpretation and/or conflict between any of the referenced specifications and standards contained herein.

1.03 CONTRACTOR

- A. The Contractor shall have five years practical experience and successful history in the application of specified product to surfaces of steel water tanks. Upon request,

they shall substantiate this requirement by furnishing a list of references and job completions.

- B. The personnel performing the work shall be knowledgeable and have the required experience and skill to adequately perform the work for this project, in accordance with SSPC-PA1, "Shop, Field and Maintenance Painting".

1.04 QUALITY ASSURANCE

- A. **General:** Quality assurance procedures and practices shall be utilized to monitor all phases of surface preparation, application, and inspection throughout the duration of the project. Procedures or practices not specifically defined herein may be utilized provided they meet recognized and accepted professional standards and are approved by the Engineer.
- B. **Surface Preparation:** Surface preparation will be based upon comparison with: "Pictorial Surface Preparation Standards for Painting Steel Surfaces: SSPC-VIS 1-89", ASTM D2200-13, "Standard Methods of Evaluating Degree of Rusting on Painted Surfaces", ASTM D 4417, Method A and/or Method C or NACE Standard RP0287. In all cases the written standard shall take precedence over the visual standard. In addition, NACE Standard SP0178, along with the Visual Comparator, shall be used to verify the surface preparation of welds.
- C. **Application:** No coating or paint shall be applied when: 1) the surrounding air temperature or the temperature of the surface to be coated or painted is below the minimum surface temperature for the products specified herein, 2) rain, snow, fog or mist is present, 3) the surface temperature is less than 5°F above the dew point, 4) the air temperature is expected to drop below the minimum temperature for the products specified within six hours after application of coating. Dewpoint shall be measured by use of an instrument such as a Sling Psychrometer in conjunction with U.S. Department of Commerce Weather Bureau Psychrometric Tables. If any of the above conditions are prevalent, coating or painting shall be delayed or postponed until conditions are favorable. The day's coating or painting shall be completed in time to permit the film sufficient drying time prior to damage by atmospheric conditions.
- D. **Coating Thickness:** Thickness of coatings and paint shall be measured checked according to the procedures outlined in SSPC-PA 2 "Measurement of Dry Film Thickness with Magnetic Gages. Use of an instrument such as a Tooke Gauge, precision groove grinder, etc. is permitted if a destructive test is deemed necessary by the Engineer and the total DFT is less than 50 mils.
- E. **Holiday (Pinhole) Testing:** The integrity of interior coated surfaces shall be tested for holidays in accordance with NACE Standard SP0188. For dry films less than 20 mils, a non-destructive holiday detector shall not exceed 67.5 volts, nor shall destructive holiday detector exceed the voltage recommended by the manufacturer of the coating system. A solution of 1-ounce non-sudsing type wetting agent, such as Kodak Photo-Flo, and 1 gallon of tap water shall be used to

perform the holiday testing. For coating thickness at 20 mils and greater, a high voltage Tinker & Razor AP/W holiday tester shall be used. Contact coating manufacturer for voltage recommendations and curing parameters.

All pinholes and/or holidays shall be marked and repaired in accordance with the manufacturer's printed recommendations and retested. No pinholes or other irregularities will be permitted in the final coating.

- F. **Inspection Devices:** The contractor shall furnish, until final acceptance of coating and painting is accepted, inspection devices in good working condition for detection of holidays and measurement of dry film thickness of coating and paint. The Contractor shall also furnish U.S. Department of Commerce, National Bureau of Standards certified thickness calibration plates and/or plastic shims, depending upon the thickness gauge used, to test the accuracy of dry film thickness gauges and certified instrumentation to test the accuracy of holiday detectors. Dry film gauges and holiday detectors shall be made available for the Engineer's use at all times until final acceptance of application. Holiday detection devices shall be operated in the presence of the Engineer.
- G. **Inspection:** Inspection for this project shall consist of 'hold point' inspections. The Engineer or his representative shall inspect the surface prior to abrasive blasting, after abrasive blasting but prior to application of coating materials, and between subsequent coats of material. Final inspection shall take place after all coatings are applied, but prior to placing the tank in service. Contractor will ensure that sufficient rigging is in place so that the Engineer or their representative shall be able to conduct the required inspections.
- H. **Warranty Inspection:** Warranty inspection shall be conducted during the eleventh month following acceptance of all coating and painting work. All defective work shall be repaired in accordance with this specification and to the satisfaction of the Engineer and/or Owner.

1.05 SAFETY AND HEALTH REQUIREMENTS

- A. **General:** In accordance with requirements set forth by regulatory agencies applicable to the construction industry and manufacturer's printed instructions and appropriate technical bulletins and manuals, the Contractor shall provide and require use of personal protective lifesaving equipment for persons working on or about the project site. The Contractor's work forces should comply with the provisions outlined in SSPC-PA-3 "A Guide to Safety in Paint Application".
- B. **Head and Face Protection and Respiratory Devices:** Equipment shall include protective helmets which shall be worn by all persons while in the vicinity of the work. In addition, workers engaged in or near the work during sandblasting shall wear eye and face protection devices and air purifying half-mask or mouthpiece respirators with appropriate filters. Barrier creams shall be used on any exposed areas of skin.

- C. **Ventilation:** Where ventilation is used to control hazardous exposure, all equipment shall be explosion-proof. Ventilation shall reduce the concentration of air contaminants to a degree a hazard does not exist. Air circulation and exhausting of solvent vapors shall be continued until coatings have fully cured.
- D. **Sound Levels:** Whenever the occupational noise exposure exceeds maximum allowable sound levels, the Contractor shall provide and require the use of approved ear protection devices.
- E. **Illumination:** Adequate illumination shall be provided while work is in progress, including explosion-proof lights and electrical equipment. Whenever required by the Engineer, the Contractor shall provide additional illumination and necessary supports to cover all areas to be inspected. The level of illumination for inspection purposes shall be determined by the Engineer.
- F. **Temporary Ladders and Scaffolding:** All temporary ladders and scaffolding shall conform to applicable safety requirements. They shall be erected where requested by the Engineer to facilitate inspection and be moved by the Contractor to locations requested by the Engineer.

1.06 PRODUCT DELIVERY, STORAGE & HANDLING

- A. All materials shall be brought to the jobsite in original sealed containers. They shall not be used until the Engineer has inspected the contents and obtained data from information on containers or label. Materials exceeding storage life recommended by the manufacturer shall be rejected.
- B. All coatings and paints shall be stored in enclosed structures to protect them from weather and excessive heat or cold. Flammable coatings and paints must be stored to conform with City, County, State and Federal safety codes for flammable coating or paint materials. At all times coatings and paints shall be protected from freezing.

1.07 JOB CONDITIONS

PART 2 - MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

- A. Materials specified are those that have been evaluated for the specific service. Products of the Tnemec Company, Inc. are listed to establish a standard of quality. The systems specified are intended to provide the longest service life, lowest service cost and most sustainable solution. **Equivalent materials of other manufacturer's may be submitted** on written approval of the Engineer.
- B. Performance equivalent products will be considered and must be approved by addendum. Requests for substitution shall include manufacturer's literature for

each product giving name, product number, generic type, descriptive information, solids by volume recommended dry film thickness and certified lab test reports showing results to equal the performance criteria of the products specified herein. As part of the proof of equality, the Engineer will require at the cost of the Contractor, certified test reports from a nationally known, reputable and independent testing laboratory conducting comparative tests as directed by the Engineer between the product specified and the requested substitution. In addition, a list of five projects shall be submitted in which each product has been used and rendered satisfactory service.

- C. All requests for product substitution shall be made at least 14 days prior to the bid date.
- D. Any material savings shall be passed to the owner in the form of a contract dollar reduction. Other approved coating manufacturer system, if provided, will be shown in the Bid Schedule as a separate bid item. The Owner will decide which coating system(s) to accept.
- E. Manufacturer's color charts shall be submitted to the Engineer at least 30 days prior to coating and/or paint application. General Contractor and Painting Contractor shall coordinate work so as to allow sufficient time (normally seven to ten days) for paint to be delivered to the job site.

2.02 GENERAL REQUIREMENTS

- A. All materials shall be lead-free as defined by the Consumer Product Safety Act, Part 1303.
- B. All zinc dust pigment contained in any zinc-rich material shall meet the requirements of ASTM D 520 Type III with regard to zinc content and purity.
- C. All systems for the interior wetted portion of the tank shall meet the requirements of ANSI/NSF/CAN Standard 600 for potable water contact.
- D. All catalyzed polyurethane products shall meet the minimum requirements of SSPC Paint Specification Number 36, Level 3 Performance Level.
- E. No products containing MOCHA shall be allowed.

2.03 MATERIAL PREPARATION

- A. Mix and thin materials according to manufacturer's latest printed instructions.
- B. Do not use materials beyond manufacturer's recommended shelf life.
- C. Do not use mixed materials beyond manufacturer's recommended pot life.
- D. Do not split kits of multi-component products.

2.04 TANK INTERIOR COATING SYSTEMS

A. Steel Substrates - Interior Wet

1. **Surface Preparation Prior to Abrasive Blast Cleaning:** Weld flux and spatter shall be removed by power tool cleaning. Sharp projections shall be ground to a smooth contour. All welds shall be ground to a smooth contour as per NACE Standard SP0178, Designation D.
2. **Shop Surface Preparation:** SSPC-SP10 Near-White Metal Blast Cleaning. A minimum angular anchor profile of 1.5 mils as per ASTM D 4417, Method C or NACE Standard RP0287 is required. All surfaces must be clean, dry, and free of contaminants.
3. **Field spot Surface Preparation:** SSPC-SP10 Near-White Metal Blast Cleaning. A minimum angular anchor profile of 1.5 mils as per ASTM D 4417, Method C or NACE Standard RP0287 is required. All surfaces must be clean, dry, and free of contaminants.
4. **Coating System:**

Shop Prime Coat: Immediately after blasting and before any rusting occurs apply Tnemec Series 94-H2O or Series 93-H2O Hydro-Zinc at 2.5 to 3.5 dry mils. Thin only with approved thinner, Tnemec 41-3, 41-2.

Field Spot Prime Coat: Immediately after blasting and before any rusting occurs apply Tnemec Series 94-H2O / 93 H2O Hydro-Zinc at 2.5 to 3.5 dry mils to bare areas. Thin only with approved thinner, Tnemec 41-3 or 41-2 Thinner. Feather into sound existing coatings.

Stripe Coat: Tnemec Series N140-1255 Pota-Pox Plus applied by brush or roller to all weld seams, edges, corners, bolts, nuts and other difficult to coat areas. Thin only with approved thinner, Tnemec 41-4 Thinner.

Finish Coat: Tnemec Series 21-WH16 "Off White" Epoxoline applied at 10.0 to 16.0 dry mils. Thin only with approved thinner, Tnemec 41-88 Thinner.

Total dry film thickness shall be a minimum of 13.5 mils.

For cold weather applications, Series 44-710 Urethane Accelerator may be added to Series 94 /93-H2O.

2.05 TANK EXTERIOR COATING SYSTEMS

A. Steel Substrates

1. **Shop Surface Preparation:** SSPC-SP6 Commercial Blast Cleaning. A minimum angular anchor profile of 1.5 mils as per ASTM D 4417, Method C or NACE Standard RP0287 is required.
2. **Field Spot Surface Preparation:** SSPC-SP6 Commercial Blast Cleaning. A minimum angular anchor profile of 1.5 mils as per ASTM D 4417, Method C or NACE Standard RP0287 is required.
3. **Coating System:**

Shop Prime Coat: Immediately after blasting and before any rusting occurs apply Tnemec Series 94-H2O or Series 93 H2O Hydro-Zinc at 2.5 to 3.5 dry mils. Thin only with approved thinner, Tnemec 41-3 or 41-2.

Field Spot Prime Coat: Immediately after blasting and before any rusting occurs apply Tnemec Series 94-H2O / 93 H2O Hydro-Zinc at 2.5 to 3.5 dry mils to bare areas. Thin only with approved thinner, Tnemec 41-3 or 41-2 Thinner. Feather into sound existing coatings.

Intermediate Coat: Tnemec Series 73 or 1095 Endura-Shield applied at 2.0 to 3.0 dry mils. Thin only with approved thinner, Tnemec 41-39 or 41-42 Thinner.

Finish Coat: Tnemec Series 700 Hydroflon applied at 2.0 to 3.0 dry mils. Thin only with approved thinner, Tnemec 41-63 Thinner.

Logo(s): Tnemec Series 700 Hydroflon applied at 2.0 to 3.0 dry mils. Thin only with approved thinner, Tnemec 41-63 Thinner. Some colors may require 2 coats for hide.

Total dry film thickness shall be a minimum of 6.5 mils.

For cold weather applications, Series 44-710 Urethane Accelerator may be added to Series 91/93, 73 and 700 at the rate specified on the Series 44-710 product data sheet.

B. Exterior Exposed Ductile Iron Pipe

1. **Surface Preparation:** Clean all surfaces as per NAPF 500-03-01 Solvent Cleaning using stiff bristle brushes to remove all grease, oil, factory-applied tar or bitumastic coatings and any other contaminants. Abrasive blast as per NAPF 500-03-04 Abrasive Blast Cleaning to remove existing paint and coatings and provide a minimum 1.5 mil surface profile. All surfaces must be clean, dry and free of contaminants.

2. **Coating System:**

Prime Coat: Tnemec Series N69 Hi-Build Epoxoline II applied at 6.0 to 8.0 dry mils. Thin only with approved thinner, Tnemec 41-4 Thinner. Roller application will require multiple applications to reach required thickness.

Intermediate Coat: Tnemec Series 73 or 1095 Endura-Shield applied at 2.0 to 3.0 dry mils. Thin only with approved thinner, Tnemec 41-39 or 41-42 Thinner.

Finish Coat: Tnemec Series 700 Hydroflon applied at 2.0 to 3.0 dry mils. Thin only with approved thinner, Tnemec 41-63 Thinner.

Total dry film thickness shall be a minimum of 10.0 mils.

PART 3 - EXECUTION

3.01 GENERAL

- A.** All surface preparation, coating and painting shall conform to applicable standards of the Society for Protective Coatings, NACE International and the manufacturer's printed instructions. Materials applied to the surface prior to the approval of the Engineer shall be removed and re-applied to the satisfaction of the Engineer at the expense of the contractor.
- B.** All work shall be performed by skilled craftsmen qualified to perform the required work in a manner comparable with the best standards of practice. Continuity of personnel shall be coordinated with the Engineer.
- C.** The Contractor shall provide a supervisor at the work site during cleaning and application operations. The supervisor shall have the authority to sign change orders, coordinate work and make decisions pertaining to the fulfillment of the contract.
- D.** Dust, dirt, oil, grease, or any foreign matter that will affect the adhesion or durability of the coating or paint must be removed by washing with clean rags dipped in an approved cleaning solvent and wiped dry with clean rags.

- E. Coating and painting systems include surface preparation, prime coating, and finish coatings. Unless otherwise approved in writing by the Engineer, prime coating shall be field applied. Where prime coatings are shop applied, the Contractor shall instruct suppliers to provide the prime coat compatible with the specified finish coat. Any off-site work which does not conform to this specification, is subjected to damage during transportation, construction or installation shall be thoroughly cleaned and touched-up in the field as directed by the Engineer. The Contractor shall use repair procedures which insure the complete protection of all adjacent primer. The specified repair method and equipment may include wire-brushing, hand or power tool cleaning, or dry air blast cleaning. In order to prevent injury to surrounding painted surfaces, blast cleaning may require use of lower air pressure, smaller nozzle and/or abrasive blast particles, or shorter blast nozzle distances from surface shielding and masking. If damage is too extensive or uneconomical to touch-up, the entire item shall be blasted and then coated or painted as directed by the Engineer.
- F. The Contractor's coating and painting equipment shall be designed for application of materials specified and shall be maintained in first class working condition. Compressors shall have suitable traps and filters to remove water and oils from the air. Contractor's equipment shall be subject to approval of the Engineer.
- G. Application of the first coat shall follow immediately after surface preparation and cleaning before rust bloom occurs or the same day, whichever is less. Any cleaned areas not receiving first coat within this period shall be recleaned prior to application of first coat. Use of dehumidification equipment shall be first reviewed by the Engineer and coatings manufacturer prior to deviating from this provision.
- H. Prior to assembly, all surfaces made inaccessible after assembly shall be prepared as specified herein and shall receive the coating or paint system specified.

3.02 SURFACE PREPARATION

- A. The latest revision of the following surface preparation specifications of the Society for Protective Coatings (SSPC) shall form a part of this specification. The summaries listed below are for informational purposes; consult the actual SSPC specification for full detail.
 - 1. **Solvent Cleaning (SSPC-SP1):** Removal of oil, grease, soil and other contaminants by use of solvents, emulsions, cleaning compounds, steam cleaning or similar materials and methods which involve a solvent or cleaning action.
 - 2. **Hand Tool Cleaning (SSPC-SP2):** Removal of loose rust, loose mil scale and other detrimental foreign matter to a degree specified by hand chipping, scraping, sanding, and wire-brushing

3. **Power Tool Cleaning (SSPC-SP3):** Removal of loose rust, loose mil scale and other detrimental foreign matter by power wire-brushing, power impact tools or power sanders.
 4. **White Metal Blast Cleaning (SSPC-SP5/NACE No. 1):** Air blast cleaning to a gray-white uniform metallic color until each element of surface area is free of all visible residues.
 5. **Commercial Blast Cleaning (SSPC-SP6 NACE No. 3):** Air blast cleaning until at least two-thirds of each element of surface area is free of all visible residues.
 6. **Brush-Off Blast Cleaning (SSPC-SP7 NACE No. 4):** Air blast cleaning to remove loose rust, loose mil scale and other detrimental foreign matter to a degree specified.
 7. **Near-White Metal Blast Cleaning (SSPC-SP10 NACE No. 2):** Air blast cleaning until at least 95% of each element of surface area is free of all visible residues.
 8. **Power Tool Cleaning to Bare Metal (SSPC-SP11):** Differs from SSPC-SP3 in that it requires more thorough cleaning and a surface profile not less than 1 mil.
- B.** Slag, weld metal accumulation and spatters not removed by the Fabricator, Erector or Installer shall be removed by chipping and/or grinding. All sharp edges shall be peened, ground or otherwise blunted as required by the Engineer. All grinding and finishing of welds, edges, etc. shall be performed prior to solvent cleaning and abrasive blasting. Welds shall be prepared as per NACE Standard SP0178 for all interior and exterior surfaces:
1. **Butt Welds:** Shall be ground smooth and free of all defects, designation "D".
 2. **Lap Welds:** Shall be ground smooth and blended, designation "D".
 3. **Fillet Welded Tee Joint:** Shall be ground smooth and blended, designation "D".
- C.** Field blast cleaning for all surfaces shall be by dry method unless otherwise directed. Blast nozzles shall be venturi-type nozzles with a minimum pressure at the nozzle of 90 psi.
- D.** Particle size of abrasives used in blast cleaning shall be that which will produce the specified surface profile or in accordance with recommendations of the manufacturer of the specified coating or paint system to be applied.

If the profile of the blasted steel exceeds the profile specified above, the Contractor shall be required to do one or both of the following:

1. Reblast the surface using a finer aggregate in order to produce the required profile.
 2. Apply a thicker prime coat, if possible given the limitations of the products being applied, in order to adequately cover the blast profile
- E. Abrasive used in blast cleaning operations shall be new, washed, graded and free of contaminants that would interfere with adhesion of coating or paint and shall not be reused unless specifically approved in writing by the Engineer.
- F. During blast cleaning operations, caution shall be exercised to ensure that existing coatings or paint are not exposed to abrasion from blast cleaning.
- G. The Contractor shall keep the area of their work and the surrounding environment in a clean condition. They shall not permit blasting materials to accumulate as to constitute a nuisance or hazard to the accomplishment of the work, the operation of the existing facilities or to the surrounding environment.
- H. Blast cleaned surfaces shall be cleaned prior to application of specified coatings or paint. All surfaces shall be free of dust, dirt, and other residue resulting from the abrasive blasting operation. No coatings or paint shall be applied over damp or moist surfaces.
- I. Pitted areas on the tank interior shall be repaired by either filling with Tnemec Series 215 Surfacing Epoxy or by welding. Epoxy filler shall be feathered smooth. Filler shall be applied after primer and prior to the application of the finish coat. No protrusions or spatter will be allowed. Pits equal or greater in depth to one-half (1/2) of the steel thickness shall be filled by welding.
- J. **Specific Surface Preparation:** Surface preparation for the specific system shall be as noted in Sections 2.04 and 2.05.

3.03 APPLICATION, GENERAL

- A. Coating and paint application shall conform to the requirements of the Society for Protective Coatings Paint Application Specification SSPC-PA1, latest revision, for "Shop, Field and Maintenance Painting".
- B. Thinning shall be permitted only as recommended by the manufacturer and approved by the Engineer, and utilizing the thinners stated in Sections 2.04 and 2.05.
- C. Each application of coating or paint shall be applied evenly, free of brush marks, sags, runs, with no evidence of poor workmanship. Care shall be exercised to

avoid lapping on glass or hardware. Coatings and paints shall be sharply cut to lines. Finished surfaces shall be free from defects or blemishes.

- D.** Protective coverings or drop cloths shall be used to protect floors, fixtures and equipment. Care shall be exercised to prevent coatings or paints from being spattered onto surfaces which are not to be coated or painted. Report to the Engineer surfaces from which materials cannot be satisfactorily removed.
- E.** When two coats of coating or paint are specified, where possible, the first coat shall contain sufficient approved color additive to act as an indicator of coverage or the two coats must be of contrasting color.
- F.** Film thickness per coat as specified in Sections 2.04 and 2.05 are the minimum required. If roller application is deemed necessary, the Contractor shall apply additional coats to achieve the specified thickness.
- G.** All material shall be as specified.

3.04 COATING SYSTEMS APPLICATION

- A.** After completion of surface preparation as specified for the specific system, materials shall be applied as noted in Sections 2.04 and 2.05.
- B.** Care shall be taken to eliminate overspray and dry spray on the tank interior. Where such conditions are encountered, the surface shall be cleaned of all over spray and dry spray prior to the application of the succeeding coat.
- C.** Areas rendered inaccessible after tank erection such as the spaces between roof plates and rafters shall receive the full coating system prior to erection and/or assembly.

3.05 DISINFECTION

- A.** Disinfection of interior surfaces shall be performed in the presence of the Engineer in accordance with all the requirements of applicable AWWA Standards and regulatory agencies. Reference ANSI/AWWA C652 Disinfection of Water Storage Facilities.
- B.** Disinfection shall be performed after protective coatings have been applied to the interior surfaces and allowed to thoroughly cure.
- C.** Prior to disinfecting, the complete interior shall be washed down with clean water and thoroughly flushed out.

3.06 SOLVENT VAPOR REMOVAL

- A.** All solvent vapors shall be completely removed by suction-type exhaust fans and blowers before placing tank in operating service.
- B.** All solvent vapors will be exhausted both during and after coating application as per AWWA D 102 to allow the proper curing of the coating material.
- C.** Ventilation shall be continued until such time as the coating has reached “full cure” as specified by the coating manufacturer.

3.07 CLEAN UP

- A.** Upon completion of the work, all staging, scaffolding and containers shall be removed from the site or destroyed in a manner approved by the Engineer. Coating or paint spots or oil stains upon adjacent surfaces shall be removed and the jobsite cleaned. All damage to surfaces resulting from the work of this section shall be cleaned, repaired or refinished to the satisfaction of the Engineer at no cost to the Owner.

END OF SPECIFICATION

SECTION 13415

MULTI-COLUMN ELEVATED WATER STORAGE TANK

1.01 GENERAL REQUIREMENTS

A. Scope

The Contractor shall be responsible for all labor, materials, and equipment necessary for the design, fabrication, construction, painting, disinfection and testing of an elevated, welded carbon steel water storage tank supported by a series of supporting columns and cross bracing. Design and construction of the Elevated Tank shall conform to all requirements of AWWA D100 Standard for Welded Carbon Steel Tanks for Water Storage, except as modified by the requirements of these contract documents.

B. Qualification of Manufacturer

- 1) The design and construction of the Multi-Column elevated water storage tank shall only be undertaken by a Contractor with a minimum of five years experience with elevated tank construction. The Contractor must be able to demonstrate experience through the design and construction of at least five Multi-Column elevated water tanks. The Contractor shall not subcontract the design or erection of the steel tank and supporting tower.
- 2) As providing a safe work environment is critical for this project, other contractors, and the community, to be approved to bid on this project, given the complexity, and risk associated with the work, all tank contractors are required to have an Experience Modification Rate (EMR) below 0.75 and a Total Recordable Incident Rate (TRIR) below 2.5 for the last three (3) years. Bidders are required to verify the above requirement by providing with their proposal a statement from their insurance carrier confirming the EMR requirement, and their last three (3) years of OSHA 300 Logs to confirm the TRIR requirement.

C. Submittals

No bid will be considered unless this information is provided with the proposal:

- 1) A list of five Multi-Column elevated tanks constructed within the last five years, including the name of the Owner, tank capacity and the Consulting Engineer.
- 2) A preliminary drawing of the tank showing major dimensions and plate thickness upon which the bid is based, the high and low water levels and the dimensions of the supporting tower.
- 3) A foundation design drawing showing preliminary dimensions and approximate quantities of concrete and reinforcing steel.
- 4) If special foundation conditions are anticipated, these must be noted on the preliminary drawings.

D. Related Requirements

- 1) AWWA (American Water Works Association) D100-21 Standard for Welded Carbon Steel Tanks for Water Storage.
- 2) AWWA D102 - Standard for Painting Steel Water Storage Tanks.
- 3) AWWA C652 - Standard for Disinfection of Water Storage Facilities.
- 4) AWS (American Welding Society) D1.1
- 5) ASCE 7 - Minimum Design Loads for Buildings and Other Structures
- 6) NSF (National Sanitation Foundation) 61 - Materials in contact with Potable Water.
- 7) Steel Structures Painting Council Manual - Volume 1 - Good Painting Practice.
- 8) Steel Structures Painting Council Manual - Volume 2 - Systems and Specifications.
- 9) ACI 318 - Building Code Requirements for Reinforced Concrete
- 10) ACI 301 - Specifications for Structural Concrete

E. Tank Details

The elevated tank shall be all-welded construction of the most economical design. All members of structural steel or of reinforced concrete shall be designed to safely withstand the maximum stresses to which they may be subjected during erection and operation.

- 1) The minimum operating capacity of the storage tank will be 150,000 US gallons.
- 2) The capacity of the tank, low water level to high water level, shall be contained within a maximum operating head range of 33 feet +/- 2.5 feet.
- 3) The height of the tank, top of foundation to high water level, shall be 158 feet.
- 4) Top of foundation elevation shall be 1764.00.
- 5) The existing ground elevation is 1763 FT +/-.
- 6) The finished ground elevation shall be 1764 FT +/-.

F. Permits, Easements, Electrical Lines and Utilities

Permits, licenses, airspace authority approval and easements required for the construction of the tank and associated work shall be provided by the Owner.

The site plan or specifications indicate the approximate location of all overhead or underground electrical lines and other utilities and piping at the time of the survey. The Contractor shall be responsible for coordination with the local power supplier and other utilities for de-energizing any electrical or utility lines that may interfere with the safe construction of the foundation or structure(s).

G. Working Drawings

After contract award and prior to construction, the Contractor shall provide engineering drawings and design calculations for the elevated steel tank and the foundation. Drawings shall show the size and location of all structural components and the foundations along with reinforcement details, the required strength and grade of all

materials, and the size and arrangement of principle piping and equipment. The drawings and calculations shall bear the certification of a professional Engineer licensed in the State of Tennessee. The design coefficients and resultant loads for snow, wind and seismic forces, and the methods of analysis shall be documented.

2.01 DESIGN

A. General

The structural design of the elevated storage tank shall conform to the following design standards (latest edition) except as modified or clarified as follows:

- 1) Foundations – AWWA D100 and ACI 318 – Building Code Requirements for reinforced concrete.
- 2) Steel Tank – AWWA D100
- 3) Steel Tank Painting – AWWA D102 (See Specification Section 09915)

B. Environmental Loads – AWWA D100 and ASCE 7

- 1) **Wind Load** – Wind pressure shall be determined in accordance with AWWA D100, Section 3.1.6. Basic wind speed used in the Wind Pressure formula shall be determined using the mapped site location and Section 3.1.6.1 of AWWA D100.

Basic Wind Speed (BWS) = (Tank Designer verify for specific location) 110 MPH

- 2) **Seismic Load** – Seismic loads shall be determined in accordance with AWWA D100, Section 3.1.7.
 - a) Region Dependent Transition Period (T_L) =
 - b) Site Class D, Design Category C
 - c) MCE Spectral Response Acceleration at 0.2sec (S_S) and 1sec (S_1)
 $S_S = 0.42 g$
 $S_1 = 0.12 g$
Longitude = W 84 deg 13 min 38.52 sec (at tank center)
Latitude = N 36 deg 21 min 17.09 sec (at tank center)
 - d) Importance Factor (I_E) = (Table 21)
- 3) **Snow Load** – Snow load shall be determined in accordance with AWWA D100, Section 3.1.4. (Assume 125 psf for this location)

C. Foundation

- 1) A Geotechnical investigation has been carried out at the site and a copy of the report is included with the Contract Documents. Recommendations for the

foundation and allowable bearing capacities are defined in this report. The Owner shall retain the services of the Geotechnical consultant to verify the adequacy of the bearing stratum after the Contractor has carried out the excavation and before any concrete or reinforcement is placed. If applicable, the concrete foundation shall be designed by the Contractor based upon the recommendations in the Geotechnical report.

If, based on the geotechnical investigation and the tank design parameters, foundation considerations other than concrete footers at each leg are required, the tank design engineer shall provide the alternate design at no additional cost to the Owner.

D. Steel Tank

1) **General**

The materials, design, fabrication, erection, welding, testing and inspection of the steel tank shall be in accordance with the applicable sections of AWWA D100 except as modified in this document.

2) **Minimum Plate Thickness**

The minimum thickness for any part of the structure shall be 3/16-inch for parts not in contact with water and 1/4-inch for parts in contact with water. All portions of the tank including the roof shall be of watertight construction.

3.01 CONSTRUCTION

A. Concrete Foundation

The foundation shall be designed and constructed to safely and permanently support the structure. The basis of the foundation construction shall be consistent with the soils investigation data included herein at the end of these specifications. Appropriate changes to construction schedule and price will be negotiated if, during excavation, soil conditions are encountered which differ from those described in geotechnical report. The concrete foundation shall be constructed in accordance with ACI 301. Minimum concrete compressive strength shall be as specified in Section 03300, "Cast-In-Place Concrete". See Section 2.01(C) for additional information concerning alternate foundation designs.

B. Steel Tank Construction

1) **General**

The erection of the steel tank shall comply with the requirements of Section 10 of AWWA D100 except as modified by these documents.

2) **Welding**

All shop and field welding shall conform to AWS and AWWA D100, Section 10. The contractor shall ensure welders or welding operators are qualified in

accordance with ASME Section IX or ANSI/AWS B2.1.

- 3) **Fabrication**
All fabrication and shop assembly shall conform to the requirements of AWWA D100, Section 9, Shop Fabrication.
- 4) **Erection**
Plates subjected to stress by the weight or pressure of the contained liquid shall be assembled and welded in such a manner that the proper curvature of the plates in both directions is maintained. Plates shall be assembled and welded together by a procedure that will result in a minimum of distortion from weld shrinkage.
- 5) **Inspection and Testing**
Inspection of shop and field welds shall be in accordance with AWWA D100, Section 11, Inspection and Testing. All inspection shall be performed prior to interior and exterior field painting. Radiographic inspection shall be performed by an independent testing agency with all costs included in the Contractor's bid and paid by the Contractor.
- 6) **Roof Lap Joints**
All interior lap joints shall be sealed by means of continuous seal welding. This shall include penetrations of roof accessories.
- 7) **Painting and Disinfection**
Surface preparation and coating of all steel surfaces shall be in accordance with Section 09915 "Coating and Painting for New Steel Water Storage Tanks".

4.01 ACCESSORIES

A. General

The following accessories shall be provided in accordance with these specifications. All items shall be in full conformity with the current applicable OSHA safety regulations and the operating requirements of the structure.

B. Ladders

Access ladders shall be provided at the following locations:

- 1) The tower ladder shall extend up one column from near the base connecting with the balcony. The first rung shall be located approximately 8-feet above top of foundation.
- 2) An outside tank ladder from the balcony to the roof hatch.

- 3) An inside tank ladder from the roof hatch to the inside bottom of the tank.
- 4) An inside riser ladder from the base of the riser to the bottom of the tank. Ladder side rails shall be a minimum of 3/8-inch by 2-inches with a 16-inch clear spacing. Rungs shall be not less than 3/4-inch, round or square, spaced at 12-inch centers. The surface of the rungs shall be knurled, dimpled or otherwise treated to minimize slipping. Ladders shall be secured to adjacent structures by brackets located at intervals not exceeding 10 feet. Brackets shall be of sufficient length to provide a minimum distance of 7 inches from the center of the rung to the nearest permanent object behind the ladder.

C. Fall Protection

Ladders shall be equipped with a fall arrest system meeting OSHA regulations. The system shall be supplied complete with safety harnesses, locking mechanisms, and accessories for two persons. Exterior ladders shall include ladder cages, 27” to 30” from the center of the ladder and at least 30” wide, with no projections inside the cage. A lockable gate to prevent ladder access shall be provided.

D. Balcony

The tank shall be equipped with a balcony not less than 36” wide with a guardrail not less than 42” high. The floor shall be perforated for drainage.

E. OPENINGS

1) **Roof Hatches**

Provide two access hatches on the roof of the tank. One hatch shall be 30-inch diameter and allow access from the roof to the interior of the tank. The hatch will be hinged and equipped with a hasp for locking. The hatch cover shall have a 2-inch downward edge. The second hatch will be 24-inch diameter and flanged with a removable cover so constructed that an exhaust fan may be connected for ventilation during painting operations. The openings shall have a minimum 4-inch curb.

2) **Tank Vent**

The tank vent should be centrally located on the tank roof above the maximum weir crest elevation. The tank vent shall have an intake and relief capacity sufficiently large that excessive pressure or vacuum will not develop during maximum flow rate. The vent shall be designed, constructed, and screened so as to prevent the ingress of wind driven debris, insects, birds and animals. The vent shall be designed to operate when frosted over or otherwise clogged. The screens or relief material shall not be damaged by the occurrence and shall return automatically to operating position after the pressure or vacuum is relieved. The screen shall be of 316 stainless steel, mechanically attached to the vent.

3) **Riser Manhole**

A minimum 24 x 30-inch elliptical access manhole shall be provided approximately 3-feet above the base of the wet riser.

F. Riser

The diameter of the wet riser shall be not less than 3 feet.

G. Piping

1) **Inlet/Outlet Piping**

The vertical inlet pipe connection to the bottom of the riser shall be an 8-inch standard weight carbon steel pipe with appropriate transition to a ductile iron base elbow of the same diameter. The vertical pipe shall extend up into the riser one foot above the riser base.

2) In order to sufficiently separate the high and low pressure piping at the site, the outlet piping shall be 8 inch diameter and shall extend through the riser to 6-inches above the bottom of the tank bowl.

3) **Overflow**

The overflow pipe shall be designed to carry the maximum design flow rate of 1,000 GPM. The 12-inch steel overflow pipe shall have a minimum wall thickness of 1/4-inch. A suitable weir shall be provided inside the tank with the crest located at High Water Level. The overflow shall be routed from the weir to closely match the roof contour and extend down the ladder column and terminate approximately 1 to 2 feet above grade and discharge onto a concrete splash pad. The point of discharge shall have a 45-degree elbow and be equipped with a #4 316 stainless steel screen.

H. Identification Plate

A tank identification plate shall be mounted on the tank riser pipe above the access manhole. The identification plate shall be corrosion resistant and contain the following information.

- 1) Tank Contractor
- 2) Contractor's project or file number
- 3) Tank capacity
- 4) Height to High Water Level
- 5) Date erected

5.01 Guarantee

- A.** The tank Contractor shall guarantee its work for a period of one year from the completion date defined in the contract documents to the extent that it will repair any defects caused by faulty design, workmanship or material furnished under the specifications. If Contractor is not advised of any defects within 30 days of end of guarantee period, guarantee shall be considered fulfilled and complete. Defects caused by damaging service conditions such as electrolytic, chemical, abrasive or other damaging service conditions are not covered by this guarantee.
- B.** All guarantees obtained by the tank Contractor from the manufacturer or installer of paint, equipment or accessories not manufactured by tank Contractor shall be obtained for the benefit of the Purchaser.
- C.** Tank Contractor shall provide written warranties for the tank components, including copies of warranties from manufacturers and/or installers of paint, equipment, or accessories.

END OF SECTION

SECTION 16001

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Provisions of Division 1 including general, supplementary conditions, and general requirements apply to work specified under Division 16.

1.02 WORK INCLUDED

- A. Provide all materials, labor, and equipment required to furnish and install a complete electrical system as indicated on the Drawings and as specified herein.
- B. Electrical work includes, but is not limited to, the following:
 - 1. Complete electrical distribution system for lighting and power including the electrical service and necessary feeders, motor control center, branch circuits, conduit, lighting fixtures, control switches, and receptacles.
 - 2. Excavation, trenching, and backfilling for conduit and/or cable.
 - 3. Grounding.
 - 4. Control components furnished under other Divisions of these Specifications including, but not limited to relays, thermostats, etc. shall be installed under this Division. Wire and connect all controls, complete and in working order, in accordance with wiring diagrams shown on shop drawings submitted under other Divisions.

1.03 RELATED WORK

- A. The following work shall be furnished under other Divisions of these Specifications but shall be coordinated with said Divisions by Division 16 tradesman prior to bid.
 - 1. Concrete work.
 - 2. Painting.
 - 3. Cutting and patching.
 - 4. Electrical control systems and interlock wiring as required by drawings, specifications, or manufacturer's schematics.
 - 5. Heating and ventilating equipment.

1.04 DEFINITIONS

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

- B. Wiring: As used shall mean wire and cable, installed in raceway with all required boxes, fittings, connectors, etc. completely installed.
- C. Engineer: As used shall mean "Engineer of Record" whose seal is affixed to the contract specifications and/or drawings of Division 16.

1.5 CODES AND STANDARDS

- A. Comply with applicable local, state, and federal codes.
- B. Electrical work shall be installed in accordance with the Drawings and Specifications, 2017 NEC, and recommendations of NFPA.
- C. In event of conflict between Drawings, Specifications and such codes, Engineer shall be notified in writing prior to bid. A ruling will then be made by the Engineer in writing. All work shall be installed in strict accordance with applicable codes without additional cost to Owner.
- D. Contractor shall submit and/or file all necessary specifications and drawings as required by governing authorities.

1.06 SUBMITTALS

- A. Provide submittals on materials and equipment identified in the Specifications and Drawings prior to manufacture, order, or installation in accordance with Section 01340, Shop Drawings, Product Data, and Samples.
- B. Submittals shall include but not be limited to the following:
 - Wiring devices & cover plates
 - Light fixtures
 - Disconnect and safety switches
 - Conduit fittings
 - Distribution transformers and panels
 - Motor control center
 - Load Centers

1.07 OPERATING AND MAINTENANCE MANUALS

- A. Furnish, to the Owner, three bound and indexed sets of operation and maintenance instructions on the electrical equipment. Instructions shall also include

recommended spare parts lists.

- B. A minimum of 4 hours of training on the operation and maintenance of the electrical equipment shall be provided for the Owner's representative.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment and materials to job site in original, unopened, labeled containers.
- B. Store ferrous materials to prevent rusting. Store finished materials and equipment to prevent staining and discoloring.

PART 2 - PRODUCTS

(Not used)

PART 3 - EXECUTION

3.01 SITE VISIT

- A. 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 a reason for an extra charge.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Section 16001: Electrical General Provisions
- B. Section 16195: Electrical Identification

1.02 QUALITY ASSURANCE

- A. **Qualifications of Manufacturer:** All materials and equipment used in work of Division 16 shall be produced by manufacturers regularly engaged in manufacture of similar items, and with history of successful production acceptable to the Engineer. They shall be new and be UL listed, or listed by other recognized testing laboratory where such label is available.
- B. **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.

PART 2 - PRODUCTS

2.01 SUBSTITUTIONS

- A. Reference in Specifications to any article, device, product, material, fixture, form and type of construction, by name, make, or catalog number shall be interpreted as established a standard of quality, and shall not be construed as limiting competition. Any article, device, product, material, fixture, form and type of construction which in the judgment of Engineer, expressed in writing is equal to that specified, may be used.
- B. 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 the Contractor's expense.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Electrical drawings 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 Division shall be prepared to relocate any outlet or device 6' in any direction without additional charge to the Owner.

- B. Equipment shall be installed according to manufacturer's recommendations.
- C. 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.
- D. Satisfactorily repair or remove and replace damaged work with new materials.
- E. Trenching and backfilling shall comply with Division 2 (Site Work) of these Specifications and provide sheathing, shoring, dewatering and cleaning necessary to keep trenches and their grades in proper condition for work to be carried on. Trenches shall be excavated 6" below elevation of bottom of conduit. Backfill shall be per Section 02210, Site Grading and Filling.
- F. Failure to route conduit without interfering with other equipment and construction, shall not constitute a reason for an extra charge. Equipment, conduit and fixtures shall fit into available space, and shall not be installed at such times and manner as to cause damage to structure. Equipment requiring services shall be readily accessible.
- G. Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Coordinate electrical systems, equipment, and materials installation with other project components.
 - 2. Verify all dimensions by field measurements.
 - 3. Arrange for chases, slots, and openings in other components during progress of construction, to allow for electrical installations.
 - 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 - 5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior.
 - 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 - 7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 - 8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent

possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Engineer.

9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other systems and components, where installed exposed in finished spaces.
 10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
 11. Insulate dissimilar metals so they are not installed in direct contact.
- H. Conduits which pass through concrete slabs shall be sealed with concrete grout.
- I. Coordinate electrical power connection requirements with all equipment suppliers. Where power requirements differ from drawing design requirements, Engineer shall be notified for clarification and installation requirements prior to installing that portion of work. Cost for equipment and labor for improperly installed electrical connections not coordinated and approved by other trades and the Engineer shall be incurred by the Electrical Contractor and shall not constitute a reason for an extra charge because of any rework.

3.02 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1, Section 01045, "Cutting and Patching."
- B. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

3.03 TESTING AND EQUIPMENT SERVICING

- A. Entire installation shall be free from improper grounds and short or open circuits. Conductors shall be tested before energizing circuit. Test to insure that entire system is in proper operating condition, and that adjustments and setting of circuit breakers, fuses, control equipment, and apparatus have been made. Correct defects discovered during tests.
- B. Equipment shall be turned over to Owner in lubricated condition with instructions on further lubrication included in operating instructions.

3.04 REMOVAL OF DEBRIS

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

construction.

3.05 IDENTIFICATION OF EQUIPMENT

- A. Equipment shall be identified in accordance with Section 16195, "Electrical Identification."

3.06 AS-BUILT DRAWINGS

- A. Maintain one set of blue line electrical prints on site, marked to show as-built conditions and installations, prints to be turned over to Owner after job is complete.

3.07 TEMPORARY LIGHTING AND POWER

- A. 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.
- B. Provide and maintain barricade lighting where required to adequately protect Owner against liability for damage to public or personnel. All wiring shall be approved for weatherproof installation.

3.08 POWER OUTAGES

- A. 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. Contractor shall include in bid cost of overtime labor required for power outage to occur after Owner's normal hours of operation.

3.09 OTHER MATERIALS

- A. Work of this Division 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 the Engineer.

3.10 OTHER COORDINATION

- A. Contractor shall obtain and pay for all necessary permits and inspection fees required for the electrical installation.

- B. Contractor shall coordinate electrical service requirements with the Knoxville Utilities Board and provide any required fee, conduit, transformer pad, meter base, etc. that is required.

3.11 GUARANTEE-WARRANTY

- A. Guarantee Work to be free of material and workmanship defects for a period of one year, from date of final acceptance for the project. 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.

END OF SECTION

SECTION 16115

CONDUIT

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Section 16001: Electrical General Provisions
- B. Section 16050: Basic Electrical Materials and Methods

1.02 WORK INCLUDED

- A. Provide a complete conduit system to support all electrical equipment and systems. Conduit system includes conduit, couplers, connectors, fittings, boxes, covers and supports.

1.03 QUALITY ASSURANCE

- A. Listing and Labeling: Provide conduit that is listed and labeled.
 - 1. The term "listed and labeled": As defined in the 2017 National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Conduit and its installation shall comply with requirements of the 2017 National Electrical Code.

PART 2 - PRODUCTS

2.01 CONDUIT

- A. Rigid Metal Conduit (RMC): Allied, Wheatland, Republic, or approved equal.
- B. Rigid Non-Metallic Conduit (PVC): Carlon, Cantex, Southern Pipe, or approved equal.
- C. Liquidtight Flexible Nonmetallic Conduit: Aflex, Electroflex, or approved equal.

2.02 CONDUIT FITTINGS

- A. Couplings and connectors: Appleton, T&B, Arlington, or O.Z. Gedney.

- B. Bushings: Appleton, T&B, O.Z., or Gedney
- C. Straps and Hangers: Appleton, T&B, Steel City, or Minerallac.
- D. Group Pipe supports: Unistrut, Kindorf, B-Line, or approved equal.
- E. Expansion Fittings: O.Z. Gedney Type AX, or equal by Appleton, or approved equal.
- F. Exposed Conduit Fittings: Appleton, Crouse-Hinds, or O.Z. Gedney.

PART 3 - EXECUTION

3.01 CONDUIT

- A. In general, conduit installation shall follow layout shown on drawings. 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.
- B. The Contractor is responsible for field routing and locating all required raceway (conduit, cable tray, pull boxes, etc) as required.
- C. Conduit shall be installed in accordance with the 2017 National Electrical Code.
- D. Provide bushings on the open ends of conduit containing conductors. Insulated bushings shall be provided for conduits containing conductors #4 AWG or larger with an insulating ring an integral part of the bushing.
- E. Use rigid metal conduit (RMC) outdoors and above grade or concrete slab.
- F. Use rigid non-metallic Schedule 80 PVC indoors and above grade or concrete slab.
- G. Use rigid non-metallic Schedule 40 PVC when run underground.
- H. In indoor areas where installed conduit may be subjected to damage, rigid metal conduit (RMC) shall be used.
- I. When PVC conduit is used, turn up with rigid galvanized elbows and provide equipment grounding conductor in accordance with NEC Article 250.
- J. 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.

- K. Route all conduit at right angles or parallel to walls of building.
- L. Use proper sized tools for bending. Do not heat metal 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.
- M. Minimum conduit size 1 inch unless otherwise required.
- N. Leave one #10 AWG or equivalent nylon pull wire in empty conduits.
- O. Use short pieces, approximately two (2') feet of flexible conduit to connect motors and other devices subject to motion and vibration. Use liquidtight flexible nonmetallic conduit where outside or subject to water spray.

3.02 CONDUIT FITTINGS

- A. Support conduit vertically and horizontally by straps or hangers. Do not exceed intervals as described in the 2017 National Electrical Code.
- B. All indoor conduit supports, brackets, mounting hardware, fasteners, etc shall be nonmetallic and corrosion resistant.
- C. Use expansion fittings, properly bonded to assure ground continuity, across expansion joints in floors and ceilings. Use double lock nuts and bushings on panel feeders at panel cans.
- D. When connections are made to motors or other equipment, not near walls or columns, provide a vertical conduit, minimum one inch, attached to floor with a floor flange, bring wiring out of this conduit by means of a condulet and flexible conduit extending to equipment junction box.

END OF SECTION

SECTION 16120
WIRE AND CABLE

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Section 16001: Electrical General Provisions
- B. Section 16050: Basic Electrical Materials and Methods

1.02 WORK INCLUDED

- A. Wire and cable for all service, feeders, branch circuits, and instrument and control wiring rated 600 volts and below.

1.03 QUALITY ASSURANCE

- A. Listing and Labeling: Provide wire and cable that is listed and labeled.
 - 1. The term "listed and labeled": As defined in the 2017 National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Wire and cable and its installation shall comply with requirements of the 2017 National Electrical Code.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Wires and cables shall meet applicable requirements of the 2017 National Electrical Code and UL for the type of insulation, jacket, and conductor specified or indicated.
- B. All conductors shall be copper with 600 volt insulation unless otherwise indicated.
- C. Cables with PVC materials are NOT permitted.
- D. Wire and cable shall be manufactured by Belden, General Cable, Essex, Encore, Rome Cable, Southwire, or approved equal.
- E. Use solid copper type XHHW/XHHW-2 for branch circuit wiring #10 AWG and smaller. No conductor for branch circuit wiring shall be smaller than #12 AWG.
- F. Use stranded copper, type XHHW/XHHW-2 for feeder and power circuits #8 AWG

and larger.

- G. Use stranded copper type XHHW/XHHW-2 #14 AWG for 120 VAC control circuit wiring.
- H. Use stranded copper type XHHW/XHHW-2 #16 AWG twisted shielded pairs for 24 VDC instrumentation wiring.
- I. Provide color coded wire and with a different color for each phase and neutral and ground as follows: 208/120 volt circuits - phases A, B, and C: black, red, and blue respectively; neutral: white; ground: green; 480/277 volt circuits – phases A, B, and C: brown, yellow, and orange respectively, neutral: gray; ground: green. Approved color tape is acceptable for feeders. Also provide color coded wire for control circuits.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Complete conduit system before pulling any wire or cable. Use cable lubricants recommended by cable manufacturer as necessary.
- B. Conductors shall be continuous from outlet to outlet or to branch circuit over-current devices. Make splices only in junction boxes. Splices shall not be made in panelboards. All control and instrumentation wiring shall be continuous between components and/or terminal boards.
- C. No splices are allowed in manufacturer supplied cables.
- D. A minimum of eight (8") inches of slack conductor shall be left in every outlet or junction box. There should also be enough slack so three (3") inches extends outside the outlet or junction box.
- E. Make splices in conductors #10 AWG and smaller diameter with insulated, pressure-type connector. Use Scotchlok, Ideal, or equal wire connectors.
- F. Make splices in conductors #8 AWG and larger diameter with solderless connectors and cover with insulation material equivalent to conductor insulation. Use Burndy compression connectors with crimpit cover, type CC, or equal.
- G. Where branch circuits homeruns exceed 70' in length for 120 volt and 150' in length for 208, 240, or 277 volt circuits, #10 AWG wire shall be the minimum size used to the first outlet.

3.02 TESTING

- A. After completion of the installation and splicing and prior to energizing the conductors, wire and cable shall be given continuity and insulation tests as herein specified.
- B. Test wiring to verify that no short circuits, open circuits, or accidental grounds exist. Continuity tests shall be conducted using a dc device with bell or buzzer.
- C. Perform insulation resistance tests on wiring #6 AWG and larger diameter using an insulation test set which applies voltage of approximately 500 volts to provide direct reading of resistance. Minimum resistance shall be 250,000 ohms.

END OF SECTION

SECTION 16130

OUTLET AND JUNCTION BOXES

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Section 16001: Electrical General Provisions
- B. Section 16050: Basic Electrical Materials and Methods

1.02 WORK INCLUDED

- A. Outlet boxes.
- B. Pull and junction boxes.

1.03 QUALITY ASSURANCE

- A. Listing and Labeling: Provide outlet and junction boxes that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the 2017 National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Outlet and junction boxes and their installation shall comply with the requirements of the 2017 National Electrical Code.

PART 2 - PRODUCTS

2.01 OUTLET AND JUNCTION BOXES

- A. Non-metallic "FS" type boxes shall be used. Cooper Wiring Devices, Crouse Hinds, T&B/Steel City, or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. Support boxes independently of conduit.
- B. Bonding jumpers shall be used around knockouts.

3.2 OUTLET BOXES

- A. Outlet boxes shall be securely anchored, set true, and plumb.
- B. Select boxes according to intended use and type of outlet. Use four (4") inches square boxes where required.
- C. If more than two conduits enter box from one direction, 4" square boxes with square-cut device covers not less than one (1") inch deep specifically designed for this purpose, shall be used.
- D. Install blank device plates on outlet boxes left for future use.

3.3 JUNCTION BOXES

- A. Pull and junction boxes shall be sized in accordance with the 2017 National Electrical Code according to number of conductors in box or type of service to be provided. Minimum size is 4-11/16" square and 2-1/2" deep.
- B. Pull boxes shall be provided where necessary in the conduit system to facilitate conductor installation. Conduit runs longer than 100 feet or with bends exceeding 270 degrees shall have a pull box installed at a convenient intermediate location.
- C. Install in locations as shown on Drawings and as required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements.
- D. Install pull and junction boxes in accessible areas only.
- E. Install knockout closures in unused box openings.

3.05 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

SECTION 16170
GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 16001: Electrical General Provisions
- B. Section 16050: Basic Electrical Materials and Methods

1.2 WORK INCLUDED

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

1.3 PERFORMANCE REQUIREMENTS

- A. The grounding system to earth resistance shall be less than 25 ohms.

1.04 SUBMITTALS

- A. Provide product data for grounding electrodes and connections.
- B. Provide project records documentation that includes:
 - 1. Actual locations of components and grounding electrodes.
 - 2. Test results of each individual ground rod and the entire system.

1.05 QUALITY ASSURANCE

- A. Listing and Labeling: Provide grounding and bonding materials that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the 2017 National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Components and installation shall comply with the requirements of the 2017 National Electrical Code (NEC).
- C. Materials shall comply with UL 467, "Grounding and Bonding Equipment."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers shall be Burndy, T&B, or approved equal.

2.02 GROUNDING ELECTRODES

- A. Ground rods shall be copper clad steel with minimum dimensions of ¾ inch diameter by 10 feet long.

2.03 CONNECTORS

- A. Exothermic welded connections shall be provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.
- B. Pressure connectors shall be high-conductivity-plated units.
- C. Bolted clamps shall be heavy-duty units listed for the application.

2.04 WIRE AND CABLE

- A. All grounding conductors shall be copper.
- B. The grounding electrode conductor shall be stranded.
- C. Equipment grounding conductors shall have green insulation.
- D. Bare copper conductors shall conform to the following:
 - 1. Solid conductors: ASTM B-3
 - 2. Assembly of stranded conductors: ASTM B-8
 - 3. Tinned Conductors: ASTM B-33

2.05 MISCELLANEOUS CONDUCTORS

- A. Ground bus shall be bare annealed copper bars.
- B. Braided bonding jumpers shall be copper tape, braided number 30 gauge bare copper wire, and terminated with copper ferrules.
- C. Bonding strap conductor/connectors shall be soft copper, 0.05 inch thick and two (2") inches wide, unless otherwise noted.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Grounding system shall be in accordance with Article 250 of the 2017 NEC except where the Drawings or Specifications exceed NEC requirements.
- B. Install code size green grounding conductors in all feeder and branch circuits. Bond conductors to chassis or fixed equipment.
- C. All grounding conductors shall be bonded to multi-terminal ground bus at panelboard or other distribution equipment. Grouping of grounding conductors under a single lug is not acceptable.
- D. Bond metal piping systems to equipment ground conductors of pumps, fans, electric heaters, and air cleaners serving individual systems.
- E. Bond structural steel and reinforcing steel in foundation footing to grounding electrode conductor. Bond steel together.
- F. Install ground rods at locations indicated. Install additional ground rods as necessary to achieve specified resistance to ground. Separate ground rods a minimum of one-rod length from each other and a least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 24 inches below grade.
- G. Ground rods shall be driven not less than 12 inches from structure foundations and to a depth such that the tops of the rods are not less than 12 inches below grade.
- H. Provide grounding test wells at each ground rod location. Install well pipes flush with finished grade.
- I. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.
- J. All separate grounding electrodes shall be bonded together to limit potential differences between them and between their associated wiring systems. This includes the power system, SCADA System, TVSS, and system grounding electrodes.

3.02 CONNECTIONS

- A. Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
 2. Make connections with clean bare metal at points of contact.
 3. Aluminum to steel connections shall be with stainless steel separators and mechanical clamps.
 4. Aluminum to galvanized steel connections shall be with tin-plated copper jumpers and mechanical clamps.
 5. Coat and seal connections involving dissimilar metals with inert material such as red lead paint to prevent future penetration of moisture to contact surfaces.
- B. Use exothermic welded connections for connections to structural steel and for underground connections. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
- C. For compression-type connections, use hydraulic compression tools to provide the correct circumferential pressure for compression connectors. Use tools and dies recommended by the manufacturer of the connectors. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on the ground conductor.
- D. Terminate insulated equipment grounding conductors for feeders and branch circuits with pressure-type grounding lugs. Where metallic raceways terminate at metallic housings without mechanical and electrical connection to the housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to the ground bus in the housing. Bond electrically noncontinuous conduits at both entrances and exits with grounding bushings and bare grounding conductors.
- E. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.
- F. Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.
- G. Do not use flexible metal conduit and fittings as a grounding means. Pull a green wire in each piece of flexible conduit, and screw to conduit system with lugs at both ends.

3.03 FIELD QUALITY CONTROL

- A. Use the fall-of-potential method as described in IEEE Standard 81 to measure the resistance of the following. Record the measurements and provide to the Engineer.
1. The resistance between earth and each ground rod prior to interconnection with other ground rods.
 2. The resistance between earth and the counterpoise.
 3. The resistance of the grounding system at the grounding electrode connection to earth.

Measure the ground resistance when there has been no precipitation for 5 days, without the soil being moistened by any means other than natural precipitation or natural drainage or seepage, and without chemical treatment or other artificial means of reducing natural ground resistance.

- B. Perform continuity tests at all power receptacles to ensure the ground terminals are properly grounded to the facility ground network.

END OF SECTION

SECTION 16190
SUPPORTING DEVICES

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Section 16001: Electrical General Provisions
- B. Section 16050: Basic Electrical Materials and Methods
- C. Section 16115: Conduit

1.02 WORK INCLUDED

- A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fasteners.

1.03 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with the 2017 National Electrical Code.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, slotted metal angle and u-channel systems shall be provided by Allied Tube & Conduit, American Electric, B-Line Systems, Inc., Unistrut Diversified Products, or approved equal.
- B. Subject to compliance with requirements, conduit sealing bushings shall be provided by Bridgeport Fittings, Inc., Cooper Industries, Inc., Killark Electric Mfg. Co., O-Z/Gedney, Raco, Inc., Spring City Electrical Mfg. Co., Thomas & Betts Corp., or approved equal.

2.02 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be aluminum or hot-dip galvanized.
- B. Products used with the rigid non-metallic conduit installed indoors shall be non-metallic and corrosion resistant including fasteners and connectors

2.03 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Raceways shall be supported with clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners: Types, materials, and construction features as follows:
 - 1. Expansion Anchors: Carbon steel wedge or sleeve type.
 - 2. Toggle Bolts: All steel springhead type.
 - 3. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.
- C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.
- E. U-Channel Systems: 16-gauge steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacturer.

2.04 FABRICATED SUPPORTING DEVICES

- A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
 - 1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
 - a. 3-inch and smaller: 20-gauge.
 - b. 4-inch to 6-inch: 16-gauge.
 - c. over 6-inch: 14-gauge.

2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the structural system and with other electrical installation.
- C. Raceway Supports: Comply with the 2017 NEC and the following requirements:
 1. Conform to manufacturer's recommendations for selection and installation of supports.
 2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.
 3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
 4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
 5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
 6. Space supports for raceway types not covered by the above in accordance with NEC.
 7. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
 8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.

- D. Vertical Conductor Supports: Install simultaneously with installation of conductors.
- E. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- F. Cast boxes threaded to raceways need not be supported separately except where used for fixture support.
- G. Sleeves: Install in concrete slabs and walls and for raceways and cable installations.
- H. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated.
- I. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the structure, including but not limited to conduits, raceways, cables, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:
 - 1. Fasten by means of wood screws or screw-type nails on wood; toggle bolts on hollow masonry units; concrete inserts or expansion bolts on concrete or solid masonry; and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
 - 2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
 - 3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.

END OF SECTION

SECTION 16195

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Section 16001: Electrical General Provisions
- B. Section 16050: Basic Electrical Materials and Methods

1.2 WORK INCLUDED

- A. Extent and types of electrical identification are indicated herein and as follows:
 - 1. Operational instructions and warnings.
 - 2. Danger signs.
 - 3. Equipment/system identification signs.
 - 4. Conduit identification.
 - 5. Power and control wiring identification.
 - 6. Terminal marking.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, identification products shall be provided by W.H. Brady Co., Ideal Industries, Inc., Panduit, T&B, or approved equal.

2.02 MATERIALS

- A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.
- B. Cable/Conductor Identification Bands: Provide manufacturer's standard wrap-around type, vinyl-cloth, self-adhesive cable/conductor markers with either pre-numbered plastic-coated type or write-on type with clear plastic self-adhesive cover flap, numbered to show circuit identification. Provide markers for all field control wiring.

- C. Self-Adhesive Plastic Signs: Provide manufacturer's standard, self-adhesive or pressure-sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings. Signs shall be of sizes suitable for application areas and adequate for visibility, with proper wording for each application (as examples: 208V, EXHAUST FAN or DANGER – HIGH VOLTAGE).
 - 1. Colors: Unless otherwise indicated or required by governing regulations, provide orange signs with black lettering.
- D. Engraved Plastic-Laminate Signs: Provide three-layer engraving stock in sizes and thickness indicated, engraved with engraver's standard letter style of sizes and wording indicated, black and white core (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
 - 1. Thickness: 1/16", for units up to 20 sq. in. or eight (8") length; 1/8" for larger units.
 - 2. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate substrate.
- E. Underground Warning Tape: Provide four (4") inch wide detectable type, plastic, yellow warning tape with suitable warning describing type of cable/circuit over buried electrical lines.

2.03 LETTERING AND GRAPHICS

- A. General: Coordinate names, abbreviations, and other designations used in electrical identification work, with corresponding designations shown, specified, or scheduled. Provide numbers, lettering, and working as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 - EXECUTION

3.01 APPLICATION AND INSTALLATION

- A. General Installation Requirements:
 - 1. Coordination: Where identification is to be applied to surfaces, which require finish, install identification after completion of painting.
 - 2. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.
 - 3. Conduit Identification: Where electrical conduit is exposed in spaces with exposed mechanical piping which is identified by a color-coded method, apply color-coded identification on electrical conduit in a manner similar to piping identification. Except as otherwise indicated, use orange as coded

- color for conduit.
4. Equipment/System Identifications: Install engraved plastic-laminate sign on each disconnect and control cabinets. Except as otherwise indicated, provide single line of text, 1/2" high lettering on 1-1/2" high sign (2" high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide identification and warning signs for each unit of the following categories of electrical work.
 - a. Electrical cabinets and enclosures.
 - b. Access panel/doors to electrical cabinets.
 - c. Control stations.
 - d. Disconnect switches.
- B. Install signs at locations indicated or, where not otherwise indicated, at locations for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with stainless steel tamperproof fasteners.
 - C. Install danger signs on all disconnect and control cabinet exteriors.
 - D. Install danger and notice to disconnect power before removing or opening on all inner panels.
 - E. Install underground warning tape in accordance with the 2017 National Electrical Code.
 - F. Install arc-flash warnings in compliance with 2017 National Electrical Code and NFPA 70E.

END OF SECTION

SECTION 16400

SERVICE AND DISTRIBUTION SYSTEM AND GROUNDING

PART 1 - GENERAL

1.01 WORK INCLUDED

- A. Service system
- B. Distribution system
- C. Grounding

1.02 RELATED WORK DESCRIBED ELSEWHERE

- A. Section 16115: Conduit
- B. Section 16120: Wire and Cable
- C. Section 16170: Grounding and Bonding

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Furnish service entrance conduit and cable and miscellaneous hardware required.

PART 3 - EXECUTION

3.01 SERVICE AND DISTRIBUTION SYSTEM

- A. The utility service shall be 240/120 volts, single (1) phase, three (3) wire, via a utility provided service drop to a Contractor furnished drop pole.
- B. The System shall commence at the service point. The service will go to the service meter/panelboard combination unit mounted on the electrical stand.
- C. Final connection at the service point must be coordinated with the utility and Owner.
- D. All contributions-in-aid to construction for electric service will be coordinated internally at the utility.

3.02 GROUNDING

- A. Ground electrical system in accordance with Article 250, 2017 National Electrical Code, and local authorities having jurisdiction.

- B. Do not use flexible metal conduit and fittings as a grounding means. Install a green ground wire in each piece of flexible conduit and bond to conduit system at both ends.
- C. Install code size green grounding conductors in all branch circuits feeding receptacles, motors, or other permanently wired fixed electrical utilization equipment and all feeder circuits. Bond conductors to chassis or fixed equipment. All grounding conductors shall be bonded to multi-terminal ground bus at the panelboard or other distribution equipment. Grouping of grounding conductors under a single lug is not acceptable.
- D. Bond metal water service to grounding electrode conductor.
- E. All separate grounding electrodes shall be bonded together to limit potential differences between them and between their associated wiring systems.

END OF SECTION

SECTION 16440

DISCONNECT SWITCHES

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Section 16001: Electrical General Provisions
- B. Section 16050: Basic Electrical Materials and Methods

1.02 WORK INCLUDED

- A. Fused Disconnect Switches

1.03 SUBMITTALS

- A. Provide product data showing switch's ratings and enclosure type.

1.04 QUALITY ASSURANCE

- A. Listing and Labeling: Provide disconnect switches that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the 2017 National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Disconnect switches and their installation shall comply with the requirements of the 2017 National Electrical Code.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Switches shall be Square D, Eaton, General Electric, or approved alternate.

2.02 MATERIALS

- A. Use heavy-duty type for 600-volt switches. Switches shall have quick make, quick break, load interrupter, enclosed knife switch manufactured to the requirements of NEMA KS 1.
- B. All switches shall have externally operable handles with interlocking covers to prevent opening front cover with switch in the ON position and have provisions for multiple padlocks in the OFF position.

- C. Provide equipment ground lug in each switch.
- D. Provide NEMA 4X stainless steel enclosures.
- E. Provide fuses as per equipment manufacturer recommendation.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Provide safety switches sized as indicated on the Drawings.
- B. Mount individually enclosed switches plumb and level with top four (4') feet above floor or grade, unless otherwise noted.
- C. Provide a set of fuses in fusible disconnect switches, as per equipment manufacturer recommendations.

3.02 IDENTIFICATION

- A. Identify disconnect switches in accordance with Section 16195, "Electrical Identification."

3.03 DEMONSTRATION

- A. Test all disconnect switches in the presence of the Owner or Owner's Representative.

END OF SECTION

SECTION 16470

DISTRIBUTION PANELBOARD

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Section 16001: Electrical General Provisions
- B. Section 16050: Basic Electrical Materials and Methods
- C. Section 16170: Grounding and Bonding
- D. Section 16195: Electrical Identification
- E. Section 16480: Overcurrent Protective Devices

1.02 WORK INCLUDED

- A. Branch circuit panelboard.

1.03 SUBMITTALS

Provide the following submittals:

- A. Product data for each distribution panelboard, accessory items, and component specified.
- B. Shop drawings from manufacturer of the distribution panelboard including dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features, and voltage rating. Include the following:
 - 1. Enclosure type.
 - 2. Bus configuration and current ratings.
 - 3. Short-circuit current rating of distribution panelboard.
 - 4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.
- C. Wiring diagrams detailing schematic diagram including control wiring and differentiating between manufacturer-installed and field-installed wiring.
- D. Maintenance data for distribution panelboard components, for inclusion in Operating and Maintenance Manual specified in Division 1. Include instructions for testing circuit breakers.

1.04 QUALITY ASSURANCE

- A. Listing and Labeling: Provide distribution panelboards that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the 2017 National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Distribution panelboards and their installation shall comply with the requirements of the 2017 National Electrical Code.
- C. NEMA Standard: Comply with NEMA PB1, "Panelboards."
- D. UL Standards: Comply with UL 61, "Panelboards" and UL 50, "Cabinets and Boxes."

1.05 EXTRA MATERIALS

- A. Provide one half-pint container of touch-up paint for distribution panelboards.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by Cutler-Hammer; General Electric, Siemens Energy & Automation, Inc, Square D, or approved equal.

2.02 PANELBOARD GENERAL REQUIREMENTS

- A. Provide type, rating, and features of overcurrent protective devices (OCPDs) as indicated. Comply with Section 16480, "Overcurrent Protective Devices," with OCPDs adapted to panelboard installation. Tandem circuit breakers shall not be used. Multipole breakers shall have common trip.
- B. Enclosure shall be NEMA Type 1, unless otherwise noted.
- C. A metal directory frame shall be mounted inside each panel door.
- D. Provide copper bus with ratings as indicated in each panelboard.
- E. Provide an electrically isolated neutral bar. Bond neutral bar to service entrance conductors.
- F. Provide a separate equipment ground bus adequate for feeder and branch circuit equipment ground conductors.

2.03 BRANCH CIRCUIT PANELBOARD

- A. Provide plug-on or bolt-on circuit breakers, replaceable without disturbing adjacent units.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. This distribution panelboard shall be installed in accordance with manufacturer's instructions.
- B. Provide engraved plastic nameplates under the provisions of Section 16195, "Electrical Identification."
- C. Provide typed circuit directory for panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- D. Install filler plates in unused spaces.
- E. Train conductors neatly in groups, bundle, and wrap with wire ties after completion of load balancing.

3.02 ADJUSTING

- A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch breakers.

3.03 FIELD QUALITY CONTROL

- A. Visual and Mechanical Inspection: Include the following inspections and related work:
 - 1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date drawings and panelboard schedules.
 - 2. Exercise and perform of operational tests of all mechanical components and other operable devices in accordance with manufacturer's instruction manual.
 - 3. Check panelboard mounting, area clearances, and alignment and fit of components.
 - 4. Check tightness of bolted electrical connections with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.
 - 5. Perform visual and mechanical inspection and related work for overcurrent protective devices as specified in Section 16480, "Overcurrent Protective Devices."

- B. Electrical tests: Include the following items performed in accordance with manufacturer's instruction:
1. Insulation resistance test of buses and portions of control wiring that disconnected from solid-state devices. Insulation resistance less than 100 megohms is not acceptable.
 2. Ground resistance test on system and equipment ground connections.
 3. Test main and subfeed overcurrent protective devices in accordance with Section 16480, "Overcurrent Protective Devices."
 4. Retest: Correct deficiencies identified by tests and observations and provide retesting of panelboards by testing organization. Verify by the system tests that the total assembly meets specified requirements.

3.04 CLEANING

- A. Upon completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

END OF SECTION

SECTION 16480

OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.01 RELATED SECTIONS

- A. Section 16001: Electrical General Provisions
- A. Section 16050: Basic Electrical Materials and Methods
- C. Section 16470: Distribution Panelboard

1.02 WORK INCLUDED

- A. This section includes circuit breakers and fuses.

1.03 SUBMITTALS

- A. Provide manufacturer's product data for the following:
 - 1. Circuit breakers
 - 2. Enclosures
 - 3. Fuses (Provide complete list of all fuses and the equipment where they are used.)
 - 4. Shunt trips
- B. Provide maintenance data for products for inclusion in the Operating and Maintenance Manual.
 - 1. Include a load current and overload relay heater list compiled by Contractor after motors have been installed. Arrange list to demonstrate selection of heaters to suit actual motor nameplate full load currents.

1.04 QUALITY ASSURANCE

- A. Listing and Labeling: Provide overcurrent protective devices that are listed and labeled.
 - 1. The term "listed and labeled": As defined in the 2017 National Electrical Code, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Overcurrent protective devices and their installation shall comply with the requirements of the 2017 National Electrical Code.

- C. Circuit breakers shall comply with UL 489, NEMA AB 1, and NEMA AB 3.
- D. Fuses shall conform to NEMA FU 1.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Circuit Breakers: Subject to compliance with requirements, provide products by Cutler-Hammer; General Electric Co.; Siemens Energy & Automation, Inc.; Square D Co.; or approved equal.
- B. Fuses: Subject to compliance with requirements, provide products by Bussmann Mfg. Co., Littlefuse Co, Ferraz Shawmut, or approved equal.

2.02 MOLDED-CASE CIRCUIT BREAKERS

- A. Circuit breakers shall be molded case or insulated case, manually operated, trip-free, with inverse-time, thermal-overload protection, and instantaneous magnetic, short-circuit protection, as required. Circuit breakers shall be completely enclosed in a molded case, with the calibrated sensing element factory-sealed to prevent tampering.
- B. Thermal-magnetic tripping elements shall be located in each pole of the circuit breaker and shall provide inverse-time-delay thermal overload protection and instantaneous magnetic short-circuit protection. On frame sizes larger than 100 amperes, the instantaneous magnetic tripping element shall be adjustable and accessible from the front of the breaker.
- C. Breaker size shall be as required for the continuous current rating of the circuit. Breaker class shall be as required.
- D. Interrupting capacity of the branch circuit breakers shall be sufficient to successfully interrupt the maximum short-circuit current imposed on the circuit at the breaker terminals. Circuit breaker minimum interrupting capacities shall be as shown on drawings and shall conform to NEMA AB 3.
- E. Multipole circuit breakers shall be of the common-trip type having a single operating handle and shall have a two-position on/off indication. Circuit breakers shall have temperature compensation for operation in an ambient temperature of 104 degrees.
- F. Circuit breakers shall have root mean square (rms) symmetrical interrupting rating sufficient to protect the circuit being supplied. Interrupting ratings may have selective type tripping (time delay, magnetic, thermal, or ground fault).
- G. Breaker body shall be of phenolic composition. Breakers shall be capable of having

such accessories as handle-extension, handle-locking, and padlocking devices attached where required.

- H. Provide UL listed service entrance equipment when used for service disconnect.
- I. Circuit breakers used for switching high intensity discharge lights or fluorescent lights shall be rated for that type of service.

2.03 FUSES

- A. A complete set of fuses for all switches shall be provided. Fuses shall have a voltage rating not less than the circuit voltage.
- B. Provide Class RK5 fuses for motor branch circuits.
- C. Fuses shall be labeled showing UL class, interrupting rating, and time-delay characteristics, when applicable.
- D. Fuse holders field-mounted in a cabinet or box shall be porcelain. Field installation of fuse holders made of such materials as ebony asbestos, Bakelite, or pressed fiber shall not be used.
- E. Provide a minimum of three (3) spare fuses of each size and type fuse installed.
- F. Provide a complete list of all fuses and the equipment where they are used.

2.04 EQUIPMENT ENCLOSURES

- A. Enclosures for equipment shall be in accordance with NEMA 250.
- B. Equipment installed inside, clean, dry locations shall be contained in NEMA Type 1, general-purpose sheet-steel enclosures unless otherwise noted.
- C. Equipment installed in wet locations shall be contained in NEMA Type 3R, rainproof, sheet-steel enclosures, constructed for outdoor use to protect against falling rain, sleet, and ice unless otherwise noted.
- D. Ferrous-metal surfaces of electrical enclosures shall be cleaned, phosphatized, and painted with the manufacturer's standard finish.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install overcurrent protective devices as indicated or required, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements.

- B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices.
- C. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cables.
- D. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of devices.
- E. Provide engraved plastic-laminate nameplates under the provisions of Section 16195, "Electrical Identification" for enclosed circuit breakers and motor controllers.

3.02 ADJUSTING

- A. Inspect circuit breaker operating mechanisms for malfunctioning and where necessary, adjust units for free mechanical movement.
- B. Adjust trip settings so that circuit breakers coordinate with other overcurrent protective devices in circuit.
- C. Adjust trip setting to provide adequate protection from overcurrent and fault currents.

3.03 FIELD QUALITY CONTROL

- A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.
- B. In the presence of the Owner or Owner's Representative, test each device and demonstrate its working as specified.

END OF SECTION



November 15, 2023

LDA Engineering
110 Tyson Boulevard #200
Alcoa, Tennessee 37701

Attention: Mr. Steve Bostic, P.E.
sbostic@ldainc.com

Subject: **REPORT OF GEOTECHNICAL EXPLORATION**
Proposed Elevated Water Tank
Caryville-Jacksboro Utility Commission
Caryville, Tennessee
GEOServices Project No. 21-231372

Dear Mr. Bostic:

We are submitting the results of the geotechnical exploration performed for the subject project. The geotechnical exploration was performed in accordance with our Proposal No. 11-23810, dated October 3, 2023. The following report presents our findings and recommendations for the proposed project. Should you have any questions regarding this report, or if we can be of any further assistance, please contact us at your convenience.

Sincerely,
GEOServices, LLC



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MBH/WRK:mbh



REPORT OF GEOTECHNICAL EXPLORATION

Proposed Elevated Water Tank
Caryville, Tennessee

GEOServices Project No. 21-231372

Submitted to:

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1.0 INTRODUCTION

1.1 PURPOSE

The purpose of our geotechnical exploration was to explore the subsurface conditions for the proposed project and provide geotechnical recommendations for site preparation and grading and for design and construction of the foundation system.

1.2 PROJECT INFORMATION AND SITE DESCRIPTION

Project information was provided in email correspondence with you dating from September 28, 2023. Included with the email were drawings and photographs showing the proposed construction, existing elevations, site location and site conditions.

The site is located off Sonny Boshears Lane in the Erschell Collins Industrial Park in Caryville, Campbell County, Tennessee. We understand the project is to include the construction of a new 150,000 gallon steel, elevated water tank. The elevated tank is to have a diameter of 28 feet with an overall height of 158 feet. The tank will be supported by four legs and by the central riser.

Based on the provided information, we understand the maximum vertical dead load to be supported by each of the tank legs will be on the order of about 330 kips, with an additional live load of up to 197 kips. The maximum horizontal live load to be supported by each of the tank legs is about 38 kips. The total load to be supported by the central riser is 154 kips.

The provided topographic drawing indicates existing site grades range from about 1,762 to 1,764 feet with a proposed top of foundation elevation of 1,762 feet. Earthwork cuts and fills of less than about 5 feet are anticipated for the proposed tank.

The site of the proposed tank is covered by bare earth, grasses, weeds and some underbrush. The site and surrounding areas have been subjected to strip mining in the past. It is our understanding mine spoil was placed across the area during a period of strip mining in the early 1990's.

1.3 SCOPE OF STUDY

This geotechnical exploration involved a site reconnaissance, field drilling, laboratory testing and engineering analysis. The following sections of this report present discussions of the field exploration, site conditions, conclusions and recommendations. Following the text of this report, Appendix A presents the figures and test boring records. The laboratory results are provided in Appendix B.

The scope of our geotechnical engineering services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air, on, or below, or around this site. Statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

2.0 EXPLORATION AND TESTING PROGRAMS

2.1 FIELD EXPLORATION

The site subsurface conditions were explored by drilling four (4) soil test borings at accessible locations. Two borings were drilled within the proposed eastern tank site (B-1 and B-2) while two borings were drilled within the proposed western tank site (B-3 and B-4).

The borings were advanced by our subcontractor using 2¼-inch hollow stem augers and casing advancer system with a Geoprobe 7822 track-mounted drill rig. The approximate locations of the soil test borings are shown on Figure 2 of Appendix A of this report. The depths in this report reference the ground surface that existed at the time of the exploration. The elevations shown on the boring logs and referenced in this report were obtained by interpolation using the provided drawing and should be considered approximate. Detailed logs for the soil test borings can also be found in Appendix A.

Within each boring advanced using hollow stem auger or casing advancer, Standard Penetration Testing (SPT) and split-spoon sampling were performed on 2½-foot intervals in the upper 10 feet and at

approximately 5-foot intervals thereafter. SPT and split-spoon sampling were performed in accordance with ASTM D 1586.

In split-spoon sampling, a standard 2-inch O.D. split-spoon sampler is driven into the soil at the bottom of the boring with a 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the sampler the last 12 inches of the standard 18 inches of total penetration (or second and third 6-inch increments when sampling 24 inches) is recorded as the SPT resistance (N-value). These N-values are indicated on the boring logs at the test depth and provide an indication of the consistency or relative density of the soil.

Rock coring was performed to explore the refusal materials in borings B-1 and B-3 after advancing casing to the interpreted top of bedrock. The refusal materials were then cored in general accordance with ASTM D 2113, using a diamond-studded bit fastened to the end of a hollow, double-tube core barrel. The rock was cored using a NQ-sized bit which obtains rock cores approximately 1-7/8 inches in diameter.

This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each core run, the core barrel is brought to the surface, the core recovery is measured, and the samples are removed. The rock core was then placed in boxes for transportation.

2.2 LABORATORY TEST PROGRAM

After completion of the field drilling and sampling phase of this project, the soil and rock samples were returned to our laboratory where they were visually-manually classified in general accordance with the Unified Soil Classification System (USCS – ASTM D 2487) by a GEOServices staff member. A selected rock core sample was then tested for unconfined compressive strength (ASTM D 7012). The laboratory test results are discussed herein and summarized in Appendix B.

3.0 SUBSURFACE CONDITIONS

3.1 GEOLOGIC CONDITIONS AND HAZARDS

The project site lies within the Cumberland Plateau Physiographic Province. The Cumberland Plateau Physiographic Province is characterized by broad rolling plateaus and steep sided valleys formed on resistant shales and sandstones. Surface drainage features such as creeks and rivers have eroded through the resistant sandstones to form steep bluffs in many areas.

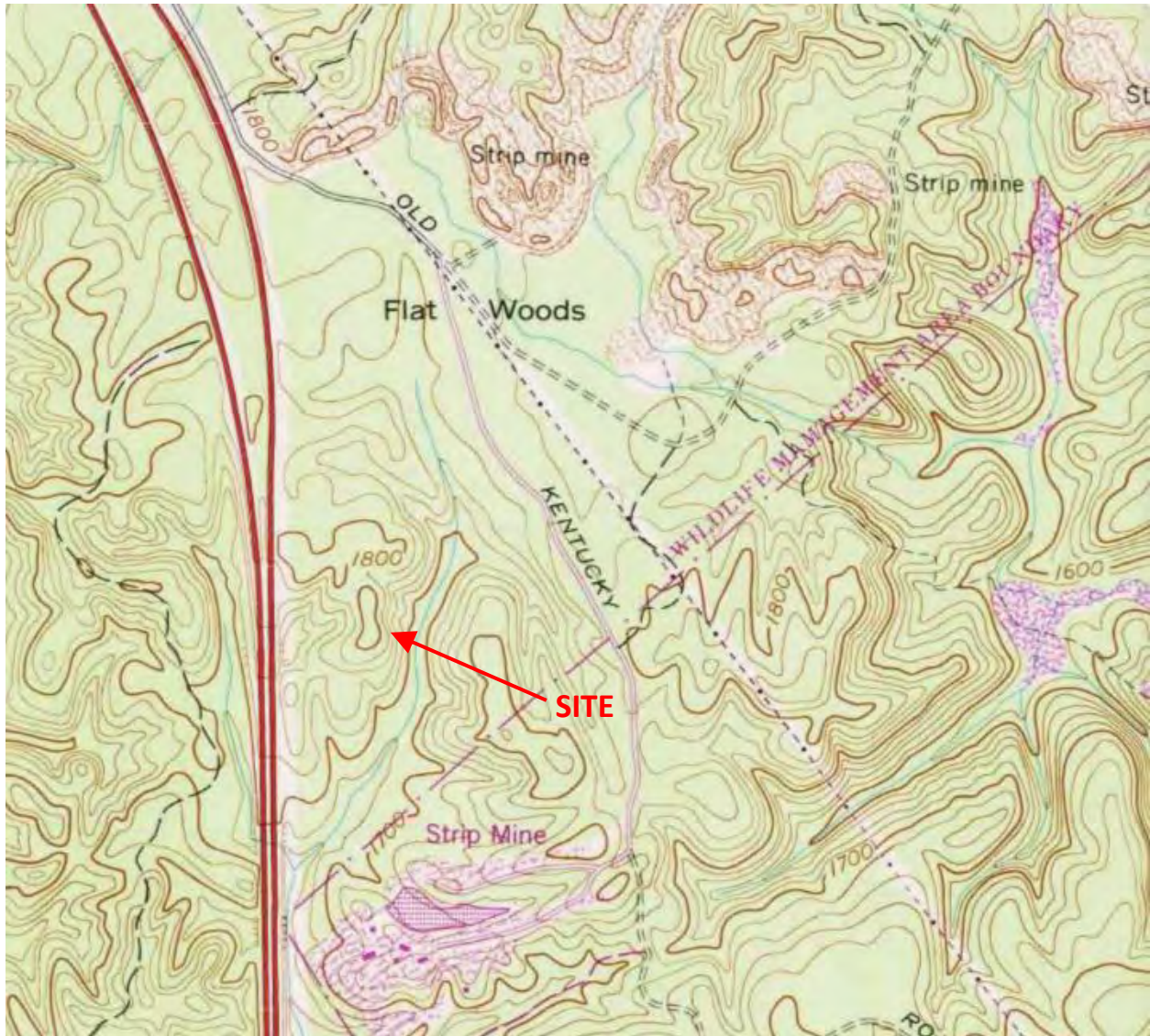
Published geologic information indicates that the site is underlain by the Slatestone Group. This group includes the Stephens, Petros, Sand Gap, and Newcomb sandstones. The sandstone units are bounded by the Jellico and Poplar Creek Coal and separated by several shale units and important coal formations. The Slatestone Group typically ranges from 420 to 720 feet in thickness.

Locally, the site has been altered by strip mining activities. Mine spoil (which is a term used to describe waste materials produced during surface mining) appears to have been placed across the site during the strip mining operations. Mine spoil typically consists of a mixture of soil and various sized rock fragments but may also contain deleterious materials such as organics.

Mine spoil is typically mass placed by dumping and blading into place and not compacted in a manner similar to engineered or structural soil fill. The large (often boulder sized) rock fragments within mine spoil preclude compaction in a manner as specified for engineered fills. Mine spoil also typically contains excessive fine size particles (more than 10 percent passing the No. 200 size sieve) which does not allow proper placement as a rock fill.

Plate 1 to follow shows the approximate location of the site and areas of identified strip mining from the 1991 revision of the United States Geologic Survey (USGS) Jacksboro, TN Quadrangle Map.

Plate 1 – USGS Jacksboro Quadrangle Map, 1991



3.2 SOIL STRATIGRAPHY

The following subsurface description is of a generalized nature to highlight the subsurface stratification features and material characteristics at the boring locations. The boring logs included in Appendix A of this report should be reviewed for specific information at each boring location. Information on actual subsurface conditions exists only at the specific boring locations and is relevant only to the time that this exploration was performed. Variations may occur and should be expected at the site.

Surficial

The borings typically encountered 3 to 5 inches of topsoil and roots at the ground surface.

Mine Spoil

Mine spoil was encountered underlying the surficial topsoil in each of the borings of this exploration. Mine spoil is a term used to describe the waste product created during surface mining activities. The depth of mine spoil ranged from 37 feet at boring B-1 to 31.6 feet at boring B-3. The remainder of the borings refused without penetrating the mine spoil.

Recovered split-spoon samples of the mine spoil consisted of varying quantities of clays, sands, shale fragments, sandstone fragments and trace organics. We note that rock coring required to penetrate the mine spoil of boring B-3 revealed boulder sized rock fragments within the mine spoil.

The SPT N-values within the mine spoil ranged from 4 blows per foot (bpf) to 50 blows for 2 inches of penetration (50/2"). We do not recommend correlating soil consistency or relative density of the mine spoil to the obtained SPT N-values given the composition of the material and the manner in which it was likely placed.

Residuum

Residual soils were encountered underlying the mine spoil in boring B-3. Residual soils are derived from the in-place weathering of the parent bedrock. The residual soils were manually classified lean (lower plasticity) clays with shale fragments and the relict bedding pattern of the parent shale bedrock.

Weathered Rock

Weathered rock was encountered at depths of 37 and 34 feet in borings B-1 and B-3, respectively. The weathered rock was sampled as gray and brown shale fragments with some sandy clay seams. The N-values within the weathered rock ranged from 26 bpf to 50 blows for 1 inch of penetration (50/1").

Auger Refusal

Auger refusal was encountered at depths ranging from 5.5 to 11.6 feet below the existing ground surface. Auger refusal is a designation applied to any material that cannot be penetrated by the power auger used

to drill the borings, which was likely caused by rock fragments within the mine spoil at this site. Borings B-1 and B-3 were advanced below the initial auger refusal depth using casing advancer and rock coring methods.

Bedrock

Rock coring was performed to explore the bedrock materials in borings B-1 and B-3. The recovered rock core consisted of gray and black shale with sandstone seams. The recovered rock core was described as slightly to highly fractured, slightly to moderately weathered and moderately hard to hard. The recovered core exhibited a slight reaction to a 10 percent hydrochloric acid solution.

The percent core recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The RQD is obtained by summing up the length of core recovered, including only the pieces of hard core that are 4 inches or longer, and divided by the total length drilled. The percent core recovery and RQD are related to the soundness and continuity of the refusal material.

The recovery values for the rock cored in the borings ranged from 22 to 100 percent while the RQD values ranged from 0 to 93 percent. Typically, the recovery and RQD values increased within increasing depth. The individual recovery and RQD values are shown for each core run in the boring logs in Appendix A.

An intact sample of the recovered rock core was subjected to unconfined compressive strength testing. The results of the testing indicated an unconfined compressive strength of 19,981 pounds per square inch (psi). The results of the laboratory testing are provided in Appendix B.

Groundwater

Groundwater was not encountered in the borings at the time of drilling. Stabilized water levels can sometimes be difficult to obtain as the encountered soils are known to be relatively impermeable. In addition, each boring was backfilled upon completion in consideration of safety so delayed water levels were not recorded. It is possible for groundwater to exist within the depths explored during other times of the year depending upon climatic and rainfall conditions. Additionally, discontinuous zones of perched water may exist within the mine spoil or at the soil to rock or weathered rock interface. The groundwater information presented in this report is the information that was collected at the time of our field activities.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 SITE ASSESSMENT

Based on the results of our geotechnical exploration, it is our opinion that the site is generally adaptable for the proposed construction. However, certain project and geotechnical related challenges are present which will affect development of the site. These include the heavily loaded nature of the proposed structure and the presence of the mine spoil.

Mine spoil was encountered in the borings to depths ranging from approximately 32 to 37 feet below the existing ground surface. There is inherent risk associated with using mine spoil for structural support; as it could contain loose/soft compressible zones, organic matter, debris, and other deleterious materials not disclosed by the borings. These materials, and loose/soft zones could lead to excessive settlements of foundations supported by bearing in the mine spoil.

Given the heavily-loaded nature of the proposed structure, encountered soils, and potential for excessive settlement, it is recommended the structure derive support from bedrock-bearing, deep foundations. Recommendations for deep foundations, including micropiles and drilled shafts, are provided in this report. Micropiles may be more easily installed though zones of boulder size rock fragments present in the mine soil. Drilled shaft construction would likely be more difficult; however, drilled shafts are advantageous for supporting larger lateral loads.

Localized excavation difficulty could occur where excavations are required to penetrate the large rock fragment containing mine spoil. Confined excavations such as for foundations (pile caps) and utilities may require the use of pneumatic hammers where the large rock fragments are present.

We strongly encourage the client to confer with the design team and a contractor with regard to the recommendations contained in this report, in an effort to assess potential costs and schedule. Once finished grades have been further refined, we recommend GEOServices be allowed to review the civil design with respect to the recommendations herein. Due to the site conditions, we recommend careful observation during construction activities.

4.2 SITE PREPARATION RECOMMENDATIONS

4.2.1 Subgrade

Site stripping within the proposed construction areas should include the removal of vegetation, topsoil, unsuitable fill, rock fragments greater than 6 inches, gravel, and other debris. While concentrated amounts of construction debris were not noted in the borings, the previous development may have buried pockets of these materials in unexplored locations across the site which should be completely undercut and removed, if encountered. The stripping operations should extend a minimum of 10 feet beyond structural footprints, where possible.

After the completion of stripping operations and excavation to reach the planned subgrade elevation, we recommend that the subgrade be proofrolled with a fully-loaded, tandem-axle dump truck or other pneumatic-tired construction equipment of similar weight. Areas to receive structural soil fill should also be proofrolled prior to the placement of new fill. The geotechnical engineer or his representative should observe proofrolling. Areas to receive structural soil fill should also be proofrolled prior to the placement of new fill. Proofrolling operations should extend a minimum distance of 10 feet beyond the structure perimeter, where possible.

4.2.2 Structural Soil Fill

Material considered suitable for use as structural fill should be clean soil free of organics, trash, and other deleterious material, containing no rock fragments greater than 6 inches in dimension. Preferably, structural soil fill material should have a standard Proctor maximum dry density of 90 pounds per cubic foot (pcf), or greater, and a PI value of 35 percent, or less. The material to be used as structural fill should be tested by the geotechnical engineer to confirm that it meets the project requirements before being placed.

The existing fill which is free of deleterious materials may be reused as new fill; provided rock fragments greater than 6 inches are removed or reduced in size prior to incorporation into the fill. Moisture conditioning will likely be required to reach the range of moisture contents recommended for compaction.

Structural fill should be placed in loose, horizontal lifts not exceeding 8 inches in thickness. Each lift should be compacted to at least 98 percent of the soil's maximum dry density per the standard Proctor method (ASTM

D 698) and within the range of minus (-) 2 percent to plus (+) 3 percent of the optimum moisture content. Each lift should be tested by geotechnical personnel to confirm that the contractors' method is capable of achieving the project requirements before placing subsequent lifts. Areas which have become soft or frozen should be removed before additional structural fill is placed.

4.2.3 Dense Graded Aggregate

Dense graded aggregate (DGA) fill may be used as backfill in undercut excavations and in utility trench excavations. The DGA used for this section should be Type A and Grading D or E in accordance with Section 903.05 of the Tennessee Department of Transportation (TDOT) specifications. The DGA fill should be placed in loose, horizontal lifts not exceeding 8 inches in loose thickness. Each lift should be compacted to at least 98 percent of maximum dry density per the standard Proctor method (ASTM D 698). Each lift should be compacted, tested by geotechnical personnel and approved before placing subsequent lifts.

4.3 DEEP FOUNDATIONS

4.3.1 Micropiles

Micropiles may be considered for foundation support of the proposed elevated water tank. The use of micropiles would allow the foundation loads to be transferred to the underlying bedrock, not relying on the mine spoil for support.

Micropiles are installed by drilling a steel pipe (i.e., casing) to the underlying bedrock. The hole is then extended, without casing, through competent bedrock creating a socket (the pile bond length). Once the appropriate socket is penetrated (a function of rock quality and design bond strength), a steel reinforcing bar is centered in the casing which extends from the bottom of the socket to the pile cut-off length. Finally, the entire cased length is filled with grout using the tremie method. Construction techniques and methods associated with micropiles are very flexible and may vary from this general description in some ways. However, given the subsurface conditions encountered and our experience with projects in the geologic setting, we recommend the piles be cased. Using uncased piles could result in collapse (or necking) of the drilled excavation, resulting in an unsatisfactory pile as well as unwarranted cost overruns due to free flowing grout.

The casing used for the design of micropiles is typically 5 to 9-inch diameter steel that meets ASTM standards (ASTM A 252) and has a typical yield strength on the order of 80 kips per square inch (ksi). GEOServices recommends an allowable bond strength of 50 pounds per square inch (psi) between the grout and bedrock along the socket in hard, continuous shale bedrock.

Given the variable bedrock surface in this geologic setting, the project budget should include contingencies for greater depths to bedrock during construction. Contingencies should also be included for weathered rock or soil seam penetration which will be required to reach the competent bedrock where the micropile socket will be formed. Several feet of large rock fragment containing mine spoil and weathered rock penetration could be required based on the borings of this exploration and our experience. Relatively continuous, hard shale bedrock was encountered at depths of 43 to 47 feet in borings B-1 and B-3; however, we note this depth is expected to vary between the boring locations.

The rock socket length may be taken as the length of pile installed in hard, continuous bedrock. Fractured, friable, or otherwise unsuitable rock encountered during the installation should not be included in the required rock socket lengths. Only horizontally continuous bedrock layers 18 inches in thickness, or greater, should be utilized as contributing to the required rock socket length provided that the rock socket is terminated in a hard, continuous bedrock layer that is a minimum of 5 feet thick.

Allowable axial capacities of micropiles will vary depending on the size of the selected pile and the applicable design standards. Axial capacities will need to be reduced accordingly for cases involving lateral loading or bending of the micropiles. We expect that settlement associated with the piles will be elastic settlement within the pile itself. Maximum total and differential settlements are expected to be less than ½ of an inch.

Micropiles are often installed successfully in this geologic setting for foundation support. Micropiles have the advantage for this application of being able to penetrate zones of rock fragment containing mine spoil and discontinuous rock relatively easily. Micropiles are not particularly well-suited for resisting large lateral loads; however, the piles can be battered to somewhat improve the lateral capacity of pile groups.

We suggest that the design and construction of micropiles be performed by a contractor specializing in

this type of construction with experience in this geologic setting. Once the final design plans have been prepared, we request the opportunity to review the design plans to confirm that our recommendations have been properly implemented. The design recommendations contained herein are contingent upon observation and testing of the pile installation procedures in the field at the time of construction by GEOServices.

4.3.2 Drilled Shafts

A deep foundation system composed of drilled shafts (sometimes referred to as drilled piers or caissons) bearing in the hard, continuous shale bedrock may be used to support the relatively heavily-loaded elevated water tank. On the basis of our knowledge in this geology and results of the rock coring of this exploration; we recommend an allowable end bearing pressure of 60 kips per square foot (ksf). The drilled shafts should extend through the mine spoil, residual soils and upper weathered rock to bear in the hard, continuous shale bedrock underlying this site. If needed for uplift design, a concrete to rock bond strength of 25 pounds per square inch (psi) for shafts socketed in competent bedrock can be used.

The drilled shafts should be installed only by a specialty contractor with proven experience in the installation of drilled shafts in similar geologic conditions. The shafts should be cased at all times as required by the Occupational Safety and Health Administration (OSHA) for the protection of workers entering the excavation.

The bottom of the drilled shafts should be observed and tested to evaluate the exposed bedrock with respect to the provided design allowable capacity. This is accomplished by drilling a 1.5-inch diameter (minimum) probe hole in the bottom of the shaft to a minimum depth of 1.5 times the socket diameter or a maximum depth of 8 feet. This probe hole is drilled by the contractor. The bottom of the shaft, socket (if present), and probe hole should be examined by a GEOServices engineer, or qualified staff professional, to verify the depth of penetration and competency of bedrock.

Should unsuitable conditions be observed, the shaft should be deepened so as to bear in suitable material. The bottom of the shaft should be free of excessive mud, broken rock or other loose debris. We recommend that the drilled shafts have a minimum diameter of 30 inches to allow room for drilling the

test hole and evaluation of the rock. If structural loads warrant the use of smaller diameter drilled shafts, we recommend pre-drilling these locations to determine the appropriate depth for each shaft.

In this geologic setting weathered rock tends to overly competent bedrock. It is likely that several feet of weathered rock/soil seam penetration will be required to reach the hard, continuous bedrock upon which the drilled shafts will bear. At this site, penetration of boulder size rock fragments within the mine spoil will also be required to reach the weathered rock. The socket depth could also increase based on the slope, orientation, and surface of the bedrock. Relatively continuous, hard shale bedrock was encountered at depths of 43 to 47 feet in borings B-1 and B-3; however, this depth is expected to vary between the boring locations.

The drilled shafts may be installed using a temporary steel casing and the dry hole method. The steel casing should be installed deep enough to allow workers to safely excavate, clean, and observe and test the drilled pier, but leaving the sides of any rock socket exposed for inspection. The protective steel casing may be extracted as the concrete is placed. A sufficient head of at least 5 feet of concrete should be maintained above the bottom of the casing during withdrawal and the contractor should prevent concrete from "hanging-up" inside the shell which can cause soil and water intrusion below the casing.

Water encountered during shaft construction should be removed from the excavation to a depth of no greater than 2 inches prior to the placement of concrete. Water removed from the shafts should be directed to an off-site outfall, away from the construction area. If it is not possible to adequately remove this water, concrete should be placed using the tremie method. The concrete should be placed in a manner to prevent segregation of the aggregate or the creation of honeycomb structures or other voids in the completed shaft. The geotechnical engineer should observe each portion of the drilled shaft construction.

Prior to entry of the drilled shafts, testing should be performed of the atmosphere within the confined space to ensure adequate oxygen levels and to monitor for the presence of flammable, explosive, or toxic vapors or substances, in accordance with OSHA standards. Air monitoring should be performed at representative intervals through the full depth of the drilled shaft to confirm the safety of personnel. Other OSHA requirements will also apply such as safety harnesses, lifelines, continuous monitoring of

down-hole personnel by an attendant at the surface, ventilation, and other requirements, as applicable. Please refer to the most current OSHA guidelines regarding drilled shaft construction.

Once the shaft section and/or groups have been designed and the lateral loads, axial loads, and moments been determined, GEOServices may be retained to perform lateral loading analyses. The purpose of these analyses would be to provide pile-head deflections and shear and moment distributions with depth for the selected shaft section to assist the structural engineer in the design of the foundations.

With design and construction as previously described, we estimate that total and differential settlement of the drilled shaft foundations in excess of the elastic deformation of the shaft will be negligible (less than ¼-inch).

Drilled shafts have the advantage of being used successfully on numerous projects in this region. Drilled shafts also are well suited for carrying heavier foundation loads, particularly lateral loads, using a single foundation element.

As discussed above, it is likely that drilled shafts would need to be extended beyond the refusal depths of the soil borings using rock auger or coring procedures to penetrate the mile spoil which contains boulder size rock fragments and zones of weathered and discontinuous bedrock. While common practice for drilled shaft construction, this rock removal (coring or drilling) could result in project delays and greater than anticipated construction costs.

4.4 SEISMIC DESIGN CRITERIA

In accordance with the 2018 IBC and ASCE 7-22, we are providing the following seismic design information. Our evaluation of the subsurface conditions is based on the soil borings and our experience on similar sites. Using this information, the subsurface conditions may be described by “Seismic Site Class D” or “Medium Dense Sand or Stiff Clay”. Table 1 provides the spectral response accelerations for both short and 1-second periods, which may be used for design.

Table 1 – Seismic Design Parameters

Structure	S_s g	S_1 g	S_{DS} g	S_{D1} g
CJUC Elevated Water Tank	0.42	0.12	0.31	0.16

The short and 1-second period values indicate the structure should be assigned a Seismic Design Category “C” using the published information. The provided values are based on the results of our field exploration and the assumption that the structure will be designed utilizing a Risk Category I, II or III. If these assumptions are incorrect, we should be contacted to reevaluate the seismic design information.

In accordance with IBC 2018 sections 1803.5.11 and 1803.5.12, we have provided a discussion on the following geologic and seismic hazards: slope instability, liquefaction, total/differential settlement, and surface displacement due to faulting or seismically induced lateral spread or lateral flow.

Liquefaction occurs when soil, primarily saturated cohesionless soils, undergo a loss in strength due to monotonic, transient, or repeated disturbance that commonly occurs during a seismic event (Kramer 1996). This loss of strength occurs due to increased pore water pressures caused by an undrained condition. The increase in pore water pressure decreases the effective stress in the soil, thus reducing the soils ability to support any applied loads. For liquefaction to occur, there must be an increase in pore pressure meaning the soil must be saturated and be able to behave in an undrained condition. According to the NHI 2011 Reference Manual on LRFD Seismic Analysis and Design of Transportation Geotechnical Features and Structural Foundations, if any of the following criteria are satisfied then a significant liquefaction hazard does not exist:

- The geologic materials underlying the site are either bedrock or have very low liquefaction susceptibility according to the relative susceptibility ratings shown in the Estimated Susceptibility of Sedimentary Deposits to Liquefaction During Strong Ground Motion table presented by Youd and Perkins in 1978.
- The soils below the groundwater table at the site are one of the following:
 - Clayey soils which have a clay content greater than 15%, liquid limit greater than 35%, or natural water content less than 90% of the liquid limit.

- Sand with a minimum corrected SPT $(N_1)_{60}$ value of 30 blows/foot.
- The water table is deeper than 50 feet below the ground surface or proposed finished grade at the site.

We note that the borings encountered soil and weathered rock above the groundwater level. Additionally, based on experience in this geologic region and immediate vicinity of the site, it is our opinion that a liquefaction hazard does not exist for the subject development. As such, we do not expect significant additional total and differential settlement, lateral soil movement, reduction in bearing capacity or lateral soil reaction, permanent increase in soil lateral pressure, or flotation of buried structures in accordance with Sections 1803.5.11 and 1803.5.12 of the 2018 IBC.

We also noted mapped faults on the geologic maps we reviewed for this project vicinity of the site. However, the known faults in the project vicinity are generally ancient, with no known active faults reaching the surface. Therefore, it is our opinion that surface displacement due to faulting or seismically induced lateral spreading or lateral flow, is not a seismic hazard that will affect the subject development. In addition, seismically induced slope instability is also not expected to be a seismic hazard that will affect the subject development.

4.5 LATERAL EARTH PRESSURES

For the design of concrete retaining walls, we have provided equivalent fluid pressures for two backfill conditions for cantilever-type walls. These are 1) active earth pressure for granular backfill (clean sand or gravel) and 2) at-rest earth pressure for granular backfill. The equivalent fluid pressures provided have assumed a level backfill and a wall with a vertical face. The designer should confirm other aspects of retaining wall design, including an evaluation of local and global stability, with respect to the proposed walls and site design.

The provided parameters should not be used for the design of other wall types, such as walls that will retain in-situ materials. Alternative wall types such as mechanically stabilized earth (MSE), soldier pile or others should be designed by a specialty contractor or proprietary wall manufacturer. No other information has been provided at this time regarding the use of retaining walls.

Condition 1 - The active earth pressure for granular backfill will result in an equivalent fluid pressure of 35 pounds per cubic foot (pcf). If the granular backfill is to develop active earth pressure conditions, walls must be flexible and/or free to rotate or translate at the top approximately one inch laterally for every 20 feet of wall height.

Condition 2 - The at-rest earth pressure for granular backfill will result in an equivalent fluid pressure of 55 pcf. For retaining walls that will not rotate or translate, such as building walls or other walls rigidly connected to structures, at-rest conditions will develop.

In each case, forces from surcharge loading including sloping backfill should be added to the equivalent fluid pressures. The walls should be properly drained to remove water or hydrostatic pressure should be added to the design pressure.

The wedge of clean aggregate backfill should have a minimum width of 1 foot at the base of the wall or the width of the footing heel, whichever is greater, and increase in width a minimum of 0.6 feet per foot of wall height. The aggregate should be fully encapsulated with a properly designed geotextile (filter fabric) to prevent migration of the adjacent soils into the aggregate. Aggregate placed behind the retaining wall should be placed in accordance with the compaction recommendations of this report. However, we caution that operating compaction equipment directly behind the wall can create lateral earth pressures far in excess of those recommended for design. Therefore, we recommend using hand operated, smaller compaction equipment in non-vibratory modes within 5 feet of the front of the wall.

For rigid, cast-in-place concrete walls, an ultimate friction factor of 0.35 between foundation concrete and the bearing soils may be used when evaluating friction. Also, an ultimate passive earth pressure resistance of well-compacted soil fill can be approximated by a uniformly acting resistance of 1,000 psf. However, to limit deformation when relying on passive strength, we recommend using a minimum safety factor of 3.0 applied to the ultimate passive resistance value.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 FOUNDATION CONSTRUCTION

Foundation excavations should be opened, the subgrade evaluated, remedial work performed (if required), and concrete placed in an expeditious manner. Exposure to weather often reduces foundation support capabilities, thus necessitating remedial measures prior to concrete placement. It is also important that proper surface drainage be maintained both during construction (especially in terms of maintaining dry footing trenches) and after construction. Soil backfill for footings should be placed in accordance with the recommendations for structural fill presented herein.

5.2 EXCAVATIONS

Auger refusal was encountered at depths ranging from 5.5 to 11.6 feet below the existing ground surface. Auger refusal conditions generally correspond to materials which require difficult excavation techniques, such as pneumatic hammers or blasting, for removal. The removal of rock for drilled shafts is typically performed using rock augers equipped with carbide teeth or large diameter core barrels.

Typically, soils penetrated by augers can be removed with conventional earthmoving equipment. However, excavation equipment varies, and field refusal conditions may vary. Generally, the weathering process is erratic and variations in the rock profile can occur in small lateral distances. Therefore, it is possible that some partially weathered rock and/or rock pinnacles or ledges requiring difficult excavation techniques may be encountered in site areas between our boring locations.

It should be anticipated that large, boulder sized rock fragments will be encountered during excavation of the mine spoil at the site. Heavy excavation equipment at a minimum will be required to remove these materials. Larger sized rock fragments within confined excavations may require the use of pneumatic hammers (i.e., hoe-ramming) for removal. Deeper confined excavations, such as utility trenches and foundation excavations, will have a greater probability of encountering materials that will require difficult excavation techniques to remove.

Excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is usually solely responsible for site safety. This information is provided only as a service, and under no circumstances should GEOservices be assumed responsible for construction site safety.

5.3 MOISTURE SENSITIVE SOILS

The plastic and fine-grained soils encountered at this site will be sensitive to disturbances caused by construction traffic and changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. Construction traffic patterns should be varied to prevent the degradation of previously stable subgrade. In addition, the soils at this site which become wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. We caution if site grading is performed during the wet weather season; increases in the undercut volumes should be expected.

Further for site fills, methods such as discing and allowing the material to dry will be required to meet the required compaction recommendations. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather. However, November through March is typically the difficult grading period due to the limited drying conditions which exist.

5.4 DRAINAGE AND SURFACE WATER CONCERNS

To reduce the potential for additional undercutting, water should not be allowed to collect in the foundation excavations, or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of collected rainwater, subsurface water, or surface runoff. Positive site surface drainage should be provided to reduce infiltration of surface water around the perimeter of the structure. The grades should be sloped and surface drainage should be collected and discharged such that water is not permitted to infiltrate the subsurface in the area of the structure.

6.0 LIMITATIONS

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. This report is for our geotechnical work only, and no environmental assessment efforts have been performed. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the exploration. The nature and extent of variations between the borings will not become evident until construction. We recommend that GEOServices be retained to observe the project construction in the field. GEOServices cannot accept responsibility for conditions which deviate from those described in this report if not retained to perform construction observation and testing. If variations appear evident, then we will re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the structures are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed, and conclusions modified or verified in writing. Also, if the scope of the project should change significantly from that described herein, these recommendations may need to be re-evaluated.

G E E S



GEOServices, LLC-Geotechnical and Materials Engineers



A UES COMPANY

TM

APPENDICES



G E S



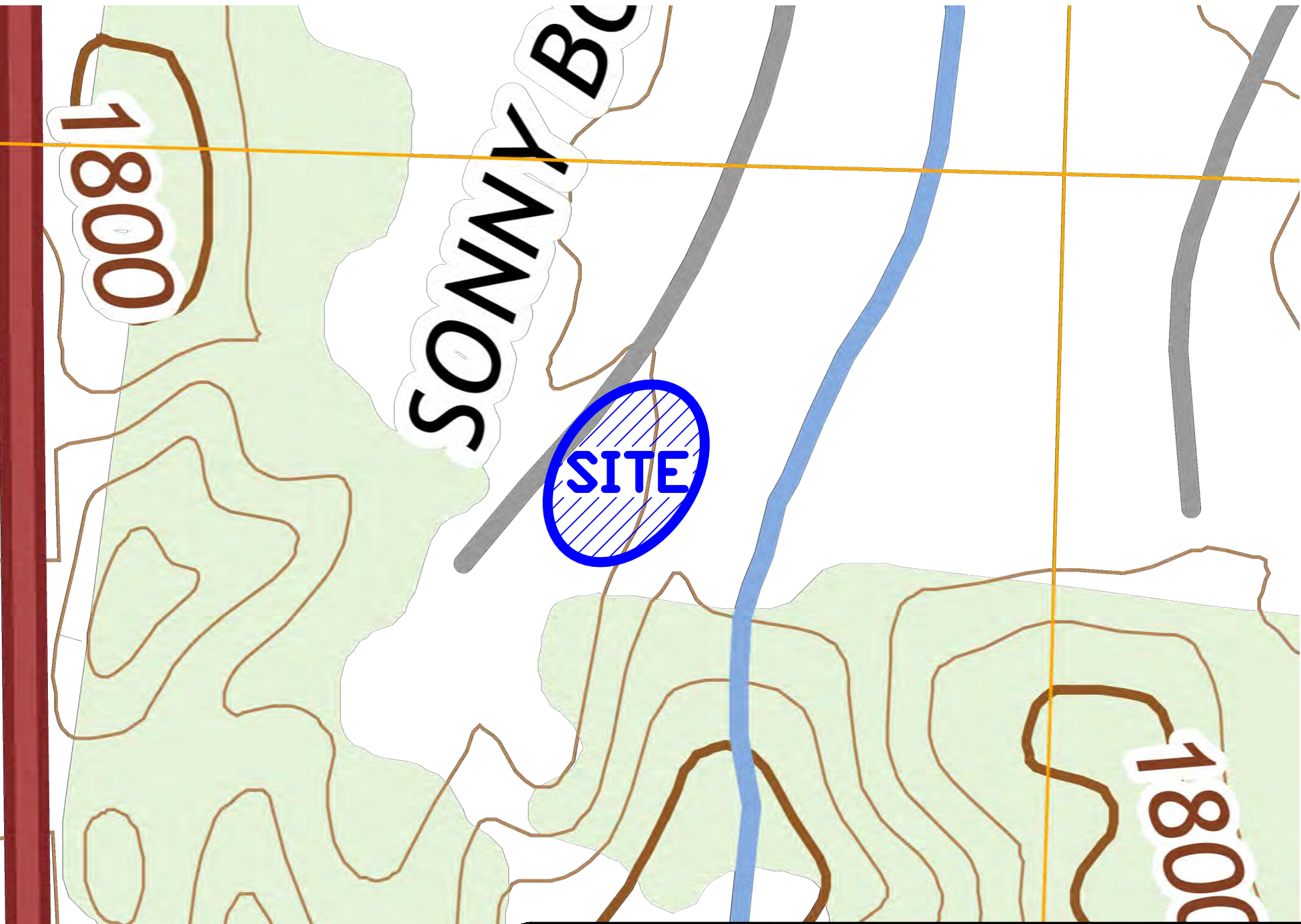
GEOservices, LLC-Geotechnical and Materials Engineers



COMPANY

APPENDIX A





NOTES:

1.) BASE MAP: USGS QUADRANGLE (JACKSBORO, TENNESSEE)

GEOS
 A **UES** COMPANY
 2561 Willow Point Way, Knoxville, TN 37931
 Office: 865-539-8242 Fax: 865-539-8252

SITE VICINITY MAP
 CJUC ELEVATED WATER TANK
 SONNY BOSHEARS LANE
 PIONEER, TENNESSEE 37847

DRAWN BY:	KSR
APPROVED BY:	MBH
SCALE:	N.T.S.
JOB NO.:	21-231372
DATE:	11/6/23

FIGURE

1



- NOTES:**
- 1.) BORING LOCATIONS ARE SHOWN IN GENERAL ARRANGEMENT ONLY.
 - 2.) DO NOT USE BORING LOCATIONS FOR DETERMINATIONS OF DISTANCES OR QUANTITIES.
 - 3.) BASE MAP PROVIDED BY: Schaad Brown Real Estate
- 📍 LOCATION OF SOIL TEST BORINGS

**SOIL TEST BORING
LOCATION PLAN**
CJUC ELEVATED WATER TANK
 SONNY BOSHEARS LANE
 PIONEER, TENNESSEE 37847

DRAWN BY:	KSR
APPROVED BY:	MBH
SCALE:	N.T.S.
JOB NO.:	21-231372
DATE:	11/6/23

GEOS
 A **UES COMPANY**

2561 Willow Point Way, Knoxville, TN 37931
 Office: 865-539-8242 Fax: 865-539-8252

Figure 2

GENERAL NOTES

FINE AND COARSE GRAINED SOIL PROPERTIES

PARTICLE SIZE		COARSE GRAINED SOILS (SANDS & GRAVELS)		FINE GRAINED SOILS (SILTS & CLAYS)		
BOULDERS:	GREATER THAN 300 mm	N-VALUE	RELATIVE DENSITY	N-VALUE	CONSISTENCY	Qu, PSF
COBBLES:	75 mm to 300 mm	0 - 4	VERY LOOSE	0 - 2	VERY SOFT	0-500
GRAVEL:	4.74 mm to 75 mm	5 - 10	LOOSE	3 - 4	SOFT	500 -1000
COARSE SAND:	2 mm to 4.74 mm	11 - 30	MEDIUM DENSE	5 - 8	FIRM	1000 - 2000
MEDIUM SAND:	0.425 mm to 2 mm	31 - 50	DENSE	9 - 15	STIFF	2000 - 4000
FINE SAND:	0.075 mm to 0.425 mm	OVER 50	VERY DENSE	16 - 30	VERY STIFF	4000 - 8000
SILTS & CLAYS:	LESS THAN 0.075 mm			OVER 31	HARD	8000 +

STANDARD PENETRATION TEST (ASTM D1586)

THE STANDARD PENETRATION TEST AS DEFINED BY ASTM D1586 IS A METHOD TO OBTAIN A DISTURBED SOIL SAMPLE FOR EXAMINATION AND TESTING AND TO OBTAIN RELATIVE DENSITY AND CONSISTENCY INFORMATION. THE 1.4 INCH I.D./2.0 INCH O.D. SAMPLER IS DRIVEN 3-SIX INCH INCREMENTS WITH A 140-LB. HAMMER FALLING 30 INCHES. THE BLOW COUNTS REQUIRED TO DRIVE THE SAMPLER THE FINAL 2 INCREMENTS ARE ADDED TOGETHER AND DESIGNATED THE N-VALUE. AT TIMES, THE SAMPLER CAN NOT BE DRIVEN THE FULL 18 INCHES. THE FOLLOWING REPRESENTS OUR INTERPRETATION OF THE STANDARD PENETRATION TEST WITH VARIATIONS.

BLOWS/FOOT (N-VALUE)

DESCRIPTION

25	25 BLOWS DROVE SAMPLER 12" AFTER INITIAL 6" SEATING
75/10"	75 BLOWS DROVE SAMPLER 10" AFTER INITIAL 6" SEATING
50/PR	PENETRATION REFUSAL OF SAMPLER AFTER INITIAL 6" SEATING

SAMPLING SYMBOLS

ST:	UNDISTURBED SAMPLE
SS:	SPLIT SPOON SAMPLE
CORE:	ROCK CORE SAMPLE
AU:	AUGER OR BAG SAMPLE

SOIL PROPERTY SYMBOLS

N:	STANDARD PENETRATION, BPF
M:	MOISTURE CONTENT %
LL:	LIQUID LIMIT %
PI:	PLASTICITY INDEX%
Qp:	POCKET PENETROMETER VALUE, TSF
Qu:	UNCONFINED COMPRESSIVE STRENGTH, TSF
DUW:	DRY UNIT WEIGHT, PCF

ROCK PROPERTIES





















ROCK HARDNESS

ROCK QUALITY DESIGNATION (RQD)




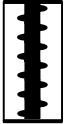


PERCENT	QUALITY
90 TO 100	EXCELLENT
75 TO 90	GOOD
50 TO 75	FAIR
25 TO 50	POOR
0 TO 25	VERY POOR

VERY SOFT:	ROCK DISINTEGRATES OR EASILY COMPRESSES TO TOUCH: CAN BE HARD TO VERY HARD SOIL.
SOFT:	ROCK IS COHERANT BUT BREAKS EASILY TO THUMB PRESSURE AT SHARP EDGES AND IT CRUMBLES WITH FIRM HAND PRESSURE.
MODERATELY HARD:	SMALL PIECES CAN BE BROKEN OFF ALONG SHARP EDGES BY CONSIDERABLE HARD THUMB PRESSURE: CAN BE BROKEN BY LIGHT HAMMER BLOWS.
HARD:	ROCK CAN NOT BE BROKEN BY THUMB PRESSURE, BUT CAN BE BROKEN BY MODERATE HAMMER BLOWS.
VERY HARD:	ROCK CAN BE BROKEN BY HEAVY HAMMER BLOWS.

LITHOLOGIC SYMBOLS
(Unified Soil Classification System)

	ASPHALT: Asphalt
	CH: USCS High Plasticity Clay
	CL: USCS Low Plasticity Clay
	CL-ML: USCS Low Plasticity Silty Clay
	CONCRETE: Concrete
	DOLOMITE: Dolomite
	GRAVEL: Gravel / Basestone
	LIMESTONE: Limestone
	ML: USCS Silt
	SANDSTONE: Sandstone
	SC: USCS Clayey Sand
	SC-SM: USCS Silty Clayey Sand
	SHALE: Shale
	SLATE: Slate
	SM: USCS Silty Sand
	SW: USCS Well-graded Sand
	SP: USCS Poorly-graded Sand
	TOPSOIL: Topsoil
	WEATHERED ROCK: Weathered Bedrock
	WOOD: Wood / Mulch




SAMPLE SYMBOLS

	Grab Sample	
	No Recovery	
	Rock Core	
	Shelby Tube	AUGER: Auger Probe
	Split Spoon	

COLOR CODES FOR LITHOLOGIC SYMBOLS

	RED: Fill
	GREEN: Cultivated
	BLUE: Residuum
	MAGENTA: Alluvium
	PINK: Colluvium
	LIGHT GRAY: Weathered Rock
	ORANGE: Loess
	DARK GRAY: Rock Core
	YELLOW: Void
	TEAL: Glacial Outwash / Glacial Till
	PURPLE: Marine

ABBREVIATIONS

LL - LIQUID LIMIT (%)	TV - TORVANE
PI - PLASTIC INDEX (%)	PID - PHOTOIONIZATION DETECTOR
W - MOISTURE CONTENT (%)	UC - UNCONFINED COMPRESSION
DD - DRY DENSITY (PCF)	ppm - PARTS PER MILLION
NP - NON PLASTIC	
-200 - PERCENT PASSING NO. 200 SIEVE	
PP - POCKET PENETROMETER (TSF)	
 Water Level at Time Drilling, or as Shown	
 Water Level at End of Drilling, or as Shown	
 Water Level After 24 Hours, or as Shown	

PROJECT NAME CJUC Elevated Water Tank
 DATE 11/1/23
 DRILLING CONTRACTOR M&W Drilling
 DRILLING METHOD Geoprobe 7822 & NQ Rock Coring
 GROUND ELEVATION 1762.5 ft PROPOSED FFE 1762.0 ft
 REFUSAL Depth 39.9 ft / Elev 1722.6 ft
 TOP OF ROCK Depth 39.9 ft / Elev 1722.6 ft
 BEGAN CORING Depth 39.9 ft / Elev 1722.6 ft
 FOOTAGE CORED (LF) 12.9 ft
 BOTTOM OF HOLE Depth 52.8 ft / Elev 1709.7 ft

GEOservices PROJECT# 21-231372
 PROJECT LOCATION Sonny Boshears Lane, Pioneer, TN 37847
 LOGGED BY KSR ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---

GROUND WATER LEVELS:

AT END OF DRILLING --- Dry
 AFTER 1 HOUR --- Backfilled
 AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
0	1762.5		Topsoil (4 Inches)						
			(CL) Sandy Lean CLAY - with rock fragments - orangish brown, dark brown, dark gray, black, and tan - moist (FILL) Mine Spoil	SS 1		8-8-11 (19)			
5	1757.5		(SC) Clayey SAND - with rock fragments - dark gray, black, dark brown, and orangish brown - moist (FILL) Mine Spoil	SS 2		7-5-5 (10)			
			(SC) Clayey SAND - with rock fragments - dark gray, black, dark brown, and orangish brown - moist (FILL) Mine Spoil	SS 3		10-50/2"			
10	1752.5		(SC) Clayey SAND - with rock fragments - dark gray, black, dark brown, and orangish brown - moist (FILL) Mine Spoil	SS 4		6-16-22 (38)			
			Rock Fragments - gray - dry (FILL) Mine Spoil	SS 5		6-11-10 (21)			
15	1747.5		(SP) Fine-Grained SAND - with large sandstone fragments - reddish brown, tan, light gray, dark gray, and brown - very moist (FILL) Mine Spoil	SS 6		3-6-12 (18)			
20	1742.5		(SP) Fine-Grained SAND - with large sandstone fragments - reddish brown, tan, light gray, dark gray, and brown - very moist (FILL) Mine Spoil	SS 6		3-6-12 (18)			

NOTES: Set casing to 39.9 feet using casing advancer. Elevations from provided drawing should be considered approximate.

PROJECT NAME CJUC Elevated Water Tank
 DATE 11/1/23
 DRILLING CONTRACTOR M&W Drilling
 DRILLING METHOD Geoprobe 7822 & NQ Rock Coring
 GROUND ELEVATION 1762.5 ft PROPOSED FFE 1762.0 ft
 REFUSAL Depth 39.9 ft / Elev 1722.6 ft
 TOP OF ROCK Depth 39.9 ft / Elev 1722.6 ft
 BEGAN CORING Depth 39.9 ft / Elev 1722.6 ft
 FOOTAGE CORED (LF) 12.9 ft
 BOTTOM OF HOLE Depth 52.8 ft / Elev 1709.7 ft

GEOServices PROJECT# 21-231372
 PROJECT LOCATION Sonny Boshears Lane, Pioneer, TN 37847
 LOGGED BY KSR ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---
 GROUND WATER LEVELS:
 AT END OF DRILLING --- Dry
 AFTER 1 HOUR --- Backfilled
 AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			
								LIQUID LIMIT	PLASTICITY INDEX		
20	1742.5		(SP) Fine-Grained SAND - with large sandstone fragments - reddish brown, tan, light gray, dark gray, and brown - very moist (FILL) <i>Mine Spoil (continued)</i>	SS 7		8-50/2"					
25	1737.5										
30	1732.5									NR 8	7-7-3 (10)
35	1727.5									SS 9	6-6-8 (14)
40	1722.5									SS 10	6-15-50/3"
			Weathered ROCK - shale with sandy clay seams - dark gray, light gray, and brown - very moist - hard (RESIDUUM)								
			Auger Refusal at 39.9 Feet (Began Coring)								

NOTES: Set casing to 39.9 feet using casing advancer. Elevations from provided drawing should be considered approximate.

PROJECT NAME CJUC Elevated Water Tank
 DATE 11/1/23
 DRILLING CONTRACTOR M&W Drilling
 DRILLING METHOD Geoprobe 7822 & NQ Rock Coring
 GROUND ELEVATION 1762.5 ft PROPOSED FFE 1762.0 ft
 REFUSAL Depth 39.9 ft / Elev 1722.6 ft
 TOP OF ROCK Depth 39.9 ft / Elev 1722.6 ft
 BEGAN CORING Depth 39.9 ft / Elev 1722.6 ft
 FOOTAGE CORED (LF) 12.9 ft
 BOTTOM OF HOLE Depth 52.8 ft / Elev 1709.7 ft

GEOservices PROJECT# 21-231372
 PROJECT LOCATION Sonny Boshears Lane, Pioneer, TN 37847
 LOGGED BY KSR ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---

GROUND WATER LEVELS:

AT END OF DRILLING --- Dry
 AFTER 1 HOUR --- Backfilled
 AFTER 24 HOURS --- Backfilled



DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
40	1722.5		SHALE - with soil seams - dark gray and black - moderately weathered and highly fractured - 0.0 to 15.0 degree dip angle - moderately hard - slight HCl reaction (<i>continued</i>)	RC 1	22 (0)				
45	1717.5		SHALE - with large sandstone seams - dark gray and light gray - slightly weathered and slightly to moderately fractured - 0.0 to 10.0 degree dip angle - hard - slight HCl reaction	RC 2	87 (46)				
50	1712.5			RC 3	100 (93)				

Refusal at 39.9 feet.
 Bottom of borehole at 52.8 feet.

NOTES: Set casing to 39.9 feet using casing advancer. Elevations from provided drawing should be considered approximate.

PROJECT NAME CJUC Elevated Water Tank
 DATE 11/1/23
 DRILLING CONTRACTOR M&W Drilling
 DRILLING METHOD Geoprobe 7822
 GROUND ELEVATION 1763.5 ft PROPOSED FFE 1762.0 ft
 REFUSAL Depth 10.5 ft / Elev 1753.0 ft
 TOP OF ROCK ---
 BEGAN CORING ---
 FOOTAGE CORED (LF) ---
 BOTTOM OF HOLE Depth 10.5 ft / Elev 1753.0 ft

GEOServices PROJECT# 21-231372
 PROJECT LOCATION Sonny Boshears Lane, Pioneer, TN 37847
 LOGGED BY KSR ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---
 GROUND WATER LEVELS:
 AT END OF DRILLING --- Dry
 AFTER 1 HOUR --- Backfilled
 AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
0	1763.5		Topsoil (5 Inches)						
			(CL) Lean CLAY - with rock fragments and sand - dark brown, dark gray, light gray, and tan - dry (FILL) Mine Spoil	SS 1		3-9-12 (21)			
			(CL) Lean CLAY - with sand, rock fragments, and trace organics at depth - orangish brown, dark brown, dark gray, and black - moist (FILL) Mine Spoil	SS 2		1-2-2 (4)			
5	1758.5				SS 3		1-2-3 (5)		
			(SC) Clayey SAND - with rock fragments - dark gray, tan, dark brown, and orangish brown - moist (FILL) Mine Spoil	SS 4		10-14-15 (29)			
10	1753.5								

Refusal at 10.5 feet.
 Bottom of borehole at 10.5 feet.

NOTES: Elevations from provided drawing should be considered approximate.



A UES COMPANY

PROJECT NAME CJUC Elevated Water Tank
 DATE 10/31/23
 DRILLING CONTRACTOR M&W Drilling
 DRILLING METHOD Geoprobe 7822 & NQ Rock Coring
 GROUND ELEVATION 1767 ft PROPOSED FFE 7162.0 ft
 REFUSAL Depth 11.6 ft / Elev 1755.4 ft
 TOP OF ROCK Depth 11.6 ft / Elev 1755.4 ft
 BEGAN CORING Depth 11.6 ft / Elev 1755.4 ft
 FOOTAGE CORED (LF) 33.0 ft
 BOTTOM OF HOLE Depth 57.1 ft / Elev 1709.9 ft

GEOservices PROJECT# 21-231372
 PROJECT LOCATION Sonny Boshears Lane, Pioneer, TN 37847
 LOGGED BY KSR ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---

GROUND WATER LEVELS:
 AT END OF DRILLING --- Dry
 AFTER 1 HOUR --- Backfilled
 AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
0	1767.0		Topsoil (3 Inches)						
			(CL) Lean CLAY - with rock fragments and sand - dark brown, dark gray, light gray, and tan - moist (FILL) Mine Spoil	SS 1		12-14-14 (28)			
5	1762.0		(CL) Lean CLAY - with rock fragments and sand - orangish brown, dark brown, dark gray, black, and tan - moist (FILL) Mine Spoil	SS 2		14-11-30 (41)			
			(CL) Lean CLAY - with rock fragments and sand - orangish brown, dark brown, dark gray, black, and tan - moist (FILL) Mine Spoil	SS 3		7-9-5 (14)			
10	1757.0		(CL) Lean CLAY - with rock fragments and sand - orangish brown, dark brown, dark gray, black, and tan - moist (FILL) Mine Spoil	SS 4		3-3-8 (11)			
			Auger Refusal at 11.6 Feet (Began Coring)						
			Silty Sand - with clay seams and shale fragments- dark gray, tan, brown, and light gray, moist (FILL) Mine Spoil						
15	1752.0			RC 1	68 (60)				
20	1747.0			RC 2	12 (8)				

NOTES: Set casing to 44.1 feet using casing advancer. Elevations from provided drawing should be considered approximate.

PROJECT NAME CJUC Elevated Water Tank
 DATE 10/31/23
 DRILLING CONTRACTOR M&W Drilling
 DRILLING METHOD Geoprobe 7822 & NQ Rock Coring
 GROUND ELEVATION 1767 ft PROPOSED FFE 7162.0 ft
 REFUSAL Depth 11.6 ft / Elev 1755.4 ft
 TOP OF ROCK Depth 11.6 ft / Elev 1755.4 ft
 BEGAN CORING Depth 11.6 ft / Elev 1755.4 ft
 FOOTAGE CORED (LF) 33.0 ft
 BOTTOM OF HOLE Depth 57.1 ft / Elev 1709.9 ft

GEOservices PROJECT# 21-231372
 PROJECT LOCATION Sonny Boshears Lane, Pioneer, TN 37847
 LOGGED BY KSR ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---

GROUND WATER LEVELS:

AT END OF DRILLING --- Dry
 AFTER 1 HOUR --- Backfilled
 AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
20	1747.0		Silty Sand - with clay seams and shale fragments- dark gray, tan, brown, and light gray, moist (FILL) Mine Spoil (continued)						
25	1742.0			RC 3	34 (20)				
30	1737.0			RC 4	10 (0)				
			(CL) Lean CLAY - with shale-like structure, weathered shale fragments, and sand - tan, light gray, dark gray, and dark brown - moist - very stiff to hard (RESIDUUM)						
35	1732.0		Weathered ROCK - shale with sandy clay seams - dark gray, light gray, and brown - very moist - hard (RESIDUUM)	SS 5		3-3-23 (26)			
40	1727.0			SS 6		18-39-50/4"			

NOTES: Set casing to 44.1 feet using casing advancer. Elevations from provided drawing should be considered approximate.



A UES COMPANY

PROJECT NAME CJUC Elevated Water Tank
 DATE 10/31/23
 DRILLING CONTRACTOR M&W Drilling
 DRILLING METHOD Geoprobe 7822 & NQ Rock Coring
 GROUND ELEVATION 1767 ft PROPOSED FFE 7162.0 ft
 REFUSAL Depth 11.6 ft / Elev 1755.4 ft
 TOP OF ROCK Depth 11.6 ft / Elev 1755.4 ft
 BEGAN CORING Depth 11.6 ft / Elev 1755.4 ft
 FOOTAGE CORED (LF) 33.0 ft
 BOTTOM OF HOLE Depth 57.1 ft / Elev 1709.9 ft

GEOServices PROJECT# 21-231372
 PROJECT LOCATION Sonny Boshears Lane, Pioneer, TN 37847
 LOGGED BY KSR ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---

GROUND WATER LEVELS:

AT END OF DRILLING --- Dry
 AFTER 1 HOUR --- Backfilled
 AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
40	1727.0		Weathered ROCK - shale with sandy clay seams - dark gray, light gray, and brown - very moist - hard (RESIDUUM) <i>(continued)</i>						
45	1722.0		SHALE - with sandstone seams - dark gray, light gray, and black - slightly to moderately weathered and moderately fractured - 0.0 to 15.0 degree dip angle - hard - slight HCl reaction	SS 7		15-50/1"			
				RC 5	67 (48)				
50	1717.0			RC 6	93 (49)				
55	1712.0			RC 7	100 (88)				

Refusal at 11.6 feet.
 Bottom of borehole at 57.1 feet.

NOTES: Set casing to 44.1 feet using casing advancer. Elevations from provided drawing should be considered approximate.



A UES COMPANY

PROJECT NAME CJUC Elevated Water Tank

DATE 10/31/23

DRILLING CONTRACTOR M&W Drilling

DRILLING METHOD Geoprobe 7822

GROUND ELEVATION 1767 ft PROPOSED FFE 1762.0 ft

REFUSAL Depth 5.5 ft / Elev 1761.5 ft

TOP OF ROCK ---

BEGAN CORING ---

FOOTAGE CORED (LF) ---

BOTTOM OF HOLE Depth 5.5 ft / Elev 1761.5 ft

GEOservices PROJECT# 21-231372

PROJECT LOCATION Sonny Boshears Lane, Pioneer, TN 37847

LOGGED BY KSR ON-SITE REP. ---

LATITUDE / LONGITUDE ---

NORTHING / EASTING ---

GROUND WATER LEVELS:

AT END OF DRILLING --- Dry

AFTER 1 HOUR --- Backfilled

AFTER 24 HOURS --- Backfilled

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
0	1767.0		Topsoil (3 Inches)						
			(CL) Gravelly Sandy Lean CLAY - dark brown, dark gray, and tan - moist to dry (FILL) Mine Spoil	SS 1		7-10-7 (17)			
				SS 2		24-50/2"			
5	1762.0								

Refusal at 5.5 feet.
Bottom of borehole at 5.5 feet.

NOTES: Elevations from provided drawing should be considered approximate.



1	Remarks	B-1 – From 39.9 Feet to 47.8 Feet
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2	Remarks	B-1 – From 47.8 Feet to 52.8 Feet
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3	Remarks	B-3 – From 11.6 Feet to 31.6 Feet
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4	Remarks	B-3 – From 44.1 Feet to 52.1 Feet
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5	Remarks	B-3 – From 52.1 Feet to 57.1 Feet
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GEOS



GEServices, LLC-Geotechnical and Materials Engineers



A

UESTM

COMPANY

APPENDIX B





PROJECT SUMMARY REPORT

GEOS Project Name:	CJUC Elevated Water Tank	GEOS Log Number:	As Identified Below
GEOS Project Number:	A23109.00383.000	Material ID:	Rock Core (See Below)
GEOS Client:	LDA Engineering	Tested By:	JBB
Project Location:	Tennessee	Approved By:	BKP

UNCONFINED COMPRESSIVE STRENGTH OF ROCK CORE ASTM D7012 METHOD C

Core ID	Depth (ft)	Diameter (in)	Length (in)	Length/Diameter Ratio	Area (in ²)	Unit Weight (pcf)	Shape Key	Ultimate Load (lbs)	Compressive Strength (psi)
B-1	49.6	1.85	4.57	2.47	2.69	160.4	A	53,748	19,981

Shape Key	Description
A	Specimen met the requirements as stated in ASTM D4543-19 for straightness, flatness, parallelism and perpendicularity.
B	Specimen did not meet the straightness requirements in ASTM D4543-19. Specimen met the requirements as stated in ASTM D4543-19 for flatness, parallelism and perpendicularity. Best effort applied.
C	Specimen did not meet the straightness and parallelism requirements in ASTM D4543-19. Specimen met the requirements as stated in ASTM D4543-19 for flatness and perpendicularity. Best effort applied.
D	Specimen did not meet the straightness, parallelism and perpendicularity requirements in ASTM D4543-19. Specimen met the requirements as stated in ASTM D4543-19 for flatness. Best effort applied.

Comments: Specimens did not meet the minimum diameter size of 1-7/8-in. as stated in ASTM D4543-19.

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GEOS Project Name: CJUC Elevated Water Tank
 GEOS Project Number: A23109.00383.000

Date: 11/14/2023



1	Sample Identification / Description:	B-1, (49.6')
	Test Identification:	ASTM D7012 Method C