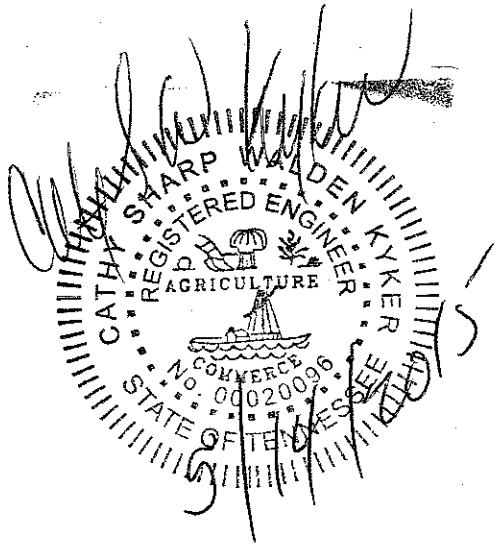
CONTRACT DOCUMENTS
FOR
PROPOSED SECONDARY CLARIFIER
2014 CDBG PROJECT TOWN OF MOUNT CARMEL
FOR
TOWN OF MOUNT CARMEL, TN
EDISON VENDOR # 2588

#14-12

MAY 2015



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FOR
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ADVERTISEMENT FOR BIDS

Project No. 14-12

Town of Mount Carmel (Owner)

Separate sealed bids for RE-BID of Proposed Secondary Clarifier - 2014 CDBG Project Town of Mount Carmel for Town of Mount Carmel will be received by Town of Mount Carmel, 100 East Main Street, Mount Carmel, TN 37645 at the Town Hall until 2:00 PM, E.S.T.(Local Time) Tuesday, December 15, 2015 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:

Town of Mount Carmel, 100 East Main Street, Mount Carmel, TN 37645
Associated General Contractors, 249 Neal Drive, Blountville, TN 37617
Builders Exchange of Tennessee, 300 Clark Street, Knoxville, TN 37291
Governor's Office of Diversity Business Enterprise State of Tennessee, Central Procurement Office, Attn: Christopher Cooper, 615-253-2733; GO.DBE@tn.gov
W&W Engineering, 800 West Andrew Johnson Highway, Ste. 2, Greeneville, TN 37745

Copies may be obtained at the office of W&W Engineering, LLC located at 800 West Andrew Johnson Highway, Suite 2, Greeneville, TN 37745 upon payment of $ 300.00 for each set. Any unsuccessful bidder, upon returning each set promptly and in good condition, will be refunded his payment, and any non-bidder upon so returning such a set will be refunded $ 0 .

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.

Tuesday, November 17, 2015 (Date) Larry Frost, Mayor

INFORMATION FOR BIDDERS

1. Receipt and Opening of Bids

The Town of Mount Carmel (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 Town of Mount Carmel, at 100 East Main Street, Mount Carmel, TN 37645 until 2:00 PM, E.S.T. on Tuesday, December 15, 2015, then at said office publicly opened and read aloud. The envelopes containing the bids must be sealed, addressed to Town of Mount Carmel, (PO Box 1421) 100 East Main Street, Mount Carmel, TN 37645 and designated as bid for Re-bid of Proposed Secondary Clarifier – 2014 CDBG Project Mount Carmel, TN.

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, Certification of Bidder Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion, 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):

Lump Sum bid for Re-bid of Proposed Secondary Clarifier - 2014 CDBG Project Town of Mount Carmel for Mount Carmel, TN.

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 s/he has received notice of the acceptance of his/her bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his/her bid.

9. Time of Completion and Liquidated Damages:

Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" of the Owner and to fully complete the project within 180 consecutive calendar days thereafter. Bidder must agree also to pay as liquidated damages, the sum of $ 250.00 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 Cathy Kyker at W&W Engineering, LLC, 800 West Andrew Johnson Hwy., Suite 2, Greeneville, TN 37745 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 sent by fax or email (at the respective addresses or fax number furnished for such purposes), not later than forty eight (48) hours prior to the time set 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 (deductive). There are alternates listed in the bid form and discussed in section 1000 of the technical specifications.

17. Obligation of Bidder:

At the time of the opening of bids each bidder will be presumed to have inspected the site and have 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 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 jobsite, 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.

19. 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.

20. Statement of Compliance Certificate Illegal Immigrants

Under the provisions of the requirements of Chapter 878 which servers to amend Tennessee Code Annotated Title 12, Chapter 4, Part I attached here in for reference.

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

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 LUMP SUM CONTRACTS

Place Mount Carmel, TN Town Hall

Date _____

Project No. 14-12

Proposal of _____ (hereinafter called "Bidder") a _____(State) corporation/a partnership/an individual doing business as _____

To the Town of Mount Carmel (hereinafter called "Owner")

Gentlemen:

The Bidder, in compliance with your invitation for bids for the construction of a Re-bid of Proposed Secondary Clarifier -2014 CDBG Project Town of Mount Carmel for Town of Mount Carmel, 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 180 consecutive calendar days thereafter as stipulated in the specifications. Bidder further agrees to pay as liquidated damages the sum of $ 250.00 for each consecutive calendar day thereafter as hereinafter provided in Paragraph 3.c. of the Supplemental General Conditions.

Bidder acknowledges receipt of the following addendum:

_____

_____

BASE PROPOSAL: Bidder agrees to perform all of the work described in the specifications and shown on the plans for the sum:

_____

_____ ($_____) (Amount shall

ALTERNATE PROPOSALS:

Alternate No. 1: Delete Installation of Secondary Sludge Station Pumps

Deduct the sum of _____ ($_____)

Alternate No. 2: Delete Furnishing the Secondary Sludge Station Pumps

Deduct the sum of _____ ($_____)

Alternate No. 3: Delete the Removal of the existing Blowers and Piping in Blower Shed

Deduct the sum of _____ ($_____)

UNIT PRICES (N/A)

For changing quantities of work items from those indicated by the contract drawings upon written instructions from the Architect/engineer, the following unit prices shall prevail:

1. Undercutting under clarifier per CY $_____
2. _____ $_____
3. _____ $_____

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. Changes shall be processed in accordance with Article 11.3.1 of the General Conditions.

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 calendar days after the scheduled closing time for receiving bids.

Upon receipt of written notice of the acceptance of this bid, the 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 following is a breakdown of the lump sum listed on the previous page:

1) Secondary Clarifier $_____
2) Grade Work excluding undercutting $_____
3) Undercutting at clarifier (175 CY x $_____) $_____
4) Yard Piping, Boxes and Sampler Platform $_____
5) Electrical $_____
6) Blower shed Modifications $_____
7) Pumps in Secondary Sludge Pump Station $_____

Total Lump Sum Price listed on page 12 of bid $_____

The bid security attached in the sum of _____ ($_____) is to become the property of the property of the Owner in the event the contract and bond are not executed within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

Respectfully submitted:

By:_____
(Signature)

_____
(Title)

_____
(Business Address & Zip Code)

(SEAL - if bid is by a corporation)

CERTIFICATION OF BIDDER REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

INSTRUCTIONS

This certification is required pursuant to 24.CFR Section 24.510(b). It shall be completed, signed and submitted as part of the bid proposal.

1. By signing and submitting this proposal, the prospective lower-tier participant certifies that neither it, its principals nor affiliates, is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency. Further, the Participant provides the certification set out below:

2. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that an erroneous certification was rendered, in addition to other remedies available to the Federal Government, the Department or agency with which this transaction originated may pursue available remedies.

3. Further, the Participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the Participant learns that this certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

4. By submitting this proposal, 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.

5. It is further agreed that by submitting this proposal, the Participant will include this Certification, without modification, in all lower-tier covered transactions and in all solicitations for lower-tier covered transactions.

Contractor Name and Title _____ Date _____

Signature _____ Address _____

City _____ State _____ Zip ___

NON-CERTIFICATION:

As the prospective lower-tier participant, I am unable to certify to statements in this Certification as explained in the attachment to this proposal.

Contractor Name and Title _____ Date _____

Signature _____ Address _____

City _____ State _____ Zip ___

The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

This form must be submitted to the State with the bid tabulations.

CERTIFICATION OF BIDDER REGARDING EQUAL EMPLOYMENT OPPORTUNITY

INSTRUCTIONS

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

Name and Address of Bidder *(include Zip Code)*:

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause.

q Yes q No

2. Compliance reports were required to be filed in connection with such contract or subcontract.

q Yes q No

3. Bidder has filed all compliance reports due under applicable instructions, including SF-100.

q Yes q No q None Required

4. Have you ever been or are you being considered for sanction due to violation of Executive Order 11246, as amended?

q Yes q No

NAME AND TITLE OF SIGNER *(Please type)*

SIGNATURE DATE

CERTIFICATION OF BIDDER REGARDING USE OF FEMALE/MINORITY SUBCONTRACTORS

INSTRUCTIONS

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

Name and Address of Bidder (include Zip Code):

I, _____, certify that every attempt was made to utilize female/minority contractors on this project.

_____

Name and Title of Signer

Signature **Date**

CERTIFICATION OF BIDDER REGARDING SECTION 3 AND SEGREGATED FACILITIES

Name of Prime Contractor _____ Project Name & Number _____

The undersigned hereby certifies that

(a) Section 3 provisions are included in the Contract.

(b) If contract equals or exceeds $100,000, HUD form 60002 will be submitted with the final pay estimate.

(c) No segregated facilities will be maintained.

_____
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

INSTRUCTIONS

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

NAME AND ADDRESS OF SUBCONTRACTOR *(include ZIP Code)*:

1. Bidder has participated in a previous contract or subcontract subject to the Equal Opportunity Clause.

   q Yes q No

2. Compliance reports were required to be filed in connection with such contract or subcontract.

   q Yes q No

3. Bidder has filed all compliance reports due under applicable instructions, including SF-100.

   q Yes q No q None Required

4. Have you ever been or are you being considered for sanction due to violation of Executive Order 11246, as amended?

   q Yes q No

NAME AND TITLE OF SIGNER *(Please type)*

SIGNATURE | DATE

CERTIFICATION OF PROPOSED SUBCONTRACTOR REGARDING SECTION 3 AND SEGREGATED FACILITIES

Name of Subcontractor _____ Project Name & Number _____

The undersigned hereby certifies that

(a) Section 3 provisions are included in the Contract;

(b) If contract equals or exceeds $100,000, HUD form 60002 will be submitted with the final pay estimate.

(c) 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 IMMIGRANTS

EACH CONTRACTOR BIDDING SHALL FILL IN AND SIGN THE FOLLOWING

This is to certify that _____ have fully complied with all the requirements of Chapter No. 878 (House Bill No. 111 and Senate Bill No. 411) which serves to amend Tennessee Code Annotated Title 12, Chapter 4, Part I, attached herein for reference.

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

Signed:

_____

State of _____)
) ss
County of _____)

Personally appeared before me, _____ the undersigned Notary Public, _____, the within named bargainer, with whom I am personally acquainted, and known to me to be the President / Owner / Partner (as applicable) of the _____, Corporation, Partnership, Sole Proprietorship (as applicable) and acknowledged to me that he executed the foregoing document for the purposes recited therein.

Witness my hand, at office, this _____ day of _____, 200__.

_____
Notary Public

My commission expires _____

WAGE RATES

FOR
RE-BID OF
PROPOSED SECONDARY CLARIFIER
2014 CDBG PROJECT TOWN OF MOUNT CARMEL, TN
FOR
TOWN OF MOUNT CARMEL, TN

Davis Bacon Wage Rate Determination is attached.

Note: Payrolls, site interviews and wage rate compliance will be done by representative of First Tennessee Development District. They can be reached at 423-928-0224.

General Decision Number: TN150129 09/25/2015 TN129

Superseded General Decision Number: TN20140129

State: Tennessee

Construction Type: Heavy
Including Water and Sewer Line Construction

County: Hawkins County in Tennessee.

HEAVY CONSTRUCTION PROJECTS (including sewer/water construction).

Note: Executive Order (EO) 13658 establishes an hourly minimum wage of $10.10 for 2015 that applies to all contracts subject to the Davis-Bacon Act for which the solicitation is issued on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.10 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/02/2015
1	09/25/2015

CARP0050-001 05/01/2013

	Rates	Fringes
Carpenter (includes form work)	$ 19.25	8.56

ELEC0934-005 06/01/2011

	Rates	Fringes
ELECTRICIAN	$ 19.79	14%+6.63

* ENGI0917-022 05/01/2015

	Rates	Fringes
Operating Engineers:		
Bulldozer and Crane	$ 26.72	9.90
Forklift	$ 24.53	9.90

LABO0818-003 05/01/2014

	Rates	Fringes
LABORER: Common or General	$ 18.73	5.80

SUTN2009-127 12/02/2009

	Rates	Fringes
LABORER: Flagger	$ 7.25	0.00
LABORER: Pipelayer	$ 10.04	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 12.97	0.00
OPERATOR: Loader	$ 8.00	0.00
TRUCK DRIVER: Dump Truck	$ 10.76	0.00

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

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

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

Union Rate Identifiers

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

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

Survey Rate Identifiers

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

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have 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 _____, 2016, by and between Town of Mount Carmel _____, herein called "Owner", acting herein through its Mayor, Larry Frost and _____

STRIKE OUT INAPPLICABLE TERMS

(a corporation)
(an individual doing business as_____)

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: Re-bid of Proposed Secondary Clarifier - 2014 CDBG Project Town of Mount Carmel

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 W&W Engineering, LLC, 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 180 consecutive calendar days thereafter. The Contractor further agrees to pay, as liquidated damages, the sum of $250.00 for each consecutive calendar day thereafter as hereinafter provided in Paragraph 3 of the Supplemental General Conditions.

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

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

Town of Mount Carmel

(Seal)
ATTEST:

By: _____

_____
(Secretary)

Mayor
(Title)

_____
(Witness)

(Seal)

_____
(Contractor)

By: _____

_____
(Secretary)

_____
(Title)

_____
(Witness)

_____

_____
(Owner)

(Address and Zip Code)

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

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 $100,000. For those contracts or subcontracts exceeding $100,000, 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: _____ _____

NOTICE TO PROCEED

To: _____ Date: _____

_____

_____

_____

_____

(Name and Address of
Construction Contractor)

You are hereby notified to commence Work in accordance with the Agreement dated _____, 2015, and you are to complete the Work within 180 consecutive calendar days after the Notice to Proceed. The date of completion of all work is therefore _____.

Town of Mount Carmel
Owner

Signature: _____

Typed Name & Title: Larry Frost,
Mayor

ACCEPTED:

_____
Contractor

Signature: _____

Typed Name & Title: _____

REQUIRED DISCLOSURES BY BIDDERS (TCA §62-6-119) AND DRUG FREE WORKPLACE AFFIDAVIT REQUIREMENT (TCA §50-09-113)

Pursuant to TCA §62-6-119, any construction bids in excess of $25,000 must have the following information on the outside of an envelope containing a bid for both the prime contractor and for any electrical, plumbing, heating, ventilation and air conditioning contractors:

Name of the contractors;

Address of contractor;

License number of the contractor;

License dollar limit;

Expiration date of license of the contractors; and

License classification of the contractors.

Prime contractors who will be performing the electrical, plumbing, heating, ventilation, and air conditioning work themselves must so designate upon the outside of the envelope.

If this required information is not on the outside of the envelope, the statute directs that the bid envelope not be opened or the bid considered.

Any questions regarding this should be directed to the State of Tennessee Board for Licensing Contractors at 615-532-3990.

Pursuant to TCA §50-09-113, 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 (including utility districts) 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 affidavit submitted with the bid shall meet the following:

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.

INSURANCE REQUIREMENTS

The contractor shall provide insurance per requirements of the General conditions and the supplemental general conditions.

The contractor shall name the Owner, Town of Mount Carmel, and the Engineer, W & W Engineering, LLC, as additional insured by endorsement as "additional insured" on the Contractor's General Liability Policy. Contractor shall provide each with a certificate of insurance.

The contractor will be required to submit an endorsement meeting the requirements of Section 5.4.11 of the General Conditions.

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.

Article or Paragraph Number

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.

Article or Paragraph Number

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, CONTRACT-OR 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.

Article or Paragraph Number

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

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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 Facilitates:

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 provided protection from claims set forth below which may arise out of or result from CONTRACTOR's performance and furnishing of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed or furnished by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

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

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

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

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

5.4.5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting there from; and

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

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

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

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

5.4.9. include completed operations insurance;

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

5.4.11. contain a provision or endorsement that the coverage afforded will not be cancelled, materially changed or renewal refused until at least thirty days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.3.2 will so provide);

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

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

OWNER's Liability Insurance:

5.5. In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.4, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

Property Insurance:

5.6. Unless otherwise provided in the Supplementary Conditions, OWNER shall purchase and maintain property insurance upon the Work at the site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

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

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

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

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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;

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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

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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.

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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.

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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:

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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, expediters, 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, of 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.

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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 14.71. through 14.7.3 or paragraphs 15.2.1 through 15.2.4 inclusive;

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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.

Article or Paragraph Number

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;

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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.

Article or Paragraph Number

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.	See Sheet Index on Plans
Heating and Ventilating:	"	
Plumbing:	"	
Electrical:	"	
	"	
	"	

SPECIFICATIONS:

General Construction	Page	11 sheets total	to	_____,	incl.
	Page	_____	to	_____,	incl.
Heating and Ventilating:	Page	_____	to	_____,	incl.
Plumbing:	Page	_____	to	_____,	incl.
Electrical:	Page	_____	to	_____,	incl.
(See Table of Contents)	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	N/A	(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 $2,000,000 for injuries, including accidental death, to any one person, and subject to the same limit for each person, in an amount not less than $2,000,000 on account of one accident, and Contractor's Property Damage Insurance in an amount not less than $1,000,000.

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

7. PHOTOGRAPHS OF PROJECT

As provided in Paragraph 3.I 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 24, and In front of Agreement.

9. BUILDER'S RISK INSURANCE

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 2.6	Insert Goals 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 Hawkins County

3. Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)

a. As used in these specifications:

(1) "Covered area" means the geographical area described in the solicitation from which this contract resulted;

(2) "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;

(3) "Employer identification number" means the federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

(4) "Minority" includes:

(a) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(b) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South America or other Spanish Culture or origin, regardless of race);

(c) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands);

(d) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

b. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

c. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

d. The Contractor shall implement the specific affirmative action standards provided in paragraphs g.(1) through (16) of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing contracts in geographical areas where they do not have a Federal or Federally-assisted construction contract shall apply the minority and female goals established for the geographic area where the contract is being performed. Goals are published periodically in the Federal Register in notice form and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

e. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

f. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

g. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

(1) Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

(2) Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its union have employment opportunities available, and maintain a record of the organization's responses.

(3) Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.

(4) Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

(5) Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under g.(2) above.

(6) Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company's EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

(7) Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

(8) Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

(9) Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date of the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

(10) Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

(11) Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR part 60-3.

(12) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

(13) Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

(14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

(15) Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

(16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

h. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations g.(1) through (16). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under g.(1) through (16) of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation shall not be a defense for the Contractor's non-compliance.

i. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

j. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

k. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

l. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

m. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph g. of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

n. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company's EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee, the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number where assigned, social security number, race, sex, status (e.g., mechanic, apprentice trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and location at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractor shall not be required to maintain separate records.

o. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

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

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

D. Civil Rights Act of 1964

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

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

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

F. "The Section 3 Clause"

1. The work to be performed under this contract is on a project assisted under a program providing direct Federal financial assistance from the Department of Housing and Urban Development and is subject to the requirements of section 3 of the Housing Urban Development Act of 1968, as amended, 12 U.S.C. 1701u. Section 3 requires that to the greatest extent feasible, opportunities for training and employment be given to lower income residents of the area of the Section 3 covered project, and contracts for work in connection with the project be awarded to business concerns which are located in, or owned in substantial part by persons residing in the area of the Section 3 covered project.

2. The parties to this contract will comply with the provisions of said Section 3 and the regulations issued pursuant thereto by the Secretary of Housing and Urban Development set forth in 24 Part CFR 135, and all applicable rules and orders of the Department issued thereunder prior to the execution of this contract. The parties to this contract certify and agree that they are under no contractual or other disability which would prevent them from complying with these requirements.

3. The contractor will send to each labor organization or representative of workers with which he has a collective bargaining agreement or other contract or understanding, if any, a notice advising the said labor organization or workers' representative of his commitments under this Section 3 clause and shall post copies of the notice in conspicuous places available to employees and applicants for employment or training.

4. The contractor will include this Section 3 clause in every subcontract for work in connection with the project and will, at the direction of the applicant for or recipient of Federal Financial assistance, take appropriate action pursuant to the subcontract upon a finding that the subcontractor is in violation of regulations issued by the Secretary of Housing and Urban Development, 24 CFR Part 135. The contractor will not subcontract with any subcontractor where it has notice or knowledge that the latter has been found in violation of regulations under 24 CFR part 135 and will not let any subcontract unless the subcontractor has first provided it with a preliminary statement of ability to comply with the requirements of these regulations.

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

G. Age Discrimination Act of 1975

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

H. Section 504 Handicapped

Non-Discrimination for Handicapped Workers

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

11. CERTIFICATION OF COMPLIANCE WITH AIR AND WATER ACTS

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

Compliance with Air and Water Acts

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

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

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

2. Agreement by the Contractor to comply with all the requirements of Section 114 of the Clean Air Act, as amended, (42 USC 1857c-8) and Section 308 of the Federal Water Pollution Control Act, as amended, (33 USC 1318) relating to inspection, monitoring, entry, reports and information, as well as all other requirements specified in said Section 114 and Section 308, and all regulations and guidelines issued thereunder.

3. A stipulation that as a condition for the award of the contract, prompt notice will be given of any notification received from the Director, Office of Federal Activities, EPA, indicating that a facility utilized, or to be utilized for the contract, is under consideration to be listed on the EPA List of Violating Facilities.

4. Agreement by the Contractor that he will include, or cause to be included, the criteria and requirements in paragraph (1) through (4) of this section in every nonexempt subcontract and requiring that the Contractor will take such action as the Government may direct as a means of enforcing such provisions.

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

A. Lead-Based Paint Hazards

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

B. Use of Explosives (Modify as Required)

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

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

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

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

13. FLOOD DISASTER PROTECTION

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

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

14. ACCESS TO RECORDS/MAINTENANCE OF RECORDS

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

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

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

16. DRUG-FREE WORKPLACE

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

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

17. PROJECT SIGN

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

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

LAND ACQUISITION

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

Please check the following boxes and sign below:

yes	no	n/a	
☐	☐	■	All permanent easements necessary for the construction of this project have been acquired and recorded with the appropriate agency.
☐	☐	■	All land acquisition necessary for the construction of this project has been acquired and recorded with the appropriate agency.
☐	☐	■	All right-of-ways, permits, and land access agreements necessary for the construction of this project have been acquired and recorded with the appropriate agency(s).

OR

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

Cathy S Kuykendall — Signature of grantee, engineer/architect, or project administrator

4/2/2015 — Date

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

Foundation Systems Engineering, P.C.
Geotechnical Engineering and Consulting

Subsurface Exploration

Town Of Mount Carmel
Waste Water Treatment Plant
Secondary Clarifier
Seminole Drive
Hawkins County, Tennessee

03/23/2015

Prepared For: Mr. David Wykle, P.E. – W & W Engineering, LLC

P.O. Box 9449
Knoxville, TN 37940
Ph: 865.577.3361 Fx: 865.573.1817

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Ph: 423.239.9226 Fx: 423.239.8677

Foundation Systems Engineering, P.C.

Geotechnical Engineering and Consulting

March 23, 2015

Mr. David Wykle, P.E.
W & W Engineering, LLC
800 West Andrew Johnson Highway
Suite 2
Greeneville, Tennessee 37745

RE: Subsurface Exploration
Town Of Mount Carmel
Waste Water Treatment Plant Upgrade
48' Diameter Secondary Clarifier
Hawkins County, Tennessee
FSE Project No. 315115

Dear Mr. Wykle:

As per your authorization, we have completed soil test borings and geotechnical engineering analysis for the above referenced project. Our exploration and analysis was performed in general accordance with our proposal dated February 6, 2015. Our services were provided using the firms of Foundation Systems Engineering, P.C., and Construction Materials Laboratory.

Please give us a call if you have any questions regarding our geotechnical report or if we may be of further service. It has been a pleasure to be of service on this portion of the project.

Sincerely,
Foundation Systems Engineering, P.C.

JACK F. LLEWELLYN, JR. REGISTERED ENGINEER COMMERCE No. 19187 STATE OF TENNESSEE 3/23/2015

Eric M. Peterson, P.E.
Senior Geotechnical Engineer
Tennessee No. 109536

Jack F. Llewellyn, Jr., P.E.
Principal In Charge
Tennessee No. 19187

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Enclosures

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1.0 EXECUTIVE SUMMARY

The waste water treatment plant is located at 116 Seminole Drive, in Mount Carmel, Tennessee. The plant site is bound to the west by an existing railroad line, to the north by Arnott Branch, and to the east and south by residential development.

Based on our review of the proposed plans prepared by your firm, we understand that the proposed new secondary clarifier is to be sized approximately 48' in diameter. The new structure will be located to the east, adjacent to, the secondary sludge pump station, and across the existing graveled drive from the shop/sludge press building.

The proposed secondary clarifier building area is grass covered. The area appears to consist of a routinely maintained grassed lawn. Topographically the building area slopes downward in elevation to the east. Topographic mapping indicates ground surface elevations of from approximately 1329.5 feet to approximately 1328 feet (approximately 1.5 feet of relief) across the proposed building area.

Arnott Branch is located on the north side of the existing waste water treatment plant. The creek is located approximately 30 feet north of the proposed new clarifier structure. Creek flow is to the east. Large limestone boulders have been placed along the creek to minimize washing. We understand that these boulders were from past construction projects at the plant site. We observed what we believe to be pinnacle limestone bedrock outcropping to the east of the proposed new structure.

The existing secondary clarifier is also approximately 48 feet in diameter, and is located to the west of the existing secondary sludge pump station. The structure is of poured in place concrete construction. Above ground clarifier walls are approximately 8 feet in height (top of wall elevation 1338 feet).

Five soil test borings and five offset borings were utilized to investigate subsurface conditions at the proposed new secondary clarifier. The borings encountered from approximately 5 inches to approximately 6 inches of topsoil and roots at existing grade. Fill was encountered beneath the topsoil veneer. The fill consists of brown, dark brown, and reddish brown silty clay mixed with fine to coarse chert and limestone gravel to boulders. Soil sample recovery from split-spoon sampling was minimal due to the boulder fill. Soft, very moist to wet, dark brown and gray, organic, silty, alluvial clay was encountered at B-3. The material was captured on auger flights (no samples were recovered from split-spoon sampling). The borings refused at depths of approximately 2 feet to approximately 8 feet below existing grade. The average depth to auger refusal

approximately 3.5 feet below existing grade. Based on the driller's field logs, shallow auger refusal was believed to be, in part, refusal on boulder fill.

No groundwater was encountered at the boring, or boring offset, locations at the time of drilling. The borings were backfilled with soil auger cuttings upon completion. Very moist to wet alluvial soils were encountered at B-3. It is likely that a perched or trapped water level would have developed after a period of 24 or more hours. Excavations that approach the level of the water in Arnott Branch should anticipate that groundwater will be encountered.

Based on the results of the borings, we recommend that the proposed new secondary clarifier, plus a minimum distance of 5 feet beyond the clarifier perimeter, be excavated down to the underlying dolomite bedrock unit. The borings encountered shallow refusal on what is believed to be boulders in some areas, as well as an undulating, pinnacled, top of rock in others. The boring indicate auger refusal between approximately elevations 1321.3 feet to 1327.5 feet, with an approximate average refusal elevation of 1325.3 feet. We did not encounter residual soil at the boring locations, it is therefore impossible to distinguish between boulder and residual bedrock refusal. Test pits, placed using a trackhoe capable of excavating through boulder fill, should be placed at the site to distinguish between refusal on boulders and refusal on bedrock, and determine the depth to top of residual bedrock.

The excavation made for the new secondary clarifier foundation preparation should extend down to the underlying residual dolomite bedrock unit. The surface of the bedrock should be cleaned to remove all soil/muck/mud/loose rock, etc. Leveling of the pinnacled rock surface should be performed such that the surface elevation varies less than 10 inches from point to point across the undercut area, in order to facilitate cleaning/backfilling/etc., and minimize potential from differential settlement. In the event that residual bedrock is encountered at an elevation that is less than 6 inches below proposed finished subgrade elevation, the excavation for foundation preparation should be extended to a minimum depth of 6 inches below finished subgrade elevation, such that a minimum 6 inch thick cushion of compacted crushed stone may be placed between the proposed new footing and residual bedrock unit. Once excavated down to the underlying bedrock unit, with the surface leveled and cleaned as outlined above (or excavated down into rock as may be required to provide the 6 inch thick cushion between footing and bedrock) the excavation should be observed by a geotechnical engineer. Any slots/cavities/fissures/etc. should be cleaned and filled with lean concrete or flowable fill, as directed by the geotechnical engineer (*dental filling*).

Once observed by the geotechnical engineer and any *dental filling* material placed, the surface of the excavation should be covered with heavy duty, woven, geotextile. A geotextile such a Propex Geotex 315 ST, or engineer approved equal, should be used. The geotextile should be lapped between successive roll widths and at the ends of the rolls of the geotextile. A minimum 2 foot lap width is recommended. The excavation may then be backfilled to the level of 1 foot below finished subgrade elevation with ASTM C 33 size No. 57 crushed limestone gravel. The top 12 inches of material below finished subgrade elevation should consist of TDOT 303 D Mineral Aggregate Base. The proposed clarifier foundation may be supported on the compacted stone overlying limestone bedrock. The clarifier foundation may be sized (bearing on the prepared foundation bearing material) utilizing an allowable bearing capacity of 4000 PSF.

The in-place fill and underlying alluvial soils are classified under OSHA guidelines as Type C soils. Temporary slopes during construction should be sloped no steeper than 2 horizontal to 1 vertical (2H:1V). Soil stockpiles, equipment, heavy loading, etc. should be placed a minimum distance back from the crest of the excavation equal to the depth of the excavation. Dewatering should be expected to be required to allow cleaning, placement of geotextile and placement/compaction of No. 57 stone fill. Of important note, fine grained material (soil, mineral aggregate base, etc.) should not be placed below the static water level and/or below the maximum flood elevation along this section of Arnott Branch (whichever elevation is higher). Only open graded limestone gravel (such as ASTM C 33 size No. 57 stone) should be placed as fill in areas which will be below the anticipated maximum flood elevation.

The above summary provides an overview only and should not be used as a separate document or in place of reading the entire report including the appendices. The summary is not a substitute for the following detailed sections of this report. A complete discussion of finding and recommendations are included in the following sections of this report.

2.0 OBJECTIVE OF SUBSURFACE EXPLORATION

The purpose of our subsurface exploration was to gather subsurface data at the proposed new secondary clarifier location to allow geotechnical engineering recommendations with regard to recommended foundation type, foundation preparation and foundation bearing capacity. To accomplish this objective, five soil test borings with Standard Penetration Testing (SPT) testing, and five offset soil test boring locations, were used to investigate the site. Split-spoon samples of the soils encountered (recovered) at the site were returned to the laboratory for visual classification by a

geotechnical engineer. USGS Topographic and Geologic mapping was reviewed, as well as the proposed site plan provided by your firm.

3.0 SCOPE OF SERVICES

Five (5) soil test borings and five offset boring locations with Standard Penetration testing (SPT) were used to investigate the subsurface conditions at the proposed new secondary clarifier location. The borings were placed at locations as selected by our firm, with offsets as required to avoid overhead and underground utilities.

The borings were placed using a CME 55 drill mounted on an F-700 Ford carrier. Eight-inch diameter Hollow-Stem augers were used to advance the borings. SPT testing was performed at 2.5-foot intervals to a depth of 10 feet below existing grade. Thereafter penetration testing was performed at 5-foot intervals. The SPT testing was performed through the Hollow-Stem augers. A *Soil Test Boring Data Summary* may be seen in Table I of this report.

The borings were checked for groundwater as augers were removed from the bore hole. Upon completion the bore holes were backfilled with soil auger cuttings.

The approximate locations of the boring may be seen on the attached *Boring Location Plan*. The results of the Standard Penetration testing and general subsurface stratification may be seen on the attached *Test Boring Records* located in the Appendix of this report.

A brief summary of the SPT test procedures utilized on this project are located in the Appendix of this report.

4.0 SITE LOCATION AND CONDITIONS

The waste water treatment plant is located at 116 Seminole Drive, in Mount Carmel, Tennessee. The plant site is bound to the west by an existing railroad line, to the north by Arnott Branch, and to the east and south by residential development.

Based on our review of the proposed plans prepared by your firm, we understand that the proposed new secondary clarifier is to be sized approximately 48' in diameter. The new structure will be located to the east, adjacent to, the secondary sludge pump station, and across the existing graveled drive from the shop/sludge press building.

The proposed secondary clarifier building area is grass covered. The area appears to consist of a routinely maintained grassed lawn. Topographically the building area slopes downward in elevation to the east. Topographic mapping indicates ground surface elevations of from approximately 1329.5 feet to approximately 1328 feet (approximately 1.5 feet of relief) across the proposed building area.

Arnott Branch is located on the north side of the existing waste water treatment plant. The creek is located approximately 30 feet north of the proposed new clarifier structure. Creek flow is to the east. Large limestone boulders have been placed along the creek to minimize washing. We understand that these boulders were from past construction projects at the plant site. We observed what we believe to be pinnacled limestone bedrock outcroppings to the east of the proposed new clarifier structure.

The existing secondary clarifier is also approximately 48 feet in diameter, and is located to the west of the existing secondary sludge pump station. The structure is of poured in place concrete construction. Above ground clarifier walls are approximately 8 feet in height (top of wall elevation 1338 feet).

5.0 SUBSURFACE STRATIFICATION

The following table summarizes the soil test boring depths and approximate subsurface stratification.

TABLE I – SOIL TEST BORING DATA SUMMARY

Boring Number	Surface Elevation (+/-)	Stratification	Refusal, Ft. (El.)
B-1	1329.3	0" – 5" Topsoil 5" – 5' Fill. Firm, very moist to moist, brown, silty clay m/w topsoil and fine to coarse chert and limestone gravel to boulders.	5' (1324.3)
B-1A	1329.3	0" – 5" Topsoil 5" – 4' Fill. Firm, very moist to moist, brown, silty clay m/w topsoil and fine to coarse chert and limestone gravel to boulders.	4' (1325.3)
B-2	1328.3	0" – 5" Topsoil 5" – 2' Fill. Firm, very moist to moist, brown, silty clay m/w topsoil and fine to coarse chert and limestone gravel to boulders.	2' (1326.3)

Boring Number	Surface Elevation (+/-)	Stratification	Refusal, Ft. (El.)
B-2A	1328.3	0" – 5" Topsoil 5" – 3' Fill. Firm, very moist to moist, brown, silty clay m/w topsoil and fine to coarse chert and limestone gravel to boulders.	3' (1325.3)
B-3	1329.5	0" – 6" Topsoil 5" – 2' Fill. Firm, very moist to moist, brown, silty clay m/w topsoil and fine to coarse chert and limestone gravel to boulders.	2' (1327.5)
B-3A	1329.3	0" – 6" Topsoil 5" – 8' Fill. Firm to soft, very moist to wet, brown, dark brown and gray silty clay m/w topsoil and fine to coarse chert and limestone gravel to boulders.	8' (1321.3)
B-4	1328.7	0" – 6" Topsoil 5" – 2' Fill. Firm, very moist to moist, brown and dark reddish brown, silty clay m/w topsoil and fine to coarse chert and limestone gravel to boulders.	2' (1326.7)
B-4A	1328.7	0" – 6" Topsoil 5" – 4' Fill. Firm, very moist to moist, brown and dark reddish brown, silty clay m/w topsoil and fine to coarse chert and limestone gravel to boulders.	4' (1324.7)
B-5	1328.7	0" – 5" Topsoil 5" – 3' Fill. Firm, very moist to moist, brown and dark reddish brown, silty clay m/w topsoil and fine to coarse chert and limestone gravel to boulders.	3' (1325.7)
B-5A	1328.7	0" – 5" Topsoil 5" – 3' Fill. Firm, very moist to moist, brown and dark reddish brown, silty clay m/w topsoil and fine to coarse chert and limestone gravel to boulders.	3' (1325.7)

Stratum Depths & Elevations Are Approximate.

5.1 Subsurface Stratification

Five soil test borings and five offset borings were utilized to investigate subsurface conditions at the proposed new secondary clarifier. The borings encountered from approximately 5 inches to approximately 6 inches of topsoil and roots at existing grade.

Fill was encountered beneath the topsoil veneer at each boring and offset boring location. In general, the fill consists of brown, dark brown, and reddish brown silty clay mixed with fine to coarse chert and limestone gravel to boulders, and variable amounts of topsoil. Soil sample recovery from split-spoon sampling was minimal due to the presence of the boulder fill. Soft, very moist to wet, dark brown and gray, organic, silty, clay (possibly alluvium) was encountered at depth at boring B-3. The material was captured on auger flights (no samples were recovered from split-spoon sampling).

The borings refused at depths of approximately 2 feet to approximately 8 feet below existing grade. The average depth to auger refusal was approximately 3.5 feet below existing grade. Based on the driller's field logs, shallow auger refusal was believed to be, in part, refusal on boulders. The approximate 8 foot refusal depth at B-3A is believed to be residual bedrock.

The in-place fill and apparent alluvial soils were typically moist to very moist and wet. Soil moisture content increased with increasing depth below existing grade. The consistency of the in-place fill is typically firm to soft, with the consistency of the apparent alluvial material being soft to very soft. In general, soil consistency decreased with increased depth below existing grade. Standard Penetration Test "N" values were artificially elevated due to the presence of the gravels and boulders, and in our opinion do not accurately reflect soil consistency.

5.2 Ground Water

By definition, ground water is the continuous body of subsurface water that fills the soil, rock voids and fissures and is free to move under the influence of gravity. The water table or phreatic surface is the level of zero (atmospheric) pressure in a continuous body of ground water. The ground water level is not a static level surface as the term *water table* implies. Instead, it is the sloping surface of a moving stream of water in the voids and fissures.

Groundwater was not encountered at the boring locations at the time of drilling. Based on the wet soils observed at boring B-3A, it is likely that a water level would have developed on top of the dense limestone bedrock with sufficient time. It is also possible for water to be trapped around the boulders suspended within the existing old fill. The presence and extent of a trapped water level may vary seasonally as well as during periods of inclement or arid weather.

It is likely that water from Arnott Branch percolates through the loose fill and alluvial soil. Excavations that approach and extend below the level of the adjacent Branch should expect that water will be encountered.

A deeper bedrock aquifer exists at some depth into the limestone bedrock below the ground surface. This depth is well below the level of our borings. A study of the deeper bedrock aquifer was beyond the scope of our exploration.

5.3 Geologic Setting

Physiographically the project site is located in the Appalachian Ridge and Valley geologic province. This is a region of folded and faulted rock formations of Cambrian to Silurian age.

Geologic mapping indicates that the site is underlain by the Chepultepec dolomite. The Chepultepec dolomite is a member of the Knox Group, and occupies the stratigraphic interval between the Kingsport formation above and the Conococheague limestone below. The Chepultepec dolomite is mapped to be from 750 feet to 950 feet in thickness. The formation strikes from northeast to southwest, and dips to the southeast at approximately 25 to 30 degrees.

Locally, the Chepultepec dolomite is described as gray to medium gray, fine –to medium fine –grained dolostone and blueish-gray, fine grained, limestone. Lenses of smooth, black chert are common in some areas; but, other types of chert may be found (they are not abundant). Thin sandstone beds are located through the formation. The base of the formation is commonly a sandstone zone, typically several feet in thickness.

No rock core drilling was performed, and compressive strength testing of the bedrock was not performed. Published data indicates typically rock compressive strength values of from 10,000 psi to 40,000 psi (hard to very hard rock). It is our opinion, based on past experience, that the compressive strength of the underlying bedrock would exceed 20,000 psi. The bedrock weathers to an irregular, pinnacled surface. The Chepultepec dolomite is a soluble carbonate rock unit and sinkholes and cavities are common. There is risk of sinkhole activity at this site.

6.0 RECOMMENDATIONS

We offer the following engineering recommendations based on the geotechnical data gathered at the time of our subsurface exploration, and the proposed secondary clarifier data furnished by your firm.

We understand that the proposed new secondary clarifier is to be approximately 48 feet in diameter. We offer the following recommendations for Foundation Preparation and Foundation Bearing Capacity for the proposed new secondary clarifier.

6.1 Secondary Clarifier Foundation Preparation

We recommend that the proposed new secondary clarifier, plus a minimum distance of 5 feet beyond the perimeter of the clarifier, be undercut down to the underlying dolomite bedrock unit. Areas that encounter residual bedrock at or above finished subgrade elevation should be undercut to the level of 6 inches below finished subgrade elevation. Areas where residual bedrock refusal is encountered at a depth of 6 inches below finished subgrade elevation, or below, will require no additional undercutting once excavated down to residual bedrock.

The borings encountered shallow refusal on what is believed to be boulders in some areas, as well as an undulating, pinnacled, top of rock in others. The borings indicate auger refusal between approximately elevations 1321 feet to 1327.5 feet. We did not encounter residual soil at the boring locations, it is therefore impossible to distinguish between boulder and residual bedrock refusal. Test pits, placed using a trackhoe capable of excavating through boulder fill, should be placed at the site to distinguish between refusal on boulders and refusal on bedrock, and to determine the depth to the top of the bedrock.

The surface of the residual bedrock at the undercut level should be cleaned to remove all soil/muck/mud/loose rock, etc. Use of backhoe/trackhoe or other similar equipment equipped with teeth are typically unable to remove all muck and soft soil, with supplemental equipment means/methods typically being required to clean the rock surface. Leveling of the pinnacled rock surface at the undercut level should be performed such that the surface elevation varies less than 10 inches from point to point across the undercut area. A sloping bedrock surface should be benched to create flat benches for support of the stone backfill. This will facilitate cleaning/backfilling/etc., and minimize differential settlement across the new clarifier.

In the event that residual bedrock is encountered at an elevation that is less than 6 inches below proposed finished subgrade elevation, the excavation for foundation preparation should be extended to a minimum depth of 6 inches below finished subgrade elevation, such that a minimum 6 inch thick cushion of compacted crushed stone may be placed between the proposed new footing and bedrock unit. Once excavated down to the underlying bedrock unit, with the surface leveled and cleaned as outlined above (or excavated down into rock as required to provide the 6 inch thick cushion between footing and bedrock) the excavation should be observed by a geotechnical engineer. Any slots/cavities/fissures/etc. should be cleaned and filled with lean concrete or flowable fill, as directed by the geotechnical engineer (*dental filling*).

Once observed by the geotechnical engineer and any *dental filling* material placed, the surface of the excavation should be covered with a heavy duty woven geotextile, such as Propex Geotex 315 ST, or engineer approved equal. The geotextile should be lapped between successive roll widths and at the ends of the rolls of the geotextile. A minimum 2 foot lap width is recommended. The geotextile should be hand tensioned to remove wrinkles and grabs. Tension should be maintained until the first lift of fill is placed.

Once the geotextile is in-place, the excavation may then be backfilled to the level of 1 foot below finished subgrade elevation with ASTM C 33 size No. 57 crushed limestone gravel. The top 12 inches of material below finished subgrade elevation should consist of TDOT 303 D Mineral Aggregate Base. The proposed clarifier foundation may be supported on the compacted stone overlying limestone bedrock. The clarifier foundation may be sized (bearing on the prepared foundation bearing material) utilizing an allowable bearing capacity of 4000 PSF.

The No. 57 sized stone should be compacted to a minimum of 95% Standard Proctor density using a smooth drum, vibratory, roller. The mineral aggregate base should be compacted to a minimum of 100% of its maximum dry density as determined by the Standard Proctor test, ASTM D 698.

All fill should be placed and compacted in horizontal lifts. Backfill lift thickness should be limited to a maximum of 12 inches, loose, for the No. 57 sized stone, and 8 inches, loose, for the mineral aggregate base. In-place density testing should be performed concurrent with placement of all fill to ensure the desired density is achieved. The recommended minimum rate of compaction testing is 3 test per every fill lift across the 48 foot diameter clarifier. A qualified construction materials testing technician, under the direction of a geotechnical engineer, should perform the density testing. Testing and observation services should be performed continuously during placement of all fill to ensure that the required compaction is achieved.

The in-place fill and alluvial soils are classified under OSHA guidelines as Type C soils. Temporary excavation slopes during construction should be sloped no steeper than 2 horizontal to 1 vertical (2H:1V). Soil stockpiles, equipment, heavy loading, etc. should be placed a minimum distance back from the crest of the excavation equal to the depth of the excavation. Dewatering should be expected to be required to allow cleaning, placement of geotextile and placement/compaction of No. 57 stone fill. Of important note, fine grained material (soil, mineral aggregate base, etc.) should not be placed below the static water level and/or below the maximum flood elevation along this section of Arnott Branch (whichever elevation is higher). Only open graded limestone gravel

(such as ASTM C 33 size No. 57 stone) should be placed as fill in areas which will be below the anticipated maximum flood elevation.

Once the area beyond the perimeter of the tank has been prepared as outlined above up to proposed tank finished subgrade elevation, the area surrounding the tank may be backfilled to finished grade with soil fill. The fill should be compacted to a minimum of 95 percent of its maximum dry density as determined by the Standard Proctor test, ASTM D 698. The moisture content of all fill should be maintained within a range of +/- 2 percent of Optimum moisture content during compaction.

All fill should be placed and compacted in horizontal lifts. Backfill lift thickness should be limited to a maximum of 8 inches, loose.

The fill should consist of lean, silty clay, free of organics, and rock fragments larger than 4 inches in greatest dimension. The soil fill should have a liquid limit of less than 50 percent, a plasticity index of less than 30, a minimum Standard Proctor maximum dry density of 90 PCF, and Standard Proctor optimum moisture content below the soil plastic limit.

Site grading should be performed to ensure that positive drainage is maintained away from the new secondary clarifier. Both cut and fill slopes should be constructed no steeper than 2 horizontal to 1 vertical. Slopes of 3H:1V, or flatter, are desirable for landscaped areas that require mowing. All slopes should be protected from erosion as soon after construction as possible. An erosion control blanket should be used to minimize washing as a vegetative cover develops.

6.2 Secondary Clarifier Foundation Bearing Capacity

We recommend that the secondary clarifier use a shallow foundation system for design. Bearing on the compacted crushed stone layer overlying residual limestone bedrock (prepared as outlined above) the basin foundation may be sized utilizing an allowable bearing capacity of 4000 PSF. Exterior footings should bear a minimum of 18 inches below outside grade. Utilizing the above outlined recommendations, differential settlement is estimated to be less than 1/4 inch.

Foundation excavations should be observed by a geotechnical engineer prior to placing reinforcing steel or concrete. In-place density testing should be performed to confirm that the stone fill has not been disturbed during foundation excavation. Footings should be poured with concrete as soon after excavation as possible.

6.3 Seismic Considerations

Earthquake Loads – 2006 IBC

We recommend the following Site Modified Design Spectral Acceleration values be used in determining earthquake loading. These values are based on the results of the soil test borings located in the proposed basin, and the design recommendations outlined within this report.

Based on the provisions listed in the 2006 International Building Code (IBC), the proposed new secondary clarifier with foundations bearing on compacted structural stone fill overlying residual dolomite bedrock rock may be design utilizing a classification designation "Class B". The site class is based on the average properties of the in-place top 100 feet. The underlying Chepultepec dolomite unit was encountered at what we believe was a depth of less than 10 feet. Overburden material is proposed to removed and replaced with compacted crushed stone. Using the IBC information, the short and 1.0 second spectral accelerations were determined for ground motion with a 2 percent probability of exceedance in 50 years. The following spectral acceleration requirements indicate the following values.

TABLE II – SEISMIC RECOMMENDATIONS

IBC DESIGN VALUE	0.2 SEC PERIOD SPECTRAL RESPONSE	1.0 SEC PERIOD SPECTRAL RESPONSE
Horizontal Spectral Accelerations, (g) for Class B Sites	Ss = 0..389	S1 = 0.101

The acceleration values were determined using IBC spectral acceleration data provided by the United States Geological Survey (USGS) Earthquake Hazards Program for Site Class B. The design spectral acceleration values listed in Table II above were not determined by a site specific seismic study, but were derived from interpolation of values provided by IBC.

7.0 ADDITIONAL RECOMMENDED WORK

We recommend that a trackhoe be utilized to excavate test pits at the secondary clarifier site. The test pits are needed to define the depth and nature of the fill, as well as trapped/perched water. An engineer from our firm should be present during excavation of the test pits.

We recommend that our firm be selected to provide all field and laboratory quality control construction material engineering and testing services during construction. Quality control testing and observation services are recommended to prepare the subgrade for foundation construction, confirm the bearing capacity of the foundations, perform proofrolling, subgrade observation, compaction testing, and to test concrete for foundations, clarifier, etc.

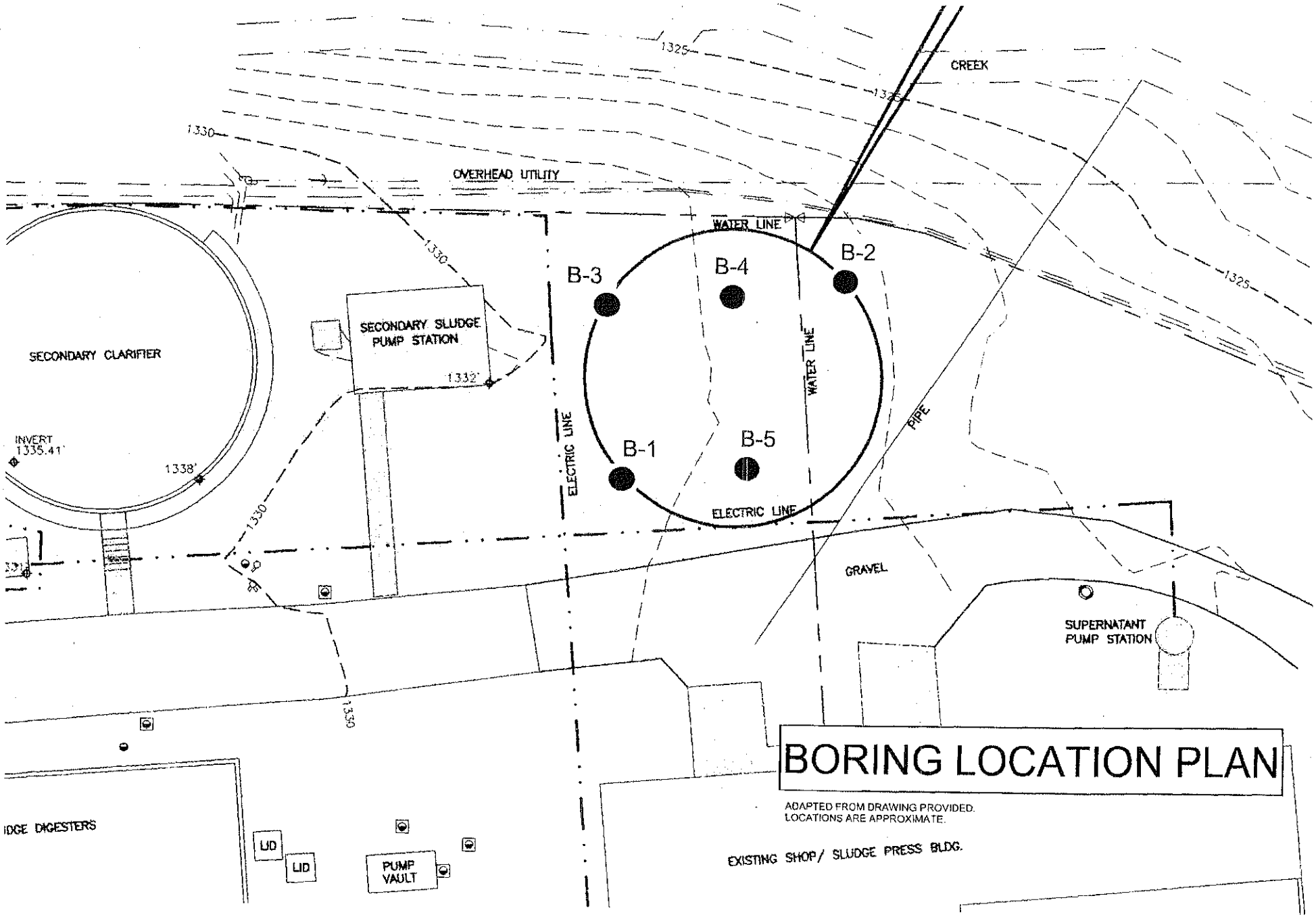
8.0 GENERAL QUALIFICATIONS

This report has been prepared for the exclusive use of W & W Engineering, LLC and the Town of Mount Carmel, Tennessee. This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to the geotechnical design elements of this project. 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, expressed or implied, is made. Foundation Systems Engineering, P.C is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of this report's subsurface data or engineering analysis without our express written authorization.

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the borings. The nature and extent of variations between the boring may not become evident until construction. If variations appear evident, then we will re-evaluate the recommendations of this report. In the event that any change in the nature, design, or location of the proposed secondary clarifier is made, 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.

Recommendations have been presented for additional test pit exploration at the site to further define the in-place old fill. The results of this additional exploration may result in alternate/revised geotechnical recommendations.

This report should not be made a part of project plans and specifications; but may be included with bidding documents for the convenience of the bidders.



BORING LOCATION PLAN

ADAPTED FROM DRAWING PROVIDED.
LOCATIONS ARE APPROXIMATE.

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TEST BORING RECORD

ELEV.	DEPTH	DESCRIPTION	DEPTH	N	CR --- RQD	S	REMARKS
1329.3	0.0	TOPSOIL AND ROOTS (5").					
1328.89	0.41	FIRM, VERY MOIST TO MOIST, BROWN, SILTY CLAY MIXED WITH TOPSOIL AND FINE TO COARSE CHERT AND LIMESTONE GRAVEL TO BOULDERS (FILL)	2.5	13*			* N VALUE ELEVATED DUE TO GRAVEL TO BOULDERS.
			4.0	50=0"*			
1324.3	5.0	AUGER REFUSAL AT 5.0 FEET. NO GROUNDWATER ENCOUNTERED AT TIME OF DRILLING.					BORE HOLE BACKFILLED WITH SOIL AUGER CUTTINGS UPON COMPLETION.

N - IS THE PENETRATION IN BLOWS PER FOOT (ASTM D-1586)

CR - 15 % CORE RECOVERY, NX OR BX DESIGNATES BIT SIZE (ASTM D-2113)

RQD - ROCK QUALITY

S - SYMBOLS DESCRIBED BELOW:

5 / 13 / 20 — 70 / 100

UNDISTURBED SAMPLE (ASTM D-1587)

WATER TABLE, TIME OF BORING

WATER TABLE, 24 HOUR READING

LOSS OF DRILLING FLUID

BORING NUMBER: B-1
DATE DRILLED: 3-17-15
LAB. NO.: K-15423

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TOWN OF MOUNT CARMEL - WWTP
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TEST BORING RECORD

ELEV.	DEPTH	DESCRIPTION	DEPTH	N	CR — RQD	S	REMARKS
1329.3	0.0	TOPSOIL AND ROOTS (5").					
1328.89	0.41	FIRM, VERY MOIST TO MOIST, BROWN, SILTY CLAY MIXED WITH TOPSOIL AND FINE TO COARSE CHERT AND LIMESTONE GRAVEL TO BOULDERS (FILL)	2.5	16*			* N VALUE ELEVATED DUE TO GRAVEL TO BOULDERS.
1325.3	4.0	AUGER REFUSAL AT 4.0 FEET. NO GROUNDWATER ENCOUNTERED AT TIME OF DRILLING.	4.0	50=0"*			BORE HOLE BACKFILLED WITH SOIL AUGER CUTTINGS UPON COMPLETION.

N - IS THE PENETRATION IN BLOWS PER FOOT (ASTM D-1586)

CR - 15 % CORE RECOVERY, NX OR BX DESIGNATES BIT SIZE (ASTM D-2113)

RQD - ROCK QUALITY

S - SYMBOLS DESCRIBED BELOW:

5 — 13 — 70 — UNDISTURBED SAMPLE (ASTM D-1587)

20 — 100 — WATER TABLE, TIME OF BORING

WATER TABLE, 24 HOUR READING

LOSS OF DRILLING FLUID

BORING NUMBER: B-1A
DATE DRILLED: 3-17-15
LAB. NO.: K-15423

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ELEV.	DEPTH	DESCRIPTION	DEPTH	N	CR — RQD	S	REMARKS
1328.3	0.0	TOPSOIL AND ROOTS (5").					* N VALUE ELEVATED DUE TO GRAVEL TO BOULDERS.
1327.89	0.41	FIRM, VERY MOIST TO MOIST, BROWN, SILTY CLAY MIXED WITH TOPSOIL AND FINE TO COARSE CHERT AND LIMESTONE GRAVEL TO BOULDERS (FILL)	1.5	50=0*			
1326.3	2.0	AUGER REFUSAL AT 2.0 FEET. NO GROUNDWATER ENCOUNTERED AT TIME OF DRILLING.					BORE HOLE BACKFILLED WITH SOIL AUGER CUTTINGS UPON COMPLETION,

N - IS THE PENETRATION IN BLOWS PER FOOT (ASTM D-1586)

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RQD - ROCK QUALITY

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20 / 100 — WATER TABLE, TIME OF BORING

WATER TABLE, 24 HOUR READING

LOSS OF DRILLING FLUID

BORING NUMBER: B-2
DATE DRILLED: 3-17-15
LAB. NO.: K-15423

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TEST BORING RECORD

ELEV.	DEPTH	DESCRIPTION	DEPTH	N	CR --- RQD	S	REMARKS
1328.3	0.0	TOPSOIL AND ROOTS (5").					
1327.89	0.41	FIRM, VERY MOIST TO MOIST, BROWN, SILTY CLAY MIXED WITH TOPSOIL AND FINE TO COARSE CHERT AND LIMESTONE GRAVEL TO BOULDERS (FILL)	1.5	50=0*			* N VALUE ELEVATED DUE TO GRAVEL TO BOULDERS.
1325.3	3.0	AUGER REFUSAL AT 3.0 FEET. NO GROUNDWATER ENCOUNTERED AT TIME OF DRILLING.					BORE HOLE BACKFILLED WITH SOIL AUGER CUTTINGS UPON COMPLETION.

N - IS THE PENETRATION IN BLOWS PER FOOT (ASTM D-1586)

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RQD - ROCK QUALITY

S - SYMBOLS DESCRIBED BELOW:

5 — 13 — 20 — 70 — 100

UNDISTURBED SAMPLE (ASTM D-1587)

WATER TABLE, TIME OF BORING

WATER TABLE, 24 HOUR READING

LOSS OF DRILLING FLUID

BORING NUMBER: B-2A
DATE DRILLED: 3-17-15
LAB. NO.: K-15423

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TEST BORING RECORD

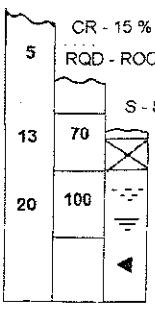
ELEV.	DEPTH	DESCRIPTION	DEPTH	N	CR --- RQD	S	REMARKS
1329.5	0.0	TOPSOIL AND ROOTS (6").					* N VALUE ELEVATED DUE TO GRAVEL TO BOULDERS.
1329	0.5	FIRM, VERY MOIST TO MOIST, BROWN, SILTY CLAY MIXED WITH TOPSOIL AND FINE TO COARSE CHERT AND LIMESTONE GRAVEL TO BOULDERS (FILL)	1.5	50=0"*			
1327.5	2.0	AUGER REFUSAL AT 2.0 FEET. NO GROUNDWATER ENCOUNTERED AT TIME OF DRILLING.					BORE HOLE BACKFILLED WITH SOIL AUGER CUTTINGS UPON COMPLETION.

N - IS THE PENETRATION IN BLOWS PER FOOT (ASTM D-1586)

CR - 15 % CORE RECOVERY, NX OR BX DESIGNATES BIT SIZE (ASTM D-2113)

RQD - ROCK QUALITY

S - SYMBOLS DESCRIBED BELOW:



UNDISTURBED SAMPLE (ASTM D-1587)

WATER TABLE, TIME OF BORING

WATER TABLE, 24 HOUR READING

LOSS OF DRILLING FLUID

BORING NUMBER: B-3
DATE DRILLED: 3-17-15
LAB. NO.: K-15423

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TEST BORING RECORD

ELEV.	DEPTH	DESCRIPTION	DEPTH	N	CR --- RQD	S	REMARKS
1329.3	0.0	TOPSOIL AND ROOTS (6").					
1328.8	0.50	FIRM TO SOFT, VERY MOIST TO WET, BROWN, DARK BROWN AND GRAY, SILTY CLAY MIXED WITH TOPSOIL AND FINE TO COARSE CHERT AND LIMESTONE GRAVEL TO BOULDERS (FILL)	1.5	50=0"			* N VALUE ELEVATED DUE TO GRAVEL TO BOULDERS.
			4.0	50=0"*			
			6.5	50=0*			
1321.3	8.0	AUGER REFUSAL AT 8.0 FEET. NO GROUNDWATER ENCOUNTERED AT TIME OF DRILLING.					BORE HOLE BACKFILLED WITH SOIL AUGER CUTTINGS UPON COMPLETION.

N - IS THE PENETRATION IN BLOWS PER FOOT (ASTM D-1586)

CR - 15 % CORE RECOVERY, NX OR BX DESIGNATES BIT SIZE (ASTM D-2113)

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LOSS OF DRILLING FLUID

BORING NUMBER: B-3A
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TEST BORING RECORD

ELEV.	DEPTH	DESCRIPTION	DEPTH	N	CR --- RQD	S	REMARKS
1328.7	0.0	TOPSOIL AND ROOTS (6").					* N VALUE ELEVATED DUE TO GRAVEL TO BOULDERS.
1328.2	0.50	FIRM, VERY MOIST TO MOIST, BROWN, SILTY CLAY MIXED WITH TOPSOIL AND FINE TO COARSE CHERT AND LIMESTONE GRAVEL TO BOULDERS (FILL)	1.5	50=0"*			
1326.7	2.0	AUGER REFUSAL AT 2.0 FEET. NO GROUNDWATER ENCOUNTERED AT TIME OF DRILLING.					BORE HOLE BACKFILLED WITH SOIL AUGER CUTTINGS UPON COMPLETION.

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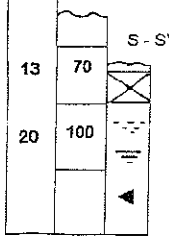
RQD - ROCK QUALITY

S - SYMBOLS DESCRIBED BELOW:



UNDISTURBED SAMPLE (ASTM D-1587)

WATER TABLE, TIME OF BORING

WATER TABLE, 24 HOUR READING

LOSS OF DRILLING FLUID

BORING NUMBER: B-4
DATE DRILLED: 3-17-15
LAB. NO.: K-15423

PAGE 1 OF 1

TOWN OF MOUNT CARMEL - WWTP
SECONDARY CLARIFIER HAWKINS COUNTY, TN

Llewellyn and Associates, Inc. dba
Construction Materials Laboratory

2204 Atchley Street
Knoxville, Tennessee 37920

P.O. Box 9449
(865)573-6031 - 573-6122

Branch
P.O. Box 5186 - E.K.S.
Johnson City, Tennessee 37603
(423) 926-0762 - 926-3860

TEST BORING RECORD

ELEV.	DEPTH	DESCRIPTION	DEPTH	N	CR — RQD	S	REMARKS
1328.7	0.0	TOPSOIL AND ROOTS (6").					
1328.2	0.50	FIRM, VERY MOIST TO MOIST, BROWN, SILTY CLAY MIXED WITH TOPSOIL AND FINE TO COARSE CHERT AND LIMESTONE GRAVEL TO BOULDERS (FILL)	1.0	8*			
			1.5	50=0"*			* N VALUE ELEVATED DUE TO GRAVEL TO BOULDERS.
1324.7	4.0	AUGER REFUSAL AT 4.0 FEET. NO GROUNDWATER ENCOUNTERED AT TIME OF DRILLING.	4.0	50=0"*			BORE HOLE BACKFILLED WITH SOIL AUGER CUTTINGS UPON COMPLETION.

N - IS THE PENETRATION IN BLOWS PER FOOT (ASTM D-1586)

CR - 15 % CORE RECOVERY, NX OR BX DESIGNATES BIT SIZE (ASTM D-2113)

RQD - ROCK QUALITY

S - SYMBOLS DESCRIBED BELOW:

5 / 13 / 20 / 70 / 100

UNDISTURBED SAMPLE (ASTM D-1587)

WATER TABLE, TIME OF BORING

WATER TABLE, 24 HOUR READING

LOSS OF DRILLING FLUID

BORING NUMBER: B-4A
DATE DRILLED: 3-17-15
LAB. NO.: K-15423

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TOWN OF MOUNT CARMEL - WWTP
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TEST BORING RECORD

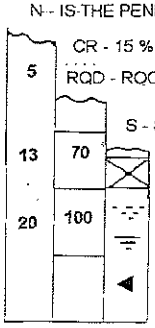
ELEV.	DEPTH	DESCRIPTION	DEPTH	N	CR — RQD	S	REMARKS
1328.7	0.0	TOPSOIL AND ROOTS (5").					
1328.29	0.41	FIRM, VERY MOIST TO MOIST, BROWN, SILTY CLAY MIXED WITH TOPSOIL AND FINE TO COARSE CHERT AND LIMESTONE GRAVEL TO BOULDERS (FILL)	1.0 1.5	9* 50=0"*			* N VALUE ELEVATED DUE TO GRAVEL TO BOULDERS.
1325.7	3.0	AUGER REFUSAL AT 3.0 FEET. NO GROUNDWATER ENCOUNTERED AT TIME OF DRILLING.					BORE HOLE BACKFILLED WITH SOIL AUGER CUTTINGS UPON COMPLETION.

N - IS THE PENETRATION IN BLOWS PER FOOT (ASTM D-1586)

CR - 15 % CORE RECOVERY, NX OR BX DESIGNATES BIT SIZE (ASTM D-2113)

RQD - ROCK QUALITY

S - SYMBOLS DESCRIBED BELOW:



UNDISTURBED SAMPLE (ASTM D-1587)

WATER TABLE, TIME OF BORING

WATER TABLE, 24 HOUR READING

LOSS OF DRILLING FLUID

BORING NUMBER: B-5
DATE DRILLED: 3-17-15
LAB. NO.: K-15423

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TOWN OF MOUNT CARMEL - WWTP
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TEST BORING RECORD

ELEV.	DEPTH	DESCRIPTION	DEPTH	N	CR --- RQD	S	REMARKS
1328.7	0.0	TOPSOIL AND ROOTS (5").					
1328.29	0.41	FIRM, VERY MOIST TO MOIST, BROWN, SILTY CLAY MIXED WITH TOPSOIL AND FINE TO COARSE CHERT AND LIMESTONE GRAVEL TO BOULDERS (FILL)	1.0 1.5	8* 50=0"*			* N VALUE ELEVATED DUE TO GRAVEL TO BOULDERS.
1325.7	3.0	AUGER REFUSAL AT 3.0 FEET. NO GROUNDWATER ENCOUNTERED AT TIME OF DRILLING.					BORE HOLE BACKFILLED WITH SOIL AUGER CUTTINGS UPON COMPLETION.

N - IS THE PENETRATION IN BLOWS PER FOOT (ASTM D-1586)

CR - 15 % CORE RECOVERY, NX OR BX DESIGNATES BIT SIZE (ASTM D-2113)

RQD - ROCK QUALITY

S - SYMBOLS DESCRIBED BELOW:

5 / 13 / 70 — UNDISTURBED SAMPLE (ASTM D-1587)

20 / 100 — WATER TABLE, TIME OF BORING

WATER TABLE, 24 HOUR READING

LOSS OF DRILLING FLUID

BORING NUMBER: B-5A
DATE DRILLED: 3-17-15
LAB. NO.: K-15423

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TOWN OF MOUNT CARMEL - WWTP
SECONDARY CLARIFIER HAWKINS COUNTY, TN

APPENDIX

APPENDIX

SOIL TEST BORING (STANDARD PENETRATION TESTING)

The soil test borings were drilled utilizing hollow-stem augers to advance the test holes. At selected intervals, samples were obtained using a 2 inch or 3 inch, outside diameter, split spoon sampler. The sampler was first seated in 6 inches to penetrate any loose cuttings and then driven an additional foot with blows of a 140 pound hammer free falling a distance of 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "penetration resistance" or "N" value. The penetration resistance, where properly evaluated, is an index to the soil's strength, relative density and ability to support foundations.

Representative portion of the soils encountered were sealed in glass jars and transported to the laboratory, There, they were examined by a soils engineer to confirm the driller's field classification.

The standard penetration testing was performed in accordance with the American Society for Testing and Materials (ASTM) Specifications, ASTMD 1586. Test boring records are attached which graphically show the soil descriptions and penetration resistance.

You area advised that there is the probability of future borehole subsidence depending on actual subsurface conditions, surface drainage, etc. The property owner should monitor the boring locations over time to discover subsidence and make necessary repairs.

Important Information About Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

The following information is provided to help you manage your risks.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you ASFE-member geotechnical engineer for more information.

ASFE
The Best People on Earth

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
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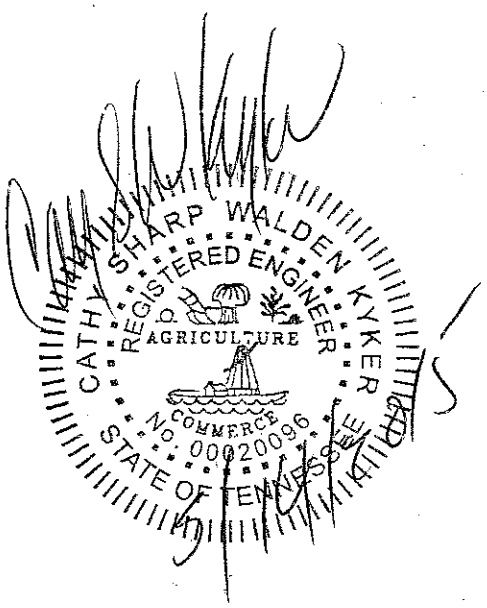
TECHNICAL SPECIFICATIONS
FOR
MT. CARMEL WWTP UPGRADE CDBG PROJECT
PROPOSED SECONDARY CLARIFIER
FOR
TOWN OF MT. CARMEL, TN
HAWKINS COUNTY, TN

#14-12

MAY 2015



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SECTION 1000 - GENERAL

CONTRACT DOCUMENTS:

The work shall be executed in accordance with the specifications, addenda, and the plans.

FUNDING:

This project is being funded with a Community Development Block Grant. Their regulations must be followed.

SCOPE OF WORK:

The work included under these specifications and the accompanying drawings consists of providing all items, articles, materials, operation, or methods listed, mentioned, or scheduled on the drawings and/or herein including all labor, materials, equipment, services, and incidentals necessary for their completion.

The intent of this contract is to upgrade the Town of Mt. Carmel's Wastewater Treatment Plant by constructing new secondary clarifier. The work included is the clarifier, piping, splitter box, valves, relocation of the effluent sampler and other related work as detailed in the Technical Specifications and Construction Drawings or listed in the bid schedule.

The contractor will be responsible for keeping the existing plant operational during construction and prevent any sewer overflows. The contractor shall be fully responsible for any fines or regulatory action if such overflows occur. The contractor may have to incorporate bypass pumping or temporary piping or other means necessary to prevent overflows. However, all hauling costs, bypassing pumping costs, temporary piping, etc. including any necessary labor and equipment is the responsibility of the Contractor and will not be considered for direct payment. Prior to initiation of construction the Contractor shall submit a plan of action to the Engineer for approval of how the sewage and plant will be managed during construction and an outline of the sequence of work. The plan should include projected time frames.

All work and materials necessary to connect any new motors or components added in this project, existing motors, outlets, lights or other components of the plant that has power requirements shall be reconnected or connected to the electrical system even if not specifically mentioned.

All equipment included in these specifications or as shown on the drawings, shall be furnished complete, installed and operational. All materials and accessories needed to be operational, secured, adequately supported and installed per manufacturer's recommendations shall be furnished even if not specifically mentioned.

The contractor shall furnish two aluminum angles (minimum of 3" x 3" x ¼") to be mounted adjacent to or on structures using non-corrosive anchors for all equipment control panels, disconnects, etc. as needed for equipment unless otherwise shown.

Any metal surfaces in contact with or adjacent to wastewater shall be coated with paint or be non-corrosive even if not specifically mentioned.

ALTERNATES - BID DEDUCTS:

Some items shown may be deducted from the contract if funds are not available. They will be deducted in the order listed.

Alternate #1 – Deduct secondary sludge pumps Installation

This deduct would be to deduct the installation of the three sludge pumps. The contractor would furnish the pumps to the Owner but the Owner would install.

Alternate #2 – Deduct furnishing secondary sludge pumps

This deduct would be to deduct furnishing the 3 secondary sludge pumps from the contract.

Alternate #3 – Deduct removal of the old Blowers and Piping

This deduct would be to deduct the removal of the old blowers and piping from the blower shed.

SPECIFIED MATERIALS / SUBSTITUTIONS:

Names of manufacturers and model numbers (when used in these specifications or on drawings) are used as general descriptive references and are referenced to establish a standard for product. Equipment and products of equal quality and performance will be acceptable. The Contractor may recommend the substitution of any material, equipment, or article which he thinks is equal in every area to that specified. If, in the opinion of the Engineer, such item is of equal quality and performance of that specified, the Engineer may approve its substitution for use. Reputation of manufacturer, past performance and service, number of years product has been manufactured, and location of service centers will be considered in evaluation of product.

ALTERNATE BRANDS:

Much research was spent in selecting the brands of major equipment specified. These particular pieces of equipment (including the dimensions and weights of these items) have been used to design equipment pads, basins, etc. The owner wishes to consider other brands that are of same quality and performance. If an alternate is "equal" in performance it may require minor redesign of equipment pads, alteration to site plan, etc. and may impact the

overall cost of the project. The contractor will be responsible for any such redesign and any additional associated cost by using an alternate brand.

EXISTING UTILITIES:

Efforts have been made to identify existing utilities in the construction area. However, some existing utilities may not be shown in actual location or may not be shown. Existing utilities shown on drawings are shown in approximate location only. Contractor is responsible for location of all existing utilities whether shown on drawings or not. Contractor shall notify Tennessee One Call (1-800-351-1111) to locate and notify all utility companies with existing utilities in the project area prior to any excavation. Contractor is responsible for following their procedures for crossing, repair, etc. of such utilities. However, the lines on site belonging to the Owner will not be marked in response to one-call. They are shown based on old construction drawings. Locations and elevations are approximate. Contractor is to excavate and find exact locations and depths far enough ahead of work so adjustments can be made as necessary to reduce or eliminate conflicts. No additional payment will be made for necessary adjustments.

ELEVATIONS AND GRADES:

Elevations and grade lines shown on the drawings indicate the height in relation to top of aeration basin walls as noted on the drawings.

The words "finished grades" as used herein refers to the required final grade elevations indicated on the drawings. Should finished grades shown by spot elevations conflict with those shown by contours, such discrepancies shall be referred to the Engineer for adjustment before any work affected thereby is performed.

The Contractor shall assume responsibility for installation and protection of bench marks, monuments, and other reference points needed for construction. The Contractor shall replace, as directed, any reference points removed or destroyed during construction.

REGULATORY REQUIREMENTS:

All work in project shall meet requirements of Tennessee Department of Environment & Conservation and local requirements for materials and installation of the work. In addition, the work shall conform to applicable state and local building codes, conform to Fire Protection NFPA 72, conform to Electrical Code NFPA 70, and Life Safety Code NFPA 101.

PROJECT RECORD DOCUMENTS:

During construction contractor shall accurately record location of pipe runs, connections, pumps, other utilities, etc. At the end of the project these "record drawings" shall be submitted to the Owner.

ABBREVIATIONS:

Abbreviations of standards, codes, and publications used within these specifications are as follows:

ANSI	American National Standards Institute
ASTM	American Society of Testing Materials
AWWA	American Water Works Association
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriter's Laboratory, Inc.

PERMITS AND INSPECTIONS:

Unless otherwise distinctly hereinafter specified, this Contractor shall apply and pay for all necessary permits, fees and inspections required by any public authority having jurisdiction. Acreage charges, bonds, property assessments and facilities charges shall not be construed to be a part of this contract.

TRAFFIC CONTROL:

The Contractor is responsible for traffic control on the project as applicable. The contractor is required to furnish, erect, and maintain a sufficient number of standard construction warning signs and traffic control devices as may be required for the protection of the general public and construction personnel. The number, location, type, and site of these construction warning signs shall conform to applicable federal, state, and local agencies governing roadways in the project area. Contractor shall also follow "The Manual on Uniform Traffic Control Devices for Streets and Highways" published by the Federal Department of Transportation.

SHOP DRAWINGS:

The Contractor shall submit six (6) copies of the shop drawings to the Owner prior to construction.

Shop drawings shall be submitted on all materials used on this project. All submittals shall have signatures by the Contractor certifying that they have reviewed and approved the submittals prior to submission to the Engineer. Each material proposed for use shall be a

standard catalog product of an established manufacturer. The shop drawing submittals shall include sufficient information on material to evaluate and compare it to brand of material specified. Any differences from brand specified shall be noted. Each submittals shall include manufacturer's name, material's intended use, performance criteria, location of manufacturer, location of service center (if applicable), sales representative's name and phone number, contractor's name, dimensions, options available and options included. On major equipment, submittals shall include references and list of recent installations with contact persons and phone numbers. Approval of shop drawings shall not be considered as a guarantee that material will fit site conditions. Any substitute of material shall be reviewed by contractor to determine if actual building conditions and other materials used on job will be compatible with substituted material. Shop drawing approval does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.

If applicable, pump station submittals shall include information on conduit seal fittings, wiring devices, disconnect switches, UL design for sealing penetrations, control diagrams, wiring diagrams, description of control systems, maintenance and calibration information, information on pumps, enclosures, hatches, locks, etc..

PROTECTION OF PROPERTY AND PERSONS:

The Contractor is cautioned that in many areas, limited working room is available. Therefore, special precautions must be taken by the Contractor.

The Contractor shall thoroughly document the existing condition of all structures, landscaping, and improvements located in all locations of the construction work. Documentation shall be done using video camera and photographs. Documentation shall be submitted to Engineer prior to the first pay estimate. The documentation will be used to help settle any disputes which may arise. This documentation shall be submitted to the Engineer prior to the first payment estimate.

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

The Contractor shall take every effort to protect public streets, curbs, and utilities from damage from the Contractor's operations. Plan work to avoid ponding, flooding, and erosion on site and upon adjacent property. Care shall be taken to avoid obstruction of flow of natural runoff.

Contractor shall provide and install bracing and shoring required to prevent cave-ins.

The contractor shall provide and maintain all pumping equipment necessary to keep excavations free of water. Water shall not be directed onto adjacent property.

Blasting work shall be done with licensed personnel and done in accordance with applicable regulations. Any required rock blasting shall be performed using the minimum practical charges. Care shall be taken to protect persons and property from damage. In areas where blasting is to be done near existing structures, pre-blast surveys shall be performed.

SILTATION AND SOIL EROSION:

Siltation and soil erosion must be minimized during construction. Refer to Section 2260 of these specifications.

CLOSE-OUT OF PROJECT:

Prior to release of all retainage, the Contractor must notify owner so that proper publication can be made. In addition, the project must be fully complete. This includes seeding, asphalt repair, testing of lines, receipt of O&M manuals for major equipment, etc. The Contractor must furnish to the Owner "Release of Liens" from all suppliers and subcontractors. Furthermore, a "Consent of Surety" must also be furnished.

When requested by the Contractor, one review of the project will be made by the Engineer to develop a punch list. The Contractor is to notify the Engineer in writing when ALL punch list items have been completed. The Engineer and the Owner will then make an inspection. If more than one inspection is required because of the Contractor's failure to correct all deficiencies in the work, the Contractor will be responsible for payment to the Owner for fees charged by the Engineer for additional inspections.

WARRANTY:

The contractor shall warranty the complete project (Including asphalt repair, seeding, etc.) for a period of one year after final acceptance of the project by the Owner. Additional warranties for some of the equipment may be specified to be longer. During that period, any warranty work identified will be reported to the Contractor. If the work is an emergency (in the opinion of the Owner) or if the Contractor fails to do warranty work in a reasonable time, the Owner may hire the work done and bill the Contractor. This may include "punch list" work if not performed by the Contractor in a reasonable time and the costs may be deducted from the Retainage. "Reasonable time" will be determined by Engineer and Owner.

END OF SECTION 1000

SECTION 2200 – FOUNDATION AND EARTHWORK

PART 1 – GENERAL:

SCOPE:

This section describes the work to be done related to the grading and site work for a clarifier, concrete pads, splitter box and other components of the wastewater treatment plant project. The contractor is to furnish all materials, labor, equipment, permits and other items necessary for the grading and site work described in these specifications and/or as shown on drawings.

This project includes:

Site layout

Perform mass excavation and embankment as shown on drawings.

Geo-technical and Soil testing as required.

Fine grading for structures, asphalt, concrete and gravel areas.

Stockpile, furnish, spread, and fine grade topsoil over all areas to be landscaped.

Install and maintain Erosion control during all grade work and construction.

Gravel placement, asphalt placement and concrete placement for driveways and sidewalks.

Ditches, storm drains, and other storm drainage components as outlined on drawings.

ELEVATIONS:

Elevations and grade lines shown on the drawings indicate the height in relation to a benchmark set at the site. Should grades shown be in conflict with those identified at the site, such discrepancies shall be referred to the Engineer for adjustment before any work affected is performed.

The contractor shall assume responsibility for protection of benchmarks, property corners, and other reference points. The contractor shall replace any reference points removed or destroyed during construction.

PROJECT EROSION AND SILTATION CONTROL:

All site work must be done in accordance with the State of Tennessee regulations regarding erosion and siltation control. The Contractor is responsible for construction, implementation, and maintenance of erosion and siltation control of project site. The plan shall be continuously implemented to effectively control erosion and siltation during the term of the contract. The contractor is to routinely check and make modifications to the erosion control devices as necessary until the project is complete and permanent measures to control erosion and siltation are in place. The Contractor will be responsible for any fines or damages resulting from erosion and siltation from project site should any result. It is anticipated that less than 1 Acre will be disturbed for this project so a NOI and SWPPP will not be necessary. Refer to Section 2260 for additional information.

GEO-TECHNICAL REPORT:

A Geo-technical report has been completed and is a part of these contract documents. The recommendations of that report are to be followed. If any of the following requirements are in conflict, the geo-technical report is to be followed for the clarifier area.

PART 2 – MATERIALS:

ROADWAYS

Stone, asphalt, concrete and related materials shall meet Tennessee Department of Transportation standard specifications for Road and Bridge construction and as specified on the drawings.

CONCRETE

All concrete shall be 4,000 psi compressive strength and shall be placed per ACI requirements.

Concrete Pads At steps : There will be concrete pads as shown on drawings with 4,000 psi concrete, a 6" compacted stone base, a 6-mil poly vapor barrier, and control joints for equipment. The concrete pads will be sealed with 1 coat of Kure-N-Seal 30% Solids, or equal. The concrete pad will have sawn control joints if largre than 10'. The perimeter of the concrete pads shall be below finish grade. The pads will have a broom finish.

Sidewalks: There will be sidewalks as shown on the drawings. The sidewalks shall be 4,000-psi strength concrete and shall be reinforced with industrial strength fiber mesh (or as shown) and shall have a broom finished.

Concrete Tests: The Contractor shall have compression tests performed on the concrete placed at his expense and under his direction. At least 3 cylinders shall be made for each 20 cubic yards of concrete placed, or fraction thereof, of each mix design of concrete placed in any one day. Test results shall be furnished to Owner prior to payment for the work.

Refer to section 3000 for additional requirements.

STORM DRAINS

See drawings for required materials for storm drainage materials.

SEEDING AND RIP-RAP

Seeding to be done per Section 2260. The Rip-rap to be done as shown on plans.

PART 3 – EXECUTION:

CONCRETE:

All concrete shall be placed per ACI requirements. Refer to section 3000.

PROTECTION

The contractor shall take every precaution to protect the adjacent existing buildings, roadways, utilities, etc. from being damaged during construction. Any damage done shall be repaired promptly by the Contractor at the contractor's expense.

GENERAL

The Contractor shall perform all work in accordance with recommendations of geo-technical report that is included with these documents. The contractor shall cut or fill the site(s), as applicable, to bring the site to the grades indicated on the drawings. Refer to Erosion Control section for additional requirements. The ground is to be sloped away from the building, or other structures, for proper drainage. The site, where applicable, shall be cleaned of all weeds, briars and bushes. Final dressing shall be performed prior to seeding.

If the Contractor encounters the remains of humans, artifacts, anything with historical or archaeological, or other material, which may require examination, the construction shall be stopped and the Engineer notified.

When all work is complete, the site is to be cleaned up and reseeded as applicable. All disturbed areas, except for locations of driveways or where other structures are located, shall be seeded.

A Geo-technical report has been prepared and is included as part of these contract documents. The report shall be followed. The contractor will be responsible for payment of the testing required and observations by a geo-technical representative as recommended by the report. There will also be some placement of stone, geotextile material and other requirements for area under and around clarifier. This preparation work will not be considered for direct payment but will be part of the lump sum cost of project.

CLEARING AND GRUBBING:

Prior to construction of any structure, the site is to be cleared. This is to include clearing, grubbing, removal and disposal of all vegetation and debris within the limits of the site. The site shall be stripped of all brush, grass, topsoil, etc. Any depressions created by clearing operations shall be filled and compacted with suitable material. All material removed shall be disposed of by contractor in accordance to local regulations.

EXCAVATION:

Prior to beginning excavation, grading, and embankment operations in any area, all necessary Clearing and Grubbing, Removal of structures and Obstructions and placement of Erosion control devices in that area shall have been performed in accordance with specifications and applicable regulations.

Excavation materials shall be removed in such a manner that the slopes may be neatly trimmed to grade lines shown on drawings. If more material is required to complete the embankments after all cuts have brought to grade, additional materials must be obtained by the Contractor. Any excess excavated soil and rocks excavated that is not needed for embankment may be disposed of on site in area shown. The excess fill shall be placed on an area stripped of top soil and brush and compacted per requirements for embankments. Any excess material removed that is not suitable to be used for fill (including brush, roots, parts of trees, and other perishable material) or that the contractor does not want to compact, shall be removed from the site and disposed of by contractor in accordance with applicable regulations. When bolder formations occur in the excavation areas, the area shall be scarified and all boulders removed to a depth of twelve inches below grade. The remaining cavities shall be filled with crushed stone or other suitable material and compacted. All loose rock on cut slope shall be removed. Excavation material that remains after all embankments have been completed shall be wasted on site as directed by the Engineer.

Any material that has been excavated, or from clearing and grubbing operations, that is unsuitable to be used in embankments shall be disposed by the Contractor in accordance with applicable regulations. All excavated material that is not needed for backfill can be wasted on-site.

UNDERCUTTING:

Refer to the Geo-technical Report. When directed by Engineer or soils testing representative, some unsatisfactory materials below grade may be required to be removed. Undercutting will consist of the removal and disposal of such materials as may be required. Undercutting may also be required for pipe placement or for other structure placement. This does not include stripping, stockpiling and placement of topsoil. The contractor is to include cost of undercutting approximately 175 CY of material in the clarifier area. If more or less is encountered a price adjustment will be made to the contract price based on the unit price included on page 13 of the bid form. "Undercutting" for this project is defined as the material excavated below elevation 1318.46 and no more than 5' outside the perimeter of the clarifier to meet the requirements of the geo-technical report. Any undercutting must be approved by the Engineer prior to excavation. The unit price listed on page 13 of the bid form must be the same in both places.

EMBANKMENTS:

Only approved materials shall be used in embankments and backfills.

If any material is needed for fill, the contractor shall furnish suitable material from on-site. In the event that suitable material is not available on-site, the contractor shall furnish the material from off-site. If any excess or unsuitable material exists, the Contractor shall dispose of said material in appropriate manner at his expense.

The original ground surface, or the surface of any embankment layer, shall not be in frozen state, and shall be free from snow, ice and mud when a subsequent layer is placed thereon.

All depressions or holes below the natural ground surface shall be filled with suitable fill material and compacted to elevation of adjacent ground before embankment construction is started.

Backfilling around a structure shall have been completed and thoroughly compacted to ground surface before any embankment materials are placed thereon.

Any area requiring fill to achieve final grade shall be proof-rolled with pneumatic tire equipment having a static weight of at least 10 tons. The Engineer shall

area shall be undercut to firm soil (or a minimum depth of 3 feet) and replaced with select structural fill and re-compacted.

Unless otherwise specified in the Contract Documents, in any area where the fill is less than three feet the area shall be cleared. In addition, the area shall be completely plowed or scarified to a minimum depth of 6 inches and then re-compacted.

Perishable materials, such as brush, weeds, roots, stumps, tree limbs, etc. shall not be incorporated or buried in the fill. The Contractor in accordance with applicable regulations shall dispose the perishable waste material. The Engineer, prior to being incorporated in the fill, shall approve any non-perishable material that is waste.

Fills shall be constructed so that adequate surface drainage will be provided at all times. Fill materials shall be placed in horizontal layers not to exceed 10 inches in depth prior to compaction.

Each layer of fill shall be compacted to a density of 98% of maximum density.

FOUNDATION PREPARATION AND BACKFILL

Foundation preparation shall consist of necessary excavating, removal, stockpiling and satisfactory disposal of all material within the limits of the foundation excavation.

When rock or other unyielding material is encountered in the foundation excavation, it shall be removed to a depth of 6 inches below the foundation grade. Excavation shall be brought up to grade with the placement of compacted crushed stone.

All suitable excavated material shall be utilized as backfill material. Backfill material adjacent to underground concrete structures shall consist of stone backfill per geo-tech report and structural drawings, extending from the wall of the structure as shown on drawings.

INSPECTION AND TESTING

The Contractor shall obtain, at his own expense, all inspections required by law, ordinances, rules, regulations, or public authority having jurisdiction over the work which is part of these specifications. All labor, materials, and equipment necessary for these tests shall be provided by the Contractor. He shall obtain certification of such inspections and submit them to the Engineer. This shall include cost of soil and concrete testing.

Any fill area shall be tested. Any cut area in the vicinity of the clarifier and splitter box shall be reviewed and approved by the geo-technical engineer prior to construction of the tank. Maximum density and optimum moisture will be determined by an independent testing laboratory hired by the Contractor in accordance with ASTM D-698 (Standard Proctor). The determination of the density of the soil in place will be in accordance with an approved method. A minimum of 2 tests per layer are required but at least 1 test every 5,000 sf of area. Each layer of fill shall be compacted to required density and approved before material for the next succeeding layer is placed. The moisture content of the fill shall be in accordance with the recommendations of the testing lab.

Following the tests and inspections, the Contractor shall submit, in writing, the specific results.

See concrete section for concrete testing.

Any defects identified by tests or inspections shall immediately be corrected by the Contractor and the tests repeated at the Contractor's expense.

PART 4 - PAYMENT

All earthwork is part of the lump sum payment for the wastewater treatment plant upgrade.

END OF SECTION

SECTION 2260
SLOPE PROTECTION, STORM WATER DISCHARGE, AND EROSION CONTROL

PART 1 – GENERAL

REQUIREMENTS OF THIS SECTION:

It is the intent of this section to require all construction work to be done to meet all local, state and federal requirements related to slope protection, storm water discharge and erosion control. In the event that any requirements listed in this set of contract documents are in conflict with any pollution control law, regulations of the State, Local or Federal Governments, the more restrictive of the laws, rules or regulations shall apply.

DESCRIPTION:

This Section shall consist of temporary and permanent measures to effectively reduce erosion, sedimentation and prevent water pollution that might result from this project. It also includes any work required by Contractor to meet requirements of Tennessee for Storm Water Discharges from Construction Activities. The work shall consist of measures utilizing berms, dikes, sediment basins, fiber mats, netting, mulches, grasses, slope drains, temporary silt fences, and other control devices in order to meet the State of Tennessee Regulations. The work shall be done following the Tennessee Erosion & Sediment Control Handbook, latest edition, and meet the requirements of the Tennessee Water Quality Control Act of 1977.

The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion control features, to assure economical effective, and continuous erosion control throughout the construction and post-construction period.

The contractor shall designate an individual, who will be on the construction site to be responsible for erosion and sediment control and storm water pollution prevention. This person shall maintain records of checks and repairs on site or at a nearby office of erosion control devices. This inspector must have successfully completed the "Fundamentals of Erosion Prevention and Sediment Control" course, or an equivalent course. See SWPPP, if applicable, for more information.

Prior to initiation of construction, the contractor shall thoroughly review the project and determine if utility line crossings of streams will be accomplished per requirements of the Aquatic Resource Alteration General Permit For Utility Line Crossings of Streams of the State of Tennessee dated July 1, 2005 as included below:

GENERAL PERMIT FOR UTILITY LINE CROSSINGS OF STREAMS

The general permit authorizes the construction, maintenance, repair, rehabilitation or replacement of utility line crossings of navigable and non-navigable streams. For the purpose of this permit, bodies of water defined as navigable pursuant to *Section 10 or the Rivers and harbors Act of 1899*, are subject to different restrictions than all other waters regarding the specific construction methodologies to be employed.

Failure to comply with the terms and conditions of this permit is a violation of the *Tennessee Water Quality control Act of 1977* and is subject to penalty in accordance with TCA 69-3-115.

Exclusions

This general permit cannot be used to authorize work in the following circumstances:

1) where the proposed project involves more than one crossing of the same stream by gravity sewer lines;

2) where a portion of the proposed activity is located in a component of the National Wild and Scenic River System, a State Scenic River, waters designated as Outstanding National Resource Waters;

3) where the proposed activity may adversely affect wetlands, except as provided for in item 21) of the Terms and Conditions section below;

4) where a portion of the proposed activity is located in any waterway which is identified by the department as having contaminated sediments, and where the activity will likely mobilize the contaminated sediments;

5) when the proposed activity will adversely affect a species formally listed on either state or federal lists of threatened or endangered species or their critical habitat;

6) when the department determines that the proposed activities, either individually or cumulatively, may result in degradation of waters of the state; or

7) when an individual permit is otherwise required.

Projects not qualifying for authorization under this general permit, may be authorized by an individual permit, provided that all requirements of the *Tennessee Quality Control Act* of 1977 are met.

Notification

Applicants proposing the construction, maintenance, repair, rehabilitation or replacement of utility line crossings of navigable and non-navigable streams under this general permit shall notify the division by submission of an original, signed application (form CN-1091) along with the following minimum information;

(a) a cover letter explaining the scope of the project;
(b) a USGS topographical map showing the exact location of the proposed project;
(c) a single copy of construction plans and drawings which include all dimensions and specifications for the proposed work, as well as pollution control methods and/or structures, and method of excavation/trenching.

Work shall not commence until the applicant has received written authorization from the division that the activities may proceed under this general permit or that an individual permit has been issued.

All activities covered under this general permit shall comply with all terms and conditions contained hereinafter.

Terms and Conditions

1) The work shall be accomplished in conformance with the accepted plans, specifications, data and other information submitted in support of the above mentioned application and the limitations, requirements, and conditions set forth herein.
2) Applicant is responsible for obtaining the necessary authorization pursuant to applicable provisions of Section 10 of *The Rivers and Harbors Act of 1899*; Section 404 of *The Clean Water Act* and Section 26a of *The Tennessee Valley Authority Act*, as well as any other federal, state or local laws.
3) Applicant is responsible for obtaining coverage under the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges from Construction Activities for construction sites involving clearing, grading or excavation that result in an area of disturbance of one or more acres, and activities that result in the disturbance of less than one acre if it is part of a larger common plan of development or sale.
4) New utility line crossings shall be located such as to avoid permanent alteration or damage to the integrity of the stream channel. Large trees, steep banks, rock outcroppings etc., should be avoided.
5) In the case of proposed utility lines, excluding gravity sewer, that follow the stream gradient or otherwise parallel the stream channel, the number of crossings shall be minimized. Where cumulative impacts are likely because of numerous crossings proposed, an individual permit may be required.
6) The crossing shall be designed to prevent the impoundment of normal or bas flows. Base flow is the usual or normal flow of the stream that is supplied primarily by groundwater from springs and seeps, but not affected by rapid runoff during and after rainfall.

7) The alignment of new utility line crossings shall intersect the stream channel as close to 90 degrees or as perpendicular as possible. Alignment shall be no less than 45 degrees angle from the centerline of the stream.
8) In the case of streams with bedrock streambeds, provisions shall be made to prevent the loss of stream flow due to fracturing of the bedrock.
9) Backfill activities shall be accomplished in a manner that stabilizes the streambed and banks to prevent erosion. All contours shall be returned to pre-project conditions and the completed activities may not disrupt or impound stream flow.
10) The excavation and fill activities associated with the utility line crossing of non-navigable streams shall be kept to a minimum and shall be separated from flowing waters. The crossing shall be constructed in the dry to the maximum extent practicable, by diverting flow using cofferdams, berms, temporary channels or pipes. Temporary diversion channels shall be protected by non-erodible material and lined to the expected high water level.
11) Excavated materials, removed vegetation, construction debris, and other wastes shall be removed to an upland location and properly stabilized of disposed of in such a manner as to prevent reentry into the waterway.
12) The excavation and fill activities associated with utility line crossing of navigable streams as defined by Section 10 of the *Rivers and Harbors Act of 1899*, may be accomplished in the water column.
13) Sediment shall be prevented from entering waters of the state. Erosion and sediment controls shall be designed according to the size and slope of disturbed or drainage areas to detain runoff and trap sediment and shall be properly selected, installed, and maintained in accordance with the manufacturer's specifications and good engineering practices.
14) Erosion and sediment control measures shall be in place and functional before earth moving operations begin, and shall be constructed and maintained throughout the construction period. Temporary measures may be removed at the beginning of the work day, but shall be replaced at the end of the work day.
15) Sediment should be removed from sediment traps silt fences, sedimentation ponds, and other sediment controls as necessary, and shall be removed when design capacity has been reduced by 50%. Discharges from sediment basins and traps shall be trough a pipe or lined or well-grassed channel so that the discharge does not cause erosion.
16) Liter, construction debris, and construction chemicals exposed to storm water shall be picked up prior to anticipated storm events (e.g. Forecasted by local weather reports), or otherwise prevented from becoming a pollutant source for storm water discharges (e.g. screening outfalls, daily pick-up, etc.). After use, silt fences should be removed or otherwise prevented from becoming a pollutant source for storm water discharges.
17) Clearing, grubbing and other disturbance to riparian vegetation shall be kept at the minimum necessary for slope construction and equipment operations. Unnecessary riparian vegetation removal, including trees, is prohibited.
18) Pre-construction vegetative ground cover shall not be destroyed, removed or disturbed more than 10 calendar days prior to grading or earth moving unless the area is seeded and/or mulched or other temporary cover is installed.
19) Stabilization measures shall be initiated within seven days after the construction activity has temporarily or permanently ceased.

20) Temporary or permanent soil stabilization shall be accomplished within 15 days after final grading or other earth work. Permanent stabilization with perennial vegetation (using native herbaceous and woody plats where practicable) or other permanently stable, non-eroding surface shall replace any temporary measures as soon as practicable.
21) Muddy water to be pumped from excavation and work areas shall be held in settling basins or filtered prior to its discharge into surface waters. Settling basins shall not be located closer that 20 feet from the top bank of the stream and water shall be discharged through a pipe, well grassed or lined channel or other equivalent means so that the discharge does not cause erosion and sedimentation.
22) Maintenance, repair and rehabilitation of existing utility lines in wetlands is authorized provided that all of the following special provisions are met:
    (a) the total amount of excavation or fill does not exceed 50 cubic yards;
    (b) the wetlands alteration is located within the right of way of the existing utility line; and
    (c) fill activities for the construction of equipment access roads is not authorized in wetlands.
23) The activity may not be conducted in a manner that would permanently disrupt the movement of fish and aquatic life.
24) Checkdams shall be utilized where runoff is concentrated. Clean rock, log, sandbag or straw bale checkdams shall be properly constructed to detain runoff and trap sediment, Checkdams or other erosion control devices are not to be constructed in stream. Clean rock can be of various type and size, depending on the application. Clean rock shall not contain fines, soils, or other wastes or contaminants.
25) Stream beds shall not be used as transportation routes for construction equipment. Temporary stream crossings shall be limited to one point in the construction area and erosion control measures shall be utilized where stream banks are disturbed. Stream crossings should be constructed of clean rock and stream flow should be conveyed in appropriately sized pipe. The crossing shall be constructed so that stream flow is not obstructed. Following construction, all materials used for the temporary crossing shall be removed and disturbed stream banks shall be restored and stabilized if needed.
26) Materials used in utility crossing projects shall be free of contaminants, including toxic pollutants, hazardous substances, waste metal, construction debris and other wastes as defined by T.C.A. 69-3103(18).
27) Material may not be placed in a location or manner so as to impair surface water flow into or out of any wetland area.
28) Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the state. All spills shall be reported to the appropriate emergency management agency and to the division. In the event of a spill, measures shall be taken immediately to prevent pollution of waters of the state, including groundwater.
29) This general permit does not authorize impacts to cultural, historical or archaeological features or sites.
30) Upon completion of the project, the stream and banks shall be returned to as close to pre-project conditions as is practicable, using clean rock, grass amts and other suitable materials.

31) The division will establish an expiration date for coverage under this general permit that is specific to the authorization and separate from the general permit expiration date.

STORM WATER DISCHARGES FROM CONSTRUCTION ACTIVITIES:

In general, a Notice of Intent Form (NOI), to be covered under the State's Storm Water Discharge General Permit, is needed on a construction site when more than 1 acre is being disturbed. In some instances, a permit is needed even when the area is less than 1 acre. The Contractor shall review the State's requirements for this (which is not contained in this document) to determine if a NOI is needed. If so, the Contractor shall contact the Owner to determine if the NOI has been approved.

If a Storm Water Pollution Prevention Plan (SWPPP) and a NOI have been prepared for this project (depending on the design and the amount of area projected to be disturbed) the contractor shall sign the NOI and submit to TDEC for approval prior to initiation of construction. The SWPPP shall be reviewed by the contractor and followed. If the contractor determines it will be necessary to deviate from the SWPPP the contractor shall notify the Engineer. If a change is approved by the Engineer the SWPPP is to be revised prior to implementation.

If a NOI is required, a Notice of Termination (NOT) will also be required. The NOT must be submitted to the State after completion of their construction activities and final stabilization of their portion of the site.

It is not anticipated that more than 1 Acre will be disturbed for this project so a SWPPP and a NOI were not developed for this project. If more than 1 Acre is disturbed the contractor will be responsible for preparing and obtaining approval for these documents. However, the contractor must install structures necessary to prevent sediment from leaving the site and stabilize disturbed areas as necessary to prevent erosion. The contractor must follow the requirements of the State of Tennessee.

PART 2 – MATERIALS:

The following are descriptions of some of the erosion control devices that may be used. Illustrations of these are contained in the TENNESSEE EROSION AND SEDIMENT CONTROL HANDBOOK prepared by the Tennessee Department of Environment and Conservation.

TEMPORARY BERMS:

A temporary berm is constructed of compacted soil, with or without a shallow ditch, at the top of fill slopes or transverse to centerline on fills.

These berms are used temporarily at the top of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.

TEMPORARY SLOPE DRAINS:

A temporary slope drain is a facility consisting of stone gutters, half-round pipe, metal pipe, plastic pipe, sod or other material acceptable to the Engineer that may be used to carry water down slopes to reduce erosion.

SEDIMENT STRUCTURES:

Sediment basins, ponds, and traps, are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.

CHECK DAMS:

Check dams are barriers of logs and poles, large stones or other materials placed across a natural or constructed drainway.

Stone check dams shall not be utilized where the drainage area exceeds fifty (50) acres. Log and pole structures shall not be used where the drainage area exceeds five (5) acres.

SEEDING AND MULCHING:

Temporary or permanent seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes including waste sites and borrow pits shall be seeded when and where necessary to eliminate erosion. In addition, all disturbed areas that are not to be paved, concreted, graveled or receive other specified surfaces are to be seeded.

Grass seed shall meet the following mixture requirements depending on when the grass will be sown. No grass is to be sown between December 1 and January 31 except for temporary erosion control or as directed by Engineer.

February 1 – June 1	
Kentucky 31 Fescue	90%
English Rye	10%
June 2 – August 15	
Kentucky 31 Fescue	75%
English Rye	25%

August 16 – December 1

Kentucky 31 Fescue	90%
English Rye	10%

Lime shall be agricultural limestone with not less than 85% calcium carbonate and magnesium carbonate combined.

Fertilizer shall be 10-10-10, commercial type with 50% of the elements derived from organic sources.

All grass seed shall be delivered to the project site in original containers showing analysis of seed mixture, percentage of pure seed, expiration date, and weight. Fertilizer and lime are to be delivered to project site in waterproof bags showing weight, chemical analysis and manufacturer.

BRUSH BARRIERS:

Brush barriers shall consist of brush, tree trimmings, shrubs, plants, and other approved refuse from the clearing and grubbing operations.

Brush barriers are placed on natural ground at the bottom of fill slopes, where the most likely erodible areas are located to restrain sedimentation particles.

BALED HAY OR STRAW CHECKS:

Baled hay or straw erosion checks are temporary measures to control erosion and prevent siltation. Bales shall be either hay or straw containing five (5) cubic fee or more of material.

Baled hay or straw checks shall be used where the existing ground slopes toward or away from the embankment along the toe of slopes, in ditches, or other areas where siltaton erosion or water run-off is a problem.

TEMPORARY SILT FENCES:

Silt fences are temporary measures utilizing woven wire or other approved material attached to posts with filter cloth composed of burlap, plastic filter fabric, etc., attached to the upstream side of the fence to retain the suspended silt particles in the run-off water.

PART 3 – EXECUTION:

UTILITY LINE CROSSINGS:

All work on the project shall be done in accordance with the General Permit, included above, and all other applicable regulations. If the contractor anticipates that for any reason the utility line crossings of streams cannot be done in accordance with the General Permit, the Contractor shall give written notice to the Engineer and the Owner. In addition, the Contractor shall submit (with notice) the information required for submittal to the State of Tennessee for a individual "Aquatic Resource Alteration Permit". No extension of contract time, nor increase in contract price, will be granted contractor for permit processing or construction costs associated with permit. No work shall be done on the crossing until an individual permit is obtained, if such a permit is required. Contractor is encouraged to complete utility line crossings per general permit requirements if at all possible.

PROJECT REVIEW:

The Contractor shall review in detail the expected problem areas in regard to the erosion control work. The Contractor shall also review the site to determine if a Storm Water Notice of Intent form is required. Different solutions should be discussed so that the best method might be determined. It is the basic responsibility of the Contractor to develop an erosion control plan acceptable to the State of Tennessee and to meet the State's requirements related to Storm Water Discharge.

STORM WATER DISCHARGE:

The Contractor shall develop a storm water pollution prevention plan (SWPPP). If a notice of intent is required to be submitted this plan is to be submitted to the State. The Contractor shall make every effort to prevent any pollution, erosion or sediment from construction activities.

CONSTRUCTION REQUIREMENTS:

Clearing and grubbing must be held to the minimum necessary for the construction activities required. Construction must be sequenced to minimize the exposure time of cleared surface area. Grading activities must be avoided during periods of highly erosive rainfall. Construction must be staged or phased for large projects. the Engineer has the authority to limit the surface area of erodible earth material exposed. The Engineer can also require the Contractor to provide immediate, permanent, or temporary berms, dikes, dams, sediment basins, slope drains, and use of temporize mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded and mulched as the excavation proceeds to the extent directed by the Engineer. Under no conditions shall the surface area of erodible earth material be exposed at one time by clearing and grubbing, exceed 750,000 square feet without approval of the Engineer. Areas of one phase must be

stabilized before another phase can be initiated. Stabilization shall be accomplished by temporarily or permanently protecting the disturbed soil surface from rainfall impacts and runoff.

The Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in his accepted schedule. Temporary pollution control measures shall be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise erosion control measures may be required between successive construction stages.

Erosion and sediment control measures must be in place and functional before earth disturbing operations begin, and must be properly constructed and maintained throughout the construction period.

Regular maintenance must be a part of the erosion and sediment control system. All control measures shall be checked weekly and after each rainfall. During prolonged rainfall, daily checking is necessary. The temporary erosion control features, installed by the Contractor, shall be properly maintained by the Contractor until they are no longer needed or permanent erosion control methods are installed. All materials used for temporary control shall be removed from the project site before the close-out of the project and disposed of by the Contractor.

In the event that temporary erosion and pollution control measures are required due to the Contractor's negligence, carelessness, or failure to install permanent controls as a part of work as scheduled, and they are directed to be installed by the Engineer or State, such work shall be performed by the Contractor at his own expense.

Construction debris must be kept from entering the stream channel. Stockpiled soil shall be located far enough from streams or drainage ways so that runoff cannot carry sediment downstream.

A specific individual shall be designated to be responsible for erosion and sediment controls on the project site.

VEGETATIVE CONTROLS:

A buffer strip of vegetation at least as wide as the stream shall be left along the stream bank whenever possible. On streams less than 15 feet wide, the buffer zone shall

extend at least 15 feet wide, the buffer zone shall extend at least 15 feet back from the water's edge.

Vegetative ground cover shall not be destroyed, removed, or disturbed more than 15 calendar days prior to construction. Temporary soil stabilization with the appropriate annual vegetation shall be applied on areas that will remain unfinished for more than 30 calendar days. Permanent soil stabilization with perennial vegetation shall be applied as soon as practicable after final construction.

STRUCTURAL CONTROLS:

Staked and entrenched straw bales and/or silt fence must be installed along the base of all fills and cuts, on the downhill sides of stockpiled soil, and along stream banks in cleared areas to prevent erosion into streams. Straw bales and/or silt fence may be removed at the beginning of the work day, but must be replaced at the end of the work day, when these devices interfere with the construction work.

All surface water flowing toward the construction area shall be diverted around the construction area to reduce its erosion potential, using dikes, berms, channels, or sediment traps as necessary. Temporary diversion channels must be lined to the expected high water level and protected by non-erodible material to minimize erosion. Clean rock, log, sandbag or straw bale check dams shall be properly constructed to detain runoff and trap sediment.

Sediment basins and traps shall be properly designed according to the size of disturbed or drainage areas. Water must be held in sediment basins until at least as clear as upstream water before it is discharged to surface waters. Water must be discharged through a pipe or lined channel so that the discharge does not cause erosion and sedimentation.

Streams shall not be used as transportation routes for equipment. Crossings must be limited to one point. A stabilized pad of clean and properly sized shot rock must be used at the crossing point. All rock shall be clean, hard rocks containing no sand, dust, or organic materials.

Below are some descriptions of structural controls that may be incorporated into the project. Refer to the Tennessee Erosion & Sediment Control Handbook, latest edition, for additional information and illustrations of these structures.

Temporary Berms:

A temporary berm shall be constructed of compacted soil, with a minimum width of 24 inches at the top and a minimum height of 12 inches with or without a shallow ditch,

constructed at the top of fill slopes or transverse to centerline on fills. Temporary berms shall be graded so as to drain to a compacted outlet at a slope drain. The area adjacent to the temporary berm in the vicinity of the slope drain must be properly graded to enable this inlet to function efficiently and with minimal ponding in this area. All transverse berms required on the downstream side of a slope drain shall extend across the grade to the highest point at approximately a 10-degree angle with a perpendicular to centerline. The top width of these berms may be wider and the side slope flatter on transverse berms to allow equipment to pass over these berms with minimal disruptions. When practical and until final roadway elevations are approached, embankments should be constructed with a gradual slope to one side of the embankment to permit the placement of temporary berms and slope to one side of the embankment to permit the placement of temporary berms and slope drains on only one side of the embankment.

Temporary Slope Drains:

Temporary slope drains consist of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half-round pipe, metal pipe, plastic pipe, flexible rubber, or other materials which can be used as temporary measures to carry water accumulating in the cuts and on the fills down the slopes prior to installation of permanent facilities or growth of adequate ground cover on the slopes.

Fiber matting and plastic sheeting shall not be used on slopes steeper than 4:1 except for short distances of 20 feet or less.

All temporary slope drains shall be adequately anchored to the slope to prevent disruption by the force of the water flowing in the drains. The base for temporary slope drains shall be compacted and concavely formed to channel the water or hold the slope drain in place. The inlet end shall be properly constructed to channel water into the temporary slope drain.

Energy dissipaters, sediment basins, or other approved devices shall be constructed at the outlet end of the slope drains to reduce erosion downstream. An ideal dissipater would be dumped rock or a small sediment basin which would slow the water as well as pick up some sediment. All temporary slope drains shall be removed when no longer necessary and the site restored to match the surroundings.

Sediment Structures:

Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains outlet; at the bottom as well as in the ditch lines atop waste sites; in the ditch lines or borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures shall be at least twice as long as they are wide. When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed, and all excavation

backfilled and properly compacted. The existing ground shall be restored to its natural or intended condition.

Check Dams:

Check dams shall be utilized to retard stream flow and catch small sediment loads. Materials utilized to construct check dams are varied and should be clearly illustrated or explained in the Contractor's erosion control plan.

All check dams shall be keyed into the sides and bottom of the channel a minimum depth of 2 feet. Typical designs are included in the State's erosion control handbook.

Stone check dams should generally not be utilized where the drainage area exceeds fifty (50) acres. Log and pole structures should generally not be used where the drainage area exceeds five (5) acres.

Seeding and Mulching:

All disturbed areas that were grassed shall be reseeded as soon as possible following disturbance. In addition, all areas where temporary seeding is required for erosion control shall be seeded as soon as possible.

When performing seeding operations, all underground improvements shall be protected from damage. Also prior to seeding, foreign materials, plants, roots, stones, contaminated subsoil and debris shall be removed from the site. Topsoil shall be applied and soil shall be prepared per seed manufacturer's directions. Seed is to be applied at a rate of 6 pounds per 1,000 sf. Lime is to be applied at a rate of 100 pounds per 1,000 sf and fertilizer is to be applied at a rate of 12 pounds per 1,000 sf. Do not apply grass seed and fertilizer at the same time, in the same machine. Do not sow grass immediately following rain, when ground is too dry, or during windy periods. Roll seeded area with roller not exceeding 112 pounds.

After seeding, protection is to be applied. Where grades exceed 3:1, cover seeded slopes with jute matting. Roll matting down slopes without stretching or pulling. Lay matting smoothly on soil surface, burying top end of each section in narrow 6-inch trenches. Leave 12 inches overlap from top roll over bottom roll. Leave 4-inch overlap over adjacent sections. Staple outside edges and overlaps at 36-inch intervals. All seeded areas with a slope of less than 3:1 shall be mulched with straw. Straw shall be of good quality and evenly spread over area at a rate of 75 pounds per 1,000 sf.

Warranty will begin on seeded areas when all seeded areas are properly established and otherwise accepted.

Brush Barriers:

Brush barriers shall consist of brush, tree trimmings, shrubs, plants and other approved materials. These may come from clearing and grubbing operations. The brush barriers shall be constructed approximately parallel to original ground contours. The brush barrier shall be compressed to an approximate height of 3 to 5 feet and approximated width of 5 to 10 feet. The embankment shall not be supported by the construction of brush barriers.

Baled Hay or Straw Erosion Checks:

Hay or straw erosion checks shall be embedded in the ground approximately 4 to 6 inches to prevent water from flowing under them. The bales shall also be anchored securely to the ground by wooden stakes driven through the bales into the ground. Bales can remain in place until they rot, or be removed after they have served their purpose, as determined by the Engineer. The Contractor shall keep the checks in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris cleanout will be considered routine maintenance.

Temporary Silt Fences:

Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches, or other areas where siltation is a problem. Silt fences are constructed of wire mesh fence with a covering of burlap or some other suitable material on the upper grade side of the fence and anchored into the soil.

The contractor shall be required to maintain the silt fence in a satisfactory condition for the duration of the project or until its removal is requested by the Engineer. The silt accumulation at the fence may be left in place and seeded, removed, etc., as directed by the Engineer. The silt fence becomes the property of the Contractor whenever the fence is removed.

EROSION CONTROL OUTSIDE PROJECT AREA:

Temporary pollution control shall include construction work outside the project area where such work is necessary as a result of this project, such as borrow pit operations, haul roads, equipment storage sites, etc.

END OF SECTION 2260

SECTION 02600 – WATER MAINS

PART 1 - GENERAL

SCOPE:

The work to be done under this Division shall consist of furnishing all labor, equipment and materials to complete all excavation, embankment and preparation of the sites as shown or noted on the drawings or specified herein or both as follows:

A. Protection against damage to all public and private roads, fences, utilities, etc.

B. Protect all adjoining property from damage that might be done under this contract.

C. Installation of water pipe, valves, hydrants, and appurtenances.

D. Restoration of ground surfaces and properties disturbed.

PART 2 - PRODUCTS

MANUFACTURERS:

Manufacturer's Qualifications: Firms regularly engaged in manufacture of potable water systems, products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years. All materials shall be AWWA approved.

WATER MAINS:

Type of pipe shall be as indicated on the drawings. The lines 6" or larger are to be ductile iron and the lines 4" or 2" are to be SDR 21 PVC and lines less than 2" are to be copper.

Class 200 (SDR 21) *:*

PVC pipe shall meet the following ASTM Standards: D-1784 (PVC Compound), D-2241 (PVC Pipe), D-3139 (Joint) and F-477 (Gasket).

Requirements for unplasticized polyvinyl chloride (PVC) pipe with integral thickened wall bell for water supply and distribution systems.

The pipe shall be rated for use in 23°C (73°F) at the maximum internal pressures as follows: SDR 21 (200 PSI). The "extra deep" thickened bell conforms to ASTM D-3139 and is designed to use a dual sealing (hydraulic and compression) rubber ring gasket, seated in a two step race to prevent push out. The design allows for greater contraction and expansion.

The product shall bear the National Sanitation Foundation seal for potable water pipe and be marked in accordance with ASTM D-1784 standard.

The pipe shall be extruded with only Type I, Grade I, 2000 PSI design stress compound meeting ASTM D-1784 standard. The pipe shall be designed to pass, without failure, the burst test for rated class as follows: SDR 21 (630 PSI) when conducted in accordance with ASTM D-1599.

The pipe shall be designed to pass, without failure, the sustained pressure test for 1000 hours for SDR 21 (420 PSI) when conducted in accordance with ASTM D-1598. A two inch long sample ring shall not flake or disintegrate when immersed for 20 minutes in a sealed container of acetone when conducted in accordance with ASTM D-2152. (Swelling or softening is not considered a failure).

A two inch long sample ring shall be compressed between parallel plates to 40% of the outer diameter of the pipe without evidence of splitting, cracking or breaking.

The pipe shall meet the ASTM D-2241 impact resistance when tested in accordance with specification requirements section of method ASTM D-2444.

All pipe shall be furnished in 20' or 40' laying lengths. Forty-foot length will be permitted provided the pipe be transported from the storage area to the laying area on racks specially designed to prevent the ends of the pipe from dragging and that the pipe be handled at all times by a minimum of two workers when being loaded, unloaded, and installed. The contractor shall take all precautions necessary to prevent the pipe from being damaged and shall suspend use of 40 foot sections of pipe should the Engineer so direct.

Ductile Iron Pipe:

Ductile iron pipe, where used, shall meet the requirements of AWWA C150, latest revision.

The pipe shall be Class 350 for sizes through 12" and Class 250 for 14" through 20". Pipe and fittings shall have cement mortar lining and bituminous outside coating in accordance with AWWA C104, AWWA C151 and AWWA C110. The joints for straight runs shall be push on.

Fittings shall be mechanical joint fittings with body thickness and radius of curvature conforming to AWWA C110-87 rubber gasket joints shall be in accordance with AWWA C111-85. AWWA C153 compact fittings will be acceptable.

Copper:

Copper to be Type K.

Marking Tape and Detection Wire:

Water pipe metallic detection tape with the word "Water" printed continuously along the tape shall be wrapped around all non-ferrous pipe, approximately every 2 feet and shall run the entire length of the pipe. Also, a #12 coated copper wire shall be installed near the top of the trench for detection.

VALVES:

Unless otherwise specified, valves shall be designed to operate continuously under a working pressure of not less than 200 pounds per square inch. Valves suitable for other working pressures shall be furnished as indicated on the drawings. All valves shall be mechanically jointed unless otherwise specified.

All gate valves 2" and larger shall conform to AWWA C500-86. All valves of the above sizes, unless otherwise stipulated, shall be iron body, resilient seat , non-rising stem type. They shall be M&H, or equal. Gate valves smaller than 2" shall be all bronze , wheel handles, screwed gate valves, suitable for the service required.

All butterfly valves 10" and larger shall conform to AWWA C504-80. Valve body shall be cast iron with stainless steel body seat. Vane shall be cast iron with a mechanically secured rubber seat. Valve operator shall be traveling-nut type for underground service.

The air relief valves shall be the same or equal to the Crispin pressure relief valve as manufactured by the Multiplex Manufacturing Company (or equal) with 3/4" inlet connection and a working pressure range of 0-200 psi. A 3/4" bronze double gate valve brass pipe and fittings shall be used on the installation. The installation shall be as shown on the standard drawing.

At the end of each dead end line or at other locations as directed by the Engineer, shall be installed a blow-off valve. The gate valve shall be the same as specified above. Installation shall be as shown in the Standard Details.

All valves shall be tested in the shop at no cost to the owner under a test pressure equal to twice the working pressure and upon request the owner shall be furnished with a certificate stating that all valves have successfully passed such a test.

All valves and fittings used in pressure reducer stations shall have 250 lb. ASA high pressure flanges and shall be as specified on the Drawings.

Cast iron tapping sleeves and valves shall be used to make "wet" taps to existing water mains where indicated on drawings. They shall be "split type" with mechanical joints, and flanged outlet for connection to tapping valve. Contractor shall verify size and type of existing water main prior to purchase of sleeve. The tapping valves shall be M&H AWWA Resilient, rated 200 psi, have non-rising stem, or equal.

YARD HYDRANTS:

Yard hydrants shall be as Eclipse, or equal, as shown on drawing.

FIRE HYDRANTS:

Fire hydrants shall be of the Dry-Barrel, post type with a pentagon nut. The hydrant shall conform to AWWA C502-85. The hydrant shall have two (2) 2 ½" hose nozzles with National Standard threads and one (1) 4 ½" pumper nozzle with National Standard threads. The hydrants shall be painted red. Hydrants shall be "break-away" type. Installation details are as designated on the Standard Drawings.

PART 3 - EXECUTION

GENERAL:

Under this section is included the inspection, laying, jointing, and testing of all water pipe, including water appurtenances, both in open cut and in tunnels, as shown on the drawings or as directed by the Engineer.

HANDLING OF MATERIALS:
Care shall be exercised in loading and unloading pipe to prevent damage to the pipe. The degree of care in handling the pipe and accessories shall meet the recommendations of the pipe manufacturer.

Proper implements, tools, and facilities shall be provided to allow safe and convenient execution of the work. Under no circumstances shall pipe or accessories be dropped into the trench.

Care shall be exercised to keep pipe clear of mud, dirt, and debris before and during laying.

No pipe shall be laid in water, and precautions shall be taken to prevent trench water from entering the pipe.

All pipe, per manufacturer's directions, shall be stored to prevent damage. PVC pipe shall be covered to protect from sunlight.

All pipe shall be inspected just prior to laying. If any portion of a shipment is found to be defective in diameter or thickness, the entire shipment shall be removed from the project at the Contractor's expense.

Ductile iron pipe shall, prior to laying, be visually inspected for defects and rung with a light hammer to detect cracks. Any defective pipe will be rejected.

All rejected pipe shall be removed from the project immediately and replaced at the expense of the Contractor.

WATER TRENCH EXCAVATION:

The contractor shall excavate for pipe installation to the minimum depths shown on drawings. In addition, in all areas the line and service lines shall be installed a minimum of 36" below the elevation of all roads. Where 36" of cover cannot be obtained and approved by the Engineer, the line may be encased in concrete. Unless otherwise shown, the main line is to be installed adjacent to the road. The contractor shall make every effort to install the waterline 3 feet from the shoulder where possible. There are some roads, or portions of roads, where this will not be possible. Any areas where this requirement cannot be met, the contractor shall backfill with gravel. This gravel that is required when the line is within 3 feet of the road is not a pay item and is considered incidental. The excavation shall include all material encountered. The Contractor shall, at all times during construction, provide and maintain necessary equipment for the removal of all water which enters the excavation. Trenches shall be kept firm and dry at all times. No direct payment will be considered for this work.

Excavated materials which are surplus or unsuitable for back filling shall be removed from the site of operations as soon as excavated. All excess or unsuitable excavated materials shall be disposed of at locations obtained by the Contractor. The Contractor shall secure written permission from the property owner(s) and furnish the Engineer with a copy of the agreement(s).

Excavated materials to be used for backfill shall be stored in neat piles adjacent to the excavation. Piles should be placed so that they will not interfere with traffic, be safety problems, or interfere with construction activities.

Open-cut excavation, either in earth or rock, shall be safely supported and of width and depth shown on drawings. Trenches shall not remain open overnight or at any time the Contractor is not on the job site.

The required width and sub-grade of the trench will vary according to the size of the water pipe to be installed, as shown on the drawings. If the maximum allowable trench width 12" above the top of the water pipe is exceeded, a higher strength classification of water pipe of sufficient strength for that particular trench width will be required, at no additional cost to the Owner. Unauthorized excavation below sub-grade shall be filled with crushed stone or concrete as ordered and directed by the Engineer at no additional cost to the Owner.

When the bottom of the excavation is unsuitable as a foundation, it shall be excavated below sub-grade and then refilled with concrete or compacted crushed stone to the sub-grade as the Engineer may direct. Such authorized work shall be paid for as set forth under the appropriate item of the Bid.

When rock is encountered in open cut excavation, it shall be removed by method selected by Contractor. The trench dimensions shall conform with the lines, grades and dimensions shown on the drawings. The Contractor shall notify the Engineer prior to removal of any rock.

When blasting is required, for the removal of rock, every precaution shall be taken to protect persons and property. Each blast shall be covered with mats to confine the rock fragments within the excavation. Only the minimum amounts of explosives shall be used; no excessive charges will be permitted. Blasting shall be performed at a safe distance ahead of the installation of the water pipe and structures to prevent damage to them as the work progresses. Blasting of rock for property service connections, T-branches, Y-branches, and studs shall be performed at the same time as the water pipe trench blasting. The rock shall be shattered by continuing the drilling and blasting operations 6 feet beyond the end of the water pipe, branch, stub or property service connection. Except with written permission and approval of the Engineer, no blasting of rock will be permitted at nights or on Sundays. See section 1000 for additional requirements. All excavated rock permitted to be used for backfilling purposes shall be used in accordance with these Specifications. All rock that is unsuitable for backfill shall promptly be removed from the site of the work at no additional cost the Owner.

SHEETING & BRACING:

The Contractor shall furnish, place and maintain adequate sheeting and bracing as may be required to support the sides of the excavation. Sheeting and bracing may be used to prevent any movement of earth which could diminish the width of the excavation or cause damage to adjacent properties. If, in the opinion of the Contractor, Sheeting and Bracing is needed the Contractor shall discuss this with Engineer. Sheeting may be of wood or steel and shall be of adequate strength for the excavation. Wherever possible, the sheeting and bracing shall be driven ahead of the excavation to avoid loss of material from behind the sheeting. If it is necessary to excavate below the sheeting, care shall be taken to avoid trimming behind the face along where the sheeting will be driven. Care shall be taken to prevent voids outside the sheeting; but, if voids develop, they shall be immediately filled with selected sandy materials and compacted as directed by the Engineer. The Engineer may order sheeting and bracing to be left in place at locations. Sheeting left in place may be ordered to be cut off at any specified elevation, but in no case shall it be left in the ground above an elevation 18 inches below the existing or proposed surface of the ground. All voids created by the cutting off of the sheeting to be left in place shall be immediately filled with selected sandy materials and compacted as directed by the Engineer.

Sheeting and bracing left in place in open cut trenches as shown on the drawings or as ordered by the Engineer shall be paid for under the appropriate items of the Bid. If the

Contractor elects not to remove certain sheeting and bracing, he will not be paid additionally for such sheeting and bracing left in place. Any sheeting left in place at the Contractor's option must be approved by the Engineer. All sheeting and bracing not to be left in place shall be carefully removed (after the backfill is complete) so as to not endanger the water pipe and other structures. All voids created by withdrawal of the sheeting shall be immediately filled with selected sandy materials and compacted as directed by the Engineer.

OPEN-CUT PIPE LAYING:

All pipe that is to be installed by open-cut method, shall be laid to the required grade and alignment. Any deviations from the alignment and grade shown on the drawings shall be as directed by the Engineer. Minimum cover over mains shall be 30 inches unless otherwise indicated on drawings or under pavement, which shall have 36 inches minimum cover. Indentions shall be made at the bell and/or coupling locations to prevent load concentration on the bell and/or couplings.

Fittings and valves shall be located at the plan location with all joints centered, spigots home, and valve stems plumb.

All joints shall be watertight and any leaks or defects discovered shall be immediately repaired to the satisfaction of the Engineer. Any pipe which has been disturbed after being laid shall be removed, the joints cleaned, and the pipe properly re-laid. Damaged or unsound pipe or fittings will be rejected. Before jointing the pipe, all lumps, blisters, excess coating material, and any dirt or sand shall be removed from the ends of pipes. Any superfluous material inside the pipe shall be removed by means of an approved follower or scraper after joints are made.

Factory-made joint materials shall be utilized. Installation shall be accomplished in strict accordance with the manufacturer's recommendations and with approval from the Engineer.

When lowered into the trench, the spigot, bell and gasket shall be cleaned in accordance with the manufacturer's recommendations. The pipe shall be pushed home and the gasket pressed firmly and evenly around the entire socket. The gland then pushed up to the bell and centered on the spigot of the pipe. Glands for large diameter pipe may require a wedge under the top side to assist in centering the gland lip against the gasket.

The bolts are then inserted and tightened with the fingers until all are even. The bolts shall then be tightened as recommended by the manufacturer.

In no case shall water be allowed to rise in or above the pipe before the joint has become thoroughly set. No walking on or working over the pipe after they have been laid, except as may be necessary in placing and compacting the backfill, will permitted until they are covered with backfill to a depth of 24 inches.

CUTTING PIPE:

Cutting of pipe for the insertion of valve fittings shall be done in a manner recommended by the manufacturer so as to avoid damage to the pipe or coating.

PERMISSIBLE DEFLECTION AT JOINTS:

The degree of deflection of a pipe in either the horizontal or vertical planes shall be as directed by the Engineer, but shall in no case exceed the recommendations of the manufacturer.

DITCH, STREAM, HIGHWAY & RAILROAD CROSSINGS:

Pipes crossing under ditches and streams shall be as shown on the drawings with bends not exceeding the angles shown.

CRADLE AND ENCASEMENT:

If, in the opinion of the Engineer, pipe cradle or encasement is needed the Contractor shall install as directed. Where the water pipe is to be laid in a crushed stone cradle, the crushed stone shall meet requirements for Class "B" aggregate, Grading "D" as defined by current Tennessee Department of Transportation Standard Specifications For Road and Bridge Construction. The crushed stone shall be deposited in the excavated trench to grade, allowing for the water pipe wall thickness and joints.

If concrete encasement is required, in the opinion of the Engineer, the concrete shall be 3,500 PSI. The depth and length of the encasement shall be as directed by Engineer. Proper bracing of the pipe shall be provided to prevent its being floated by the concrete encasement.

SEPARATION OF WATER MAINS AND SEWERS:

Water lines and sewer mains shall be separated per State of Tennessee requirements. They shall not be placed in the same trenches in any instance.

Whenever possible, water mains should be laid at least 10 feet horizontally from any existing or proposed sewer lines. Should local conditions prevent a lateral separation of 10 feet, they may be laid closer than 10 feet if the water line is laid in a separate trench, and if the elevation of the top (crown) of the sewer is at least 18 inches below the bottom (invert) of the water main.

Whenever water mains must cross over sewer lines, the water lines shall be laid at such elevation that the top of the sewer is at least 18 inches below the bottom of the water main. If this requirement cannot be met, the sewer main shall be relocated to provide this separation.

When it is impossible to obtain proper horizontal and vertical separation as stipulated above, both the water main and sewer shall be constructed of mechanical-joint cast-iron pipe and shall be pressure-tested to assure water tightness. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

No water pipe shall pass through or come into contact with any part of a sewer or sewer manhole.

THRUST BLOCKS:

All valves, blowoffs, all plugs capped, all reducers, all bends, and other fittings shall be securely anchored by thrust blocking as shown on the drawings. GripRings (Romac Industries, Inc., or equal) shall be used on all pipes 4" and larger, at all blowoffs, valves, where pipe changes from PVC to DI, at reducers, bends and other fittings. Thrust blocks are also required at these locations.

WATER PIPE BACKFILL:

Backfilling of excavated trenches in open cut shall be completed as soon as possible after the water line is laid and reviewed by owner's representative. Any pipe not reviewed prior to backfill will not be considered for payment.

The following materials shall be used to backfill the trenches:

1. *Stone:* Backfill in trenches within the limits of existing or proposed paved surfaces or shoulders, where defined in the drawings or authorized by the Engineer, shall be made with crushed stone, crushed slag or washed gravel meeting the requirements of Subsection 903.17 of the Tennessee Department of Transportation Standard Specifications. The backfill shall extend from the top of the bedding to the bottom of the existing or proposed paving base. Stone backfill will also be required where the line is installed closer than 3 feet to the road. See Water Trench Excavation section.

2. *Selected Excavated Materials:* Backfill in trenches for water lines shall be made with selected excavated materials taken from the trench excavation except where stone backfill is required or the excavated materials are not suitable. The selected excavated materials used from the top of the pipe to 2 feet above the top of the pipe shall contain no rocks. The selected excavated backfill materials used between the plane 2 feet above the top of the pipe or structure and one foot below the ground surface may include rock fragments taken from the excavation. In backfill containing rock, the maximum dimension along any axis of rock shall not exceed six inches, and all rock fragments shall be mixed with sufficient earth materials to completely eliminate all voids, subject to the approval of the Engineer. The amount of rock in the backfill shall not exceed 33% of the total backfill. Rock fragments and surplus earth materials not used in the backfill shall be removed from the site of the work at no expense to the Owner.

Backfill material shall be compacted as recommended by pipe manufacturer, indicated on the drawings or allowed by the Engineer.

If materials for any method of backfilling is dumped, bulldozed, or dropped from a height exceeding 5 feet above the previously placed backfill, its fall shall be broken by timber grillage or other means acceptable to the Engineer to prevent possible damage to the water lines.

Suitable backfill materials required, in addition to that which is excavated from trenches, shall be purchased by the Contractor, at no additional cost to the Owner.

LEAKAGE TESTS:

The Contractor shall test all sections of water lines in accordance with the Tennessee Department of Health & Environment Regulations and these specifications. All labor, materials and equipment used in testing procedures (including water) shall be furnished by the Contractor.

Hydrostatic Tests: After water pipe has been laid and backfilled, all newly laid pipe or any valve section thereof shall be subject to a hydrostatic pressure of not less than 200 psi or 1 ½ times anticipated line pressure, whichever is greater. The duration of the pressure tests shall be two hours. Each valve section of pipe shall be slowly filled with water. While the pipe is being filled and before the application of the specified test pressure, all air shall be expelled from the pipe. Taps (other than what is required by drawings) may be required at points of highest elevation. These taps are to be tightly plugged after completion of the test and will not be considered for payment. The test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. The pump, pump connections, gauges, and all necessary apparatus and labor shall be furnished by the Contractor. The Contractor shall calibrate the gauges in the presence of the Engineer.

A test shall be made only after a part or all of the backfilling has been completed and at least 36 hours after the last concrete thrust block has been cast with high-early-strength cement or at least seven (7) days after the last thrust block has been cast using standard cement.

Any cracked or defective pipes, fittings, or valves discovered during hydrostatic pressure tests shall be removed and replaced with sound material and the test repeated until satisfactory to the Engineer. No payment shall be made for the removal and replacement of defective pipes and appurtenances.

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any valved section thereof, to maintain pressure within 5 psi of the specified test pressure. Leakage shall not be measured by a drop in pressure in a test section over a period of time. See Table 1 below:

Table 1.
Allowable leakage per 1000 ft of pipeline* - gph†

Avg. Test Pressure psi	NOMINAL PIPE DIAMETER–in.																	
	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54	60	64
450	0.48	0.64	0.95	1.27	1.59	1.91	2.23	2.55	2.87	3.18	3.82	4.78	5.73	6.69	7.64	8.60	9.56	10.19
400	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.60	4.50	5.41	6.31	7.21	8.11	9.01	9.61
350	0.42	0.56	0.84	1.12	1.40	1.69	1.97	2.25	2.53	2.81	3.37	4.21	5.06	5.90	6.74	7.58	8.43	8.99
300	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60	3.12	3.90	4.68	5.46	6.24	7.02	7.80	8.32
275	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49	2.99	3.73	4.48	5.23	5.98	6.72	7.47	7.97
250	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41	7.12	7.60
225	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38	4.05	4.73	5.41	6.03	6.76	7.21
200	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73	6.37	6.80
175	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36	5.96	6.36
150	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97	5.52	5.88
125	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53	5.04	5.37
100	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05	4.50	4.80

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
†Calculated on the basis of Eq.1.

Allowable leakage. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

In inch-pound units,

$$L = \frac{SD\square P}{133{,}200}$$

Where:

L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

DISINFECTION OF PRESSURE WATER PIPELINES:

Before being placed into general use all pressure water piping and pipelines shall be flushed thoroughly, disinfected with chlorine and flushed again, per AWWA C651 and the State of Tennessee Regulations. Refer to section 02516.

Blow-offs may be required for flushing. Those required but not shown on drawings will not be considered for direct payment but will be considered incidental. These flushing points may be left in place after testing only if approved by Engineer. Sampling ports are also required and will not be considered for direct payment.

The Contractor shall repeat the disinfection procedure until samples indicate proper bacteriological quality and the approval of the Tennessee Department of Environment & Conservation is given.

All expenses for testing, disinfecting and flushing prior to approval and acceptance of the work shall be borne by the Contractor. Cost of water for testing, disinfecting and flushing will be paid by Contractor. The water department's representative will take the bacteriological samples. However, the contractor will be responsible for the cost of having tests run.

SETTING VALVES, VALVE BOXES & FITTINGS:

All gate valves, and any other valves designated, shall be set in cast iron Buffalo type, two-piece screw type valve boxes unless otherwise indicated on the plans. Wrench nuts shall be readily accessible through the opening. Valve boxes shall be firmly supported and shall be kept centered and plumb over the wrench nut of the gate valve. The box cover shall be flush with the surface of the finished pavement or any other level designated by the Engineer.

Drainage branches or blow-offs shall not be connected with any sewer or submerged in any stream or be installed in any other manner which will permit back siphonage into the distribution system. A steel valve marker post and sign shall be erected at the location of each valve. Concrete pads shall be placed around each valve box.

PLUGGING DEAD ENDS:

Standard plugs shall be inserted into the bells of all dead end fittings. Spigot ends shall be capped. Thrust blocking shall be provided at all dead ends of pipe that are capped or plugged.

UTILITIES RELOCATION AND REPAIR:

Contractor shall relocate or repair any utility lines damaged during construction. No separate payment will be made for repair or replacement.

All repair materials shall be equal to type of pipeline damaged and repaired to the satisfaction of the utility owner.

All repair materials shall be approved by Tennessee Department of Environment & Conservation or other regulatory agency. Contractor shall submit shop drawings on anticipated repair materials unless the materials are provided by the utility owner.

PAYMENT:

No separate payment will be made for waterline installation but it is a part of the lump sum bid for project.

END OF SECTION 2600

SECTION 2700 – GRAVITY SEWER LINES

PART 1 – GENERAL

SCOPE:

The work to be done under this Section shall consist of furnishing all labor, equipment and materials to complete excavation, backfill, installation, and testing of gravity sewer lines. Work shall be as shown on drawings or specified in these documents. The work includes:

A. Installation of gravity sewer lines, manholes, pre-cast boxes and related appurtenances

B. Protection and restoration of adjoining properties, utilities, etc.

PART 2 – PRODUCTS

GENERAL:

MANUFACTURERS:

Manufacturers regularly engaged in manufacture of wastewater products shall furnish products. The products shall be of type, size and quality as those specified. The products shall have been used in similar applications on previous jobs for not less than five years. References on products shall be furnished upon request. See Section 1000 for additional requirements.

INSPECTION OF MATERIALS:

All pipe, manholes, and other materials used on the projects shall be examined prior to installation. Ductile iron pipe shall be rung with a light hammer to detect cracks. If any portion of a shipment is found to be defective, the entire shipment shall be removed from the project at the Contractor's expense. Useable portions of the rejected materials may be salvaged upon approval of the Engineer. Minimum manufacturer's standard shall be met on all salvaged material.

All pipe, per manufacturer's directions, shall be stored to prevent damage. PVC pipe shall be covered to protect from sunlight.

GRAVITY SEWER MAINS:

PIPE

Ductile Iron is to be used for all lines unless otherwise noted.

Ductile Iron Pipe

Ductile Iron Pipe shall conform to AWWA C151 and ANSI/ASTM A746, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown and shall be furnished complete with rubber gaskets. The ductile iron pipe, specials, and fittings shall be manufactured or supplied by American Ductile Iron Pipe (a division of American Cast Iron Pipe Company, Birmingham, Alabama) or equal.

Ductile iron pipe shall conform to AWWA C151. All pipes shall have a minimum pressure rating of 350 psi for 12" diameter and smaller, 250 psi for diameters of 14" to 20" and 200 psi for diameters 24" and larger.

Ductile Iron Pipe and fittings shall be furnished with push-on joints, push-on restrained joints, mechanical joints, flanged joints, and grooved joints as required.

Unless otherwise specified, buried gravity pipe shall have Push-on joints which shall conform to AWWA C111. Unless otherwise specified gasket material shall be standard styrene butadiene copolymer (SBR.) Push-on joints shall be Fastite, as manufactured by American Ductile Iron Pipe, or equal. The pressure rating for push-on joints shall be a minimum of 350 psi or the specified pressure rating of the pipe, whichever is less. Standard allowable joint deflection for 4" – 30" Fastite pipe shall be five degrees, for 36" Fastite pipe shall be four degrees, and for 42" – 64" Fastite pipe shall be three degrees. Allowable deflection of American's Fastite joint "Special Deflection Bells" for 36" – 42" shall be five degrees and for 48" – 64" shall be four degrees.

For bores longer than 40 feet (or where other wise specified) joints shall be restrained joints. Restrained joints shall be "Flex-Ring" or "Lok-Ring" restrained joints as manufactured by American Ductile Iron Pipe or equal. Field-adaptable restraint shall be provided through the use of "Fast-Grip" or "Field Flex-Ring" as manufactured by American Ductile Iron Pipe, or other approved and bolt-less, push-on restrained devices. When restrained joints require factory welding, the MANUFACTURER shall qualify all welding procedures and welders used to produce the product per the requirements of a documented quality assurance system based on ANSI/AWS D11.2. Unless

otherwise specified, gasket material shall be standard styrene butadiene copolymer (SBR.) Restrained joints and restrained joint pipe shall be rated for specified pressure rating of the pipe. The MANUFACTURER shall furnish test results showing that restrained joints in the sizes specified have been successfully tested to at least twice the specified pressure rating of the joint without leakage or failure. Tests shall be performed on pipe with nominal metal thickness less than or equal to that specified for the project. Torque-activated restrained joint devices that rely on threaded bolts or setscrews for joint restraint shall not be used.

Except otherwise provided herein, interior surfaces of all ductile iron pipe, fittings, and specials shall be cleaned and lined in the shop with a standard thickness cement-mortar lining applied in conformity with AWWA C104, Portland cement mortar. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found faulty at delivery site, the damaged or unsatisfactory portions shall be repaired or replaced with lining conforming to these Specifications.

The minimum lining thickness shall be 1/16" for 12" diameter and smaller, 3/32" for 14" to 24" diameters, and 1/8" for 30" diameters and larger.

Ductile iron pipe, specials, and fittings shall be lined with cement-mortar lining with an asphaltic seal coating, 1 mil, in accordance with AWWA C104.

The exterior of buried ductile iron pipe, special, and fittings shall be coated with a 1-mil asphaltic coating in accordance with AWWA C151, Section 51-9. When specified, loose polyethylene encasement shall be supplied in accordance with AWWA C105.

PVC Pipe

Polyvinyl Chloride (PVC) Gravity Sewer Pipe shall conform to ASTM Standards D-3034 and F-679 and have SDR of 35.

The pipe shall be joined with an integral bell rubber gasket allowing for contracting and expansion at each joint. Joint tightness shall be tested in accordance with ASTM D-3212. The gasket shall be secured in the race by means of a non-metallic polypropylene retainer ring.

The pipe shall be white in color and be furnished in 12.5 feet laying lengths.

AIR PIPING:

Air Piping shall be ductile iron as specified above except it must not have cement-motar lining. In addition, all exposed piping shall be flanged joints.

MANHOLES:

Manholes shall be pre-cast concrete meeting ASTM 478. All sections are to be constructed of 4,000 psi reinforced concrete except flat tops and transition tops which shall be 5,000 psi concrete. Steel reinforcement shall conform to ASTM C-478 Specifications. Lift holes shall be provided in all sections but shall not penetrate through walls. Inverts shall be precast unless otherwise approved. All inverts shall be smooth and changes in sizes, directions, and grades shall be made gradually and evenly. Gaskets are to be provided between sections and all joints shall be mortared. A-lok boots, or approved equal, shall be furnished for all pipe to manhole connections.

All manhole components shall be free of cracks, defects, honeycomb, spalling, etc. Any defective manholes, in the opinion of the Engineer, shall not be used and are to be removed from the project site.

Depth of manhole will be measured from the invert elevations to the top of the lid.

Manhole steps shall be polymer coated ductile iron or steel rod. They shall be placed 16" apart and shall be in a straight line in the completed manhole.

Outside walls of manholes shall be coated with a layer of bitumastic, 10 mil dry thickness. Backfill shall not be placed against manhole until the coating is dry.

Where specified on drawings, manholes shall have hydrogen sulfide protection and shall be coated with a XYPEX coating, or equal. This product shall be used to coat the interior walls of manholes. The dry powder shall be mixed per manufacturers recommendations and applied in two coats per manufacturer's instructions.

Manhole frames (except where water tight lids are specified) shall be JR Hoe and Sons MC-375, or equal. They shall be solid and lettered "Sewer". All frames shall have anchor lugs or be anchored to manholes as detailed on the drawings. Watertight lids shall be JR Hoe and Sons MC-375, or equal (where specified).

Manhole adjusting rings shall be installed where existing manholes need to be raised to extend above finished grade. After locating the manhole, the contractor shall determine the size of riser needed to bring the manhole cover to the finished grade surface.

Other pre-cast structures shall also meet these specifications, as applicable.

PART 3 – EXECUTION

GENERAL:

Included under this section are laying, jointing, and backfill of gravity sewer pipe (both in open cut and encased applications) as shown on drawings or as directed by the Engineer.

DISRUPTION OF SERVICE:

It should be noted that there is flow in the existing lines. No sewer shall be allowed to be discharged onto the ground. If any spills are incurred, clean up, fines, etc. are the responsibility of the contractor. Refer to section1000.

SEWER TRENCH EXCAVATION

The Contractor shall excavate for pipe installation to depths as shown on drawings. This shall include all material encountered. The Contractor shall, at all times during construction, provide and maintain necessary equipment for the removal of all water that enters the excavation. Trenches shall be kept firm and dry at all times. No direct payment will be considered for this work.

Excavated materials that are surplus or unsuitable for backfilling shall be removed from the site as soon as excavated. All excess or unsuitable excavated materials shall be disposed of at locations obtained by the Contractor. The Contractor shall secure written permission from the property owner(s) and furnish the Engineer with a copy of the agreement(s).

Excavated materials to be used for backfill shall be stored in neat piles adjacent to the excavation. Piles should be placed so that they will not interfere with traffic, be safety problems, or interfere with construction activities.

Open-cut excavation, either in earth or rock, shall be safely supported and of width and depth shown on drawings. Trenches shall not remain open overnight or at any time the Contractor is not on the job site.

Excavations for sewer pipe in both earth and rock shall have a minimum and maximum allowable trench width below the outside top of the sewer pipe as shown on the Drawings. The trench shall be excavated to a specified depth below the outside diameter of the pipe, hereafter called the sub-grade, so as to permit the placing of the sewer and appurtenances at the specified elevations on the bedding or encasement material. Depth of pipe (for payment purposes) shall be measured from the bottom of pipe to top of ground.

The required width of the trench will vary according to the size of the sewer pipe to be installed. If the maximum allowable trench width 12" above the top of the sewer pipe is exceeded, a higher strength sewer pipe (to be approved by Engineer for particular application) will be required, at no additional cost to the Owner.

The required depth of sub-grade below the outside diameter of the sewer pipe will be 6" in rock and 4" in earth.

When the bottom of the excavation is unsuitable as a foundation, in the opinion of the Engineer, the Engineer may direct the trench to be excavated below sub-grade and then refilled with concrete or crushed stone to the sub-grade. Such work must be authorized by Engineer prior to implementation and will be paid for as set forth under the appropriate item of the Bid. When sub-grade becomes unsuitable due to uncontrolled water (when pumping rate is insufficient) additional pay for use of crushed stone will not be considered.

Unauthorized excavation below sub-grade shall be filled with crushed stone or concrete as ordered and directed by the Engineer at no additional cost to the Owner.

Rock excavation is defined as rock which cannot be economically excavated without the use of explosives or is a boulder or formation having a volume of greater than one-half (1/2) cubic yard.

When rock is encountered in open cut excavation, it shall be removed by drilling, blasting, digging or other approved methods so that the open cut trenches conform to the lines, grades and dimensions shown on the Drawings. The Contractor shall notify the Engineer prior to removal of any rock.

When blasting is required for the removal of rock, every precaution shall be used for the protection of persons and private and public property. Each blast shall be well covered with mats or other suitable means to confine the rock fragments within the excavation. Only the minimum amounts of explosives shall be used; no excessive charges will be permitted. Blasting of rock for property service connections, T-branches, Y-branches, and studs shall be performed at the same time as the sewer trench blasting. The rock connections, shall be shattered by continuing the drilling and blasting operations 6 feet beyond the end of the sewer, branch, stub or property service connection. Except with written permission and approval of the Engineer, no blasting of rock will be permitted at nights or on Sundays. Contractor is required to have pre-blast surveys done of structures near blasting sites.

If, for any reason, rock is excavated beyond the necessary limits as shown on the Drawings, such unauthorized excavation, or over breakage, shall be

refilled with crushed stone or concrete as directed by the Engineer, at no additional cost to the Owner.

All excavated rock permitted to be used for backfilling purposes shall be used in accordance with these specifications. All rock specified as unsuitable for backfill shall be removed from the site of the work at no additional cost to the Owner.

OPEN CUT PIPE INSTALLATION

GENERAL

All installation work shall be done per manufacturer's recommendations.

Proper implements, tools and equipment shall be provided to allow safe and convenient execution of the work. Under no circumstances shall pipe or accessories be dropped into the trench.

Care shall be exercised to keep pipe clear of mud, dirt, and debris before and during pipe laying.

No pipe shall be laid in water, and precautions shall be taken to prevent trench water from entering the pipe. In no case shall water be allowed to rise in or above the pipe before the joint has become thoroughly set. No walking on or working over the pipe after it has been laid, except as may be necessary for backfill, will be permitted until the pipe is covered with a minimum of 24" of backfill.

After the trench is excavated to the subgrade specified, it shall be filled to grade with crushed stone (except where concrete is specified) to provide a firm and satisfactory bed, for the entire length of the sewer pipe. Pipe shall be laid to form a watertight joint with the next adjoining pipe, with the inverts in a straight line and grade as shown on the drawings. The pipe shall be laid in an upstream direction, with bells upstream. Engineer will allow no skipping of sections without prior approval.

Any pipe that has been disturbed after being laid shall be taken up, the joints cleaned, and the pipe properly re-laid. Before jointing pipe, all excess coating material, dirt or other debris shall be removed from the bell and spigot ends of pipe. Any material inside of pipe shall be removed.

CRADLES

The crushed stone cradle required for gravity sewer pipe shall meet requirements for Class "B" aggregate, Grading "D" as defined by TDOT specifications. The crushed stone shall be deposited in the excavated trench

to grade, allowing for the sewer pipe wall thickness and providing "bell holes" for making joints. The sewer pipe shall be accurately laid to line and grade, and then crushed stone shall be carefully deposited and tamped around the pipe up to the spring line of the pipe, as shown on the drawings.

ENCASEMENT

In some areas, concrete encasement may be required. Where lines have a clearance of less than 18" from potable waterlines, where lines have less than 3 feet of cover in roadways, where lines have less than 18" of cover in other areas, in streambeds, or any areas where directed by the Engineer, concrete encasement and cradle may be required. Concrete used shall be 4000 psi.

BACKFILL REQUIREMENTS

Backfilling of excavated trenches in open cut shall commence as soon as possible after the sewer pipe is laid and the jointing and alignment are approved, but not until authorized by the Engineer.

All backfill in trenches within the limits of existing or proposed paved surfaces or shoulders, or where indicated in other places, shall be stone. The stone shall be crushed stone, crushed slag or washed gravel meeting the requirements of section 903.17 TDOT Specifications.

Backfill in other areas, where stone is not required, shall be selected excavated materials taken from the trench. If excavated material is not suitable, other backfill material from sources procured by the Contractor must be obtained by the Contractor with no expense to the Owner and must be approved by the Engineer. The selected material used in the area from the top of the pipe to two feet above the pipe and the top one-foot of the trench shall contain no rock. The backfill for the area in between may include rock fragments with the maximum dimension along any axis of the rock not exceeding six inches. The rock fragments shall be mixed with rock so the total amount of rock in the mixture does not exceed 33%. Any excavated material that is not suitable for backfill shall be removed from the project site at no expense to the Owner.

Backfill shall be compacted by wheel loading as indicated on the drawings or allowed by the Engineer. No backfill shall be compacted in any method that does not agree with pipe manufacturer's recommendations.

If backfill materials are dropped into the trench from a height exceeding 5 feet above the pipe or previously placed backfill, its fall shall be broken by means acceptable to Engineer.

Stone shall be used under all manholes for leveling to provide a firm stable foundation. The thickness shall be 6" minimum. Manholes in paved areas

must be backfilled with stone. Backfill under all pipes connecting to manholes shall be bedded with crushed stone for a length of three feet from the manholes and thoroughly compacted. Other backfill around manholes, except where stone is required, shall be selected material, placed in uniform layers and compacted to the satisfaction of the Engineer.

Backfill around ductile iron pipe shall be free of cinders, rubbish and other materials that would be injurious to the pipe. Backfill containing clay, sand, or gravel shall be used for backfilling within 24" of the iron pipe.

CHECK DAMS

Check dams shall be installed in the bedding and backfill of all new or replaced sewer lines to limit drainage area subject to the French drain effect of gravel bedding. Dams shall consist of compacted clay bedding and backfill at least three feet thick to the top of the trench and cut into the walls of the trench two feet. Alternatively, concrete may be used, keyed into the trench walls. Dams shall be placed no more than 500 feet apart. Effort should be made to install the check dams upstream of each manhole and out of roadways. All stream crossings shall include check dams on both sides of the crossing.

BORES AND TUNNELLING

Where indicated on drawings, pipe shall be installed by boring method. In the event that line and grade cannot be obtained by boring, the Contractor shall be required, at his expense, to construct a lined, mined tunnel in lieu of a tunnel by boring. Should a mined tunnel be required, it should be anticipated by Contractor that the tunnel diameter would probably be a diameter larger than bore diameter specified, depending upon method used by Contractor.

The Contractor shall provide all materials and equipment necessary to perform boring operations. Backstops for boring shall be of sufficient strength and positioned to support the thrust of the boring equipment without incurring any vertical or horizontal displacement during such boring operations. The guide rails for the boring equipment may be of either timber or steel. They shall be laid accurately to line and grade maintained in this position until completion of the boring operations. When complete, bore pits shall be backfilled per trench specifications and compacted.

Bored casing pipe shall be installed using equipment that encases the hole as the earth is removed. Installation of casing pipe concurrently with boring is required. All joints in casing pipe shall be welded. Casing pipe shall extend through the entire fill or from ditch line to ditch line (cut sections) and be installed in a manner that will not disrupt traffic nor damage roadway grade

and surface. No water shall be introduced into the excavation. The pipe shall be supported in the casing pipe to prevent damage to bells or couplings.

Tunnels, where necessary, shall be excavated by full face, heading and bench, or multiple drift procedures. Other methods of tunnel excavation may be used when approved by the Engineer. All work shall be done under the supervision of a superintendent familiar with tunneling and the use of tunnel liner plates. Tunneling may begin at either end unless otherwise specified. When necessary to reach the entrance grade, a shaft having a minimum width of 8 feet and a minimum length of 12 feet shall be dug, and the shaft shall be sheeted and shored as necessary. Excavation for the tunnel shall be done in such a manner so as to closely conform to the outside shape of the liner plates.

The Contractor shall replace, at his expense, any linear plates that may be damaged during handling and placing. Coated plates shall be handled in a manner to prevent damage to the coating. The linear plates shall be assembled in accordance with the manufacturer's recommendations and at such time there will not be more than 2 feet of tunnel excavation ahead of the bolting up of plates. At the end of each workday, the Contractor shall construct a bulkhead inside the assembled liner plate at the construction face unless the Engineer specifically grants permission to omit the bulkhead.

Grout blocks shall be installed at each end after bolting of liner plates is complete. Voids occurring between the linear plates and excavation shall be force grouted through the grouting holes in the plates with such pressure that all voids will be filled. Grouting shall progress simultaneously with installation of the liner plates.

Bedding material, approved by the Engineer, shall be provided to the depth necessary to uniformly support the pipe barrel. This support shall be provided for the entire length of the tunnel.

CONNECTIONS TO MANHOLES AND OTHER CONCRETE STRUCTURES:

Connections made to existing pre-cast manholes (or other concrete structures) shall be made using a boot or by coring the manhole and using Link Seal. Link Seal, or equal. This flexible product, shall be used to provide a watertight seal between the manhole wall and the pipe. Any damage made to manhole, or structure, during coring shall be repaired using a non-shrink grout.

Any connections made to new manholes shall be made using boots specified in manhole section.

SHEETING & BRACING

The contractor shall furnish, place and maintain adequate sheeting and bracing as may be required to support the sides of the excavation. Sheeting and bracing may be used to prevent any movement of earth that could diminish the width of the excavation or cause damage to adjacent properties. If, in the opinion of the Contractor, Sheeting and Bracing is needed the Contractor shall discuss this with the Engineer. Sheeting may be of wood or steel and shall be of adequate strength for the excavation. Wherever possible, the sheeting and bracing shall be driven ahead of the excavation to avoid loss of material from behind the sheeting. If it is necessary to excavate below the sheeting, care shall be taken to avoid trimming behind the face along where the sheeting will be driven. Care shall be taken to prevent voids outside the sheeting; but, if voids develop, they shall be immediately filled with selected sandy materials and compacted as directed by the Engineer. The Engineer may order sheeting and bracing to be left in place at locations. Sheeting left in place may be ordered to be cut off at any specified elevation, but in no case shall it be left in the ground. All voids created by the cutting off of the sheeting to be left in place shall be immediately filled with selected sandy materials and compacted as directed by the Engineer.

Sheeting and bracing left in place in open cut trenches, as shown on the drawings or as ordered by the Engineer, shall be paid for under the appropriate items of the Bid. If the Contractor elects not to remove certain sheeting and bracing, he will not be paid additionally for such sheeting and bracing left in place. The Engineer must approve any sheeting and bracing left in place at the contractor's option. All sheeting and bracing not to be left in place shall be carefully removed (after the backfill is complete) so as to not endanger the water pipe and other structures. All voids created by withdrawal of the sheeting shall be immediately filled with selected sandy materials and compacted as directed by the Engineer.

SEPARATION OF WATER MAINS AND SEWERS

Water mains and sewer mains shall be separated per State of Tennessee requirements. They shall not be installed in the same trenches in any instances.

Whenever possible, sewer mains should be installed at least 10 feet horizontally from any water main. Should local conditions prevent a lateral separation of 10 feet, a sewer main may be laid closer than 10 feet if it is installed in a separate trench and if the elevation of the top of the sewer line is at least 18" below the bottom of the water main.

When the elevation of the sewer line cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation or

reconstructed with mechanical-joint pipe for a distance of 10 feet on each side of the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

When it is impractical to obtain proper horizontal and vertical separation as stipulated above, the sewer shall be designed and constructed equal to the water main pipe and shall be pressure-tested to assure water-tightness.

Utilities Relocation and Repair: Contractor shall be repair or pay for any repairs of any utility lines damaged during construction. No separate payment will be made to contractor for said repairs. All repair materials shall be equal to type of utility damaged and repaired to the satisfaction of the utility owner. All repair materials used on water and sewer lines shall meet State of Tennessee Regulations.

PART 2 – PAYMENT:

No direct payment will be made for any sewerline work unless it is listed in bid schedule. This work will be considered incidental to other work.

END OF SECTION 2700

SECTION 2701 – FORCE MAIN SEWER LINES

PART 1 – GENERAL

SCOPE:

The work to be done under this Section shall consist of furnishing all labor, equipment and materials to complete excavation, backfill, installation, and testing of force main sewer lines. Work shall be as shown on drawings or specified in these documents. Refer to Pump Station specifications for piping inside pump station(s). The work includes:

A. Installation of force main sewer lines, and related appurtenances

B. Protection and restoration of adjoining properties, utilities, etc.

PART 2 – PRODUCTS

GENERAL:

MANUFACTURERS:

Manufacturers regularly engaged in manufacture of wastewater products shall furnish products. The products shall be of type, size and quality as those specified. The products shall have been used in similar applications on previous jobs for not less than five years. References on products shall be furnished upon request. See Section 1000 for additional requirements.

INSPECTION OF MATERIALS:

All pipe and other materials used on the projects shall be examined prior to installation. Ductile iron pipe shall be rung with a light hammer to detect cracks. If any portion of a shipment is found to be defective, the entire shipment shall be removed from the project at the Contractor's expense. Useable portions of the rejected materials may be salvaged upon approval of the Engineer. Minimum manufacturer's standard shall be met on all salvaged material.

All pipe, per manufacturer's directions, shall be stored to prevent damage. PVC pipe shall be covered to protect from sunlight.

PIPE:

Pipe shall be ductile iron unless otherwise noted on drawings.

Ductile Iron Pipe

Ductile Iron Pipe shall conform to AWWA C151 and ANSI/ASTM A746, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown and shall be furnished complete with rubber gaskets. The ductile iron pipe, specials, and fittings shall be manufactured or supplied by American Ductile Iron Pipe (a division of American Cast Iron Pipe Company, Birmingham, Alabama) or equal.

Ductile iron pipe shall conform to AWWA C151. All pipes shall have a minimum pressure rating of 350 psi for 12" diameter and smaller, 250 psi for diameters of 14" to 20" and 200 psi for diameters 24" and larger.

Ductile Iron Pipe and fittings shall be furnished with push-on joints, push-on restrained joints, mechanical joints, flanged joints, and grooved joints as required.

Unless otherwise specified, buried pipe in straight runs shall have Push-on joints which shall conform to AWWA C111. Unless otherwise specified gasket material shall be standard styrene butadiene copolymer (SBR.) Push-on joints shall be Fastite, as manufactured by American Ductile Iron Pipe, or equal. The pressure rating for push-on joints shall be a minimum of 350 psi or the specified pressure rating of the pipe, whichever is less. Standard allowable joint deflection for 4" – 30" Fastite pipe shall be five degrees, for 36" Fastite pipe shall be four degrees, and for 42" – 64" Fastite pipe shall be three degrees. Allowable deflection of American's Fastite joint "Special Deflection Bells" for 36" – 42" shall be five degrees and for 48" – 64" shall be four degrees.

For bores longer than 40 feet (or where other wise specified) joints shall be restrained joints. Restrained joints shall be "Flex-Ring" or "Lok-Ring" restrained joints as manufactured by American Ductile Iron Pipe or equal. Field-adaptable restraint shall be provided through the use of "Fast-Grip" or "Field Flex-Ring" as manufactured by American Ductile Iron Pipe, or other approved and bolt-less, push-on restrained devices. When restrained joints require factory welding, the MANUFACTURER shall qualify all welding procedures and welders used to produce the product per the requirements of a documented quality assurance system based on ANSI/AWS D11.2. Unless otherwise specified, gasket material shall be standard styrene butadiene copolymer (SBR.) Restrained joints and restrained joint pipe shall be rated for specified pressure rating of the pipe. The MANUFACTURER shall furnish test results showing that restrained joints in the sizes specified have been

successfully tested to at least twice the specified pressure rating of the joint without leakage or failure. Tests shall be performed on pipe with nominal metal thickness less than or equal to that specified for the project. Torque-activated restrained joint devices that rely on threaded bolts or setscrews for joint restraint shall not be used.

Except otherwise provided herein, interior surfaces of all ductile iron pipe, fittings, and specials shall be cleaned and lined in the shop with a standard thickness cement-mortar lining applied in conformity with AWWA C104, Portland cement mortar. Every precaution shall be taken to prevent damage to the lining. If lining is damaged or found faulty at delivery site, the damaged or unsatisfactory portions shall be repaired or replaced with lining conforming to these Specifications.

The minimum lining thickness shall be 1/16" for 12" diameter and smaller, 3/32" for 14" to 24" diameters, and 1/8" for 30" diameters and larger.

Ductile iron pipe, specials, and fittings shall be lined with cement-mortar lining with an asphaltic seal coating, 1 mil, in accordance with AWWA C104.

The exterior of buried ductile iron pipe, special, and fittings shall be coated with a 1-mil asphaltic coating in accordance with AWWA C151, Section 51-9. When specified, loose polyethylene encasement shall be supplied in accordance with AWWA C105.

Air Piping:

Air Piping shall be ductile iron as specified above except it must not have cement-motar lining. In addition, all exposed piping shall be flanged joints. The line shall be installed per this section.

FITTINGS:

Fittings for pipe below ground shall be mechanical joint fittings with body thickness and radius of curvature conforming to AWWA C110-87 rubber gasket joints shall be in accordance with AWWA C111-85. These may be C153 compact fittings. Flanged joints shall be used for all piping exposed or inside valve box, pump station, etc.

VALVES:

Unless otherwise specified, valves shall be designed to operate continuously under a working pressure of not less than 200 pounds per square inch. Valves suitable for other working pressures shall be furnished as indicated on the drawings. All valves buried shall be mechanically jointed. All valves inside valve vaults or exposed are to be flanged.

All gate valves 2" and larger shall conform to AWWA C500-86. All valves of the above sizes, unless otherwise stipulated, shall be iron body, resilient seat non-rising stem type. They shall be M&H, or equal. Gate valves smaller than 2" shall be all bronze , wheel handles, screwed gate valves, suitable for the service required.

All butterfly valves 10" and larger shall conform to AWWA C504-80. Valve body shall be cast iron with stainless steel body seat. Vane shall be cast iron with a mechanically secured rubber seat.

Plug Valves are to be M&H 1820 or equal. Check Valves are to be M&H C508 Style 259 or equal.

The air relief valves shall be the same or equal to the Crispin pressure relief valve as manufactured by the Multiplex Manufacturing Company with 3/4" inlet connection and a working pressure range of 0-200 psi. A 3/4" bronze double gate valve brass pipe and fittings shall be used on the installation. The installation shall be as shown on the standard drawing.

At the end of each dead end line or at other locations as directed by the Engineer, shall be installed a blow-off valve. The gate valve shall be the same as specified above. Installation shall be as shown in the Standard Details.

The telescoping valves are to be Halliday Products, Series V4A, Model 503, or equal. The valves shall be stainless steel, manually operated, as shown on drawings.

All valves shall be tested in the shop at no cost to the owner under a test pressure equal to twice the working pressure and upon request the owner shall be furnished with a certificate stating that all valves have successfully passed such a test.

Valve operator shall be traveling-nut type for underground service (except where wheels are shown) and wheels for above ground. Floor boxes are to be provided where shown.

PART 3 – EXECUTION

GENERAL:

Included under this section are laying, jointing, and backfill of force main sewer pipe (both in open cut and encased applications) as shown on drawings or as directed by the Engineer.

SEWER TRENCH EXCAVATION

The Contractor shall excavate for pipe installation to depths as shown on drawings. This shall include all material encountered. The Contractor shall, at all times during construction, provide and maintain necessary equipment for the removal of all water that enters the excavation. Trenches shall be kept firm and dry at all times. No direct payment will be considered for this work.

Excavated materials that are surplus or unsuitable for backfilling shall be removed from the site as soon as excavated. All excess or unsuitable excavated materials shall be disposed of at locations obtained by the Contractor. The Contractor shall secure written permission from the property owner(s) and furnish the Engineer with a copy of the agreement(s).

Excavated materials to be used for backfill shall be stored in neat piles adjacent to the excavation. Piles should be placed so that they will not interfere with traffic, be safety problems, or interfere with construction activities.
Open-cut excavation, either in earth or rock, shall be safely supported and of width and depth shown on drawings. Trenches shall not remain open overnight or at any time the Contractor is not on the job site.

Excavations for sewer pipe in both earth and rock shall have a minimum and maximum allowable trench width below the outside top of the sewer pipe as shown on the Drawings. The trench shall be excavated to a specified depth below the outside diameter of the pipe, hereafter called the sub-grade, so as to permit the placing of the sewer and appurtenances at the specified elevations on the bedding or encasement material. Depth of pipe (for payment purposes) shall be measured from the bottom of pipe to top of ground.

The required width of the trench will vary according to the size of the sewer pipe to be installed. If the maximum allowable trench width 12" above the top of the sewer pipe is exceeded, a higher strength sewer pipe (to be approved by Engineer for particular application) will be required, at no additional cost to the Owner.

The required depth of sub-grade below the outside diameter of the sewer pipe will be 6" in rock and 4" in earth.

When the bottom of the excavation is unsuitable as a foundation, in the opinion of the Engineer, the Engineer may direct the trench to be excavated below sub-grade and then refilled with concrete or crushed stone to the sub-grade. Such work must be authorized by Engineer prior to implementation

and will be paid for as set forth under the appropriate item of the Bid. When sub-grade becomes unsuitable due to uncontrolled water (when pumping rate is insufficient) additional pay for use of crushed stone will not be considered.

Unauthorized excavation below sub-grade shall be filled with crushed stone or concrete as ordered and directed by the Engineer at no additional cost to the Owner.

Rock excavation is defined as rock which cannot be economically excavated without the use of explosives or is a boulder or formation having a volume of greater than one-half (1/2) cubic yard.

When rock is encountered in open cut excavation, it shall be removed by drilling, blasting, digging or other approved methods so that the open cut trenches conform to the lines, grades and dimensions shown on the Drawings. The Contractor shall notify the Engineer prior to removal of any rock.

When blasting is required for the removal of rock, every precaution shall be used for the protection of persons and private and public property. Each blast shall be well covered with mats or other suitable means to confine the rock fragments within the excavation. Only the minimum amounts of explosives shall be used; no excessive charges will be permitted. Blasting of rock for property service connections, T-branches, Y-branches, and studs shall be performed at the same time as the sewer trench blasting. The rock connections, shall be shattered by continuing the drilling and blasting operations 6 feet beyond the end of the sewer. Except with written permission and approval of the Engineer, no blasting of rock will be permitted at nights or on Sundays. Contractor is required to have pre-blast surveys done of structures near blasting sites.

If, for any reason, rock is excavated beyond the necessary limits as shown on the Drawings, such unauthorized excavation, or over breakage, shall be refilled with crushed stone or concrete as directed by the Engineer, at no additional cost to the Owner.

All excavated rock permitted to be used for backfilling purposes shall be used in accordance with these specifications. All rock specified as unsuitable for backfill shall be removed from the site of the work at no additional cost to the Owner.

OPEN CUT PIPE INSTALLATION

GENERAL

All installation work shall be done per manufacturer's recommendations.

Proper implements, tools and equipment shall be provided to allow safe and convenient execution of the work. Under no circumstances shall pipe or accessories be dropped into the trench.

Care shall be exercised to keep pipe clear of mud, dirt, and debris before and during pipe laying.

No pipe shall be laid in water, and precautions shall be taken to prevent trench water from entering the pipe. In no case shall water be allowed to rise in or above the pipe before the joint has become thoroughly set. No walking on or working over the pipe after it has been laid, except as may be necessary for backfill, will be permitted until the pipe is covered with a minimum of 24" of backfill.

After the trench is excavated to the subgrade specified, it shall be filled to grade with crushed stone (except where concrete is specified) to provide a firm and satisfactory bed, for the entire length of the sewer pipe. Pipe shall be laid to form a watertight joint with the next adjoining pipe, with the inverts in a straight line and grade as shown on the drawings. The pipe shall be laid in an upstream direction, with bells upstream. Engineer will allow no skipping of sections without prior approval.

Any pipe that has been disturbed after being laid shall be taken up, the joints cleaned, and the pipe properly re-laid. Before jointing pipe, all excess coating material, dirt or other debris shall be removed from the bell and spigot ends of pipe. Any material inside of pipe shall be removed.

CRADLES

The crushed stone cradle required for sewer pipe shall meet requirements for Class "B" aggregate, Grading "D" as defined by TDOT specifications. The crushed stone shall be deposited in the excavated trench to grade, allowing for the sewer pipe wall thickness and providing "bell holes" for making joints. The sewer pipe shall be accurately laid to line and grade, and then crushed stone shall be carefully deposited and tamped around the pipe up to the spring line of the pipe, as shown on the drawings.

ENCASEMENT

In some areas, concrete encasement may be required. Where lines have a clearance of less than 18" from other utilities, where lines have less than 3 feet of cover in roadways, where lines have less than 18" of cover in other areas, in streambeds, or any areas where directed by the Engineer, concrete encasement and cradle may be required. Concrete used shall be 4000 psi.

BACKFILL REQUIREMENTS

Backfilling of excavated trenches in open cut shall commence as soon as possible after the sewer pipe is laid and the jointing and alignment are approved, but not until authorized by the Engineer.

All backfill in trenches within the limits of existing or proposed paved surfaces or shoulders, or where indicated in other places, shall be stone. The stone shall be crushed stone, crushed slag or washed gravel meeting the requirements of section 903.17 TDOT Specifications.

Backfill in other areas, where stone is not required, shall be selected excavated materials taken from the trench. If excavated material is not suitable, other backfill material from sources procured by the Contractor must be obtained by the Contractor with no expense to the Owner and must be approved by the Engineer. The selected material used in the area from the top of the pipe to two feet above the pipe and the top one-foot of the trench shall contain no rock. The backfill for the area in between may include rock fragments with the maximum dimension along any axis of the rock not exceeding six inches. The rock fragments shall be mixed with rock so the total amount of rock in the mixture does not exceed 33%. Any excavated material that is not suitable for backfill shall be removed from the project site at no expense to the Owner.

Backfill shall be compacted by wheel loading as indicated on the drawings or allowed by the Engineer. No backfill shall be compacted in any method that does not agree with pipe manufacturer's recommendations.

If backfill materials are dropped into the trench from a height exceeding 5 feet above the pipe or previously placed backfill, its fall shall be broken by means acceptable to Engineer.

Backfill under all pipes connecting to manholes shall be bedded with crushed stone for a length of three feet from the manholes and thoroughly compacted.

Backfill around ductile iron pipe shall be free of cinders, rubbish and other materials that would be injurious to the pipe. Backfill containing clay, sand, or gravel shall be used for backfilling within 24" of the iron pipe.

CHECK DAMS

Check dams shall be installed where shown on drawings or on either side of stream crossings. All stream crossings shall include check dams on both sides of the crossing.

SHEETING & BRACING

The contractor shall furnish, place and maintain adequate sheeting and bracing as may be required to support the sides of the excavation. Sheeting and bracing may be used to prevent any movement of earth that could diminish the width of the excavation or cause damage to adjacent properties. If, in the opinion of the Contractor, Sheeting and Bracing is needed the Contractor shall discuss this with the Engineer. Sheeting may be of wood or steel and shall be of adequate strength for the excavation. Wherever possible, the sheeting and bracing shall be driven ahead of the excavation to avoid loss of material from behind the sheeting. If it is necessary to excavate below the sheeting, care shall be taken to avoid trimming behind the face along where the sheeting will be driven. Care shall be taken to prevent voids outside the sheeting; but, if voids develop, they shall be immediately filled with selected sandy materials and compacted as directed by the Engineer. The Engineer may order sheeting and bracing to be left in place at locations. Sheeting left in place may be ordered to be cut off at any specified elevation, but in no case shall it be left in the ground. All voids created by the cutting off of the sheeting to be left in place shall be immediately filled with selected sandy materials and compacted as directed by the Engineer.

Sheeting and bracing left in place in open cut trenches, as shown on the drawings or as ordered by the Engineer, shall be paid for under the appropriate items of the Bid. If the Contractor elects not to remove certain sheeting and bracing, he will not be paid additionally for such sheeting and bracing left in place. The Engineer must approve any sheeting and bracing left in place at the contractor's option. All sheeting and bracing not to be left in place shall be carefully removed (after the backfill is complete) so as to not endanger the water pipe and other structures. All voids created by withdrawal of the sheeting shall be immediately filled with selected sandy materials and compacted as directed by the Engineer.

SEPARATION OF WATER MAINS AND SEWERS

Water mains and sewer mains shall be separated per State of Tennessee requirements. They shall not be installed in the same trenches in any instances.

Whenever possible, sewer mains should be installed at least 10 feet horizontally from any water main. Should local conditions prevent a lateral separation of 10 feet, a sewer main may be laid closer than 10 feet if it is installed in a separate trench and if the elevation of the top of the sewer line is at least 18" below the bottom of the water main.

When the elevation of the sewer line cannot be varied to meet the above requirements, the water main shall be relocated to provide this separation or

reconstructed with mechanical-joint pipe for a distance of 10 feet on each side of the sewer. One full length of water main should be centered over the sewer so that both joints will be as far from the sewer as possible.

When it is impractical to obtain proper horizontal and vertical separation as stipulated above, the sewer shall be designed and constructed equal to the water main pipe and shall be pressure-tested to assure water-tightness.

PART 4 – TESTING

General

The Contractor shall test all sections of pipe in accordance with the State of Tennessee Department of Environment and Conservation requirements and the following instructions. All materials, labor and equipment used for testing, (including water) shall be furnished by the Contractor at no cost to the Owner. The Contractor shall notify the Engineer prior to any testing.

Hydrostatic Tests – Force Main Sewer Pipe

All force main sewer pipe shall be tested to a hydrostatic pressure of not less than 150 psi or 50% higher than the design operating condition of the pipe (which ever is greater). The section of pipe being tested, shall be filled with water. While the pipe is being filled all air shall be expelled from the pipe. Taps may be required at high elevations. Any taps made shall be plugged after the tests are completed and the costs of the taps are the responsible of the Contractor. The test pressure shall be applied by connecting a pump to the pipe in a manner approved by the Engineer. Gauges, pump, materials for connections to the sewer line, and other materials necessary for test shall be furnished by Contractor. The gauges shall be calibrated in the presence of the Engineer. The test shall last for two hours. No tests shall be done until pipe is backfilled and all thrust blocks have been in place for seven days.

Any defects identified in pipe, valves, fittings, or other portions of the sewer line during the hydrostatic pressure test shall be corrected. After such corrections have been made, the line shall be re-tested. No payment will be made for repairs.

Allowable Leakage (measured in gallons per hour) shall not exceed the following:

2" Diameter	**0.17** Gallons per 1000 Linear feet
2.5" Diameter	**0.21** Gallons per 1000 Linear feet
3" Diameter	**0.25** Gallons per 1000 Linear feet
4" Diameter	**0.33** Gallons per 1000 Linear feet
6" Diameter	**0.50** Gallons per 1000 Linear feet
8" Diameter	**0.66** Gallons per 1000 Linear feet

10" Diameter	**0.83** Gallons per 1000 Linear feet
12" Diameter	**0.99** Gallons per 1000 Linear feet

Utilities Relocation and Repair: Contractor shall be repair or pay for any repairs of any utility lines damaged during construction. No separate payment will be made to contractor for said repairs. Al repair materials shall be equal to type of utility damaged and repaired to the satisfaction of the utility owner. All repair materials used on water and sewer lines shall meet State of Tennessee Regulations.

PART 5 – PAYMENT

GENERAL:

This work is part of lump sum price for project unless listed in bid schedule.

END OF SECTION 2701

SECTION 2702 – WEIR GATES

PART 1 – GENERAL:

SCOPE:

This section describes the work to be done related to the two (2) downward opening weir gates to be installed in splitter box. The contractor is to furnish all materials, labor, and other items necessary for the weir gates described in these specifications and/or as shown on drawings.

The equipment provided under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer unless exceptions are noted by the engineer.

PART 2 – MATERIALS:

Gates and operators shall be supplied with all the necessary parts and accessories indicated on the drawings, specified or otherwise required for a complete, properly operating installation and shall be the latest standard product of a manufacturer regularly engaged in the production of water control gates.

Weir gates supplied under this section shall be Series 40 Stainless Steel Downward Opening Weir Gates as manufactured by H.Fontaine Ltd., or equal.

Except as modified or supplemented herein, all gates and operators shall conform to the applicable requirements of AWWA C513, latest edition.

Weir gates shall be substantially watertight under the design head conditions. Leakage shall not exceed 0.05 U.S. gallon per minute per foot (0.60 l/min per meter) of seal periphery under the design seating head and 0.1 U.S. gallon per minute per foot (1.25 l/min per meter) of seal periphery for the design unseating head.

Weir gates shall be designed to withstand the design head (maximum design head shall be taken as the height of the slide unless otherwise shown).

The weir gate's sealing system should have been tested through a cycle test in an abrasive environment and should show that the leakage requirements are still obtained after 25,000 cycles with a minimum deterioration.

Weir gates shall be self-contained and of the rising stem configuration.

The gate frame shall be constructed of structural members or formed plate welded to form a rigid one-piece frame. The frame shall be of the flange back design, suitable for mounting on a concrete wall (CW). The guide slot shall be made of UHMWPE (ultra high molecular weight polyethylene).

The slide shall consist of a flat plate reinforced with formed plates or structural members to limit its deflection to 1/720 of the gate's span under the design head.

The guides shall be made of UHMWPE (ultra high molecular weight polyethylene) and shall be of such length as to retain and support at least two thirds (2/3) of the vertical height of the slide in the fully open position.

The bottom and side seals shall be made of UHMWPE (ultra high molecular weight polyethylene) of the self-adjusting type. A continuous compression cord shall ensure contact between the UHMWPE guide and the gate in all positions. The sealing system shall maintain efficient sealing in any position of the slide and let the water flow only in the open part of the gate.

Seals shall maintain the specified leakage rate in both seating and unseating conditions.

The operating stem shall be of stainless steel designed to transmit in compression at least two (2) times the rated output of the operating manual mechanism with a 40 lbs (178 N) effort on the crank or handwheel.

The stem shall have a slenderness ratio (L/r) less than 200. The threaded portion of the stem shall have machine cut threads of the Acme type.

The gates will be manually operated.

For stems in more than one piece and with a diameter of 1 ¾ inches (45 mm) and larger, the different sections shall be joined together by solid bronze couplings. Stems with a diameter smaller than 1 ¾ inches, shall be pinned to an extension tube.

The couplings shall be grooved and keyed and shall be of greater strength than the stem.

Stem guides shall be fabricated from type 304L stainless steel. The guide shall be equipped with an UHMWPE bushing. Guides shall be adjustable and shall be spaced in accordance with the manufacturer's recommendation. The L/r ratio shall not be greater than 200.

Rising stem gates shall be provided with a clear polycarbonate stem cover. The stem cover shall have a cap and condensation vents as well as a clear mylar position indicating tape. The tape shall be field applied to the stem cover after the gate has been installed and positioned.

Manual operators shall be provided by the gate manufacturer.

All bearings and gears shall be totally enclosed in a weather tight housing. The pinion shaft of crank-operated mechanisms shall be constructed of stainless steel and supported by roller or needle bearings.

Each manual operator shall be designed to operate the gate under the maximum specified seating and unseating heads by using a maximum effort of 40 lbs (178 N) on the crank or handwheel, and shall be able to withstand, without damage, an effort of 80 lbs (356 N).

The crank shall be removable and fitted with a corrosion resistant rotating handle. The maximum crank radius shall be 15 inches (381 mm) and the maximum handwheel diameter shall be 24 inches (610 mm).

Self-contained gates shall be provided with a yoke made of structural members or formed plates. The maximum deflection shall be 1/360 of the gate's span.

PART	**MATERIAL**
Frame, yoke, stem guides, slide, stem extension	Stainless steel ASTM A-240 type 304L
Guides, side and bottom seals, stem guide liner	Ultra high molecular weight polyethylene (UHMWPE) ASTM D-4020
Compression cord	Nitrile ASTM D2000 M6BG 708, A14, B14, E014, E034
Threaded stem	Stainless steel ASTM A-276 type 303 MX or 316
Fasteners	ASTM F593 and F594 GR1 for type 304 and GR2 for type 316
Pedestal, handwheel and crank	Tenzaloy aluminum
Gasket (between frame and wall)	EPDM ASTM 1056
Stem cover	Polycarbonate ASTM D-3935
Lift nut, couplings	Manganese bronze ASTM B584 UNS-C86500

PART 3 – EXECUTION:

Gates and appurtenances shall be handled and installed in accordance with the manufacturer's recommendations.

Following the completion of each gate installation, the gates shall be operated through at least two complete open/close cycles.

Gates should be checked for leakage by the contractor.

PART 4 - PAYMENT

The gates are part of the lump sum payment for the wastewater treatment plant upgrade.

END OF SECTION

SECTION 03001 – CONCRETE

PART 1 – GENERAL

WORK INCLUDED:

Form work, shoring, bracing and anchorage

Concrete reinforcement and accessories

Cast-in-place concrete

This section does not apply to pre-cast structures.

RELATED WORK:

The construction of the sub-grade, including compaction, is specified under Division 2. If the sub-grade is not in suitable condition at the time construction begins, it shall be put in proper condition by removing all unsuitable materials, backfilling all holes with well-compacted granular material, and bringing the surface to crown and elevation.

This Contractor shall build into the concrete work any recesses, inserts, anchors, sleeves, anchor bolts, etc. as required by all trades.

REFERENCES:

"Specifications for Structural Concrete for Buildings" ACI 301-84 (Revised 1987).

In addition to ACI 301-84, cast-in place concrete shall conform to ACI 305-R88 and ACI 306-R83 for Hot Weather Concreting and Cold Weather Concreting, respectively. The use of any methods described in ACI 305-R82 or ACI 306-83 shall be approved by the Engineer before implementation.

"Building Code Requirements for Reinforced Concrete", ACI 318-86.

"Standard Specification for Ready-Mixed Concrete", ANSI/ASTM C94-84.

ANSI C311-77, "Standard methods of Sampling and Testing Fly Ash for use as an Admixture in Portland Cement Concrete".

ANSI C618-80, "Standard Specifications for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete".

ANSI/ASTM A185 – Welded Steel Wire Fabric for Concrete Reinforcement
ASTM A615 – Deformed and Plain Billet-Steel for Concrete Reinforcement

ASTM C33 – Concrete Aggregates

ASTM C260 – Air Entraining Admixtures for Concrete

ASTM C309 – Liquid membrane – Forming Compounds for Curing Concrete

ASTM D2103 – Polyethylene Film and Sheeting

FS TT-C-800 – Curing Compound, Concrete, for New and Existing Surfaces

NOTE: The term "Standard Specifications" is used herein referring to ACI 301-84 (latest revision).

Materials and work shall conform to the requirements of standards, codes and recommended practices required in this section. A copy of all ACI references shall be kept available at the job site at all times.

TESTS:

Materials and operations shall be tested and inspected as work progresses. Failure to detect defective work shall not prevent rejection when defect is discovered, nor shall it obligate the Owner for final acceptance.

Submit proposed mix design of each class of concrete to Engineer for review and acceptance prior to commencement of work.

The Contractor shall, at his own expense, obtain compression strength tests for each 20 cubic yards or fraction thereof, of each mix design of concrete placed in any one (1) day. However, for the secondary clarifier only cylinders for each 100 CY or fraction thereof, of each mix design of concrete placed in any one day will be required. Contractor shall mold and cure three (3) specimen and shall be tested (ASTM C39) at 7 days for information. One specimen shall be tested at 28 days for acceptance. The remaining specimen shall be tested only if irregularities occur during the handling or testing of the previous two (2) specimens. Test results shall be submitted to the Engineer for review and acceptance.

One additional test cylinder will be taken during cold weather and be cured on site under same conditions as concrete it represents.

Strength level of concrete will be satisfactory if 90% of strength test results and averages of all sets of three consecutive strength test equal or exceed specified strengths and of individual test result is below strength by more than 500 psi.

Inspection and testing of concrete as delivered to the job site, other than compressive tests, will be performed by the Engineer. Tests for slump, air content, and any other test deemed necessary will be performed as needed. Concrete for testing will be taken from random samples. No payment will be made for concrete used for testing.

SHOP DRAWINGS:

Submit shop drawings of reinforcing steel.

Indicate reinforcement sizes, spacing, locations and quantities of reinforcing steel, bending and cutting schedules, splicing, supporting and spacing devices.

PART 2 - PRODUCTS

FORM MATERIALS:

Conform to ACI 301.

Furnish formwork as required to complete work.

2 x 4 shall be minimum size wood bracing members including those members used as edge form for slabs.

REINFORCING STEEL:

Reinforcing Steel: ASTM A615, 60 psi yield grade billet steel deformed bars; uncoated finish.

Welded Steel Wire Fabric: Plain type, ANSI/ASTM A185; in flat sheets or coiled rolls; uncoated finish.

CONCRETE MATERIALS:

Cement: ASTM C150, normal – Type 1 Portland, gray color.

Fine and Coarse Aggregates: ASTM C33.

Water: Clean and not detrimental to concrete.

ADMIXTURES:

Air Entrainment Admixture: ASTM C260.

Water-reducing, Set-controlling Admixture: ASTM C494-80. Type A (water-reducing and retarding), Type E (water-reducing and accelerating). If used, a qualified concrete technician employed by the manufacturer shall assist in proportioning concrete materials for optimum use, to advise on proper use of admixtures and adjustment of concrete mix proportions to meet job site and climatic conditions. Field inspection by employee representative during concrete placement will be required.

Fly Ash, conforming to ANSI/ASTM C618, Class F, except ignition loss, shall not exceed six percent (6%). Only one source of fly ash shall be used.

ACCESSORIES:

Bonding Agent: Agent to bond new concrete to existing concrete shall be Sondbond epoxy resin system as manufactured by Sonneborn Building Products, Inc.

Vapor Barrier: ASTM D2103, 6-mil thick clear polyethylene film.

Grouts (Non-Shrink): EPI Top 100 (Celanese Coating Co.): COLMAO-DUR or SIKASTIX 370 (SIKA Chemical Corp.): FX-75 HYDROESTER BONDING AGENT (Fox Industries) and FEL-POXY 102 (FEL-PRO Building Products, Inc.).

Construction Joints: "Dayton" 24 gage galvanized steel screen joint as shown on the drawings and shall be backed by 2 x full depth.

Expansion Joints shall be pre-molded of bituminous materials manufactured in accordance with the latest edition of ASTM standards. The joints shall run the full depth of the concrete. Non-extruding joint material shall be used in all exterior applications.

Form Release Agent: Colorless material which will not stain concrete, absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.

Waterstop: Waterstop-RX (coiled rope containing sodium bentonite) or PVC understop, 3/8" x 12", ribbed with center bulb.

Anchors: Where permitted, shall be Hilti HVA Adhesive, or equal.

CURING MATERIALS:

Water: Clean and drinkable.

Absorptive Mat: Burlap-polyethylene, 8 oz./S.Y., bonded to prevent separation during use.

Absorptive Mat: Burlap fabric.

Membrane Curing Compound: ASTM C309. Material providing water retention not exceeding loss of 0.55 kg/m_2 when tested in accordance with ASNI/ASTM C156-80. Master Builders Masterseal or equal.

CONCRETE MIX:

Selection of Proportions: General – Concrete shall be composed of Portland Cement, 211.1-78 aggregate, water, fly ash, admixtures, and air-entraining admixture. Proportions of ingredients shall produce concrete that will work readily into corners and angles of forms, bond to reinforcement, without segregation or excessive bleed water forming on the surface. Proportioning of materials shall be in accordance with ACI 211.1-78, "Recommended Practices for Selecting Proportions for Normal, Heavy and Mass Weight Concrete".

Concrete mix for each strength of concrete required shall be submitted to Engineer for approval.

1. Proportions of ingredients shall be selected by past field experience or, in lieu of past performance; laboratory trail mixes to produce placability, durability, specified strength and properties specified.

   (a) Maximum water-cement ratio: 0.45

   (b) Minimum cement content:

Coarse Aggregate No.	#per C.Y.
467 (1 ½" maximum)	517
57 (1" maximum) or	
67 (3/4" maximum	564

Compressive strength of all concrete: 28 days; 4000 PSI

Air Entrainment:

Concrete subject to exposure shall be air-entrained. Total air content required (air-entrained and entrapped air) shall be:

Normal Max. Size Coarse Aggregate	Total Air Content
¾" (19 mm)	7% +/- 1
1" (25 mm)	6% +/- 1
1 ½" (38 mm)	5% +/- 1

1. Air content shall be measured by ANSI/ASTM C231-78, "Standard Test Method for Air Content of Freshly Mixed Concrete by Pressure Method".

2. Maximum total air content on troweled flatwork receiving a surface hardener shall be 3%.

Slump:

1. 1" minimum

2. Slabs, beams, walls, columns, 4" maximum

3. Footings, 3" maximum

4. Flowable concrete, with prior written approval from the Engineer, 8" slump, not to exceed 10".

Aggregate Size:

Maximum size of coarse aggregate shall not exceed:

1. One-fifth narrowest dimension between forms.

2. Three-fourths minimum clear spacing between reinforcing bars.

3. One-third the thickness of slabs.

Temperature:

When concreting at temperatures above 35° F, the aggregates or water shall be heated or cooled if necessary prior to being placed in the mixer so that the temperature of the resultant mixture will not be less than 50° F at the time of placement. If heating is required, the apparatus used shall heat the mass uniformly and shall be so arranged as to preclude the possible occurrence of overhead areas which might injure the concrete.

When concreting is authorized at temperatures 35° F or less, the Engineer will require the water or the aggregates or both to be heated to not less than 70° F nor more than 150° F. The temperature of the mixed concrete shall not be less than 60° F or more than 90° F at the time of placing.

STONE BASE:

Stone base for slab-on-grade, minimum 6" compacted thickness, shall be crushed run stone, Tennessee Department of Transportation, Class "B" aggregate, Grading "D" compacted to 75% of as-placed volume. Stone base under basin slabs shall be compacted per Soils Report.

PART 3 – EXECUTION

FORMWORK ERECTION:

Examine the drawings carefully and provide all recesses and all openings of the sizes and shapes required or as may be directed by the Engineer for the installation of all work requiring openings. Furnish all forms of the size and shapes necessary except where sleeves are specified under other sections of the specifications.

Section 4.1.3 of the standard specifications is revised to permit forms of footings to be omitted when the soil and the workmanship permit accurate excavation to size and if omission is approved by the Engineer.

Removal of forms shall be done in a manner which will assure complete safety of the structure. In no case shall the supporting forms or shoring be removed until the members have acquired sufficient strength to support their weight and the loads thereon safely. Remove forms of exposed concrete carefully without injury to lines and edges.

REINFORCEMENT:

Place reinforcement and support to prevent displacement.

Reinforcing splices shall have minimum lap of 30 diameters.

All welded wire fabric shall be placed in accordance with Section 5.5.4 of the standard specifications.

PLACING CONCRETE:

Notify Engineer a minimum of 24 hours prior to commencement of concreting operations.

Unless authorized in writing by the Engineer, mixing and concreting operations shall be discontinued when a descending air temperature in the shade and away from artificial heat reaches 40° F, and not resumed until an ascending air temperature in the shade and away from artificial heat reaches 35° F.

Preparation – Contractor shall provide access for delivery, provide sufficient equipment and manpower to rapidly place all concrete.

Framework shall have been completed and snow, ice, water, debris removed from within forms.

Expansion joint materials, anchors and all embedded items shall have been positioned.

Sub-grades shall be sprinkled sufficiently to eliminate water loss from concrete if vapor barrier is not required.

Install vapor barrier under all floor slabs on grade. Lap joints minimum 6 inches. Install one layer of vapor barrier continuously under all slabs on grade. Lap joints 6 inches. Turn up membrane at vertical surfaces full thickness of slab, and lap separate strip of membrane to provide double thickness. Seal around all pipes and conduits penetrating the membrane in accordance with the membrane manufacture's recommendations. Do not disturb vapor barrier while placing reinforcement.

All exterior construction joints must have a water stop installed when the construction joint is below grade.

Concrete shall not be placed on frozen ground.

Conveying – Concrete shall be placed rapidly by methods to prevent segregation or loss of quality.

Placement – Concrete shall be deposited continuously or, when continuous placement is not possible, construction joints shall be located as approved by Engineer. Concrete shall be placed as nearly as possible to its final position. Avoid rehandling.

1. Concrete shall be consolidated by vibration, spading, rodding, or forking. Work concrete around reinforcement embedded items and into corners; eliminate air or stone pockets and other causes of honeycombing, pitting or planes of weakness.

2. Internal vibration shall have a minimum frequency of 8000 v/min. with amplitude to consolidate effectively.

    a. Vibrators shall be operated by competent workers.

    b. Use of vibrators to transport concrete will not be allowed.

    c. Vibrators shall be inserted and withdrawn approximately every 18 inches for 5 to 15 seconds each time.

Saw cut control joints at an optimum time after finishing. Cut slabs with 3/16" thick blade, cutting ¼ of depth of slab thickness.

Separate exterior slabs on grade from vertical surfaces by turning up 6-mil poly V.B.

Sections of walls shall be maximum of 30 feet between construction joints with placement within each section made continuously to produce a monolithic unit. At least 48 hours should elapse between castings of adjoining units.

Wall sleeves shall be used in locations where piping and conduits pass through concrete walls and shall be caulked watertight.

FINISHES (CAST-IN-PLACE STRUCTURES):

Finish for walls, sidewalks, equipment pads and curbs shall be broom finish.

Interior slabs shall receive a steel troweled finish. This does not apply to slabs inside basins, but to slabs inside buildings.

All formed concrete shall be "smooth form finished" as defined by Section 10.2.2 of ACI 301-72. All tie holes and defects shall be patched and fins completely removed. All interior (including areas under water level) and all exposed exterior surfaces above grade shall receive two coats of Thoroseal, or equal. All exposed exterior surfaces above grade shall receive one coat of Thorosheen, or equal.

TOLERANCES:

Surfaces which are to receive troweled finish or broom finish shall be built to a true plane within 1/8 inch in 10 feet as determined by a 10 foot straightedge placed anywhere on the slab in any direction.

Surfaces which are to receive scratched finish or floated finish shall be built to a true plane within ¼ inch in 10 feet as determined above.

CURING AND PROTECTION:

Immediately following placement, concrete shall be protected from premature drying, hot and cold temperatures, rain, flowing water and mechanical injury.

Material and method of curing shall be approved by Engineer. Final curing shall continue for not less than 7 days.

1. Approved methods include: ponding or continuous sprinkling, continuous wet mats, sand kept continuously wet and liquid membrane-forming compounds.

    a. Applications of waterproof sheet material shall conform to ANSI/ASTM C171-69 (Re-approved 1975), "Standard Specification for Sheet Materials for Curing Concrete".

        1. Material shall maintain a maximum moisture loss of 0.55 kg/m2 tested in accordance with ASTM/ASTM C156-80, "Standard Test Method for Water Retention by Concrete Curing Materials".

    b. Application of membrane-forming compounds shall conform to ANSI/ASTM C309-81, "Standard Specifications for Liquid Membrane-Forming Compounds for Curing Concrete"., Master-Seal", manufactured by Master Builders, or equal.

CONCRETE GROUT:

Grout shall be mixed in quantities as needed and shall not be retempered or used after it has begun to set. The grout shall consist of one part Portland Cement (Portland Cement, AASHTO Spec. M-85) and two parts of sand by volume mixed with sufficient water to form a grout of proper consistency. Ehen non-shrinking or non-shrinking fast setting grout is used, it shall be formulated by the incorporation of an admixture, or a pre-mixed grout may be used. The formulation and the admixture or the pre-mixed grout used will be subject to the approval of the Engineer, and shall be mixed and used in accordance with the recommendations of the manufacturer. Water for the grout shall be clean and free from silt or suspended solids. Bonding agent shall be used to bond grout on existing concrete.

SAND:

Sand for grout shall be uniformly graded from coarse to fine within the following limits (TN D.O.T. 903.02)

Sieve Size	Total Percent Passing by Weight
No. 8	100
No. 50	15-40
No. 100	0-10
No. 200	0-5

PART 4 - PAYMENT

Concrete Work shall be included in lump sum price for project.

END OF SECTION 03001

SECTION 05500 METAL FABRICATIONS

PART 1 – GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specifications, apply to work of this Section.

SUMMARY:

This section includes the following metal fabrications:

Miscellaneous Steel Trim

Aluminum Bar Gratings and Support Systems

Aluminum Pipe Railings

Aluminum Stairs

Steel Equipment Supports

Anchors for Masonry Work

Access Platforms

Weir troughs and supports

Miscellaneous Metals

DEFINITIONS:

Definitions in ASTM E 985 for railing-related terms apply to this section.

SYSTEM PERFORMANCE REQUIREMENTS:

Structural Performance of Handrails and Railing Systems: Design, engineer, fabricate, and install handrails and railing systems to comply with requirements of International Building Code for Occupant load No Greater than 50.

Aluminum Grating: Capable of withstanding a uniform load of 200 lbf per sq. ft. with a maximum deflection of ¼".

SUBMITTALS:

General: Submit the following in accordance with Conditions of Contract and Division 1 Specifications Section.

Product Data for products used in miscellaneous metal fabrications, including paint products and grout.

Shop Drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other sections.

Where installed metal fabrications are indicated to comply with certain design loadings, include structural computations, material properties, and other information needed for structural analysis that has been signed and sealed by the qualified professional engineer who was responsible for their preparation.

PROJECT CONDITIONS:

Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit, by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of Work.

SEQUENCING AND SCHEDULING:

Sequenced and coordinate installation of wall handrails as follows:

Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.

Mount handrails only on gypsum board assemblies reinforced to receive anchors, and where the location of concealed anchor plates has been clearly marked for benefit of Installer.

PART 2 - PRODUCTS:

FERROUS METALS:

Metal Surfaces, General: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.

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

Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

Concrete Inserts: Threaded or wedge type; stainless steel. Provide bolts, washers, and shims as required.

ALUMINUM:

See Specifications Below:

FASTENERS:

General: Provide stainless steel fasteners. Select fasteners for the type, grade, and class required.

PAINT:

Shop Primer for Ferrous Metal: See Section 09900 of these Specifications.

Field Coat for Ferrous Metal: See Section 09900 of these Specifications.

FABRICATION, GENERAL:

Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated and specified for various components of each metal fabrication.

Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

Remove sharp or rough areas on exposed traffic surfaces.

Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware, screws, and similar items.

Fabricated joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

MISCELLANEOUS FRAMING AND SUPPORTS:

General: Provide framing and supports for applications indicated or which are not part of structural framework, as required to complete work.

Panel Supports: Aluminum frames are to be furnished made of 3" x 3" x ¼" aluminum angles that will support the equipment control panel, disconnects, etc. that will allow the panels (or boxes) to be mounted approximately 4 feet above ground.

Fabricated units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitered joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

METAL BAR GRATINGS:

Aluminum grating shall be fabricated of I-shaped bars, alloy 6063-T6, with swaged cross bars spaced on 4" centers. Bearing bars shall be spaced on 1 3/16" centers. Top surface of bearing bars shall be striated to provide a non-slip surface.

Grating shall be designed to support a uniform load of 200 pounds per square foot with a maximum deflection of 1/4". The maximum fiber stress shall not exceed that which is allowed by the Aluminum Association.

Standard installation clearances and tolerances shall conform to the requirements of the current Metal Bar Grating Manual published by the National Association of Architectural Metal Manufacturers.

Aluminum frames embedded in concrete shall incorporate a recess under the horizontal bearing leg to receive the hold down fasteners. The frames shall be TF1.25A thru TF2.50A as manufactured by Thompson Fabricating, LLC (Birmingham, AL), or equal.

Install aluminum clamps or clips to anchor the grating securely to supports. A minimum of 4 fasteners per panel shall be provided, unless otherwise shown on the drawings.

Cutouts for circular obstructions are to be at least 2" larger in diameter than the obstruction. Cutouts for all piping 2" in diameter or less shall be made in the field. Band all ends of grating.

Aluminum shelf angles shall be anchored to the concrete using stainless steel (type 18-8) wedge anchors.

Aluminum stair treads shall be I-bar grating type with an extruded aluminum corrugated nosing.

Paint all aluminum surfaces in contact with concrete or dissimilar metals with a shop coat of bituminous paint.

Coordination:

Arrange supports for stairs, grating and other to allow for operation of any equipment or installation of piping as shown. Fabricate cutouts_ in grating sections for penetrations required (slide gates, piping, valves, etc..). Arrange layout of cutouts to permit grating removal without disturbing items penetrating gratings.

Gratings shown between structures, and at the location where it meets the clarifier walkway, shall be completed in such a manner to allow for smooth transition and result in a secure walkway with no voids or gaps.

Edge band openings in grating that interrupt 4 or more bearing bars of same size and material as bearing bars.

Do not notch bearing bars at supports to maintain elevation.

ALUMINUM GUARDRAILS, HANDRAILS, AND RAILINGS:

All guardrails, handrails and railings shall meet the design specifications for Factory-Industrial Guardrail, International Building Code for Occupant Load No Greater Than 50. They shall also meet OSHA Specifications.

Guardrails and Handrails shall be the product of a company normally engaged in the manufacture of pipe railing. Railings shall be shop assembled in lengths not to exceed 24 feet for field erection.

The handrail shall be made of pipes joined together with component fittings. Samples of all components, bases, toe plate and pipe must be submitted for approval at the request of the engineer. Components that are pop-riveted or glued at the joints will not be acceptable. All components must be mechanically fastened with stainless steel hardware. Handrail and components shall be TUFRAIL, as manufactured by Thompson Fabricating, LLC (Birmingham, Alabama) or equal.

Railings shall be 1 1/2" Schedule 40 aluminum pipe alloy 6105-T5, ASTM-B-429 or ASTM-B-221. Post shall be 1 1/2" Schedule 40 aluminum pipe of the same alloy. Post spacing shall be a maximum of 6'-0".

Guardrails and Handrails shall be designed to withstand a 200lb concentrated load applied in any direction and at any point on the top rail. Guardrails and Handrails shall also be designed to withstand a uniform load of 20 lb/ft applied horizontally to the top rail. Uniform loads are not to be applied simultaneously with the concentrated loads.

Intermediate railings shall be provided such that a 21-inch diameter sphere cannot pass through any opening.

Intermediate railings shall be designed to withstand a horizontally applied normal load of 50lb on an area not to exceed one square foot including openings and spaces between rails.

The manufacturer shall submit calculations for approval at the request of the Engineer. Testing of base castings or base extrusions by an independent lab

or manufacturer's lab (if manufacturer's lab meets the requirements of the Aluminum Association) will be an acceptable substitute for calculations. Calculations will be required for approval of all other design aspects.

Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations (OSHA 1910.23). The top surface of the top railing shall be smooth and shall not be interrupted by projected fittings.

The mid-rail at a corner return shall be able to withstand a 200lb load without loosening. The manufacturer is to determine this dimension for their system and provide physical tests from a laboratory to confirm compliance.

Concrete anchors shall be stainless steel type 303 or 304 wedge anchors and shall be furnished by the handrail manufacturer. The anchor design shall include the appropriate reduction factors for spacing and edge distances in accordance with the manufacturers published data.

Toeboard shall conform to OSHA standards. Toeboard shall be a minimum of 4" high and shall be an extrusion that attaches to the posts with clamps that will allow for expansion and contraction between posts. Toeboard shall be set 1/4" above the walking surface. Toeboards shall be provided on handrails as required by OSHA and/or as shown on drawings. Toeboards shall be shipped in stock lengths for field installation.

A self-closing gate shall guard Openings in the railing (OSHA 1910.23). Safety chains shall not be used unless specifically shown on the drawings.

Finish shall be Aluminum Association M10-C22-A41 (215-R1). The pipe shall be plastic-wrapped. The plastic wrap is to be removed after erection.

Aluminum surfaces in contact with concrete, grout or dissimilar metals will be protected with a coat of bituminous paint, Mylar isolators or other approved material.

PART 3 – EXECUTION:

PREPARATION:

Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

Set sleeves in concrete with tops flush with finish surface elevations; protect sleeves from water and concrete entry.

INSTALLATION - GENERAL:

Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connections as required. All anchorage devices and fasteners shall be coordinated with tank supplier so that no damage is done to tank and the tank can be designed to accommodate the loading and stresses.

Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

Provide temporary bracing or anchors in framework for items that are to be built into concrete, masonry or similar construction.

Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with heavy cot of bituminous paint or zinc chromate primer.

INSTALLATION OF METAL BAR GRATING:

General: Install gratings to comply with recommendations of NAAMM grating standard referenced under Part 2 that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.

Secure removable units to supporting members with type and size of clips and fasteners indicated, or if not indicated as recommended by grating manufacturer for type of installation conditions shown.

Secure nonremovable units to supporting members by welding where both materials are the same; otherwise, fasten by bolting as indicated above.

INSTALLATION OF RAILINGS AND HANDRAILS:

Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loadings. Plumb posts in each direction. Anchor posts and railing ends in concrete with grout.

Field fabrication of the railing system is not permitted.

Set handrails plumb within 1/8" of vertical and align horizontally to within 1/8" in 12 feet.

Install wedge anchors to proper depth to develop full pullout and shear values. Check all fasteners and bolts in base connections and splices for tightness.

Adequate provisions for expansion and contraction shall be incorporated into the rails. Expansion joints shall be placed at 60 foot intervals and at all concrete expansion joints.

Toeboards shall be shipped loose and attached to the handrail in the field. Attachment to the posts will be made with clamps which allow for expansion and contraction while maintaining a straight line.

All defective, damaged or otherwise improperly installed handrails shall be removed and replaced with material which complies with this section at no additional cost to the Owner.

Following installation, aluminum handrail shall be cleaned with mild soap and clean water. Acid solutions, steel wool, or harsh abrasives shall not be used.

PAYMENT:

Payment for any metal fabrications will be part of lump sum price for project.

END OF SECTION 05500

SECTION 09900
PAINTING

PART 1 – GENERAL

WORK INCLUDED:

This specification covers preparation of surfaces, performance and completion of painting of all surfaces as required by the drawings and as specified herein.

SYSTEM DESCRIPTION:

Performance Requirements: Include the following performance data as certified by a qualified testing laboratory:

1. Abrasion – ASTM D 4060, CS-17 Wheel, 1,000 grams load.
2. Adhesion – ASTM D 3359 Method B.
3. Exterior Exposure – Exposed at 45 degrees facing ocean (Atlantic Sea Coast)
4. Hardness – ASTM D 3363-74
5. Humidity – ASTM D 2247-68
6. Salt Spray (FOG) – ASTM B 117-73

QUALITY ASSURANCE:

All materials specified herein meet the current regulations in effect for the emission of Volatile Organic Compounds (V.O.C.) for the State and Federal Governments.

Coating materials specified in contact with Potable Water must be approved in writing by both the State of Tennessee Division of Water and by the current Federal regulatory authority in effect at the time of application.

DELIVERY, STORAGE AND HANDLING:

All materials shall be delivered to jobsite in original sealed and labeled containers of the paint manufacturer.

PROJECT/SITE CONDITIONS:

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.

PART 2 – PRODUCTS

MATERIAL QUALITY:

Provide best quality grade of various types of coatings and regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.

Federal specifications establish minimum acceptable quality for paint materials. Provide written certification from paint manufacturer that materials provide, meet or exceed these minimums.

Manufacturer's products which comply with coating quantitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to Designer. Furnish material data and manufacturer's certificate of performance to Design for any proposed substitutions.

Provide undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

MATERIALS:

Where brand names are used in this section, they are used as a general descriptive reference only. Use of other brands of equal quality and performance will be permitted.

Colors, where not specified, shall be as selected by the Engineer.

PART 3 – EXECUTION

EXAMINATION:

Examine surfaces prior to surface preparation and determine if they are suitable to proceed in accordance with paint manufacturers recommendations. Commencement of application implies acceptance of substrate and responsibility thereof.

SURFACE PREPARATION:

General:

Prepare surfaces in accordance with coating system's specifications. Surfaces shall be cleaned. Touch up welds, burned and abraded areas with specified primer before applying field coats.

Allow each coat to dry thoroughly before applying next coat.

Finish coats shall be uniform in color and sheen without streaks, laps, sags or missed areas. Primer and finish coats shall be furnished from the same manufacturer to ensure compatibility.

All surface preparation and repairs shall be approved by the Engineer/Owner before primer is applied.

Correct work that is not acceptable and request re-inspection.

Steel, Non-Immersion Service – Structural, Tanks, Pipes, and Equipment:

To be prepared in accordance with Steel Structures Painting Council recommendations for an SSPC-SP6 Commercial Blast Cleaning.

Steel, Immersion Service – Structural, Tanks, Pipes and Equipment, and Mill Coated Steel Pipe:

To be prepared in accordance with Steel Structures Painting Council recommendations for an SSPC-SP10 Near-White Blast Cleaning.

Metal Anchorage for Buried Piping:

To be prepared in accordance with Steel Structures Painting Council recommendations for an SSPC-SP3 Power Tool Clean.

Factory Primed Steel and Mill Coated Steel Pipe (Non-Immersion):

Surface shall be clean and dry.

Concrete, Dense Masonry and Porous Masonry:

Exterior, Non-Immersion – Surface shall be clean and dry. New concrete will be cured a minimum of 28 days.

Immersion – Brush-Off Blast. New concrete will be cured minimum of 28 days. Fill flush all bug holes and voids with TNEMEC or Thoroseal or other filler and surfacer product compatible with finish coat, or equal.

Plaster, Wallboard, Wood and Insulated Pipe:

Interior/Exterior – Surface shall be clean and dry.

APPLICATION:

Materials shall be mixed, thinned and applied according to the manufacturer's printed instructions and in accordance with AWWA D 102-78.

CLEANUP:

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

PROTECTION:

Request acceptance of each coat before applying succeeding coats.

Correct work that is not acceptable and request re-inspection.

PAINTING SCHEDULE:

Steel – Structural, Tanks, Pipes and Equipment:

1. Exterior, Non-Immersion

   1st Coat: Apply Tnemec Series 66-1255 Hi-Build Expoxoline at 4.0-6.0 mils DFT, or equal.

   2nd Coat: Apply Tnemec Series 73-Color Endura-Shield III at 3.0-5.0 mils DFT, or equal.

2. Immersion, Potable or Non-Potable Water

   1st Coat: Apply Tnemec Series 66-1255 Hi-Build Expoxoline (*) at 3.0-5.0 mils DFT, or equal.

   2nd Coat: Apply Tnemec Series 66-Color Hi-Build Epoxoline (*) at 4.0-6.0 mils DFT, or equal.

   * Use Tnemec Series 20 Poto-Pox in Potable Water, or equal.

3. Immersion, Non-Potable water with high levels of Hydrogen Sulfide (Pump Stations)

   1st Coat: Apply Tnemec Series 120-5002 Vinester at 12.0-18.0 mils DFT, or equal.

   2nd Coat: Apply Tnemec Series 120-5001 Vinester at 12.0-18.0 mils DFT, or equal.

4. Interior, Non-Immersion

   1st Coat: Apply Tnemec Series 66-1255 Hi-Epoxoline at 3.0-5.0 mils DFT, or equal.

   2nd Coat: Apply Tnemec Series 66-Color Hi-Build Epoxoline at 4.0-6.0 mils DFT, or equal.

5. Metal Anchorage for Buried Piping

   1st Coat: Apply Tnemec Series 46-450 Heavy TnemeCol at 13.0-16.0 mils DFT, or equal.

6. Miscellaneous Castings, Including Manhole Rings and Covers

   One Coat: Apply Tnemec Series 46H-413 Hi-Build Tneme-Tar at 12.0-16.0 mils DFT, or equal.

7. Factory Primed

   Intermediate Coat: Apply Tnemec Series 50-330 Poly-Ura-Prime at 2.0-3.0 mils DFT, or equal.

   Finish Coat: See top coat for exposure. System 3.06 A. 1,2,4, or 6.

Mill Coated Steel Pipe:

1. Exterior of Pipe, Non-Immersion

   1st Coat: Apply Tnemec Series 66-1255 Hi-Build Expoxoline at 4.0-6.0 mils DFT, or equal.

   2nd Coat: Apply Tnemec Series 73-Color Endura-Shield III at 3.0-5.0 mils DFT, or equal.

2. Immersion, Potable or Non-Potable Water

   1st Coat: Apply Tnemec Series 66-1255 Hi-Build Expoxoline (*) at 3.0-5.0 mils DFT, or equal.

   2nd Coat: Apply Tnemec Series 66-Color Hi-Build Epoxoline (*) at 4.0-6.0 mils DFT, or equal.

   * Use Tenemec Series 20 Poto-Pox in Potable Water, or equal.

Concrete: No coatings are required for Floors and sidewalks. See Section 03001 for additional specifications.

Porous Masonry:

1. Exterior

   Primer: Sherwin-Williams Heavy Duty Block Filler, B42W46, 10 mils DFT, or equal.

   Finish: Two (2) coats Sherwin-Williams A-100 Satin Latex House and Trim, 1.5 mils DFT, or equal.

2. Interior

   Primer: Apply Sherwin-Williams Pro Mar 200 Latex Wall Primer, 1.1 mils DFT, or equal.

   Finish: Apply two (2) coats of Sherwin-Williams Pro Mar 200 Alkyd Semi-Gloss Enamel, 17 mils DFT, or equal.

Plaster and Wallboard:

1. Interior

   Primer: Apply Sherwin-Williams Pro Mar 200 Latex Wall Primer, 1.1 mils DFT, or equal.

   Finish: Apply two (2) coats of Sherwin-Williams Pro Mar 200 Alkyd Semi-Gloss Enamel, 17 mils DFT, or equal.

Wood:

1. Interior

   Primer: Apply Sherwin-Williams Pro Mar 200 Latex Wall Primer, 1.1 mils DFT, or equal.

   Finish: Apply two (2) coats of Sherwin-Williams Pro Mar 200 Alkyd Semi-Gloss Enamel, 17 mils DFT, or equal.

2. Exterior

   Primer: Apply Sherwin-Williams A-100 Exterior Wood Primer, Y24W20, 2.2 mils DFT, or equal.

Finish: Apply two (2) coats of Sherwin Williams Pro Mar Alkyd Flat House Paint, 1.8 mils DFT, or equal.

Insulated Pipe:

1. Interior

   1st Coat: Apply Tnemec Series 6/7-Color Tneme-Cryl at 2.0-3.0 mils DFT, or equal.

   2nd Coat: Apply Tnemec Series 6/7-Color Tneme-Cryl at 2.0-3.0 mils DFT, or equal.

Non-Ferrous Metals:

1. Interior

   One Coat: Apply Tnemec Series 66-Color Hi-Build Epoxoline at 4.0-6.0 mils DFT, or equal.

2. Exterior

   1st Coat: Apply Tnemec Series 66-1255 Hi-Build Expoxoline at 4.0-6.0 mils DFT, or equal.

   2nd Coat: Apply Tnemec Series 73-Color Endura-Shield III at 3.0-5.0 mils DFT, or equal.

END OF SECTION 09900

SECTION 11220 – SECONDARY SLUDGE PUMPS

PART 1 – GENERAL:

SCOPE:

This section describes the work to be done related to the installation of three new pumps in the existing secondary sludge pump station. The existing 3 pumps are to be removed and new ones installed on the same guide rails and then reconnected to the existing control panels. These are operated with variable speed drives.

The same brand that was installed when this station was originally constructed is specified. Other brands with equal performance and quality will be accepted. However, any rework that is necessary for an alternate brand will not be considered for payment.

The contractor is to furnish all materials, labor, equipment, permits and other things necessary for the sewage pump station work described in these specifications and/or as shown on drawings.

ALTERNATES:

Bid Alternate #1 is to deduct the installation of the pumps. The contractor would furnish the pumps and accessories and the Owner would install.

Bid Alternate #2 is to deduct the furnishing of the three pumps and accessories.

Alternate #3 is not related to the pumps. See section 1000.

PART 2 – MATERIALS:

PUMPS

Contractor is to furnish all labor, materials, equipment and incidentals required for replacement of three (3) sewage pumps in the existing pump station.

PUMPS: Each pump shall be rated 1.5 H.P., 230 volts, 3 phase, 60 hertz, and 6.75" impeller. The unit shall produce 200 GPM at 11.3 ft TDH and be able to pump 80 GPM at 11.1 ft TDH. The pumps shall be Hydromatic model S4H, or equal.

Each pump shall be equipped with stainless steel nameplate.

The pump shall be capable of handling a 3" solid. The pump shall be non-overloading throughout the entire range of operation without employing service factor. The pump shall reserve a minimum service factor of 1.20. The performance curve submitted for approval shall state in addition to head and capacity performance, the pump efficiency, solid handling capacity, and reflect motor service factor.

CONSTRUCTION

The pump shall be a centrifugal, solids handling, submersible, wastewater type, model S4H as manufactured by Hydromatic Pump, or equal. The pump volute, motor and seal housing shall be high quality gray cast iron, ASTM A-48, Class 30. The pump discharge shall be fitted with a 4" standard ASA 125 lb. flange, faced and drilled. All external mating parts shall be machined and Nitrile O-ring (or equal) sealed on a beveled edge. Gaskets shall not be acceptable. All fasteners exposed to the pumped liquids shall be 300 series stainless steel.

ELECTRICAL POWER CORD

Electrical power cord shall be SOOW, W, or GGC, water resistant 600V, 90°C, UL and CSA approved and applied dependent on amp draw for size.

The pump shall be triple protected with a compression fitting and two epoxy potted areas at the power cord entry to the pump. A separation between the junction box area of the pump and the motor by a stator lead sealing gland or terminal board shall not be acceptable.

The power cable entry into the cord cap assembly shall first be made with a compression fitting. Each individual lead shall be stripped down to bare wire at staggered intervals, and each strand shall be individually separated. This area of the cord cap shall then be filled with an epoxy compound potting which will prevent water contamination to gain entry even in the event of wicking or capillary action.

The power cord leads shall then be connected to the motor leads with extra heavy connectors having brass inserts with a screwed wire-to-wire connection, rather than a terminal board that allows for possible leaks.

The connection box wiring shall be separated from the motor housing wiring by stripping each lead down to bare wire, at staggered intervals, and separating each strand. This area shall be filled with an epoxy compound potting. Fiberglass terminal boards, which are subject to heat fatigue and cracking and which may lead to possible leaks, shall not be acceptable.

The cord cap assembly where bolted to the connection box assembly and the connection box assembly where bolted to the motor housing shall each be sealed with a Nitrile O-ring, or equal on a beveled edge to assure proper sealing.

MOTOR

The stator, rotor and bearings shall be mounted in a sealed submersible type housing. The stator windings shall have Class F insulation (155°C or 311°F) or Class H insulation (180°C or 356°F) and a dielectric oil-filled motor, NEMA B design. Further protection shall be provided by using on-winding thermal sensors. Because air-filled motors do not dissipate heat as efficiently as oil-filled motors, air-filled designs shall not be acceptable.

The pump and motor shall be specifically designed so that they may be operated partially or completely submerged in the liquid being pumped. The pump shall not require cooling water jackets. Dependence upon, or use of, water jackets for supplemental cooling shall not be acceptable.

Stators shall be securely held in place with a removable end ring and threaded fasteners so they may be easily removed. No special tools shall be required for pump and motor disassembly.

Pump shall be equipped with heat sensors. The heat sensor shall be a low resistance, bi-metal disc that is temperature sensitive. It shall be mounted directly on the stator windings and sized to open at 120°C and automatically reset at 30–35°C differential. The sensors shall be connected in series with motor starter coil so that the starter shall be equipped with 3 leg overload heaters, making all normal overloads protected by the starter.

BEARINGS AND SHAFT

An upper radial bearing and a lower thrust bearing shall be required. These shall be heavy-duty single row ball bearings that are permanently lubricated by the dielectric oil that fills the motor housing. Double row, sealed grease packed bearings shall not be acceptable. Bearings that require lubrication according to a prescribed schedule shall not be acceptable. The upper radial bearing and lower thrust bearing shall have a minimum B-10 life of 50,000 hours.

The shaft shall be machined from a solid 400 series stainless steel forging and be a design that is of large diameter with minimum overhang to reduce shaft deflection and prolong bearing life.

SEALS

The pump shall have two mechanical seals, mounted in tandem, with an oil chamber between the seals. Type 21 seals shall be used with the rotating seal faces being carbon and the stationary seal faces to be ceramic. The lower seal shall be replaceable without disassembly of the seal chamber and without the use of special tools. Pump-out vanes shall be present on the backside of the impeller to keep contaminates out of the seal area. Units that require the use of tungsten-carbide seals or foreign manufactured seals shall not be acceptable.

The pump shall be equipped with a seal leak detection probe and warning system. This shall be designed to alert maintenance personnel of lower seal failure without having to take the unit out of service for inspection or requiring

access for checking seal chamber oil level and consistency.

There shall be an electric probe or seal failure sensor installed in the seal chamber between the two tandem mechanical seals. If the lower seal fails, contaminants that enter the seal chamber shall be detected by the sensor, which sends a signal to operate the specified warning device.

Units equipped with opposed mechanical seals shall not be acceptable.

IMPELLER

Impeller shall be of the mono-vane or two-vane, enclosed solids handling design and have pump-out vanes on the front and backside of the impeller to prevent grit and other materials from collecting in the seal area. Impeller shall not require coating. Because most impeller coatings do not remain beyond the very early life of the impeller, efficiency and other performance data submitted shall be based on performance with an uncoated impeller. Attempts to improve efficiency by coating impeller shall not be acceptable.

Impellers shall be dynamically balanced. The tolerance values shall be listed below according to the International Standard Organization grade 6.3 for rotors in rigid frames. The tolerance is to be split equally between the two balance planes that are the two impeller shrouds.

RPM	Tolerance
3500	.01 in. – oz./lb. of impeller weight
1750	.02 in. – oz./lb. of impeller weight
1150	.026 in. – oz./lb. of impeller weight
870	.03 in. – oz./lb. of impeller weight

The impeller shall be threaded shaft or tapered shaft and key driven. A 300 series stainless steel washer and impeller bolt shall be used to secure the impeller to the shaft for both threaded and tapered shafts. Straight end shafts for attachment of the impeller shall not be acceptable.

CASING

The casing shall be of the end suction volute type having sufficient strength and thickness to withstand all stress and strain from service at full operating pressure and load. The casing shall be of the centerline discharge type equipped with an automatic pipe coupling arrangement for ease of installation and piping alignment. The design shall be such that the pumps will be automatically connected to the discharge piping when lowered into position with the guide rails. The casing shall be accurately machined and bored for register fits with the

suction and casing covers.

A volute case wear ring shall be provided to minimize impeller wear. The wear ring shall be 85-5-5-5 red brass or 80-10-10 bronze, ASTMB-43 and held by 300 series stainless steel fasteners. The wear ring shall be easily replaceable in the field. Wear rings of any other material shall not be acceptable.

SERVICEABILITY

The complete rotating assembly shall be capable of being removed from the volute without disturbing the suction piping, discharge piping, and volute. The motor housing, seal housing with seal plate and impeller still attached to the shaft shall be capable of being lifted out of the volute case from the top as one assembly.

SUPPORT

Though the pump may not require feet to support the unit while installed, the pump volute must have feet to support the unit when removed for service. Units that do not have feet upon which the unit can be supported when removed for service shall not be acceptable.

TESTING

Commercial testing shall be required and include the following:

- The pump shall be visually inspected to confirm that it is built in accordance with the specification as to HP, voltage, phase and hertz.

- The motor seal and housing chambers shall be meggered for infinity to test for moisture content or insulation defects.

- Pump shall be allowed to run dry to check for proper rotation.

- Discharge piping shall be attached, the pump submerged in water, and amp readings shall be taken in each leg to check for an imbalanced stator winding. If there is a significant difference in readings, the stator windings shall be checked with a bridge to determine if an unbalanced resistance exists. If so, the stator shall be replaced.

- The pump shall be removed from the water, meggered again, dried and the motor housing filled with dielectric oil.

Optional testing available: Megger Test, Hydrostatic Test, Non-Witnessed Hydraulic Institute Performance Test.

PAINT

The pump shall be painted with waterborne hybrid acrylic/alkyd paint. This custom engineered, quick dry paint shall provide superior levels of corrosion and chemical protection.

ELECTRICAL

All work shall be done per National Electrical Code NFPA 70, Local Ordinances, meet requirements of Tennessee Department of Environment & Conservation, conform to applicable state and local building codes, conform to Fire Protection NFPA 72, and Life Safety Code NFPA 101. Contractor shall obtain inspections and permits required. Existing Control panels shall be used. There are disconnects at the station and the controls are in the sludge press building.

RAIL SYSTEMS AND OTHER COMPONENTS IN WET WELL

The Contractor is to use the existing rail system and discharge piping in basin. The discharge flange assembly (as shown on drawings) will have to be replaced for each pump.

PART 3 – EXECUTION:

All equipment to be installed per manufacturers directions. All work to be done in accordance with plans and specifications.

PART 4 - TESTING

General:

The Contractor shall provide all labor, materials and equipment necessary for testing of each pump and shall provide a written report of testing to Owner following test. A representative of the pump company shall be present at pump start-up and verify that the pumps meet the design conditions. The Contractor shall obtain, at his Expense, all inspections required by law, ordinances, regulations or public authority having jurisdiction over the work. Such inspection reports shall be submitted to the Engineer. This includes the State of Tennessee Electrical Inspection. All control apparatus shall be properly calibrated and adjusted. The Contractor shall notify the Engineer prior to performance of tests and the Engineer shall be present. Any defects identified during the tests shall be promptly corrected and the tests repeated.

Commercial testing, at the factory, shall be required and include the following:

1. The pump shall be visually inspected to confirm that it is built in accordance with the specification as to HP, voltage, phase and hertz.
2. The stator motor leads shall be tested for integrity using a megohmeter at the highest setting.
3. Pump shall be allowed to run dry to check for proper rotation.

4. Discharge piping shall be attached; the pump submerged in water and amp readings shall be taken in each leg to check for an imbalanced stator winding. If there is a significant difference in readings, the stator windings shall be checked with a bridge to determine if an unbalanced resistance exists. If so, the stator shall be replaced.
5. The pump shall be removed from the water, megohmeter tested again, dried and the motor housing filled with dielectric oil.

Field Testing by Contractor shall be performed include the following:

6. The pump basin shall be cleaned from all construction debris or debris that may cause damage using portable pump or other method prior to testing pumps.
7. The pumps shall be visually inspected to confirm that it is built in accordance with the specification as to HP, voltage, phase and hertz.
8. Each pump shall be started using floats and run. Operating flow rate shall be calculated and compared to design points. Amperage readings shall be taken on each leg for each pump.
9. Rail system for pumps shall be checked to determine if pumps can be removed easily and that they are aligned properly.

PART 5 - WARRANTY

The pump unit or any part thereof shall be warranted against defects in material or workmanship within one year from date of installation or 18 months from date of manufacture, whichever comes first, and shall be replaced at no charge with a new or manufactured part, F.O.B. factory or authorized warranty service station. The warranty shall not assume responsibility for removal, reinstallation or freight, nor shall it assume responsibility of incidental damages resulting from the failure of the pump to perform.

PART 6 - PAYMENT

The pumps will be part of the lump sum payment for the wastewater treatment plant upgrade.

END OF SECTION

SECTION 11310 – SECONDARY CLARIFIERS

PART 1 - GENERAL

SCOPE

A. Description of Work

1. Provide all labor, material and equipment to furnish and install the circular center feed scraper collector type clarifiers as specified herein.

2. This specification covers the general requirements for the design, fabrication and installation of one (1) clarifier by Evoqua Water Technologies (formerly Siemens), or equal. Walker Process Equipment and Envirodyne Systems, Inc. appear to be acceptable manufactories of clarifier equipment.

3. All walkways, troughs, supports, etc. shall meet the requirements of Section 05500. The clarifier shall submit required stamped drawings for these components with shop drawings.

PART 2 – EQUIPMENT / MANUFACTURER

A. Work and Components Included (But Not Limited To)

1. The Equipment Manufacturer shall furnish the items listed below:

   a. Drive mechanism complete with reducer, motor, and overload device
   b. Torque tube
   c. Influent feedwell and supports
   d. Access bridge including handrailing and toe plate
   e. One(1) surface skimmer with skimmer blade
   f. One (1) scum trough and ramp
   g. Associated attachment bolts and anchor bolts for above
   h. Electrical Disconnect
   i. Effluent Weir troughs, weirs, and scum baffle with supports.

2. Like items of equipment specified herein shall be the end products of one manufacturer in order to achieve standardization for operation, maintenance, spare parts and manufacturer's service.

3. Refer to drawings and other sections of specifications for additional requirements.

B. Manufacturer

1. It is the intention of this specification to cover minimum acceptable quality for a complete installation with the exception of the motor controls, electrical work and piping requirements.

2. Part numbers or trade names are used in this specification only to facilitate the general configuration and description of the equipment desired and in no way implies that equal equipment of other manufacturers cannot be used. Products of other manufacturers will be considered in accordance with the Alternate Equipment section of this specification.

C.. Manufacturer's Experience

1. The equipment Manufacturer shall have not less than five (5) successful years experience in the design, construction and operation of the type specified at ten (10) different plants.

2. The Engineer may require evidence, in the form of operating records, from these plants to substantiate any claims concerning the ability of the equipment to perform as required.

PART 3 - SUBMITTALS

A. Operating instructions, manuals and shop drawings shall be submitted in accordance with section 1000.

B. Alternate Equipment – See Section 1000 of specifications

PART 4 EQUIPMENT MANUFACTURER'S SERVICE REPRESENTATIVE

A. Installation Assistance

1. Provide for installation assistance as required for the equipment supplied.

B. Operating Instructions and/or Operator Training

1. Provide for one (1) four (4) hour working period total to instruct plant Operators for the equipment supplied. The training period will be integrated by the Owner with overall training.

2. An additional one (1) trip not less than one-half day shall be provided for operation assistance of the equipment supplied.

PART 5 - PRODUCTS

GENERAL

A. The design and layout shown on the drawings are based on Evoqua Water Technologies Clarifier. If equipment other than that of the manufacturer shown is submitted to the Engineer for consideration as an equal, it shall be the responsibility of the Bidder wishing to make the substitution to submit with the request a revised drawing of the mechanical equipment and basin layouts acceptable to the Engineer. This revised drawing shall show the proposed location of the substitute unit, and area required for withdrawal space of replacement or serviceable components. This drawing shall also show clearances of adjacent equipment and service area required by that equipment.

B. Changes in architectural, structural, electrical, mechanical and plumbing requirements for the substitution shall be the responsibility of the Bidder wishing to make the substitution. This shall include the cost of redesign by affected designers. Any additional cost incurred by affected subcontractors shall be the responsibility of the Bidder and not the Owner.

EQUIPMENT

A. General

1. Furnish and deliver center feed scraper type sludge collectors for installation in one (1) new concrete settling tank.

    a. Tank diameter to be 48 feet.
    b. Tank side depth to be 13.5 feet (12 feet water depth).
    c. Tank freeboard to be 1.5 feet.
    d. Floor slope to be 1 inch per foot.

2. Sludge Collector Mechanism

    a. Bridge supported, side feed type with peripheral overflow.
    b. Provide a center drive mechanism that supports and rotates a torque tube to which two (2) structural steel type scraper arms are attached.
    c. A structural steel bridge shall span the tank diameter and shall support the entire collector mechanism.
    d. Fabricated steel structures shall be shipped in the largest sub-assemblies permitted by carrier regulations, properly matchmarked and identified for ease of field erection.

B. Design Criteria

1. Hydraulics shall be designed to handle:

	MIN.	AVE.	MAX.	PEAK
Influent Flow (MGD)	0.177	0.354	0.472	1.180
Return Flow (MGD)	0.177	0.354	0.472	1.180
Total Flow into Basin (MGD)	0.354	0.708	0.826	1.534
Overflow Rate (gpd/ft2)	98	196	261	652
Solids Loading Rate (lbs/ft2/Day)		9.8	11.4	21.2

2. Influent Mixed liquor Concentration of 3,000 mg/l and Secondary Effluent TSS of 20 mg/l.
3. Influent Well size 10.67 feet diameter x 4 feet deep
4. Side feed pipe diameter - 12 inch
5. Maximum influent velocity through center pier/inlet pipe – 3.29 fps
   Minimum influent velocity through center pier/inlet pipe – 0.76 fps
6. Drive to be F-20-LT, or equal
   a. Tip Speed – 7.54 ft/min.
   b. Motor horsepower: 0.50 HP.
   c. AGMA rated torque: 4,600 ft-lbs. with 1.25 service factor
   d. Speed: 0.05 RPM.

C. Structural Members

1. Structural steel to conform to ASTM A36.
2. Structural steel components shall have minimum thickness of 1/4" unless noted in the specification.
3. All welding to conform to American Welding Society Standard AWS D1.1. Structural support members shall be shop welded for bolted field assembly. No field welding shall be required
4. Design components so that stresses developed do not exceed allowable stresses, as defined by current AISC standards when designed for the AGMA rated torque.
5. Panel lengths and member sizes shall be selected such that slenderness ratios do not exceed 200 for compression and 240 for tension. For strength, the controlling member force shall be used to determine member size.
6. Maximum deflection in a span under combined live and dead loads shall not exceed L/360.

D. Drive Mechanism

1. General

a. Drive mechanism shall be completely factory assembled consisting of primary helical gear and a final worm gear reduction unit.

b. All gearing shall be enclosed in gray cast iron ASTM A-48 Class 40B housings. Fabricated steel housings, exposed gearing and submerged bearings will not be acceptable.

c. All components of the drive mechanism shall be designed in accordance with AGMA Standard 6034-B92 (February 1992) □Practice for Enclosed Cylindrical Worm Gear Speed Reducers and Gearmotors, for 24-hour continuous, uniform load duty, 20-year life at the specified output speed. The AGMA rated torque of the drive shall be the rating of the worm gear set.

d. The drive AGMA rated torque shall be as specified above with a minimum 1.25 service factor.

e. All bearings shall be designed for a minimum B-10 life of 200,000 hours.

2. Primary Reduction Unit

a. Provide commercially available heavy duty helical gear reducer or gearmotor in a cast housing.

b. All bearings shall be anti-friction type running in oil.

c. Motor shall be totally enclosed, ball bearing type, of ample power for starting and continuously operating the drive mechanism without overloading.

d. Motor to conform to NEMA standards and be suitable for operation on 240/480 volt, 3 phase, 60-Hertz current.

e. Primary reduction unit shall drive the final reduction unit through a chain and sprocket arrangement with #80L self-lubricating chain and non-corrosive OSHA approved removable chain guard.

f. Provide proper chain tension by an adjustable steel base mounted on the intermediate reduction unit.

3. Final Reduction Unit

a. Provide final reduction, cut-tooth casting, worm gear mounted on an anti-friction ball bearing assembly. Bearing balls shall be of the finest quality, high carbon, alloy steel, running on hardened steel races.

b. The bearings shall be mounted in a high strength cast iron housing.

c. A steel torque tube shall be bolted to the gear that supports the scraper mechanism.

d. The final reduction gear and the anti-friction ball bearings shall run in an oil bath within the final gear reduction housing. A ready accessible oil filling and level pipe with sight gauge shall be furnished.

e. Mount an electro-mechanical overload device on the thrust end of the worm shaft consisting of plate spring assembly, plunger, indicator dial two (2) microswitches (one N.O. and one N.C.) and a terminal block, all enclosed in a weather tight, gray cast iron housing. The end thrust of the worm shaft against the plate spring shall actuate the plunger, which in turn shall move the indicator dial. Amperage metering devices will not be considered equal to the overload device specified.

f. Microswitches shall be factory set to: (1) sound an alarm when the load on the mechanism reaches 100% of the AGMA torque; and (2) stop the motor when the load reaches 120% of the AGMA torque.

g. Provide a shear pin device, set for 130% of the AGMA torque mounted on the drive end of the worm shaft.

E. Torque Tube and Scraper Arms

1. The steel torque tube shall be bolted to the final reduction gear and shall support two (2) structural steel rake arms.

2. Equip sludge collecting arms with scraper blades set and spaced to scrape settled sludge from the tank bottom to a sludge hopper located at the center of the tank. The collecting arms shall attach to and be rotated by the torque tube.

3. Fabricate the collecting arms of structural steel with a minimum thickness of 1/4" and adequately brace with struts.

4. Space blades so that the entire tank bottom is scraped twice for each

revolution of the mechanism.

5. Provide adjustable spring brass squeegees, for all blades, that project 1-1/2" below the bottom of the blade.

F. Influent Feedwell

1. The influent well shall be fabricated from 3/16" steel plate.

2. Ports shall be cut into the influent well to permit entrapped scum to escape.

3. Ports shall be baffled to prevent short circuiting to the weirs.

4. Provide a flanged pipe fitting for connection to the influent pipe furnished by the General Contractor.

5. Support the influent well on two (2) structural steel beams spanning the tank which shall hold the well in alignment in both a horizontal and vertical plane. The beams shall be anchored to the tank walls.

G. Access Bridge

1. Provide a bridge, of wide flange beam construction, that spans the tank and is supported from the tank walls.

2. The bridge, consisting of two (2) structural steel members, shall be braced to assure rigidity.

3. Bridge to be designed for the dead load and a live load of 50#/sq. ft., with a deflection not exceeding 1/360 of the span.

4. Provide a 3' wide walkway of 1-1/4" X 3/16" aluminum grating extending from the side wall to just beyond the drive.

5. Provide a double handrail (mechanical type) consisting of 1-1/2" diameter, Sch. 40 aluminum pipe for the rails and posts.

6. Provide a 4" high aluminum toe plate along both sides of bridge and bridge extension.

H. Surface Skimmer

1. Provide One (1) full-radius skimmer consisting of scum blade, hinged wiper assembly, scum trough, scum trough and counter weight arm.

2. Support the scum blade and counter weight arm from the torque tube.

3. Mount the hinged wiper assembly on the outer end of the scum blade

to form a pocket for trapping scum. Provide structural steel counterweight arm, 180 degrees apart from skimmer, for proper equipment balance.

4. The wiper assembly shall maintain continual contact and proper alignment between scum blade, inner scum baffle and scum trough.

5. The wiper blade shall have a wearing strip on its outer end which contacts the scum baffle and neoprene strip on its inner and lower edges which contact the scum trough.

6. The scum shall be trapped as the wiper blade meets the skimmer blade ramp and is raised up the beach to be dumped into the scum trough.

7. All springs, pivot points and threaded fasteners shall be constructed of 18-8 stainless steel.

8. Skimmers which rely on support from the scum baffle will not be acceptable.

9. The scum trough and beach shall be fabricated of 1/4" thick steel plate, supported from the tank wall.

10. Scum trough shall be 4'-0" wide with an overall length of 4'-9" along the scum baffle consisting of beach plate, inner radius baffle, hopper and 6" discharge pipe stub with matching flexible connector.

11. Beach plate to slope at a nominal incline of 1-3/4" per foot to a point 5" below the maximum water elevation.

I. Effluent Weirs and Scum Baffles

1. The effluent trough shall be as shown on drawings and shall be fabricated of ¼" steel plate (minimum).

2. Fabricate weirs from 1/4" thick x 9" fiberglass.

3. Weir shall have 90 degree, 2.5 inch deep "V" notches spaced 6" on centers.

4. Fabricate scum baffle from 1/4" thick x 12" fiberglass or steel.

5. Supports for effluent trough and related components shall be aluminum and design requirements (including submittals) shall be per section 05500.

J. Anchor Bolts

1. All equipment anchor bolts shall be Type 316 stainless steel.

2. Anchors shall be set by the General Contractor in accordance with the Manufacturer's instructions.

PART 6 - TESTING

TORQUE TEST

A. Test by anchoring both sludge collector arms of one (1) collector.

B. Start collector drive to demonstrate the structure's ability to withstand loads resulting from at least 120% of clarifier drive design torque.

C. Demonstrate proper operation of high torque alarm and cut-off.

D. Repeat test to verify results.

PART 7 - EXECUTION

INSTALLATION

A. The Contractor shall install the clarifier as shown on the drawings.

B. Equipment shall be installed in accordance with GENERAL MECHANICAL REQUIREMENTS, and in accordance with the Manufacturer's recommendations to provide a complete installation.

C. The Contractor shall adjust for true plane of rotation and grout the floor in accordance with the Manufacturer's recommendations.

ELECTRICAL CONNECTIONS AND WIRING

A. Wiring and conduits for electrical power is to be provided. A disconnect shall be installed at unit (NEMA 4X stainless steel enclosure) and mounted near the walkway. The power to the clarifier is to be connected to the main plant power in the sludge building. A control panel is to be furnished, as necessary, in NEMA 4x stainless steel enclosure, for operation of unit. The panel is to include HOA switch, running time meters, torque trip switches, high torque alarm light, light indicating running, breaker, and all other components necessary for proper operation.

B. Refer to section 16010 for additional information.

PART 8 -PAYMENT:

The clarifier will be part of the lump sum for project.

SECTION 16010 - ELECTRICAL

PART 1 - GENERAL

SCOPE:

The work to be done under this Division shall consist of furnishing all labor, equipment and materials to complete electrical connections to specified equipment as shown or noted on the drawings or specified herein or both as follows:

Work shall include connection of equipment to existing electrical service and panels at WWTP, underground raceways, breakers, disconnects, grounding systems, wiring to control panels, and other items necessary to make equipment operational and to meet the National Electrical Code and local requirements. The existing electrical main panels are located inside the lab building. Wiring and conduit necessary to connect equipment shown shall be furnished and installed to make connections to these existing panels. Exact location / route of underground conduit will be field determined. Any damages made to existing piping or other conduits during installation of new must be repaired by contractor at no additional pay.

The only new equipment being installed is the new secondary clarifier. An existing sampler is being relocated to a new location. The contractor is to install a receptacle near the new sampler location as shown on the drawings. The owner will relocate the sampler. Also, new pumps are being installed at the secondary pump station and connected to existing controls A new receptacle is also shown to be installed in the blower shed. See the instructions for bidders and other sections of technical specifications for additional information.

Contractor shall apply and pay for all permits necessary for installation and inspection of electrical work. The work shall be inspected by the Tennessee State Electrical Inspector and a certificate of inspection furnished to the owner.

PART 2 - PRODUCTS

MANUFACTURERS:

Manufacturer's Qualifications: Firms regularly engaged in manufacture of electrical systems, products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years. All materials shall be NEC approved.

MATERIALS:

All wire, enclosures, breakers, disconnects, etc. shall meet requirements of National Electrical Code, the local electrical code, and other applicable codes. Nothing in the documents shall be

construed to permit work not conforming to the most stringent of applicable codes. The National Electrical Code, the electrical requirements as established by the State and Local fire Marshal, and the rules and regulations of the power company serving the project, are hereby made part of this specification.

Conduit shall be used for all wiring and cords and shall be a minimum size is ¾". All exposed conduit shall be securely fastened to walls, or walkways or other using non corrosive (stainless steel or other material approved by Engineer) fasteners. All exposed conduit shall be PVC coated rigid metal conduit. All buried conduit is to be buried a minimum of 30" deep.

A disconnect and a control panel shall be furnished and installed on aluminum framing at the location of the new clarifier. The contractor is to submit the type of frame and proposed location of to be used with the shop drawings. The "on-site" disconnects shall be visible from the equipment location. A Control panel for this piece of equipment must be installed (see section 11310 for additional information).

All wiring is to be copper. All conductors #10 or smaller are to be solid. Larger conductors are to be stranded. All circuits are to contain a ground wire.

PART 3 - EXECUTION

GENERAL:

Under this section is included the installation of all electrical components as shown on the drawings or as directed by the Engineer. All work shall be done per applicable codes including NEC and local codes and these specifications.

Work is to be coordinated with equipment supplier. Some work may be required that is not shown so that the equipment is completely operational when completed. The exact location of control panels and other devices may be changed per equipment manufacturer's specifications.

Care is to be taken to avoid conflict with existing electrical lines, sewer lines, water lines and other utilities. Any damage to existing utilities must be repaired at no additional cost to owner.

HANDLING OF MATERIALS:

Care shall be exercised in loading and unloading materials and protection of materials on site.

Proper implements, tools, and facilities shall be provided to allow safe and convenient execution of the work. Care shall be exercised to keep conduits clear of mud, dirt, and debris before and during laying.

No conduit shall be laid in water, and precautions shall be taken to prevent trench water from entering the conduit.

All conduit, per manufacturer's directions, shall be stored to prevent damage. PVC conduit shall be covered to protect from sunlight.

All materials shall be inspected just prior to laying. If any portion of a shipment is found to be defective in diameter or thickness, the entire shipment shall be removed from the project at the Contractor's expense.

All rejected materials shall be removed from the project immediately and replaced at the expense of the Contractor.

COORDINATION:

The contractor shall coordinate the electrical work with other portions of the project and with manufacturers furnishing equipment on the project. Verify field measurements and existing components to be connected to. Coordinate the installation of required supporting devices, fasteners and sleeves to be installed in concrete or through grating and other structural components as they are constructed.

PAYMENT :

Payment for all electrical work for connection of equipment to existing electrical panels and making equipment operational will be part of lump sum price for project.

END OF SECTION 16010