CONTRACT DOCUMENTS AND SPECIFICATIONS

HISTORIC DISTRICT WATER AND STORMWATER SYSTEM IMPROVEMENTS

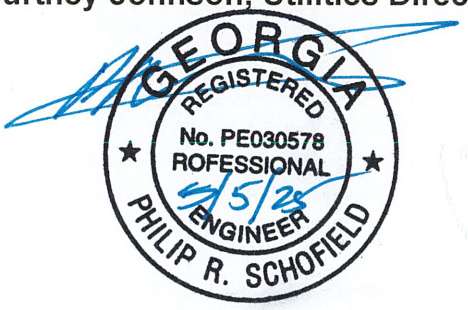
FORT EST. 1949
FORT OGLETHORPE
GEORGIA

Prepared for

CITY OF FORT OGLETHORPE, GEORGIA

City Council
Earl Gray, Mayor
Derek Rogers, Mayor Pro Tem
Jim Childs
Craig Crawford
Rhonda James
Paula Stinnett

Molly Huhn, City Manager
Courtney Johnson, Utilities Director



April 2025
Project No. G24029

CTIENGINEERS

CTI Engineers, Inc.
1122 Riverfront Parkway
Chattanooga, Tennessee 37402
423.267.7613

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CTI ENGINEERS, INC.
Chattanooga, Tennessee ◊ Cartersville, Georgia
Project No. G24029
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DIVISION 00

PROCUREMENT AND CONTRACTING REQUIREMENTS

PROCUREMENT REQUIREMENTS, FORMS, AND SUPPLEMENTS

ADVERTISEMENT FOR BIDS
ITB # 005-25

Owner: City of Fort Oglethorpe, Georgia

Separate sealed Bids for furnishing of all materials, labor, tools, equipment, and appurtenances necessary for the construction of the Historic District Water and Stormwater System Improvements will be received by the Owner at the City of Fort Oglethorpe, 500 City Hall Drive, Fort Oglethorpe, GA 30742, until 10:00 a.m., local time, on Thursday, September 4, 2025, and then at said office publicly opened and read aloud.

The Project consists of the following major elements: The project will involve the complete replacement of approximately 8,000 linear feet of aging 6-inch-diameter waterlines with 8-inch-diameter DIP. The stormwater pipe replacement will include upgrading approximately 4,000 linear feet of the aging stormwater drainage system. The Project is located in the Historic District on 1st Street, 2nd Street, 3rd Street, Thomas Road, Mitchell Road, and N. Thomas Road.

Copies of the Contract Documents and Specifications, including bidding documents and requirements, and Contract Drawings may be examined at the offices of the Engineer, CTI Engineers, Inc., 1122 Riverfront Parkway, Chattanooga, TN 37402 (phone 423/267-7613, www.ctiengr.com). Copies may be obtained there upon payment of $100.00 for each set. This payment is not refundable.

Bidders must be listed on Engineer's list of planholders who have purchased the Contract Documents, Specifications, and Drawings.

Engineer shall be provided with the following information: mailing address for U.S. Postal Service, physical delivery address, telephone number, contact person, and email address.

A Bid Bond of 5% of the total project cost is to be included in the proposal package. The Successful Bidder will be required to furnish performance and payment bonds with the executed Agreement meeting the requirements of the Contract Documents and executed on the forms attached to the Agreement. The terms and time for payment are set forth in the Agreement.

Surety and insurance companies must have an AM Best rating of A-10 or greater, be listed in the Federal Registry of Companies holding Certificates of Authority and Acceptable Sureties on Federal Bonds, be licensed by the Georgia Insurance Department and the Georgia Secretary of State to do business in the State of Georgia.

Contractor must have minimum Worker's Comp and General Liability Insurance in full force and effect. No proposal will be considered unless it is accompanied by satisfactory evidence that the Bidder holds Georgia State Contractor's License of proper classification and in full force and effect, in compliance with the provisions of O.C.G.A. Sec. 43-14-2 et seq. Pursuant to O.C.G.A. § 13-10-91, all contractors and sub-contractors performing work within the State of Georgia on a contract with a public employer must register and participate in a federal work authorization. Fort Oglethorpe will require certification from contractor that this requirement has been met.

Each Respondent shall submit with its proposal a copy of current Business License and/or Occupational Tax Certificate issued in the state it resides. If bidder cannot prove this license, it will be required to obtain one from Ft. Oglethorpe if it is the Awarded Respondent.

Fort Oglethorpe reserves the right to accept or reject any and all proposals, to waive formalities, technicalities or irregularities and to re-advertise if necessary. The contract between Fort Oglethorpe and the selected responder shall be subject to the payment agreement drawn up between Fort Oglethorpe and the selected responder.

Fort Oglethorpe, Georgia
/s/ Molly Huhn, City Manager

Date: August 6,2025
August 20, 2025

INFORMATION FOR BIDDERS

1. Receipt and Opening of Bids

City of Fort Oglethorpe, Georgia (herein called the "Owner"), invites Bids on the form attached hereto, all blanks of which must be appropriately filled in. Bids will be received by the Owner at the location and time noted in the Advertisement for Bids.

The 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 shall be submitted on the Bid forms bound in the Contract Documents. All blank spaces for Bid prices must be filled in, in ink or typewritten. All computations will be checked; and in the event of a discrepancy, the unit price will govern. All required enclosed certifications must be fully completed and executed when submitted.

Each Bid must be submitted in a sealed envelope, addressed to the Owner. Each sealed envelope containing a Bid must be plainly marked on the outside as, "Bid for Historic District Water and Stormwater System Improvements."

If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed to the City of Fort Oglethorpe, P.O. Box 5509, 500 City Hall Drive, Fort Oglethorpe, GA 30742, Attention: Courtney Johnson, Utilities Director.

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

3. Subcontracts

The Bidder is specifically advised that any person, firm, or other party to whom it is proposed to award a subcontract under this Contract must be acceptable to the Owner and funding agencies.

4. Facsimile Modifications

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

5. Overhead, Profit, and Revision of Quantities

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

6. Qualifications of Bidder

The Owner may make such investigations as deemed necessary to determine the ability of the Bidder to perform the work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any Bid if the evidence submitted by, or investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein. Conditional Bids will not be accepted.

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

7. Bid Security

Each Bid must be accompanied by a cashier's check on a duly authorized bank, certified check of the Bidder, or a bid bond prepared on the form of bid bond attached hereto, duly executed by the Bidder as principal and having as security thereon a surety company listed in the latest issue of U.S. Treasury Circular 570, in the amount of 5 percent of the Bid. Certified checks or cashier's checks shall be made payable to the Owner. Such checks or bid bonds will be returned to all except the three lowest Bidders within three days after the opening of Bids; the remaining checks or bid bonds will be returned promptly after the Owner and the accepted Bidder have executed the contract, or, if no award has been made within 60 days after the date of the opening of Bids, upon demand of the Bidder at any time thereafter, so long as he has not been notified of the acceptance of his Bid.

8. Liquidated Damages for Failure to Enter into Contract

The successful Bidder, upon his failure or refusal to execute and deliver the Contract and bonds required within 10 days after he has received notice of the acceptance of his Bid, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the security deposited with his Bid.

9. Time for Completion and Liquidated Damages

Bidder must agree to commence work on or before a date to be specified in a written Notice to Proceed of the Owner and to fully complete the Project within 365 consecutive calendar days thereafter. Bidder must agree also to pay as liquidated damages the sum of $500 for each consecutive calendar day in default as hereinafter provided in the General Conditions.

10. Conditions of Work

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

11. Addenda and Interpretations

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

Every request for such interpretation should be in writing addressed to pschofield@ctiengr.com or Philip Schofield, P.E., Project Manager, CTI Engineers, Inc., at 1122 Riverfront Parkway, Chattanooga, TN 37402, and to be given consideration must be received at least five days prior to the date fixed for the opening of Bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the Specifications which, if issued, will be mailed and transmitted by facsimile to all prospective Bidders (at the respective addresses and facsimile numbers furnished for such purposes), not later than three days prior to the date fixed for the opening of Bids. Failure of any Bidder to receive any such addendum or interpretation shall not relieve such Bidder from any obligation under his Bid as submitted. All addenda so issued shall become a part of the Contract Documents.

12. Security for Faithful Performance

Simultaneously with his delivery of the executed Contract, the Contractor shall furnish a surety bond or bonds as security for faithful performance of this Contract and for the payment of all persons performing labor on the Project under this Contract and furnishing materials in connection with this Contract, as specified in the General Conditions included herein. Surety companies executing bonds must appear on the Treasury Department's most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.

13. Power of Attorney

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

14. Notice of Special Conditions

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

a. Inspection and testing of materials
b. Insurance requirements
c. Wage rates (if applicable)
d. Surveys, permits, and regulations

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

15. Laws and Regulations

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

16. Obligation of Bidder

At the time of the opening of Bids, each Bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Drawings and Contract Documents (including all addenda). The failure or omission of any Bidder to examine any form, instrument, or document shall in no way relieve any Bidder from any obligation in respect of his Bid.

17. Execution of Bid Documents

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

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

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

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

18. Method of Award - Lowest Qualified Bidder

The Contract will be awarded to the responsive, responsible Bidder submitting the lowest Bid complying with the conditions of the Information for Bidders. Award will be made on the basis of the prices given in the base Bid either with or without alternates at the

discretion of the Owner. The Bidder to whom the award is made will be notified at the earliest possible date. The Owner reserves the right to reject any and all Bids and to waive any informality in Bids received whenever such rejection or waiver is in its interest.

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

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

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

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

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

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

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

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

19. Employment of Local Labor

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

20. Bid Envelope

All Bidders doing utility construction covered by OCGA 43-14 must have a Utility Contractor's License issued by the State of Georgia. In compliance with these requirements, the envelope in which the Bid is contained must bear on the outside the following:

a. Name of Bidder.
b. Address of the Bidder.
c. Name of Project for which Bid is Submitted.
d. Bidder's Utility Contracting License Number.
e. Bidder's License Expiration Date.

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

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

CONTRACTOR'S IDENTIFICATION

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

BIDDER:

Name _____

Address _____

_____

_____

Georgia Utility License No. _____

Expiration Date _____

SEALED BID PROPOSAL FOR THE CITY OF FORT OGLETHORPE, GEORGIA FOR THE CONSTRUCTION OF THE HISTORIC DISTRICT WATER AND STORMWATER SYSTEM IMPROVEMENTS

Bid Date _____ **Bid Time** _____

BID

Project Description: Historic District Water and Stormwater System Improvements

Proposal of _____

(hereinafter called "Bidder"), doing business as _____.
a corporation, a partnership, an individual

To the City of Fort Oglethorpe (hereinafter called "Owner").

Gentlemen:

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

Bidder hereby agrees to commence work under this contract on or before a date to be specified in written Notice to Proceed of the Owner and to fully complete the project within 365 consecutive calendar days thereafter as stipulated in the Specifications. Bidder further agrees to pay as liquidated damages, the sum of $500 for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.

Bidder acknowledges receipt of the following addenda:

_____

_____

_____

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

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

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

The Bidder agrees that this Bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closing time for receiving Bids.

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

Respectfully submitted:

_____

By _____
Signature

Title _____

_____

_____

_____
Business Address

ATTEST:

_____

Name _____
(Please Type)

Title _____ (SEAL)

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

BID SCHEDULE
HISTORIC DISTRICT WATER AND STORMWATER SYSTEM IMPROVEMENTS
CITY OF FORT OGLETHORPE
FORT OGLETHORPE, GEORGIA

SCHEDULE I - WATER SYSTEM IMPROVEMENTS

Item No.	DESCRIPTION	Unit	Est. No. of Units	Unit Price	Item Total
00 61 13	**Performance & Payment Bonds** (Max 2% of Bid)	LS	1		$ -
00 72 00	**General Conditions,** Including Project Management, Site Safety, Maintenance, and Supervision	LS	1		$ -
01 11 00	**Mobilization** (Maximum 2.5% of Bid), Including Shop Drawings and Submittals, Locating and Excavating (Pot-holing) the Existing Utilities, Project Layout and Staking	LS	1		$ -
01 22 00	Traffic Control Devices for Traffic Control and Road Closure to Meet MUTCD and GDOT Requirements	LS	1		$ -
01 32 38	**Pre-Construction Video Taping** of Existing Ground Conditions along the path of the Proposed Water Line Improvements	LS	1		$ -
01 22 00b	**Traffic Control Devices for Traffic Control and Road Closure** to Meet MUTCD and GDOT Requirements and in Coordination with the City of Fort Oglethorpe	LS	1		$ -
01 78 39	**GPS Survey** for Record Drawings	LS	1		$ -
31 20 00	**Earthwork**				
31 20 00a	**Crushed Stone Backfill** in Trench for 8" Water Lines in Streets, Parking Lots, and Asphalt or Concrete Driveways from Top of Bedding to Finished Grade	LF	10		$ -
31 20 00b	**Crushed Stone Bedding Material**, in Excess of that Required for Standard Bedding and Haunching	CY	15		$ -
31 20 00c	**Compacted Crushed Base Stone** (GAB) for Roadway and Fine Grading for Transitions.	Tons	25		$ -
31 20 00d	**Demolition and Removal of Existing Asphalt Pavement,** Including Saw-cutting, Excavation and Disposal of Asphalt Debris	LF	10		$ -
31 20 00e	**Topsoil**, Fine Sifted Topsoil (Purchased and Imported to Project Site) Approved by the Engineer, not Including On-Site Soil	CY	10		$ -
31 20 00f	**Final Grading and Cleanup -** Including Re-grading Existing Ditches to Allow Proper Drainage	LF	800		$ -
31 20 00g	**Trench Concrete/ Rock Excavation** by Rock Trenching, or Hoe-ramming Methods, Including Hauling and Proper Disposal of Spoil Materials	LF	10		$ -
31 25 00	**Sedimentation and Erosion Control**				
31 25 00a	**Temporary Silt Fence**, Including Installation of Filter Barrier, Stakes, Maintenance and Removal after Site Stabilization	LF	1,250		$ -

Item No.	DESCRIPTION	Unit	Est. No. of Units	Unit Price	Item Total
32 10 00	**New and Replacement Paving**				
32 10 00a	**Asphalt Pavement Replacement** for Streets, Driveways and Parking Lots, Trench Width Repair and Driveway Apron Replacement 4" Thick, with 2.5" of 12.5 mm GDOT mix and 1.5" of 9.5 GDOT mix, Including Saw-cutting and Base Stone Compaction	Tons	500		$ -
32 10 00b	**Asphalt Pavement Transitions** for Roadway, including Milling, 1.5-Inch Thick Hot Mix Asphalt	Tons	25		$ -
32 92 19	**Seeding**				
32 92 19a	Seeding	LF	800		$ -
33 12 13	**Water Services**				
33 12 13a	Connect to Existing Service Line, Including Pipe Fittings	EA	10		$ -
33 12 13b	8" x 3/4" Double Strap Tapping Saddles Installed, Including Corporation Stop	EA	10		$ -
33 12 19	**Hydrants**				
33 12 19a	Replace Existing Fire Hydrants with New Fire Hydrants Complete, Including, Hydrant, Anchor Coupling, Valve, Thrust Restraint, and Stone Bedding (MJ Tee Weight and Pipe Length to be Paid in Other Pay Items)	EA	6		$ -
40 05 13.53	**Ductile Iron Pipe (DIP) and Fittings**				
40 05 13.53a-1	8-Inch Ductile Iron Pipe Installed in Roadway, Including All Materials, Labor and Equipment	LF	6,750		$ -
40 05 13.53a-2	8-Inch Ductile Iron Pipe Installed in Trench, Including All Materials, Labor and Equipment	LF	800		$ -
40 05 13.53b-1	8-Inch DIP Installed in Casing, Including All Materials, Labor, Equipment, and Restrained Gasket Materials	LF	240		$ -
40 05 13.53b-2	**Ductile Iron MJ Pipe Fittings** for All Other Fittings not Specified as Paid Per Each in Other Pay Items (Use Published Weights for Ductile Iron, AWWA C-153 Compact Fittings, Excluding Bolts, Gaskets, and Other Incidental Attachments)	LBS	1,600		$ -
40 05 13.53c-8	8" x 8" MJ Anchor Tee (Valve Tee)	EA	3		$ -
40 05 13.53d	**Connection to Existing Water Lines**				
40 05 13.53d-8	Connection New 8-inch Water Line to Existing Water Line, Including Tapping Sleeve and Valve	EA	3		$ -
40 05 61	**Gate Valves, Including Valve Box, Cover, and Extensions as Required**				
40 05 61a-8	8-Inch Gate Valve Installed including Valve Box & Cover, Concrete Support Block, Thrust Block, and Valve Box Extensions	EA	8		$ -
	TOTAL - SCHEDULE I			**$**	

Item No.	DESCRIPTION	Unit	Est. No. of Units	Unit Price	Item Total
SCHEDULE II -STORMWATER SYSTEM IMPROVEMENTS					
03 30 00	**Cast-in-Place Concrete, Includes All Material and Labor**				
03 30 00a	Class A (4,000 psi) Concrete for Type 2 Gutter or Curb and Gutter, Including Materials, Excavation, Bedding, Form Work, Concrete, Pour and Finish Rubbing, Complete In Place as Shown in Detail on the Plans and as directed by the Engineer.	LF	150		$ -
03 30 00b	**Class A (4,000 psi) Concrete for Type 2 Header Curb** , Including Excavation, Bedding, Form Work, Concrete Mix, Pour and Finish Rubbing, Complete In Place as Shown in Detail on the Plans and as directed by the Engineer.	LF	50		$ -
03 30 00c	**Class B Concrete (3,000 PSI)** for Utility Crossings and Other Areas Not Specified or as Directed by Engineer	CY	10		$ -
31 20 00	**Earthwork**				
31 20 00a	**Crushed Stone Backfill** in Trench RCP in Streets, Parking Lots, and Asphalt or Concrete Driveways from Top of Bedding to Finished Grade	LF	3,000		$ -
31 20 00b	**Crushed Stone Bedding Material**, in Excess of that Required for Standard Bedding and Haunching	CY	15		$ -
31 20 00c	**Compacted Crushed Base Stone** (Pug Mix) for Gravel Driveway Repair and Fine Grading for Transitions to Existing Driveways.	Ton	50		$ -
31 20 00d	**Demolition and Removal of Existing Asphalt Pavement,** Including Saw-cutting, Excavation and Disposal of Asphalt Debris	LF	3,000		$ -
31 20 00e	**Trench Concrete/ Rock Excavation** by Rock Trenching, or Hoe-ramming Methods, Including Hauling and Proper Disposal of Spoil Materials	LF	3,000		$ -
31 25 00	**Sedimentation and Erosion Control**				
31 25 00a	**Concrete Washout Structure,** Including (CWA)	LS	1		$ -
32 10 00	**New and Replacement Paving**				
32 10 00a	**Asphalt Pavement Replacement** for Streets, Driveways and Parking Lots, Trench Width Repair and Driveway Apron Replacement 4" Thick, with 2.5" of 12.5 mm GDOT mix and 1.5" of 9.5 GDOT mix, Including Saw-cutting and Base Stone Compaction	Ton	215		$ -
32 10 00b	**Asphalt Pavement Transitions** for Roadway, including Milling, 1.5-Inch Thick Hot Mix Asphalt	Ton	55		$ -
32 92 19e	**Landscape Repair Allowance**	LS	1	$ 10,000.00	$ 10,000.00
33 40 00	**Storm Sewerage**				
33 40 00a-30	36-Inch RCP 0' to 8.0 Feet Deep	LF	2,150		$ -
33 40 00a-24	24-Inch RCP 0' to 8.0 Feet Deep	LF	800		$ -

Item No.	DESCRIPTION	Unit	Est. No. of Units	Unit Price	Item Total
33 40 00c	**Pre-Cast or Cast-in-Place Concrete Manhole for 36", 24" RCP**, Including excavation, Stone Bedding, Pre-cast Concrete, Brick, or Concrete-Constructed Structure, and Connection to Pipe as Shown on Plans or as Directed by Engineer	EA	5		$ -
33 40 00d	**Pre-Cast or Cast-in-Place Concrete Catch Basin for 36", 24" RCP**, Including excavation, Stone Bedding, Pre-cast Concrete, Brick, or Concrete-Constructed Structure, and Connection to Pipe as Shown on Plans or as Directed by Engineer	EA	34		$ -
33 40 00e	**Connection to Existing Catch Basin / Inlet,** Including Excavation, Pipe Connection to Structure, and Adjusting Structure to Finish Grade	EA	4		$ -
				TOTAL SCHEDULE II	**$**
				TOTAL - SCHEDULE I	**$**
				TOTAL - SCHEDULE I and SCHEDULE II	**$**

Notes:

1. Contractor shall Bid on all Schedules.

2. The Owner may award any combination of Schedules. Contract will be awarded (if it is awarded) to the responsible and responsive Bidder submitting the lowest Bid sum in the selected combination of Schedules.

3. Some schedules may not be awarded.

4. Contractor certifies that he has reviewed the Drawings and Specifications and that all work not specifically listed in the Bid Schedule is included in the prices for various items listed in the Bid Schedule.

Bidder: Date:

By: (Signature) Title:

Address:

City: State: Zip Code:

Telephone:

BID BOND

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

The condition of the above obligation is such that whereas the Principal has submitted to Fort Oglethorpe a certain Bid, attached hereto and hereby made a part hereof to enter into a contract in writing for the construction of the Historic District Water and Stormwater System Improvements.

NOW, THEREFORE,

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

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

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

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

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

CONTRACTOR - PRINCIPAL:

_____

By _____

Name _____
(Please Type)

Title _____

ATTEST:

_____

Name _____
(Please Type)

Title _____ (SEAL)

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

SURETY:

_____

By _____

Name _____
(Please Type)

Title _____
(Attach Power of Attorney)

ATTEST:

_____

Name _____
(Please Type)

Title _____ (SEAL)

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

BIDDER ACKNOWLEDGMENT OF CONTRACT TIME

By signature below, Bidder acknowledges and agrees that 365-day contract time for substantial completion of the work included in these Contract Documents is either:

1. Sufficient, barring changed conditions, acts of God, or abnormal weather conditions that would justify time extensions; or

2. Insufficient, in which case the Contractor agrees that the price bid includes an allowance for liquidated damages of adequate magnitude to cover the additional time required to complete the work.

Bidder Name _____

Signature _____

Attest:

_____

STATEMENT OF BIDDER'S QUALIFICATIONS

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

1. Name of Bidder.

2. Permanent main office address.

3. When organized.

4. If a corporation, where incorporated.

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

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

7. General character of work performed by your company.

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

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

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

11. List your major equipment available for this project.

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

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

14. Credit available: $_____

15. Give bank reference.

16. Will you, upon request, fill out a detailed financial statement and furnish any other information that may be required by the City of Fort Oglethorpe?

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

Dated this _____ day of _____, 20___.

_____
Name of Bidder

By _____

Title _____

State of _____

County of _____

_____ being duly sworn deposes and says that he is _____ of _____ _____ and that the answers to the foregoing questions and all statements therein contained are true and correct. Subscribed and sworn to before me this _____ day of _____, 20___.

_____
Notary Public

My Commission Expires:

_____
(Date) (SEAL)

STATEMENT OF EQUIPMENT

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

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

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

Signed _____

Name _____

Title _____

NONCOLLUSION AFFIDAVIT OF PRIME BIDDER

State of _____)
)ss.
County of _____)

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

1. He is _____ of _____
(owner, partner, officer, representative, or agent)
_____, the Bidder that has submitted the attached Bid;

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

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

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

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

(Signed) _____

_____
Title

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

_____

_____
Title

My commission expires _____
(Date) (SEAL)

PARTNERSHIP CERTIFICATE

STATE OF _____

COUNTY OF _____

On this _____ day of _____, 20__, before me personally appeared _____ _____, known to me to be the person who executed the above instrument, who, being by me first duly sworn, did depose and say that he is a general partner in the firm of _____ and that said firm consists of himself and _____ _____ and that he executed the foregoing instrument on behalf of said firm for the uses and purposes stated therein, and that no one except the above named members of the firm have any financial interest whatsoever in said proposed contract.

_____ Partner

_____ Partner

_____ Partner

_____ Partner

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

_____ Notary Public

My Commission Expires:

_____ (Date)

(SEAL)

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

CORPORATE CERTIFICATE

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

This _____ day of _____, 20____.

_____

(SEAL)

JOINT VENTURE QUESTIONNAIRE

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

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

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

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

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

5. Has either member of the joint venture been separately awarded a contract by the City of Fort Oglethorpe, and if so, what was the most recent contract awarded to each?

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

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

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

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

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

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

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

State of _____

County of _____

_____ being duly sworn deposes and says that he is _____ of _____ and _____ being duly sworn deposes and says that he is _____ of _____ and that the answers to the foregoing questions and all statements therein contained are true and correct. Subscribed and sworn to before me this _____ day of _____, 20__.

_____
Notary Public

My Commission Expires:

_____ (SEAL)
(Date)

END OF SECTION

STATEMENT OF LICENSE CERTIFICATE

Each contractor bidding shall fill in and sign the following:

This is to certify that _____, being a bidding contractor on the within and foregoing proposed contract, has fully reviewed the complete Bid Package and all invitations, information, supplemental conditions and addendum or addenda thereto, and has contacted and complied with all of the applicable requirements imposed or stated in writing by the Georgia State Construction Industry Licensing Board laws and rules, or the applicable rules of any other qualifying governing body, agency, or board.

The undersigned contractor further does hereby certify, warrant and represent that such contractor has verified and determined that such contractor is fully licensed to perform all aspects of the contract project within the plans, documents, and specifications, and such license is not in any way suspended, conditional, impaired or revoked.

The Contractor has been issued License or Certificate Number _____ in the name of (contractor's name) _____ by (name of issuing body, agency or board) _____ _____, which License or Certificate expires on (date of expiration) _____.

Signed _____

Name _____

Title _____

E-VERIFY

Contractor Affidavit under O.C.G.A. § 13-10-91(b)(1)

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. § 13-10-91, stating affirmatively that the individual, firm or corporation which is engaged in the physical performance of services on behalf of ***(the City of Fort Oglethorpe)*** has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned contractor will continue to use the federal work authorization program throughout the contract period and the undersigned contractor will contract for the physical performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the contractor with the information required by O.C.G.A. § 13-10-91(b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____
Federal Work Authorization User Identification Number

_____
Date of Authorization

_____
Name of Contractor

Historic District Water and Stormwater System Improvements
Name of Project

City of Fort Oglethorpe
Name of Public Employer

I hereby declare under penalty of perjury that the foregoing is true and correct.

Executed on _____, 20__ in _____ (city), _____ (state).

_____
Signature of Authorized Officer or Agent

_____
Printed Name and Title of Authorized Officer or Agent

SUBSCRIBED AND SWORN BEFORE ME
ON THIS THE _____ DAY OF_____, 20__.

_____
NOTARY PUBLIC

My Commission Expires:

_____

CONTRACTING REQUIREMENTS

NOTICE OF AWARD

To: _____

Project Description: The project will involve the complete replacement of approximately 8,000 linear feet of aging 6-inch-diameter waterlines with 8-inch-diameter DIP. The stormwater pipe replacement will include upgrading approximately 4,000 linear feet of the aging stormwater drainage system. The Project is located in the Historic District on 1st Street, 2nd Street, 3rd Street, Thomas Road, Mitchell Road, and N. Thomas Road.

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

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

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

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

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

Dated this _____ day of _____, 20___.

CITY OF FORT OGLETHORPE, GEORGIA

By _____

Name _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above Notice of Award is hereby acknowledged _____ _____, this the _____ day of _____, 20___.

By _____

Name _____

Title _____

CONTRACT

THIS CONTRACT, made this _____ day of _____, 20___, by and between the City of Fort Oglethorpe, Georgia, hereinafter called "Owner" and _____ _____ doing business as a _____ corporation, individual, or partnership hereinafter called "Contractor."

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

1. The Contractor will commence and complete the construction of the Historic District Water and Stormwater System Improvements.

2. The Contractor will furnish all the material, supplies, tools, equipment, labor and other services necessary for the completion of the work described herein.

3. The Contractor will commence the work required by the Contract Documents within 10 calendar days after the contract start date of the written Notice to Proceed and will complete the work within 365-day contract time unless the periods of completion are extended otherwise by the Contract Documents. The Contractor further agrees to pay as liquidated damages, the sum of $500.00 for each consecutive calendar day in default thereafter as hereinafter provided in the General Conditions.

4. The Contractor agrees to perform all the Work described in the Contract Documents and comply with the terms therein for the sum of _____.

5. The term "Contract Documents" means and includes the following:
   a. Advertisement for Bids
   b. Information for Bidders
   c. Bid
   d. Bid Bond
   e. Contract
   f. General Conditions
   g. Supplemental General Conditions
   h. Payment Bond
   i. Performance Bond
   j. Notice of Award
   k. Notice to Proceed
   l. Change Order(s)
   m. Drawings prepared by CTI Engineers, Inc., as numbered on Page 00 01 15-1
   n. Specifications prepared or issued by CTI Engineers, Inc., dated April 2025
   o. Addenda:
      No. _____, dated _____, 20___
      No. _____, dated _____, 20___
      No. _____, dated _____, 20___

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

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

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

OWNER:
CITY OF FORT OGLETHORPE, GEORGIA

By _____

Name _____
(Please Print or Type)

Title _____

WITNESS:

Name _____
(Please Print or Type)

Title _____ (SEAL)

CONTRACTOR:

_____

By _____

Name _____
(Please Print or Type)

Address _____

_____

ATTEST:

Name _____
(Please Print or Type)

Title _____ (SEAL)

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

NOTICE TO PROCEED

To: _____

Project Description: The project will involve the complete replacement of approximately 8,000 linear feet of aging 6-inch-diameter waterlines with 8-inch-diameter DIP. The stormwater pipe replacement will include upgrading approximately 4,000 linear feet of the aging stormwater drainage system. The Project is located in the Historic District on 1st Street, 2nd Street, 3rd Street, Thomas Road, Mitchell Road, and N. Thomas Road.

You are hereby notified to commence work in accordance with the Contract dated ____, 20____, on or before _____, 20____, and you are to complete the work within 365-day contract time. The date of completion of all work is therefore _____ _____, 20____.

Dated this _____ day of _____, 20____.

CITY OF FORT OGLETHOPRE, GEORGIA

By _____

Name _____

Title _____

ACCEPTANCE OF NOTICE

Receipt of the above Notice to Proceed is hereby acknowledged by _____ _____, this the _____ day of _____, 20____.

By _____

Name _____

Title _____

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that _____

_____

Name and Address of Contractor

_____ of the State of _____,

a Corporation, a Partnership, or an Individual

the "Principal," and _____,

_____ the "Surety,"

Name and Address of Surety

are held and firmly bound unto City of Fort Oglethorpe the "Owner," existing under and by virtue of the laws of the State of Georgia, in the sum of _____

_____ ($_____)

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

The condition of this obligation is such that whereas Principal has entered into a certain Contract with the Owner, dated as of the _____ day of _____, 20____, which is by reference incorporated in and made a part hereof as fully as if copied here verbatim, for the construction of the Historic District Water and Stormwater System Improvements.

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

Principal and Surety further bind themselves, their heirs, executors, administrators, and assigns, jointly and severally, that if the Principal shall keep and perform its agreement to repair or replace defective work or equipment during the warranty period of one (1) year as provided, then this paragraph shall be void; but if default shall be made by Principal in the

performance of its contract to so repair or replace said work, then this paragraph shall be in effect and Owner shall have and recover from Principal and its Surety damages for all defective conditions arising by reason of defective materials, work, or labor performed by or on the account of Principal and it is further understood and agreed that this obligation shall be a continuing one against the Principal and Surety hereon, and that successive recoveries may be had hereon for successive breaches until the full amount shall have been exhausted; and it is further understood that the obligation therein to maintain said work shall continue throughout said maintenance period, and the same shall not be changed, diminished, or in any manner affected from any cause during said time; and to fully save and hold the Owner harmless for any damages it may be caused to pay on account of injury to person, loss of life or damage to property.

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

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

CONTRACTOR - PRINCIPAL:

_____

By_____

Name_____
(Please Print or Type)

Title_____

ATTEST:

Name_____
(Please Print or Type)

Title_____ (SEAL)

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

SURETY:

_____

By_____

Name_____
(Please Print or Type)

Title_____
(Attach Power of Attorney)

WITNESS:

Name_____
(Please Print or Type)

Title_____ (SEAL)

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

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that _____

_____

Name and Address of Contractor

_____ of the State of _____,

a Corporation, a Partnership, or an Individual

the "Principal," and _____,

_____ the "Surety,"

Name and Address of Surety

are held and firmly bound unto City of Fort Oglethorpe, the "Owner," existing under and by virtue of the laws of the State of Georgia, in the sum of _____

_____($_____)

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

The condition of this obligation is such that whereas Principal has entered into a certain Contract with the Owner, dated as of the _____ day of _____, 20____, which is by reference incorporated in and made a part hereof as fully as if copied here verbatim, for the construction of the Historic District Water and Stormwater System Improvements.

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

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

And the Surety, for value received, hereby stipulates and agrees that the obligations of the Surety and this Bond shall in no way be impaired or affected by any extension of time, modification, omission, addition, or change in or to the contract, the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provision thereof, or by any assignment subletting or other transfer thereof, or of any part thereof, of any work to be performed, or of any moneys due to become due thereunder;

and the said Surety does hereby waive notice of any and all such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts, and transfer, and hereby stipulates and agrees that any and all things done and omitted to be done by and in relation to executors, administrators, successors, assignees, subcontractors, and other transferees shall have the same effect as to said Surety as though done or omitted to be done by and in relation to the Principal.

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

CONTRACTOR - PRINCIPAL:

_____

By_____

Name_____
(Please Print or Type)

Title_____

ATTEST:

Name_____
(Please Print or Type)

Title_____ (SEAL)

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

SURETY:

_____

By_____

Name_____
(Please Print or Type)

Title_____
(Attach Power of Attorney)

WITNESS:

Name_____
(Please Print or Type)

Title_____ (SEAL)

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

CHANGE ORDER

Order No. _____

Date: _____

Agreement Date: _____

NAME OF PROJECT: HISTORIC DISTRICT WATER AND STORMWATER SYSTEM IMPROVEMENTS

OWNER: CITY OF FORT OGLETHORPE, GEORGIA

CONTRACTOR: _____

The following changes are hereby made to the Contract Documents:

Change to Contract Price

Original Contract Price $_____

Current Contract Price adjusted by previous Change Order $_____

The Contract Price due to this Change Order will be

increased/decreased by: $_____

The new Contract Price including this Change Order will be $_____

Change to Contract Time

The Contract Time will be increased/decreased by _____ calendar days.

The date for completion of all work will be _____ (date).

Justification

_____

_____

Approvals Required

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

Accepted by: _____ (Contractor)

Recommended by: _____ CTI Engineers, Inc.

Ordered by: _____ City of Fort Oglethorpe, Georgia

CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, Robert L. Stulz, the duly authorized and acting legal representative of the City of Fort Oglethorpe, Georgia, do hereby certify as follows:

I have examined the attached contract(s) and performance and payment bond(s) and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements are adequate and have 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: _____

NOTE: Delete phrase "performance and payment bonds" when not applicable.

PROJECT CLOSEOUT

CERTIFICATE OF SUBSTANTIAL COMPLETION

Project: Historic District Water and Stormwater System Improvements

Agreement Date: _____

Contractor: _____
_____
_____

Owner: City of Fort Oglethorpe, Georgia
500 City Hall Drive
Fort Oglethorpe, GA 30742

Engineer: CTI Engineers, Inc.
1122 Riverfront Parkway
Chattanooga, Tennessee 37402

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

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

By: _____ Title: _____ Date:_____

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

By: _____ Title: _____ Date: _____

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

By: _____ Title: _____ Date: _____

PROJECT CLOSE OUT FORMS

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

1. Affidavit of Payment

2. Affidavit of Release of Liens

3. Consent of Surety for Final Payment

4. Final Waiver of Lien
   (To be executed by each and every subcontractor and supplier of materials.)

CERTIFICATE OF PROPERTY RESTORATION

Date _____

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

Signed _____

Witness _____

AFFIDAVIT OF PAYMENT

To: _____
(Owner)

WHEREAS, the undersigned has been employed by _____ _____ to furnish labor and materials for _____ _____work, under a contract for the Historic District Water and Stormwater System Improvements for the improvement of the property described as the complete replacement of approximately 8,000 linear feet of aging 6-inch-diameter waterlines with 8-inch-diameter DIP. The stormwater pipe replacement will include upgrading approximately 4,000 linear feet of the aging stormwater drainage system. The Project is located in the Historic District on 1st Street, 2nd Street, 3rd Street, Thomas Road, Mitchell Road, and N. Thomas Road in the City of Fort Oglethorpe, County of Catoosa, State of Georgia of which the City of Fort Oglethorpe is the Owner.

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

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

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

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

_____(SEAL)
(Signature of Authorized Representative)

(Affix corporate seal here)

TITLE:_____

AFFIDAVIT OF RELEASE OF LIENS

To: _____
(Owner)

WHEREAS, the undersigned has been employed by _____

_____

to furnish labor and materials for _____

_____ work,

under a contract for the Historic District Water and Stormwater System Improvements for the improvement of the property described as: the complete replacement of approximately 8,000 linear feet of aging 6-inch-diameter waterlines with 8-inch-diameter DIP. The stormwater pipe replacement will include upgrading approximately 4,000 linear feet of the aging stormwater drainage system. The Project is located in the Historic District on 1st Street, 2nd Street, 3rd Street, Thomas Road, Mitchell Road, and N. Thomas Road in the City of Fort Oglethorpe, County of Catoosa, State of Georgia of which the City of Fort Oglethorpe is the Owner.

NOW, THEREFORE, this _____ day of _____, 20____.
The undersigned, as the Contractor for the above-named Contract pursuant to the conditions of the Contract hereby certifies that to the best of his knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services, who have or may have liens against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

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

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

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

_____(SEAL)
(Signature of Authorized Representative)

(Affix corporate seal here)

TITLE: _____

CONSENT OF SURETY FOR FINAL PAYMENT

Project Name: Historic District Water and Stormwater System Improvements
Location _____
Project G24029 Contract No. _____
Type of Contract _____
Amount of Contract _____

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

_____

_____

on the Payment Bond of the following named Contractor:

_____

_____

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

_____

_____

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

_____
(Name of Surety Company)

(Affix corporate seal here)

_____
(Signature of Authorized Representative)

Title: _____

FINAL WAIVER OF LIEN

To: _____
(Owner)

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

_____

to furnish labor and materials for (B) _____

_____ work,

under a contract (C) for the Historic District Water and Stormwater System Improvements of the premises described as (D) the complete replacement of approximately 8,000 linear feet of aging 6-inch-diameter waterlines with 8-inch-diameter DIP. The stormwater pipe replacement will include upgrading approximately 4,000 linear feet of the aging stormwater drainage system. The Project is located in the Historic District on 1st Street, 2nd Street, 3rd Street, Thomas Road, Mitchell Road, and N. Thomas Road in the City of Fort Oglethorpe, County of Catoosa, State of Georgia of which the City of Fort Oglethorpe is the Owner.

NOW, THEREFORE, this _____ day of_____ 20____, for and in consideration of the sum of (E) _____ Dollars paid simultaneously herewith, the receipt whereof is hereby acknowledged by the undersigned, the undersigned does hereby waive and release any lien rights to, or claim of lien with respect to and on said above-described premises, and the improvements thereon, and on the monies or other considerations due or to become due from the Owner, or account of labor, services, material, fixtures, apparatus or machinery heretofore or which may hereafter be furnished by the undersigned to or for the above-described premises by virtue of said contract.

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

_____(SEAL)
(Signature of Authorized Representative)

(Affix corporate seal here)

TITLE: _____

INSTRUCTIONS FOR FINAL WAIVER

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

CONDITIONS OF THE CONTRACT

Section 00 72 00

GENERAL CONDITIONS

1. DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

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

1.13 FIELD ORDER - A written order effecting a change in the WORK not involving an

adjustment in the CONTRACT PRICE or an extension of the CONTRACTOR during construction.

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

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

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

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

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

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

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

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

1.22 SUBSTANTIAL COMPLETION - That date as certified by the ENGINEER when the construction of the PROJECT or a specified part thereof is sufficiently completed, in accordance with the CONTRACT DOCUMENTS, so that the PROJECT or specified part can be utilized for the purposes for which it is intended.

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

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

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

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

2. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWING

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

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

3. SCHEDULES, REPORTS, AND RECORDS

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

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

each part and, as applicable:

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

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

3.3 The CONTRACTOR shall also submit a schedule of payments that he anticipates he will earn during the course of the WORK.

4. DRAWINGS AND SPECIFICATIONS

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

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

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

5. SHOP DRAWINGS

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

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

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

6. MATERIALS, SERVICES AND FACILITIES

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

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

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

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

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

7. INSPECTION AND TESTING

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

7.2 The OWNER shall provide all inspection and testing services not required by the CONTRACT DOCUMENTS.

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

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

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

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

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

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

8. SUBSTITUTIONS

8.1 Whenever a material, article, or piece of equipment is identified on the DRAWINGS or SPECIFICATIONS by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality, and function shall be considered. The CONTRACTOR may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the CONTRACT DOCUMENTS by reference to brand name or catalogue number, and if, in the opinion of the ENGINEER, such material, article, or piece of equipment is of equal substance and function to that specified, the ENGINEER may approve its substitution and use by the CONTRACTOR. Any cost differential shall be deductible from the CONTRACT PRICE and the CONTRACT DOCUMENTS shall be appropriately modified by CHANGE ORDER. The CONTRACTOR warrants that if substitutes are approved, no major changes in the function or general design of the PROJECT will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the CONTRACTOR without a change in the CONTRACT PRICE or CONTRACT TIME.

9. PATENTS

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

design process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the ENGINEER.

10. SURVEYS, PERMITS, REGULATIONS

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

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

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

11. PROTECTION OF WORK, PROPERTY AND PERSONS

11.1 The CONTRACTOR will be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the WORK. He will take all necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the WORK and other persons who may be affected thereby, all the WORK and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation or replacement in the course of construction.

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

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

12. SUPERVISION BY CONTRACTOR

12.1 The CONTRACTOR will supervise and direct the WORK. He will be solely responsible for the means, methods, techniques, sequences and procedures of construction. The CONTRACTOR will employ and maintain on the WORK a qualified supervisor or superintendent who shall have been designated in writing by the CONTRACTOR as the CONTRACTOR'S representative at the site. The supervisor shall have full authority to act on behalf of the CON-

TRACTOR and all communications given to the supervisor shall be as binding as if given to the CONTRACTOR. The supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the WORK.

13. CHANGES IN THE WORK

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

13.2 The ENGINEER, also, may at any time, by issuing a FIELD ORDER, make changes in the details of the WORK. The CONTRACTOR shall proceed with the performance of any changes in the WORK so ordered by the ENGINEER unless the CONTRACTOR believes that such FIELD ORDER entitles him to a change in CONTRACT PRICE or TIME, or both, in which event he shall give the ENGINEER WRITTEN NOTICE thereof within seven (7) days after the receipt of the ordered change. Thereafter the CONTRACTOR shall document the basis for the change in CONTRACT PRICE or TIME within thirty (30) days. The CONTRACTOR shall not execute such changes pending the receipt of an executed CHANGE ORDER or further instruction from the OWNER.

14. CHANGES IN CONTRACT PRICE

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

(a) Unit prices previously approved.

(b) An agreed lump sum.

(c) The actual cost for labor, direct over-head, materials, supplies, equipment, and other services necessary to complete the work. In addition there shall be added an amount to be agreed upon but not to exceed fifteen (15) percent of the actual cost of the WORK to cover the cost of general overhead and profit.

15. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

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

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

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

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

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

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

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

16. CORRECTION OF WORK

16.1 The CONTRACTOR shall promptly remove from the premises all WORK rejected by the ENGINEER for failure to comply with the

CONTRACT DOCUMENTS, whether incorporated in the construction or not and the CONTRACTOR shall promptly replace and re-execute the WORK in accordance with the CONTRACT DOCUMENTS and without expense to the OWNER and shall bear the expense of making good all WORK of other CONTRACTORS destroyed or damaged by such removal or replacement.

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

17. SUBSURFACE CONDITIONS

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

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

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

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

18. SUSPENSION OF WORK, TERMINATION AND DELAY

18.1 The OWNER may suspend the WORK or any portion thereof for a period of not more than ninety days or such further time as agreed upon by the CONTRACTOR, by WRITTEN NOTICE to the CONTRACTOR and the ENGINEER which notice shall fix the date on which WORK shall be resumed. The CONTRACTOR will resume that WORK on the date so fixed. The CONTRACTOR will be allowed an increase in the CONTRACT PRICE or an extension of the CONTRACT TIME, or both, directly attributable to any suspension.

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

18.3 Where the CONTRACTOR'S services have been so terminated by the OWNER, said termination shall not affect any right of the OWNER against the CONTRACTOR then existing or which may thereafter accrue. Any

retention or payment of monies by the OWNER due the CONTRACTOR will not release the CONTRACTOR from compliance with the CONTRACT DOCUMENTS.

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

18.5 If, through no act or fault of the CONTRACTOR, the WORK is suspended for a period of more than ninety (90) days by the OWNER or under an order of court or other public authority, or the ENGINEER fails to act on any request for payment within thirty (30) days after it is submitted, or the OWNER fails to pay the CONTRACTOR substantially the sum approved by the ENGINEER or awarded by arbitrators within thirty (30) days of its approval and presentation, then the CONTRACTOR may, after ten (10) days from delivery of a WRITTEN NOTICE to the OWNER and the ENGINEER, terminate the CONTRACT and recover from the OWNER payment for all WORK executed and all expenses sustained. In addition, and in lieu of terminating the CONTRACT, if the ENGINEER has failed to act on a request for payment or if the OWNER has failed to make any payment as aforesaid, the CONTRACTOR may upon then (10) days WRITTEN NOTICE to the OWNER and the ENGINEER stop the WORK until he has been paid all amounts then due, in which event and upon resumption of the WORK, CHANGE ORDERS shall be issued for adjusting the CONTRACT PRICE or extending the CONTRACT TIME or both to compensate for the costs and delays attributable to the stoppage of the WORK.

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

19. PAYMENTS TO CONTRACTOR

19.1 At least ten (10) days before each progress payment falls due (but not more often than once a month), the CONTRACTOR will submit to the ENGINEER a partial payment estimate filled out and signed by the CONTRACTOR covering the WORK performed during the period covered by the partial payment estimate and supported by such data as the ENGINEER may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the WORK but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the OWNER, as will establish the OWNER'S title to the material and equipment and protect his interest therein, including applicable insurance. The ENGINEER will, within ten (10) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present the partial payment estimate to the OWNER, or return the partial payment estimate to the CONTRACTOR indicating in writing his reasons for refusing to approve payment. In the latter case, the CONTRACTOR may make the necessary corrections and resubmit the partial payment estimate. The OWNER will, within ten (10) days of presentation to him of an approved partial payment estimate, pay the CONTRACTOR a progress payment on the basis of the approved partial payment estimate. The OWNER shall retain ten (10) percent of the amount of each payment until final completion and acceptance of all work covered by the CONTRACT DOCUMENTS. The OWNER at any time, however, after fifty (50) percent of the WORK has been completed, if he finds that satisfactory progress is being made, shall reduce retainage to five (5%) percent on the current and remaining estimates. When the WORK is substantially complete (operational or beneficial occupancy), the retained amount may be further reduced below five (5) percent to only that amount necessary to assure completion.
On completion and acceptance of a part of the WORK on which the price is stated separately in the CONTRACT DOCUMENTS, payment may be made in full, including retained percentages, less authorized deductions.

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

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

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

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

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

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

20. ACCEPTANCE OF FINAL PAYMENT AS RELEASE

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

21. INSURANCE

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

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

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

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

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

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

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

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

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

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

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

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

22. CONTRACT SECURITY

22.1 The CONTRACTOR shall within ten (10) days after the receipt of the NOTICE OF AWARD furnish the OWNER with a Performance Bond and a Payment Bond in penal sums equal to the amount of the CONTRACT PRICE, conditioned upon the performance by the CONTRACTOR of all undertakings, covenants, terms, conditions, and agreements of the CONTRACT DOCUMENTS, and upon the prompt payment by the CONTRACTOR to all persons supplying labor and materials in the prosecution of the WORK

provided by the CONTRACT DOCUMENTS. Such BONDS shall be executed by the CONTRACTOR and a corporate bonding company licensed to transact such business in the state in which the WORK is to be performed and named on the current "Department of the Treasury's Listing of Approved Sureties (Department Circular 570)." The expense of these BONDS shall be borne by the CONTRACTOR. If at any time a surety on any such BOND is declared a bankrupt or loses its right to do business in the state in which the WORK is to be performed or is removed from the listing of approved sureties, CONTRACTOR shall within ten (10) days after notice from the OWNER to do so, substitute an acceptable BOND (or BONDS) in such form and sum and signed by such other surety or sureties as may be satisfactory to the OWNER. The premiums on such BOND shall be paid by the CONTRACTOR. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable BOND to the OWNER.

23. ASSIGNMENTS

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

24. INDEMNIFICATION

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

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

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

25. SEPARATE CONTRACTS

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

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

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

therefor as provided in Sections 14 and 15.

26. SUBCONTRACTING

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

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

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

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

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

27. ENGINEER'S AUTHORITY

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

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

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

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

28. LAND AND RIGHTS-OF-WAY

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

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

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

29. GUARANTY

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

30. DISPUTES

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

31. TAXES

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

SUPPLEMENTAL GENERAL CONDITIONS

1. DEFINITIONS

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

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

(b) CITY, COUNTY, OR AUTHORITY - City of Fort Oglethorpe, Georgia.

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

(d) ENGINEER - CTI Engineers, Inc., or its lawfully designated successor.

(e) OWNER - City of Fort Oglethorpe, Georgia.

(f) OWNER'S ATTORNEY – Robert L. Stulz or his/her lawfully designated successor or assistant.

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

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

(I) THE SITE is the location of the proposed WORK as shown on the Drawings.

2. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

(RESERVED)

3. SCHEDULES, REPORTS, AND RECORDS

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

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

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

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

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

4. DRAWINGS AND SPECIFICATIONS

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

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

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

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

5. SHOP DRAWINGS

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

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

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

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

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

6. MATERIALS, SERVICES AND FACILITIES

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

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

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

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

6.5 The Contractor shall make his own arrangements for delivery and handling of equipment and materials as he may require for the prosecution of the work. The location of all temporary lines, roadways and similar facilities shall be subject to the approval of the Engineer, and these shall be located and operated so as not to interfere with other work carried on by the Owner or by other contractors.

6.6 It is agreed that any temporary power lines, roadways or other facilities which the Contractor furnishes, installs, maintains, and removes at the completion of the work, may be used by the Owner or any of its contractors at such reasonable time or

times as may be directed by the Engineer. Likewise, it is provided that similar facilities of other contracts will become available to the Contractor under similar conditions.

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

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

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

7. INSPECTION AND TESTING

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

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

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

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

8. SUBSTITUTIONS

8.1 The Contract is based on the materials, equipment, and methods described in the Contract Documents.

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

8.3 The Contractor shall not substitute materials, equipment, or methods unless such substitution has been specifically approved for this project by the Engineer.

9. PATENTS

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

10. SURVEYS, PERMITS, REGULATIONS

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

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

11. PROTECTION OF WORK, PROPERTY AND PERSONS

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

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

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

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

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

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

11.7 Contractor will be required, at his own expense, to do everything necessary to support, protect and sustain all sewer, water or gas pipe; service pipes; electric lights; power, telephone, or telegraph poles; conduits; and other fixtures laid across or along the site of the work. The Engineer, as well as the company or the corporation owning said poles, pipes or conduits, must be notified by the Contractor before any such fixtures are removed or molested. In case any of the said sewer, gas, or water pipes; service pipes; electric lights; power, telephone or telegraph poles; conduits; or other fixtures are damaged, they shall be repaired by the authorities having control of the same, and the expense of said repairs shall be deducted from the monies due or to become due the Contractor under this Contract.

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

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

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

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

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

12. SUPERVISION BY CONTRACTOR

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

13. CHANGES IN THE WORK

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

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

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

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

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

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

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

14. CHANGES IN CONTRACT PRICE

14.1 For any change in contract price, the Contractor shall submit a detailed price breakdown sufficient to permit analysis of all material, labor, equipment, subcontract, and overhead costs, as well as profit, regardless of whether the change is an increase or a decrease in price. Any amounts claimed by subcontractors must be supported by a similar price breakdown.

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

15. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

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

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

16. CORRECTION OF WORK

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

17. SUBSURFACE CONDITIONS

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

17.2 The Engineer may have made certain subsurface explorations in the vicinity of the work to be constructed under this Contract. These borings were made only for the Engineer's information in designing the project. Copies of these logs of borings and their locations will be provided to prospective Bidders upon request. These logs of

borings are furnished only as information to Bidders for whatever interpretation and use they desire to make of conditions found when the borings were made. The Owner and Engineer do not warrant that the same conditions exist between borings and the Bidder shall satisfy himself as to the nature of the subsurface conditions throughout the project. If the Bidder wishes to make borings at any location, he shall be afforded the opportunity to do so. Cost of such borings shall be at the Bidder's expense.

18. SUSPENSION OF WORK, TERMINATION, AND DELAY

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

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

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

19. PAYMENTS TO CONTRACTOR

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

20. ACCEPTANCE OF FINAL PAYMENT AS RELEASE

(RESERVED)

21. INSURANCE

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

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

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

Blasting damage
Damage to existing structures
Damage to private driveways, walks, shrubbery, plantings, etc.
Damage to public utilities, electric, water, telephone, gas, sewerage, etc.
Damage to U.S. Government markers.

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

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

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

Bodily Injury	$1,000,000	each person
	1,000,000	each occurrence
Property Damage	$ 500,000	each occurrence
	500,000	aggregate

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

Bodily Injury	$1,000,000	each person
	1,000,000	each occurrence
Property Damage	$ 250,000	each occurrence

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

21.9 The Contractor shall provide installation floater insurance to protect the Contractor and the Owner from all insurable risks of physical loss or damage to materials, products and equipment not otherwise covered under builder's risk insurance while

in warehouses or storage areas, during installation, during testing, and after the work is completed. Equipment such as pumps, motors, engine-generators, compressors, process equipment, switchgear, transformers, panel boards, control equipment, and other similar equipment shall be insured under installation floater insurance when the aggregate value of the equipment exceeds $10,000.

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

22. CONTRACT SECURITY

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

23. ASSIGNMENTS

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

24. INDEMNIFICATION

(RESERVED)

25. SEPARATE CONTRACTS

(RESERVED)

26. SUBCONTRACTING

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

27. ENGINEER'S AUTHORITY

27.1 The Engineer may appoint such resident project representatives as he may desire. Scope of the resident project representative's authority will extend to all parts of the work and to the preparation and manufacture of the materials to be used. A resident project representative is placed on the work to keep the Engineer and

Owner informed as to the progress of construction and the manner in which it is being done and also to call to the attention of the Contractor any deviation from the Drawings and Specifications.

27.2 The resident project representatives have the authority to reject defective material or work that is being improperly done subject to the final decision of the Engineer. The resident project representatives are not authorized to revoke, alter, enlarge, or relax the provisions of these conditions, nor are they authorized to approve or accept any portion of the completed work, or to issue instructions contrary to the Drawings and Specifications.

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

28. LAND AND RIGHTS-OF-WAY

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

29. GUARANTY

(RESERVED)

30. DISPUTES

(RESERVED)

31. TAXES

(RESERVED)

32. CONFLICTING CONDITIONS

32.1 Any provision in any of the Contract Documents which may be in conflict or inconsistent with any of the paragraphs in the General Conditions or the Federal Regulations shall be void to the extent of such conflict or inconsistency except if when and as clarified by the Supplemental General Conditions. Interpretations of any conflicts not clarified may be requested by the Contractor in writing to the

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

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

Contract (including Supplemental Agreements and Change Orders thereto)
Addenda
Bid Proposal
Supplemental General Conditions
General Conditions
Specifications
Governing Standard Specifications
Schedules on Drawings
Notes on Drawings
Details on Drawings
Large Scale Drawings
Small Scale Drawings
Dimensions Given in Figures
Scaled Dimensions

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

33. REQUIRED PROVISIONS DEEMED INSERTED

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

34. PROHIBITED INTEREST

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

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

contract, subcontract, insurance contract, or any other contract pertaining to the Project.

35. USE OF PREMISES AND REMOVAL OF DEBRIS

35.1 The Contractor expressly undertakes at his own expense:

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

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

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

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

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

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

36. ESTIMATE OF QUANTITIES

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

37. CONTRACTOR'S OBLIGATIONS

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

shall observe, comply with and be subject to all terms, conditions, requirements, and limitations of the Contract and Specifications and shall do, carry on, and complete the entire work to the satisfaction of the Engineer and the Owner.

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

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

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

38. PAYMENTS BY CONTRACTOR

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

39. INFORMATION TO BE FURNISHED

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

40. WAIVER

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

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

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

41. CONNECTING OF EXISTING WORK

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

42. PROGRAM AND METHOD OF CONSTRUCTION

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

43. BUILDINGS AND SHANTIES

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

44. "OR EQUAL" CLAUSE

44.1 Any reference to an item of equipment or material by a specific manufacturer's brand or trade name in these Contract Documents is intended merely as a standard. Products or materials of other manufacturers which, in the opinion of the Engineer, are the equal of that specified considering quality, workmanship, and economy of operation and are suitable for the purpose intended, will be accepted.

44.2 Where the phrase "or equal" occurs in the Contract Documents, the Contractor shall not assume that materials, equipment, or methods will be approved by the Engineer unless the item has been specifically approved for this project by the Engineer.

44.3 The decision of the Engineer shall be final.

44.4 The Contractor shall provide all data required by the Engineer to verify the equality of items which the Contractor may wish to substitute for the specified items.

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

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

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

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

45. CONSTRUCTION METHODS AND PROTECTION OF PROPERTIES

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

45.2 Damage to Property

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

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

45.3 Existing Sanitary, Combined and/or Storm Sewers

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

expense of maintaining, repairing, replacing, or connecting to existing sewers shall be borne by the Contractor.

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

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

46. SEWAGE, SURFACE, AND FLOOD FLOWS

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

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

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

46.4 The Contractor shall not discharge or allow discharge of pollutants, as defined in the Clean Water Act, including fill and sediment, into waters of the State or United States, including wetlands, unless authorized by an appropriate State or Federal permit. This prohibition specifically applies to silt and sediment in storm water runoff and in water pumped from trenches and excavations.

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

47. OBSTRUCTIONS ENCOUNTERED

47.1 In addition to showing the structures to be built under this Contract, the Drawings show certain information obtained by the Owner regarding the pipelines and other structures which exist along the site of the Work, both at and below the surface of the ground. The Owner expressly disclaims any responsibility for the accuracy or completeness of the information given on the Drawings with regard to existing

structures and pipelines, and the Contractor will not be entitled to any extra compensation on account of inaccuracy or incompleteness of such information, said structures and pipelines being shown only for the convenience of the Contractor who must verify the information to his own satisfaction. The giving of this information upon the Drawings will not relieve the Contractor of his obligations to support and protect all pipelines and other structures which may be encountered during the construction of the work and to make good all damages done to such pipelines and structures as provided in these Supplemental General Conditions.

48. USE OF STREETS

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

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

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

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

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

49. CONSULTING AND RESIDENT OBSERVATION SERVICES DURING CONSTRUCTION

49.1 In providing the Owner with consulting services and resident project representation during construction, the Engineers and their employees do not assume any duty to supervise construction means or methods and safety procedures followed by any

contractor, subcontractor and/or their respective employees or to any other person; nor for any public liability or for property damage caused through acts of the Contractor, subcontractor and/or their respective employees or any other person.

50. SAFETY AND HEALTH REGULATIONS

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

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

51. ACCESS BY REPRESENTATIVES OF GOVERNMENTAL AGENCIES

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

52. LOCAL AND STATE LAWS

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

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

53.1 The Contractor shall:

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

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

54. CONSTRUCTION RESTRICTIONS

54.1 Heavy construction machinery shall not be used within 500 feet of residential areas between the hours of 10:00 p.m. and 7:30 a.m.

54.2 No blasting or drilling shall be performed within 500 feet of residential areas between the hours of 10:00 p.m. and 7:30 a.m.

55. LEAD BASE PAINT AND JOINT SEALERS

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

56. SUSPENSION AND RESUMPTION OF CONTRACT

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

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

57. ABANDONMENT OR TERMINATION OF CONTRACT

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

58. EVIDENCE OF PAYMENT

58.1 Contractor may be asked to present acceptable evidence from time to time that all bills have been paid for labor, materials, and equipment for which payment on account has been made in monthly estimates. Before final payment is made, Contractor shall, if required by the Owner, present sworn affidavit that all labor, materials, equipment, and service engaged for the work have been paid in full and that there are no outstanding debts or liens on any portions of the work.

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

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

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

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

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

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

60.4 If the Contractor requests that the Engineer's field representative(s) be available to work on a weekend or a holiday but does not actually commit to work, the Contractor will be assessed an amount equal to 2 hours of the representative's time for "on-call" pay for each day that the Contractor so requests.

60.5 The above assessments for field representative's overtime pay, show-up pay, and on-call pay will be deducted as a separate line item on the Contractor's next progress payment request. Unless otherwise stated, the Engineer's field representative's time will be assessed at $60.00 per hour for regular time and $90.00 per hour for overtime.

END OF SECTION

SUPPLEMENTAL GENERAL CONDITIONS FOR GEORGIA

1. Local and State Laws

   The provisions of Chapter 9 of Title 25 of the Official Code of Georgia Annotated (O.C.G.A.) known as the Georgia Utility Facility Protection Act (and all amendments thereto), enacted by the General Assembly of the State of Georgia, is in its entirety to be considered a part of these documents.

2. Water Quality

   The Georgia Department of Natural Resources Environmental Protection Division NPDES Permit No. GAR 100000 for Storm Water Discharges from Construction Activities requirements, in their entirety, shall be considered a part of these documents.

3. Land Disturbance Activity Permit

   The provisions of Chapter 7 of Title 12 of the O.C.G.A., Section 12-7, known as the Georgia Erosion and Sediment Act of 1975 (and all amendments thereto), enacted by the General Assembly of the State of Georgia, is in its entirety to be considered a part of these documents.

4. Contractor Licensing

   The provisions of the O.C.G.A. Section 43-14 (and all amendments thereto), enacted by the General Assembly of the State of Georgia, is in its entirety to be considered a part of these Specifications.

5. Escrow Account of Contractor Retainage

   If applicable, the Owner will set up separate escrow account for deposit of retainage due Contractor in accordance with the provisions of the O.C.G.A., Sections 13-10-80, 13-10-81, 13-10-82, and 13-10-83 (and all amendments thereto), are in their entirety to be considered a part of these Specifications.

6. Conflicts Between Documents

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

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 11 00

SUMMARY OF WORK

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The work described in these Contract Documents consists of furnishing, delivering, and installing all materials, equipment, and products for the construction of the Historic District Water and Stormwater System Improvements as shown on the Drawings.

B. Furnish all materials, power, equipment, tools, labor, transportation, and other items necessary or convenient to the Contractor for the installation of the equipment, materials, and products specified or described in these Contract Documents and for the completion of all work to be performed by the Contractor as specified herein.

1.2 PROJECT COORDINATION

A. The Contractor shall be responsible for project coordination, which includes but is not limited to the following:

1. Work of employees and subcontractors under contract to him. Conduct work to ensure compliance with schedules.

2. Submission of all invoices, progress schedules, progress reports, progress estimates, and other data needed in support of requests for payment.

3. Product and equipment deliveries adequate to maintain the schedule of construction. Report noncompliance to Owner with a recommendation for remedy.

4. Obtaining and use of all temporary structures, offices, storage sheds, and utilities.

5. Obtaining any required building permits, special permits, and approvals from all authorities having jurisdiction.

6. Testing laboratory activities associated with Contractor's scope of work.

7. Check-out of systems and equipment and start-up operations.

8. Work and operations between the Contractor and all trades in such a manner that no union labor dispute of jurisdiction arises regarding unloading, handling, installations, and connections to utilities and otherwise of the various items in the various trades.

1.3 SUBSTANTIAL COMPLETION

A. The work will not be considered to be fully functional and usable by the Owner for its intended purposes and will not be considered substantially complete until the following items are submitted.

1. Copies of specified inspection and test reports and certifications on materials.

2. Copies of written warranties on equipment and products in accordance with Section 01 78 36, Warranties and Bonds.

B. In addition to the above submissions, the work will not be considered to be fully functional and useful by the Owner for its intended purposes and will not be accepted as substantially complete until all of the following components and/or items have been completed:

1. Process and mechanical piping, valving, and manholes, including pressure and leak testing.

2. Plumbing.

3. Roadways, parking areas, and stone surfaces.

4. Drainage.

5. Slope protection and riprap.

6. The following items, unless waived in writing by the Owner due to inclement weather:
   a. Finish grading.
   b. Seeding and mulching.
   c. Pavements and surface treatment.
   d. Sidewalks.
   e. Landscaping.

1.4 FINAL COMPLETION

A. The work under these Contract Documents will not be considered for final acceptance as complete until all of the following items have been completed or submitted:

1. Any items not completed at the time of substantial completion, including all remaining punch list items.

2. Final cleanup.

3. Restoration of all disturbed or damaged properties.

4. Executed project close-out documents included with the Contract Documents.

5. Record drawings.

6. As-built surveys, if required by the Specifications.

1.5 ACCEPTANCE AND START-UP OF OPERABLE COMPONENTS

A. Because of the need to maintain operation during construction, it may be necessary to accept as substantially complete and start-up operable components of the project at various times prior to the completion and acceptance of the entire project.

B. An "operable component" of the project, as used herein, shall mean a complete process subsystem capable of independent operation and shall include all associated structures, equipment, piping, controls, etc.

C. Acceptance and start-up of operable components shall not relieve the Contractor of his obligation to substantially complete the project within the Contract Time.

END OF SECTION

SECTION 01 11 01

WEATHER DELAYS

PART 1 - GENERAL

1.1 EXTENSIONS OF CONTRACT TIME

A. If the basis exists for an extension of time in accordance with the Conditions of the Contract, an extension of time on the basis of weather may be granted only for the number of Weather Delay Days in excess of the number of days listed as the Standard Baseline for that month.

1.2 STANDARD BASELINE FOR AVERAGE CLIMATIC RANGE

A. The Owner has reviewed weather data available from the National Oceanic and Atmospheric Administration and determined a Standard Baseline of average climatic range for the Metro Chattanooga area.

B. Standard Baseline is defined as the normal number of calendar days for each month during which construction activity exposed to weather conditions is expected to be prevented and suspended by cause of adverse weather. Suspension of construction activity for the number of days each month as listed in the Standard Baseline is included in the Work and is not eligible for extension of Contract Time.

C. Standard Baseline is as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
12	11	8	7	7	6	7	5	4	5	6	11

1.3 ADVERSE WEATHER AND WEATHER DELAY DAYS

A. Adverse Weather is defined as the occurrence of one or more of the following conditions within a twenty-four (24) hour day that prevents construction activity exposed to weather conditions or access to the site:

1. Precipitation (rain, snow, or ice) in excess of one-tenth inch (0.10") liquid measure.

2. Temperatures that do not rise above that required for the day's construction activity, if such temperature requirement is specified or accepted as standard industry practice.

3. Sustained wind in excess of twenty-five (25) m.p.h.

B. Adverse Weather may include, if appropriate, "dry-out" or "mud" days:

1. resulting from precipitation days that occur beyond the standard baseline;

2. only if there is a hindrance to site access or sitework and Contractor has taken all reasonable accommodations to avoid such hindrance; and,

3. at a rate no greater than 1 make-up day for each day or consecutive days of precipitation beyond the standard baseline that total 1.0 inch or more, liquid measure, unless specifically recommended otherwise by the Designer.

C. A Weather Delay Day may be counted if adverse weather prevents work on the project for fifty percent (50%) or more of the contractor's scheduled work day and critical path construction activities were included in the day's schedule, including a weekend day or holiday if Contractor has scheduled construction activity that day.

D. Contractor shall take into account that certain construction activities are more affected by adverse weather and seasonal conditions than other activities, and that "dry-out" or "mud" days are not eligible to be counted as a Weather Delay Day until the standard baseline is exceeded. Hence, Contractor should allow for an appropriate number of additional days associated with the Standard Baseline days in which such applicable construction activities are expected to be prevented and suspended.

1.4 DOCUMENTATION AND SUBMITTALS

A. Submit daily jobsite work logs showing which and to what extent critical path construction activities have been affected by weather on a monthly basis.

B. Submit actual weather data to support claim for time extension obtained from nearest NOAA weather station or other independently verified source approved by Designer at beginning of project.

C. Use Standard Baseline data provided in this Section when documenting actual delays due to weather in excess of the average climatic range.

D. Organize claim and documentation to facilitate evaluation on a basis of calendar month periods, and submit in accordance with the procedures for Claims established in the Conditions of the Contract.

E. If an extension of the Contract Time is appropriate, such extension shall be made in accordance with the Conditions of the Contract, and the applicable General Requirements.

END OF SECTION

SECTION 01 22 00

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.2 SUMMARY

A. This section specifies administrative and procedural requirements for unit prices.

1. A unit price is an amount proposed by Bidders and stated in the Bid Schedule as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of work required by the Contract Documents are increased or decreased.

2. Payment will be made only for those items listed in the Bid Schedule. All other items not specifically listed shall be deemed incidental and cost of same shall be included in other items of work.

3. Unit prices include all necessary material, overhead, profit and applicable taxes.

4. Refer to individual specification sections for construction activities requiring the establishment of unit prices. Methods of measurement and payment for unit prices are specified in Part 3 of this section.

B. Specification sections referenced in the Bid Schedule contain requirements for materials and methods described under each unit price.

PART 2 - PAYMENT

2.1 PARTIAL PAYMENT

A. Partial payment may be made for stored material on site, providing:

1. The material meets the specifications outlined elsewhere in these documents.

2. The material is stored according to the recommendations of the Engineer and/or manufacturer.

3. The Contractor submits copies of all shipping invoices for the stored materials delivered to the site.

2.2 NO SEPARATE PAYMENT PROVIDED

A. No separate payment shall be made for any items of work not specifically included in the Bid Schedule.

PART 3 - MEASUREMENT AND PAYMENT

3.1 SECTION 03 30 00, CAST-IN-PLACE CONCRETE

A. Measurement of the volumes of Class B concrete for which payment will be allowed shall be expressed in cubic yards as computed from the dimensions as shown on the Drawings.

B. Measurement of the volumes of 4-inch-thick Class A concrete for which payment will be allowed shall be expressed in square feet as computed from the dimensions as shown on the Drawings.

3.2 SECTION 31 20 00, EARTHWORK

A. Excavation

1. No separate measurement or payment will be made for standard trench earth excavation for pipelines, nor for any other appurtenant facilities. Payment for all such excavation shall be included in the unit prices bid for pipe laid and respective appurtenances. Trench depths shall be the vertical distance between the ground surface and the invert elevation of the pipe.

2. No separate payment shall be made for pumping, bailing, draining, clearing, grubbing, backfilling, borrow excavation, removing of all pavements, pavement foundations, sidewalks, driveways, vegetable growth, debris, buildings, or waste material nor for the disposal of any materials or similar work.

B. Sheeting and Shoring. No measurement or payment will be made for sheeting and shoring. Payment shall be included in other items of work.

C. Crushed Rock Material for Rock Trench Bedding or Trench Undercutting. Crushed rock material as required by these Specifications and/or shown on the Drawings shall be measured and paid by the cubic yard (must agree with the Bid Schedule) of bedding required in excess of standard bedding. Payment shall include the cost of removing all subgrade materials regardless of classification to the required or specified bottom of the crushed stone bedding.

D. Rock Excavation. No separate measurement or payment will be made for trench rock excavation for pipelines, nor for any other facilities, unless noted in the Bid Schedule.

E. Crushed Stone Backfill. Crushed stone backfill as required by these Specifications and/or shown on the Drawings shall be measured and paid for by the linear foot as measured along the centerline of the pipe. Payment shall include the cost of delivered stone, installation in the trench from top of bedding to the specified grade and compaction, complete in place.

F. Sifted Topsoil. Additional offsite high quality topsoil shall be measured and paid for by the cubic yard (must agree with the Bid Schedule) of topsoil in excess of standard topsoil required by the Drawings and Specifications.

3.3 SECTION 31 25 00, SLOPE PROTECTION AND EROSION CONTROL

A. Silt Fences. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of silt fence including posts, filter fabric, tie wire, and bracing, all in accordance with the Specifications and details shown on the

Drawings, shall be made at the applicable unit price bid in the Bid Schedule for the actual number of linear feet installed.

B. Temporary Seeding. Payment for Temporary Seeding and Mulch. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of temporary seeding and mulch, all in accordance with the Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule.

C. Hay Bales. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of hay bales including bales, stakes, and chinking, all in accordance with the Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule for the actual number of bales installed.

D. Riprap Stone. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of riprap stone including filter fabric and stone placement, all in accordance with the Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule for the actual number of tons installed.

E. Grass Jute or Straw Matting. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of matting for stabilization, all in accordance with the Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule for the actual number of square yards installed.

F. Tubes / Waddles. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of tubes / waddles including staking and bracing, all in accordance with the Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule for the actual number of linear feet installed.

G. Inlet Protection. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of inlet protection, all in accordance with the Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule for the actual number installed.

H. Construction Exit. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of construction exit, all in accordance with the Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule for the actual number installed.

I. Dewatering Structure. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of de-watering structure, including, but not limited to excavation, crushed stone, geotextile fabric, and filter bag, all in accordance with the Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule for the actual number installed.

J. Concrete Washout Structure. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of concrete washout structure, including, but not limited to earth berm, geotextile fabric, staples, sand bags, and signage, all in accordance with the Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule for the actual number installed.

3.4 SECTION 32 10 00, NEW AND REPLACEMENT PAVING

A. Measurement. The quantities of the various types of paving for which payment will be made shall be at the applicable contract units stated in the Bid Schedule.

B. Payment for each type of pavement shall be made for the quantities determined in the manner specified above at the applicable contract unit prices stated in the Bid Schedule. This amount, so paid, shall be compensation in full for furnishing all labor, materials, tools, plant equipment, services and other work in connection with or incidental to the construction of the roadway pavement.

3.5 SECTION 32 92 19, SEEDING

A. Measurement for Seeding and Mulch. The quantities of seeding and mulch for which payment will be made shall be expressed in linear feet and shall be measured along the centerline of pipe.

B. Payment for Seeding and Mulch. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of seeding and mulch, all in accordance with the Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule.

3.6 SECTION 33 05 23, UTILITY CROSSINGS OF HIGHWAYS

A. SR 146 and Cross Street Crossings. Payment for furnishing all labor, materials, equipment and services required for the complete installation of restrained joint ductile iron pipe and casing pipe by boring or jacking methods, and steel liner plates by construction in tunnels including all classes of excavation, backfill, concrete, casing spacers, end seals, etc., all in accordance with these Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule for the actual number of linear feet of casing pipe or liner plates installed.

3.7 SECTION 33 11 00, POLYETHYLENE WRAP

A. Measurement for Polyethylene Wrap. The quantities of Poly Wrap for which payment will be made shall be expressed in linear feet and shall be measured along the centerline of pipe.

B. Payment for Polyethylene Wrap. Payment for furnishing all labor, materials, equipment, and services required for the complete installation of Poly Wrap, all in accordance with the Specifications and details shown on the Drawings, shall be made at the applicable unit price bid in the Bid Schedule.

3.8 SECTION 30 11 20, DUCTILE IRON PIPE AND FITTINGS

A. Pipe shall be measured for payment along the centerline of the installed pipe with no length deduction for fittings, valves, etc. No separate payment shall be made for excavation, standard bedding, and backfill; and the cost shall be included in the unit cost of installed pipe.

B. The weight of ductile iron fittings for which payment will be made shall be the number of pounds of fittings furnished, placed, jointed, and tested in accordance with these Specifications. The total weight of all fittings shall be the catalog weights as published for each type furnished and placed. No payment will be allowed for weights of jointing compound, bolts, nuts, washers or gaskets which shall be considered an incidental part

of the fitting and included in the unit price bid per pound for fittings or the applicable unit price bid in the Bid Schedule for the actual number installed.

C. Any necessary repairs to existing mains and service lines damaged during performance of work under these Contracts shall be made at the Contractor's expense and no reimbursement will be made for any labor, materials, equipment, or other costs involved in such repairs.

D. Where connections are shown or required to be made between new and existing water mains, the cost of all such work, services, and equipment, including excavation, cutting pipe, pumping, etc., as required to complete such connections shall be included in the unit prices bid in the Bid Schedule and no separate payment therefor will be made. Payment for furnishing and installing any new pipe and fittings and furnishing and installing accessory items such as valves, etc., required for such connections shall be made at the unit prices bid for connections.

E. Concrete for pipe protection and encasement and concrete thrust blocking at bends and other fittings, when and as authorized by the Engineer, shall be paid for at the unit price per cubic yard of Class B concrete as set forth in the Bid Schedule.

F. No separate measurement or payment will be allowed for pressure testing or performing leakage, chlorine, and bacteriological tests on new water lines installed under these contracts, payment for this work shall be included in the unit price or lump sum price of other items, unless otherwise noted in the Bid Schedule. .

3.9 SECTION 33 12 16, VALVES FOR WATER DISTRIBUTION
SECTION 33 12 19, FIRE HYDRANTS

A. Measurement shall be made by each of the various types of valves; each air release valve including manhole; each hydrant including tee, valve, thrust block, gravel and piping; each water service including meter, meter box, yoke, corporation stop, etc. complete as shown on the Drawings and specified herein.

B. Payment for each type of valve or hydrant shall be made for the quantities determined in the manner specified above at the applicable contract unit price stated in the Bid Schedule.

END OF SECTION

SECTION 01 29 76

APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Submit Applications for Payment to the Engineer.

1.2 RELATED DOCUMENTS

A. Contract between Owner and Contractor.

B. General Conditions: Progress Payments, Retainages and Final Payment.

C. Section 01 78 00, Project Closeout.

1.3 FORMAT AND INFORMATION REQUIRED

A. Review preliminary application with resident project representative.

B. Submit applications typed on forms acceptable to the Owner.

C. Provide itemized data on application:

1. Format, schedules, line items, unit prices, units completed by month and project-to-date, and values.

2. Project photographs illustrating progress of work during the period.

3. Documentation of employee wages, as requested.

1.4 PREPARATION OF APPLICATION FOR EACH PROGRESS PAYMENT

A. Application Form

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

2. Fill in summary of dollar values to agree with respective totals indicated.

3. Execute certification with signature of a responsible officer.

B. Continuation Sheets

1. Fill in total list of all scheduled component items of work, with item number and scheduled dollar value for each item.

2. Fill in dollar value in each column for each scheduled line item when work has been performed or products stored. Round off values to nearest dollar, or as specified for the Bid Schedule.

3. List each Change Order executed prior to date of submission. List by Change Order number and description, as for an original component item of work.

4. To receive approval for payment on component material stored on site, submit copies of the original paid invoices with the application for payment along with the material location report (see Section 01 32 00, Schedules and Reports).

1.5 SUBSTANTIATING DATA FOR PROGRESS PAYMENTS

A. Substantiating Data. When the Owner or the Engineer requires substantiating data, submit suitable information, with a cover letter identifying:

1. Project.

2. Application number and date.

3. Detailed list of enclosures.

4. For stored products:
   a. Item number and identification as shown on application.
   b. Description of specific material.

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

1.6 PREPARATION OF APPLICATION FOR FINAL PAYMENT

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

1.7 SUBMITTAL PROCEDURE

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

B. Number: Six copies of each application.

1.8 PROCESSING OF PERIODIC APPLICATIONS FOR PAYMENT

A. No applications for payment for work under this Contract will be processed until the Contractor's Preliminary Construction Schedule, Submittal Tabulation, and Schedule of Values are submitted in accordance with the requirements of Section 01 32 00, Schedules and Reports.

B. No further applications for payment will be processed after the due date of the Contractor's Construction Schedule and Submittal Schedule until both schedules are submitted in conformance with the requirements of Section 01 32 00, Schedules and Reports.

C. No applications will be processed for stored materials unless the application is accompanied with copies of original paid invoices and the Material Location Report specified in Section 01 32 00, Schedules and Reports.

D. No further applications for payment will be processed after the expiration of the Contract Time, including approved extensions thereof, until the date of Substantial Completion as described in these Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 - GENERAL

1.1 SCOPE

A. This section specifies administrative and procedural requirements for project meetings including but not limited to:

1. Pre-Construction Conference.
2. Pre-Installation Conferences.
3. Coordination Meetings.
4. Progress Meetings.

B. Construction schedules are specified in another Division 1 section.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3 PRE-CONSTRUCTION CONFERENCE

A. Attend and participate in a pre-construction conference and organizational meeting at the project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees. The Owner, Engineer and their consultants, the contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda. Discuss items of significance that could affect progress including such topics as:

1. Tentative construction schedule.
2. Critical work sequencing.
3. Designation of responsible personnel.
4. Procedures for processing field decisions and Change Orders.
5. Procedures for processing Applications for Payment.
6. Distribution of Contract Documents.
7. Submittal of shop drawings, product data and samples.
8. Preparation of record documents.
9. Use of the premises.
10. Office, work and storage areas.
11. Equipment deliveries and priorities.
12. Safety procedures.
13. First aid.

14. Security.
15. Housekeeping.
16. Working hours.

1.4 PRE-INSTALLATION CONFERENCES

A. Conduct a pre-installation conference at the site before each construction activity that requires coordination with other construction. The installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the Engineer of scheduled meeting dates.

1. Review the progress of other construction activities and preparations for the particular activity under consideration at each pre-installation conference, including requirements for:

    a. Contract documents.
    b. Options.
    c. Related change orders.
    d. Purchases.
    e. Deliveries.
    f. Shop drawings, product data and quality control samples.
    g. Possible conflicts.
    h. Compatibility problems.
    i. Time schedules.
    j. Weather limitations.
    k. Manufacturer's recommendations.
    l. Compatibility of materials.
    m. Acceptability of substrates.
    n. Temporary facilities.
    o. Space and access limitations.
    p. Governing regulations.
    q. Safety.
    r. Inspection and testing requirements.
    s. Required performance results.
    t. Recording requirements.
    u. Protection.

2. Record significant discussions and agreements and disagreements of each conference, along with the approved schedule. Distribute the record of the meeting to everyone concerned, promptly, including the Owner and Engineer.

3. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the conference at the earliest feasible date.

1.5 COORDINATION MEETINGS

A. Conduct project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation meetings.

B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.

C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.6 PROGRESS MEETINGS

A. Conduct progress meetings at the project site at regularly scheduled intervals but not less than monthly. Notify the Owner and Engineer of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees. In addition to representatives of the Owner and Engineer, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Agenda. Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.

2. Contractor's Submittal Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Submittal Schedule, whether on time or ahead or behind schedule. Determine how submittals behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.

3. Review the present and future needs of each entity present, including such items as:

    a. Interface requirements.
    b. Time.
    c. Sequences.
    d. Deliveries.
    e. Off-site fabrication problems.
    f. Access.
    g. Site utilization.
    h. Temporary facilities and services.
    i. Hours of work.
    j. Hazards and risks.
    k. Housekeeping.
    l. Quality and work standards.
    m. Change Orders.
    n. Documentation of information for payment requests.

D. Reporting. No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

1. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 32 00

SCHEDULES AND REPORTS

PART 1 - GENERAL

1.1 SUMMARY

A. General. This section specifies administrative and procedural requirements for schedules and reports required for proper performance of the work.

B. Coordination. Each prime Contractor shall closely coordinate scheduling and reporting with the scheduling and reporting of other prime Contractors.

C. Schedules required include:

1. Preliminary Construction Schedule, including Submittals Tabulation.
2. Contractor's Construction Schedule.
3. Submittal Schedule.
4. Schedule of Values.

D. Reports required include:

1. Daily Construction Reports.
2. Material Location Reports.
3. Field Correction Reports.
4. Spare Parts Inventory Reports.
5. Equipment Start-up Report and Certifications.

E. Project meeting minutes are included in Section 01 31 19, Project Meetings.

F. Inspection and test reports are included in Section 01 40 00, Quality Control Services.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar Chart Schedule. Submit a preliminary horizontal bar chart type construction schedule within seven days of the date established for commencement of the work.

B. Bar Chart Schedule. The Contractor for General Construction shall submit a preliminary horizontal bar chart type construction schedule, with a copy to each prime Contractor, within seven days of the date established for commencement of the work. Within five working days of this submittal, each other prime Contractor shall submit a matching preliminary horizontal bar chart schedule showing their construction operations sequenced and coordinated with general construction.

1. Provide a separate time bar for each significant construction activity. Coordinate each element on the schedule with other construction activities. Schedule each construction activity in proper sequence. Provide a continuous vertical line to identify the first working day of each week.

2. Indicate completion of the work in advance of the date established for substantial completion.

3. If adjustments are necessary for sequencing and coordination of the work, the Contractor for general construction shall arrange a meeting with the other prime Contractors at the earliest possible date. At this meeting each prime Contractor shall negotiate reasonable adjustments to their schedules.

C. Submittal Tabulation. With the submittal of the preliminary construction schedule, include a tabulation by date of submittals required during the first 90 days of construction. List those submittals required to maintain orderly progress of the work, and those required early because of long lead time for manufacture or fabrication.

1. At the Contractor's option, submittal dates may be shown on the schedule, in lieu of being tabulated separately.

1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Bar Chart Schedule. Prepare a comprehensive, fully developed, horizontal bar chart type Contractor's construction schedule based on the preliminary construction schedule and on whatever updating and feedback was received since the start of the project.

B. Bar Chart Schedule. The Contractor for general construction shall secure time commitments for performing critical construction activities from each of the other prime Contractors and shall prepare a combined construction schedule for the entire project. The Schedule shall be a comprehensive, multi-sheet, integrated, fully developed horizontal bar chart type schedule (Microsoft Project 2003, or similar) based on the preliminary construction schedules and reflecting updating and feedback received since the start of the project.

1. Submit the schedule within 30 calendar days of the date established for commencement of the work, unless a longer time has been requested and approved.

2. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week.

a. If practical, use the same breakdown of units of the work as indicated in the "Schedule of Values."

3. For significant construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in 10 percent increments within the time bar. As work progresses, place a contrasting mark in each bar to indicate actual completion percentage.

4. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data clearly for the entire construction period.

    a. Show the activities of each prime contract on a separate sheet.

    b. Prepare a simplified summary sheet indicating the combined construction activities of the prime contracts.

5. Secure time commitments for performing critical elements of the work from parties involved. Coordinate each element on the schedule with other portions of the work; include minor elements involved in the overall sequence of the work. Show each construction activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the work. Show critical path activities or elements.

6. Coordinate the Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other required schedules and reports.

7. Indicate completion of the work in advance of the date established for substantial completion. Indicate substantial completion on the schedule to allow ample time for the Engineer's administrative procedures necessary for certification of substantial completion.

C. Work Stages. Use crosshatched bars to indicate important stages of construction for each major portion of the work.

D. Such stages include, but are not necessarily limited to:

1. Subcontract awards.
2. Purchases.
3. Mockups.
4. Fabrication.
5. Sample testing.
6. Deliveries.
7. Installation.
8. Testing.
9. Adjusting.
10. Curing.
11. Start-up and placement into final use and operation.

E. Distribution. Following the Engineer's response to initial submittal of the Contractor's construction schedule, print and distribute copies to the Engineer, Owner, separate contractors, subcontractors, suppliers, fabricators, and other parties required to comply with scheduled dates.

1. Post copies of the schedule in the project meeting room and temporary field office.

2. When revisions are made, distribute the updated schedule to the same parties and post in the same locations. Delete parties from distribution when they have

completed their assigned portion of the work and are no longer involved in performance of construction activities.

F. Schedule Updating. Revise the schedule immediately after each meeting or other activity, where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.5 SUBMITTAL SCHEDULE

A. Prepare a complete submittal schedule concurrent with the development of the Contractor's construction schedule. Submit the schedule within 30 calendar days of the date established for commencement of the work, unless a longer period has been requested and approved.

1. Coordinate submittal schedule with the list of subcontracts, Schedule of Values, and the list of products specified in Section 01 60 00, Materials and Equipment, as well as the Contractor's construction schedule.

2. Prepare the schedule in chronological order; include submittals listed on the tabulation of submittals required during the first 90 days of construction. Provide the following information on the schedule:

a. Schedule date for the first submittal.
b. Related section number.
c. Submittal category.
d. Name of subcontractor.
e. Description of the part of the work covered.
f. Scheduled date of the Engineer's final release or approval.

3. Scheduled submittal dates shall be staggered.

4. Items of a critical nature shall be prioritized and so noted.

5. Scheduled final release or approval dates shall be coordinated with construction schedule.

B. Distribution. Following the Engineer's response to initial submittal, print and distribute the schedule to the Engineer, Owner, separate Contractors, subcontractors, suppliers, fabricators, and other parties required to comply with submittal dates indicated.

1. Post copies in the project meeting room and temporary field office.

2. When revisions are made, distribute the updated schedule to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned part of the work and are no longer involved in the performance of construction activities.

C. Schedule Updating. Revise the schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with report of each meeting.

1.6 SCHEDULE OF VALUES

A. Prepare and submit a schedule of values established in the Agreement within 15 days of the date established for commencement of the work.

1. Refer to Section 01 22 00, Measurement and Payment, for a listing of categories of work where unit prices are required.

2. Refer to individual specification sections for portions of the work where the establishment of unit prices is required. Methods of measurement and pricing are specified in these sections.

B. Prepare the schedule in tabular form, including the following items:

1. Name of the part of the work.
2. Related specification section.
3. Name of subcontractor assigned.
4. Unit of measurement.
5. Price per unit.

C. Distribution. Distribute to the Owner, Engineer, and each party involved in performance of the portion of the work, where established unit prices could come into force and effect.

1.7 REPORTS

A. Daily Construction Reports. Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Engineer at weekly intervals:

1. List of subcontractors at the site.
2. List of separate contractors at the site.
3. Approximate count of personnel at the site.
4. High and low temperature, general weather conditions.
5. Accidents (refer to accident reports).
6. Meetings and significant decisions.
7. Unusual events (refer to special reports).
8. Stoppages, delays, shortages, losses.
9. Meter readings and similar recordings.
10. Emergency procedures.
11. Orders and requests of governing authorities.
12. Change Orders received, implemented.
13. Services connected, disconnected.
14. Equipment or system tests and start-ups.
15. Partial completions, occupancies.
16. Substantial completions authorized.

B. Material Location Reports. At monthly intervals prepare a comprehensive list of materials delivered to and stored at the site. The list shall be cumulative, showing materials previously reported plus items recently delivered. Include with the list a statement of progress on and delivery dates for all materials or items of equipment

being fabricated or stored away from the building site. Submit copies of the list to the Engineer at monthly intervals.

C. Field Correction Report. When the need to take corrective action that requires a departure from the Contract Documents arises, prepare a detailed report including a statement describing the problem and recommended changes. Indicate reasons the Contract Documents cannot be followed. Submit a copy to the Engineer immediately.

D. Spare Parts Inventory Report. Document in writing on forms provided by the Engineer delivery to the Owner of specified spare parts. Include the manufacturer's name, part name, number, and quantity delivered. Reports shall be signed by representatives of the Contractor, Owner, and Engineer. Reports are due prior to substantial completion.

1.8 LOGS

A. RFI Log. Maintain a tabular log of all Requests for Information (RFI). Number RFIs in a sequential manner. Note date of request and date of response for each. Update the RFI log monthly and distribute at the monthly progress meeting.

B. Shop Drawing and Product Data Submittal Log. Maintain a tabular log of all shop drawing and product data submittals. Number submittals in a sequential manner. Note dates of initial submittal, first return, resubmittal, second or final return along with Engineer’s action noted for each submittal. Update the shop drawing submittal log monthly and distribute at the monthly progress meeting.

C. Change Order Request/Proposal Log. Maintain a tabular log of all change order requests/proposals. Number change order requests/proposals in a sequential manner. Note date of submittal, brief description of covered work, proposed price, requested number of days (if applicable), and status (denied/approved/pending). For those that are approved, indicate in which change order they are included. Update the log monthly and distribute at the monthly progress meeting.

D. O & M Manual Log. Maintain a tabular log of all O & M Manual submittals. Number submittals in a sequential manner. Note dates of initial submittal, first return, resubmittal, second or final return along with Engineer’s action noted for each submittal. Update the O & M Manual submittal log monthly and distribute at the monthly progress meeting.

1.9 EQUIPMENT START-UP REPORT AND CERTIFICATION

A. An experienced, authorized service representative (not a sales representative) of the manufacturer of each item of equipment shall visit the site of the work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the equipment manufacturer's representative shall be present when the equipment is placed in operation and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of the Engineer.

B. Each equipment manufacturer's representative shall furnish to the Owner, through the Engineer, a written report certifying that the equipment (1) has been properly installed and lubricated; (2) is in accurate alignment; (3) is free from any undue stress imposed by connecting piping or anchor bolts; and (4) has been operated under full load

conditions and that it operated satisfactorily. Work will not be accepted as substantially complete until executed Equipment Start-up Report and certification forms have been submitted in accordance with the requirements of this section.

C. Properly coordinate the visits by the manufacturer's representatives, particularly where the operation of an item of equipment is dependent on the operation of other equipment. Prior to calling the manufacturer's representative, ensure that all necessary related equipment, structures, piping, and electrical work is complete. Pay for any revisits to the site by the manufacturer's representative made necessary due to the Contractor's failure to properly coordinate the visits.

D. Secure the services of the manufacturer's representative at the site of the work for as long as is necessary to check the installation and place the equipment in satisfactory operation.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PAYMENT

A. No requests for payment for work under this Contract will be processed until the Contractor's Preliminary Construction Schedule, Submittals Tabulation, and Schedule of Values are submitted in conformance with the requirements of this section.

B. No further requests for payment will be processed after the due date of the Contractor's Construction Schedule and Submittal Schedule until both schedules are submitted in conformance with the requirements of this section.

C. If payment is being requested for stored materials, the material location report must be included with the request for payment.

END OF SECTION

SECTION 01 32 38

VIDEO RECORDING OF EASEMENT AREAS

PART 1 - GENERAL

1.1 SCOPE

A. The work covered by this section consists of furnishing all labor, equipment, and material required to provide a digital video record of all easement areas before construction begins in each area. One copy of the video shall be presented to the Owner for their records.

B. The purpose of the video is to aid the Owner in determining the extent of construction damage to property in easement areas.

C. Contractor shall have alignment staked before video recording is performed.

PART 2 - PRODUCTS

2.1 VIDEO MEDIA

A. The video media shall be a standard digital copy for use with DVD, thumbdrive or other device as requested by the Owner.

PART 3 - EXECUTION

A. Contractor shall use a quality video camera with sound available. The camera must have zoom capabilities, date record, and produce a clear, concise color picture of the easement area.

B. Before construction begins, Contractor shall video record each easement by walking along the sewer alignment, recording all topographic features (i.e. trees, sheds, gardens, pools, fences, shrubs, buildings, walls, etc.) on line and also to the left and right of the centerline. The limits shall be determined by the Contractor and the Engineer as the area estimated to be disturbed by the construction.

C. Contractor shall add sound to the video by denoting the line number, date and time, and stations at manholes or names and addresses of property owners.

D. Contractor shall especially record and denote areas of existing damage prior to the construction (i.e. existing cracks in walls, dead trees or shrubs, damaged fences, etc.).

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies administrative and procedural requirements for submittal of shop drawings, product data, and samples to verify that products, materials, and systems proposed for use comply with provisions of the Contract Documents.

B. Shop drawings are required for all materials, products, and equipment furnished on this project, unless otherwise specified.

C. Standard information prepared without specific reference to the project is not considered to be shop drawings.

D. Coordination drawings are a special type of shop drawing that show the relationship and integration of different construction elements that require close and careful coordination during fabrication or during installation to fit in the restricted space provided or to function as intended.

E. Product data include, but are not limited to, the following:

1. Manufacturer's product specifications.
2. Manufacturer's installation instructions.
3. Standard color charts.
4. Catalog cuts.
5. Roughing-in diagrams and templates.
6. Standard wiring diagrams.
7. Printed performance curves.
8. Operational range diagrams.
9. Mill reports.
10. Standard product operating and maintenance manuals.

F. Samples include, but are not limited to, the following:

1. Partial sections of manufactured or fabricated components.
2. Small cuts or containers of materials.
3. Complete units of repetitively used materials.
4. Swatches showing color, texture, and pattern.
5. Color range sets.
6. Components used for independent inspection and testing.

G. Administrative Submittals. Refer to other Division 1 sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:

1. Permits.
2. Applications for payment.

3. Performance and payment bonds.
4. Insurance certificates.
5. Listing of subcontractors.

H. Project Photographs. Submittal of project photographs is included under Section 01 32 33, Construction Photographs.

I. Inspection and Test Reports. Submittal of inspection and test reports is included under Section 01 40 00, Quality Control Services.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3 CONTRACTOR'S RESPONSIBILITY

A. It is the duty of the Contractor to check all drawings, data, and samples prepared by or for him before submitting them to the Engineer for review. Each and every copy of the Drawings and data shall bear Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement. Shop drawings shall indicate any deviations in the submittal from requirements of the Contract Documents.

B. The Contractor shall determine and verify:

1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Conformance with Specifications.

C. Do not begin any of the work covered by a drawing, data, or a sample returned for correction until a revision or correction thereof has been reviewed and accepted by the Engineer.

D. Submit to the Engineer all drawings and schedules sufficiently in advance of construction requirements to provide no less than 21 calendar days for checking and appropriate action from the time the Engineer receives them.

E. Stagger shop drawing submittals and indicate priority for critical delivery items on the shop drawing submittal schedule.

F. Submit four copies for the Engineer plus the number of copies the Contractor requires of descriptive or product data submittals to complement shop drawings (up to a maximum of eight copies). The Engineer will retain four sets. All blueprint shop drawings shall be submitted with one set of reproducibles and only four sets of prints. The Engineer will review the blueprints and return to the Contractor the set of marked-up prints with appropriate review comments.

G. Contractor shall be responsible for and bear all cost of damages which may result from the ordering of any material or from proceeding with any part of the work prior to the review by Engineer of the necessary shop drawings.

1.4 ENGINEER'S REVIEW OF SHOP DRAWINGS

A. The Engineer's review of drawings, data, and samples submitted by the Contractor is for general conformance with the design concept of the project and for general compliance with the information given in the Contract Documents. The Engineer's review and exception, if any, will not constitute an approval of dimensions, quantities, and details of the material, equipment, device, or item shown.

B. The review of drawings and schedules shall not be construed:

1. As permitting any departure from the Contract requirements;

2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;

3. As approving departures from details furnished by the Engineer, except as otherwise provided herein.

C. If the drawings or schedules as submitted describe variations and show a departure from the Contract requirements which the Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in contract price or time for performance, the Engineer may return the reviewed drawings without noting an exception.

D. When reviewed by the Engineer, each of the shop drawings will be identified as having received such review, being so stamped and dated. Shop drawings stamped "REVISE AND RESUBMIT" and with required corrections shown will be returned to the Contractor for correction and resubmittal.

E. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing or on resubmitted shop drawings, to revisions other than the corrections requested by the Engineer on previous submissions. Make any corrections required by the Engineer.

F. If the Contractor considers any correction indicated on the Drawings to constitute a change to the Contract Drawings or Specifications, the Contractor shall give written notice thereof to the Engineer.

G. The Engineer will review a submittal/resubmittal a maximum of 3 times, after which the cost of review will be borne by the Contractor. The cost of engineering will be equal to the Engineer's charges to the Owner under the terms of the Engineer's agreement with the Owner.

H. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

I. No partial submittals will be reviewed. Submittals not complete will be returned to the Contractor, and will be considered "Rejected" until resubmitted.

1.5 SUBMITTAL PROCEDURES

A. Coordination. Coordinate preparation and processing of submittals with performance of the work. Transmit each submittal to the Engineer sufficiently in advance of scheduled performance of related construction activities to avoid delay.

1. Coordinate each submittal with other submittals and related activities that require sequential activity including:

a. Testing.
b. Purchasing.
c. Fabrication.
d. Delivery.

2. Coordinate transmittal of different types of submittals for the same element of the work and different elements of related parts of the work so that processing will not be delayed by the Engineer's need to review submittals concurrently for coordination.

a. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are forthcoming.

b. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Engineer sufficiently in advance of the work to permit processing.

B. Submittal Preparation. Prepare and submit shop drawings in accordance with the following:

1. Attach a submittal cover sheet to each copy of a shop drawing. The submittal cover sheet shall contain the following information:

a. Project name and Owner’s name.
b. Contractor’s name and address.
c. Engineer’s name and address.
d. Specification section and title.
e. Drawing reference number.
f. Submittal number.
g. Space to indicate the results of the Contractor’s review.
h. Space to indicate any deviations from the Contract Documents or comments by the Contractor.
i. Space approximately 8 inches wide and 4 inches high for the Engineer to indicate the results of his review and any comments.

2. Each shop drawing submittal shall be assigned a sequential number, beginning with the number 1. Resubmittals shall be identified by a letter suffix (i.e., 1A, 1B, etc.).

C. Submittal Transmittal. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Engineer, and to other destinations, as indicated, by use of a transmittal form. Submittals received from sources other than the Contractor will be returned to the sender without action. A separate transmittal shall be used for each shop drawing submittal.

1.6 SHOP DRAWINGS

A. The term "shop drawings," when used in the Contract Documents, shall be considered to mean Contractor's plans for material and equipment which become an integral part of the Project. These drawings shall be complete and detailed. Shop drawings shall consist of fabrication, erection and setting drawings and schedule drawings, manufacturer's scale drawings, and wiring and control diagrams. Cuts, catalogs, pamphlets, descriptive literature, and performance and test data, shall be considered only as support to required shop drawings as defined above.

B. Drawings and schedules shall be checked and coordinated with the work of all trades involved before they are submitted for review by the Engineer. Contractor shall indicate whether the shop drawing complies with or deviates from the requirement of the Contract Documents.

C. If drawings show deviations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall clearly mark and describe such deviation in his letter of transmittal. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such drawings have been reviewed.

D. Data on materials and equipment include, without limitation, materials and equipment lists, catalog data sheets, cuts, performance curves, diagrams, materials of construction and similar descriptive material. Materials and equipment lists shall give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.

E. Installation List. When requested by the Engineer, manufacturers or equipment suppliers who propose to furnish equipment or products shall submit an installation list to the Engineer along with the required shop drawings. The installation list shall include at least five installations where identical equipment has been installed and has been in operation for a period of at least 1 year.

F. Color. Only the Engineer will utilize the color "red" in marking shop drawing submittals.

G. Before final payment is made, the Contractor shall furnish to Engineer five sets of record drawings, all clearly revised, complete and up-to-date showing the permanent construction as actually made for all reinforcing and structural steel, miscellaneous metals, process and mechanical equipment, yard piping, electrical system and instrument system.

1.7 SAMPLES

A. Furnish, for the approval of the Engineer, samples required by the Contract Documents or requested by the Engineer. Samples shall be delivered to the Engineer as specified or directed. The Contractor shall prepay all shipping charges on samples. Materials

or equipment for which samples are required shall not be used in work until approved by the Engineer.

1.8 SPECIFIC SUBMITTAL REQUIREMENTS

A. Submit coordination drawings where required for integration of different construction elements. Show construction sequences and relationships of separate components where necessary to avoid conflicts in utilization of the space available.

B. Highlight, encircle, or otherwise indicate deviations from the Contract Documents on the shop drawings.

C. Do not permit shop drawing copies without an appropriate final stamp or other marking indicating the action taken by the Engineer to be used in connection with construction.

D. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit shop drawings on sheets at least 8½ by 11 inches but no larger than 30 by 40 inches.

1.9 PRODUCT DATA

A. Collect product data into a single submittal for each element of construction or system. Mark each copy to show which choices and options are applicable to the Project.

B. Where product data have been printed to include information on several similar products, some of which are not required for use on the project, or are not included in this submittal, mark copies to clearly indicate which information is applicable.

C. Where product data must be specially prepared for required products, materials, or systems, because standard printed data are not suitable for use, submit as "shop drawings," not "product data."

D. Include the following information in product data:

1. Manufacturer's printed recommendations.
2. Compliance with recognized trade association standards.
3. Compliance with recognized testing agency standards.
4. Application of testing agency labels and seals.
5. Notation of dimensions verified by field measurement.
6. Notation of coordination requirements.

E. Submittals. Submit two copies of each required product data submittal; submit two additional copies where copies are required for maintenance manuals. The Engineer will retain one copy, and will return the other marked with the action taken and corrections or modifications required.

F. Distribution. Furnish copies of final product data submittal to manufacturers, subcontractors, suppliers, fabricators, installers, governing authorities and others as required for performance of the construction activities. Show distribution on transmittal forms.

1. Do not proceed with installation of materials, products and systems until a copy of product data applicable to the installation is in the installer's possession.

2. Do not permit use of unmarked copies of project data in connection with construction.

1.10 ENGINEER'S ACTION

A. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. Final Unrestricted Release: Where submittals are marked "NO EXCEPTIONS," that part of the work covered by the submittal may proceed, provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

2. Final-But-Restricted Release: When submittals are marked "EXCEPTIONS AS NOTED," that part of the work covered by the submittal may proceed, provided it complies with both the Engineer's notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

3. Returned for Resubmittal: When submittal is marked "REVISE AND RESUBMIT," do not proceed with that part of the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the Engineer's notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

   a. Do not permit submittals marked "REVISE AND RESUBMIT" to be used at the project site, or elsewhere where construction is in progress.

4. Rejected: When submittal is marked "REJECTED," the materials, equipment, and/or methods identified in the submittal do not comply with the Contract requirements and shall not be incorporated into the work. No resubmittal of the same materials, equipment, and/or methods shall be made.

5. Other Action: Where a submittal is primarily for information or record purposes, for special processing or other Contractor activity, the submittal will be returned, marked "Action Not Required."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 40 00

QUALITY CONTROL SERVICES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include contract enforcement activities performed by the Engineer.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

1. Specific quality control requirements for individual construction activities are specified in the sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.

2. Inspections, tests, and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

3. Requirements for the Contractor to provide quality control services required by the authorities having jurisdiction are not limited by provisions of this section.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3 RESPONSIBILITIES

A. Contractor Responsibilities. Provide inspections, tests, and similar quality control services, specified in individual specification sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are provided by another identified entity; these services include those specified to be performed by an independent agency and not by the Contractor. Costs for these services shall be included in the contract sum.

1. Employ and pay an independent agency to perform specified quality control services.

2. The Owner will engage and pay for the services of an independent agency to perform inspections and tests specified as the Owner's responsibility.

3. Retesting: The Contractor is responsible for retesting where results of required inspections, tests, or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

    a. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

4. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

    a. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

    b. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

    c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

    d. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

    e. Security and protection of samples and test equipment at the project site.

B. Owner Responsibilities. The Owner will employ and pay for the services of an independent agency, testing laboratory, or other qualified firm to perform services which are the Owner's responsibility.

C. Duties of the Testing Agency. The independent testing agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual specification sections shall cooperate with the Engineer and Contractor in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

    1. The agency shall notify the Engineer and Contractor promptly of irregularities or deficiencies observed in the work during performance of its services.

    2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents, or approve or accept any portion of the work.

    3. The agency shall not perform any duties of the Contractor.

D. Coordination. The Contractor and each agency engaged to perform inspections, tests, and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.4 SUBMITTALS

A. The independent testing agency shall submit to the Engineer, in duplicate, a certified written report of each inspection, test, or similar service.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

2. Report Data: Written reports of each inspection, test, or similar service shall include, but not be limited to:

a. Date of issue.
b. Project title and number.
c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the work and test method.
g. Identification of product and specification section.
h. Complete inspection or test data.
i. Test results and an interpretation of test results.
j. Ambient conditions at the time of sample-taking and testing.
k. Comments or professional opinion as to whether inspected or tested work complies with Contract Document requirements.
l. Name and signature of laboratory inspector.
m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

A. Qualification for Service Agencies. Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state in which the project is located.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General. Upon completion of inspection, testing, sample-taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION

SECTION 01 42 13

ABBREVIATIONS

PART 1 - GENERAL

1.1 GENERAL

A. Wherever in these Specifications and Contract Documents the abbreviations, or pronouns in place of them are used, the intent and meaning shall be interpreted as specified herein.

1.2 ABBREVIATIONS

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies
AFBMA	Anti-Friction Bearing Manufacturers Association
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALSC	American Lumber Standard Committee
ANSI	American National Standards Institute
AMCA	Air Moving and Conditioning Association
APA	American Plywood Association
APHA	American Public Health Association
API	American Petroleum Institute
APWA	American Public Works Association
ARC	Appalachian Regional Commission
AREA	American Railroad Engineering Association
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BIA	Brick Institute of America
CFR	Code of Federal Regulations
CRSI	Concrete Reinforcing Steel Institute
CTI	Cooling Tower Institute

DIPRA	Ductile Iron Pipe Research Association
EIA	Electronic Industries Association
EPA	Environmental Protection Agency
EPD	Georgia Environmental Protection Division
FM	Factory Mutual
FmHA	Farmers Home Administration
FS	Federal Specifications
HEI	Heat Exchange Institute
IBC	International Building Code
IEEE	Institute of Electronic and Electrical Engineers
IES	Illuminating Engineering Society
IPCEA	Insulated Power Cable Engineers Association
IPC	Institute of Printed Circuits
ISA	Instrument Society of America
MBMA	Metal Building Manufacturers Association
MSS	Manufacturers Standardization Society of the Valve and Fitting Industry
MUTCD	Manual on Uniform Traffic Control Devices
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NAPF	National Association of Piping Fabricators
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NRMA	National Ready-Mix Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
SBC	Southern Building Code Congress International, Inc.
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSCRB	Standard Specification Construction of Roads and Bridges, Department of Transportation, State of Georgia
SSPC	SSPC: The Society for Protective Coatings
SSRBC	Standard Specifications for Road and Bridge Construction, Tennessee Department of Transportation
SSRS	Standard Specifications for Roads and Structures, latest edition, North Carolina Department of Transportation, Division of Highways
TCA	Tile Council of America
TDEC	Tennessee Department of Environment and Conservation
TEMA	Tubular Exchangers Manufacturers Association
UBC	Uniform Building Code
UL	Underwriters Laboratories
USDC	United States Department of Commerce
WEF	Water Environment Federation (Formerly WPCF)
WPCF	Water Pollution Control Federation

END OF SECTION

SECTION 01 42 19

APPLICABLE CODES AND STANDARDS

PART 1 - GENERAL

1.1 GENERAL

A. All materials, equipment, fabrication, and installation practices shall comply with the following applicable codes and standards, unless the Contractor's quality standards establish more stringent quality requirements, as determined by the Engineer.

1. Pressure Piping and Tubing

ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
NAPF	National Association of Piping Fabricators
NSF	NSF International

2. Materials

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials

3. Painting and Surface Preparation

NACE	National Association of Corrosion Engineers
SSPC	SSPC: The Society for Protective Coatings

4. Gear Reducers and Bearings

AFBMA	Anti-friction Bearing Manufacturers Association
AGMA	American Gear Manufacturers Association

5. Ventilating Fans

AMCA	Air Moving and Conditioning Association
PFMA	Power Fan Manufacturers Association

6. Electrical and Instrumentation

EIA	Electronic Industries Association
IEEE	Institute of Electrical and Electronic Engineers
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
NEMA	National Electrical Manufacturers Association

NFPA National Fire Protection Association
UL Underwriter's Laboratories

7. Aluminum Structures

AA Aluminum Association
AAMA Architectural Aluminum Manufacturers Association

8. Steel Structures

AISC American Institute of Steel Construction
API American Petroleum Institute
AWWA American Water Works Association
SJI Steel Joist Institute

9. Concrete Structures

ACI American Concrete Institute

10. Welding

ASME American Society of Mechanical Engineers
AWS American Welding Society

11. Safety

OSHA Occupational Safety and Health Act

12. General Building Construction

FM Factory Mutual Fire Insurance Corporation
IBC International Building Code by the International Code Council
NFPA National Fire Protection Association

13. Subgrades and Pavement

SSCRB Standard Specification Construction of Roads and Bridges, Department of Transportation, State of Georgia, 1993 Edition, and Supplemental Specifications
SSRBC Standard Specifications for Road and Bridge Construction, Tennessee Department of Transportation
SSRS Standard Specifications for Roads and Structures, latest edition, North Carolina Department of Transportation, Division of Highways.

14. Ductwork and Sheet Metal Work

SMACNA Sheet Metal and Air Conditioning Contractors National Association

15. Plumbing

AGA	American Gas Association
NSF	NSF International
PDI	Plumbing Drainage Institute
SPC	SBCC Standard Plumbing Code

16. Refrigeration, Heating, and Air Conditioning

ARI	American Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers

17. Pressure Vessels

ASME	American Society of Mechanical Engineers

18. Wood

AF&PA	American Forest & Paper Association
AWPA	American Wood Preservers' Association

In addition, all work shall comply with the applicable requirements of local codes, utilities, and other authorities having jurisdiction.

B. All material and equipment, for which a UL Standard, an AGA approval, or an ASME requirement is established, shall be so approved and labeled or stamped. Label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.

END OF SECTION

SECTION 01 60 00

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies administrative and procedural requirements governing the Contractor's selection of products for use in the project.

1. Multiple Prime Contracts: Provisions of this section apply to the construction activities of each prime Contractor.

B. The Contractor's Construction Schedule and the Schedule of Submittals are included under Section 01 32 00, Schedules and Reports.

C. Standards. Refer to Section 01 42 19, Applicable Codes and Standards, for applicability of industry standards to products specified.

1.2 RELATED DOCUMENTS

A. Drawings and general provision of Contract, including General and Supplemental Conditions and other Division 1 Specification sections, apply to this section.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "system," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the work, whether purchased for the project or taken from previously purchased stock. In all cases, products shall be new and unused. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

a. "Named products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form a part of the work.

3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.4 QUALITY ASSURANCE

A. Source Limitations. To the fullest extent possible, provide products of the same kind, from a single source.

B. Compatibility of Options. When the Contractor is given the option of selecting between two or more products for use on the project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1. Each prime Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other prime or separate Contractors.

2. Equipment Nameplates: Provide a permanent nameplate of each item of service-connected or power-operated equipment. Locate on an easily accessible surface. The nameplate shall contain the following information and other essential operating data:

a. Name of product and manufacturer.
b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products in accordance with the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to the site in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products upon delivery to ensure compliance with the Contract Documents, and to ensure that products are undamaged and properly protected.

5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.

6. Store heavy materials away from the project structure in a manner that will not endanger the supporting construction.

7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements. Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and for the intended use and effect.

2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures. Product selection is governed by the Contract Documents and governing regulations. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.

2. Semiproprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.

a. Where products or manufacturers are specified by name, accompanied by the term "or equal" or "or approved equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

3. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

4. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

5. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with

these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.

a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.

6. Compliance with Standards, Codes, and Regulations: Where the Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.

7. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer to comply with other specified requirements. The Engineer will select the color, pattern, and texture from the product line selected.

2.2 SHOP PRIMING AND PAINTING

A. Shop prime and/or shop finish all shop fabricated equipment prior to shipping.

B. Surface preparation, primers, finishes, number of coats, and film thicknesses shall comply with applicable provisions of Section 09 91 00, Painting (if included), unless alternative procedures and materials are accepted by the Engineer during shop drawing and product data review.

C. Prepare and finish electrical and mechanical equipment prior to final assembly. Do not sandblast or paint assembled equipment or machined interior surfaces of equipment.

D. Coat interior, inaccessible surfaces of equipment with an epoxy system suitable for the lifetime of the equipment at anticipated operating conditions and temperatures, unless otherwise specified or accepted.

E. Coat exterior and accessible interior surfaces with an appropriate epoxy system, unless otherwise specified or accepted.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

SECTION 01 65 00

TRANSPORTATION AND HANDLING

PART 1 - GENERAL

1.1 SCOPE

A. Provide transportation of all equipment, materials, and products furnished under these Contract Documents to the site of the work. In addition, provide preparation for shipment and storage, unloading, handling and rehandling, short-term storage, extended storage, storage facilities, maintenance and protection during storage, preparation for installation, and all other work and incidental items necessary or convenient to the Contractor for the satisfactory prosecution and completion of the work.

1.2 TRANSPORTATION

A. Suitably box, crate, or otherwise protect all equipment during transportation.

B. Ship and deliver all equipment in the largest assembled sections practical or permitted by carrier regulations to minimize the number of field connections.

C. Ensure that the equipment is assembled and transported in such a manner so as to clear buildings, power lines, bridges, and similar structures encountered during shipment or delivery to the site of the work.

D. Ensure that the weights of the assembled sections do not exceed the capacity of the cranes or hoisting equipment where equipment will be installed using existing cranes or hoisting equipment.

E. Small items and appurtenances such as gauges, valves, switches, instruments, and probes which could be damaged during shipment shall be removed from the equipment prior to shipment and packaged and shipped separately. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

F. Paint temporary shipping braces and supports orange or yellow for easy identification.

1.3 HANDLING

A. Carefully handle all equipment, materials, and products to prevent damage or excessive deflections during unloading or transportation. All equipment, materials, and products damaged during transportation or handling shall be repaired or replaced by the Contractor at no additional cost to the Owner prior to being incorporated into the work.

B. Strictly follow lifting and handling drawings and instructions furnished by the manufacturer or supplier. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Shafts and operating mechanisms shall not be used as lifting points. Spreader bars or lifting beams shall be used when the distance between lifting points exceeds that permitted by standard industry practice. Slings and

chains shall be padded as required to prevent damage to protective coatings and finishes.

C. Under no circumstances shall equipment or products such as pipe, structural steel, casting, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.

D. Handle items such as nonmetallic pipe, nonmetallic conduit, flagpoles, and lighting poles using nonmetallic slings or straps.

END OF SECTION

SECTION 01 66 00

STORAGE AND PROTECTION

PART 1 - GENERAL

1.1 SCOPE

A. Equipment shall be received, inspected, unloaded, handled, stored, maintained, and protected by the Contractor in a suitable location on or off site, if necessary, until such time as installation is required.

B. Storage and protection of Contractor-furnished equipment shall be in strict conformance with the requirements of the applicable provisions of the General Conditions of these Specifications.

1.2 STORAGE

A. Provide satisfactory storage facilities which are acceptable to the Engineer. In the event that satisfactory facilities cannot be provided on site, satisfactory warehouse, acceptable to the Engineer, will be provided by the Contractor for such time until the equipment, materials, and products can be accommodated at the site.

B. Equipment, materials, and products which are stored in a satisfactory warehouse acceptable to the Engineer will be eligible for progress payments as though they had been delivered to the job site.

C. Maintain and protect all equipment, materials, and products placed in storage and bear all costs of storage, preparation for transportation, transportation, rehandling, and preparation for installation.

D. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel, and sheet construction products shall be stored with one end elevated to facilitate drainage.

E. Building products and materials such as cement, grout, plaster, gypsum-board, particleboard, resilient flooring, acoustical tile, paneling, finish lumber, insulation, wiring, etc., shall be stored indoors in a dry location, unless otherwise permitted in writing by the Engineer. Building products such as rough lumber, plywood, concrete block, and structural tile may be stored outdoors under a properly secured waterproof covering.

F. Tarps and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarps and covers shall be arranged to prevent ponding of water.

1.3 EXTENDED STORAGE

A. In the event that certain items of major equipment such as air compressors, pumps, and mechanical aerators have to be stored for an extended period of time, the Contractor shall provide satisfactory long-term storage facilities which are acceptable to the Engineer. The Contractor shall provide all special packaging, protective coverings, protective coatings, power, nitrogen purge, desiccants, lubricants, and exercising necessary or recommended by the manufacturer to properly maintain and protect the equipment during the period of extended storage.

END OF SECTION

SECTION 01 78 00

PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies administrative and procedural requirements for project closeout, including but not limited to:

1. Inspection procedures.
2. Project record document submittal.
3. Operating and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate sections in Divisions 2 through 48.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures. Before requesting inspection for certification of substantial completion, complete the following. List exceptions in the request.

1. Advise Owner of pending insurance change-over requirements.

2. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.

3. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures. On receipt of a request for inspection, the Engineer will either proceed with inspection or advise the Contractor of unfulfilled requirements. The Engineer will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Engineer will repeat inspection when requested and assured that the work has been substantially completed.

2. Results of the completed inspection will form the basis of requirements for substantial completion.

C. Reinspection Procedure. The Engineer will reinspect the work upon receipt of notice that the work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Engineer.

1. Upon completion of reinspection, the Engineer will prepare a certificate of final acceptance or advise the Contractor of work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

2. If necessary, reinspection will be repeated.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures. Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

2. Submit an updated final statement, accounting for final additional changes to the contract sum.

3. Submit a certified copy of the Engineer's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Engineer.

4. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.

5. Obtain and submit releases enabling the Owner unrestricted use of the work and access to services and utilities; include occupancy permits, operating certificates, and similar releases.

6. Submit record drawings, final project photographs, damage or settlement survey, property survey, and similar final record information.

7. Deliver any specified tools, spare parts, extra stock, and similar items.

8. Make final change-over of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of change-over in security provisions.

9. Submit all project close out forms completed and executed.

10. Submit operation and maintenance data.

11. Submit spare parts list.

12. Submit project record drawings (mark-up of plans showing revisions during construction).

13. Submit a final liquidated damages settlement statement, if required.

14. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operating and Maintenance Instructions. Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. A list of available instruction dates shall be submitted to the Owner through the Engineer at least two weeks in advance of the earliest proposed date for each instruction program. The Engineer will, within three business days, notify the Contractor of the Owner’s preferred date. To the maximum extent possible, instruction of related equipment systems will be conducted concurrently. The final coordination of the instruction is the sole responsibility of the Contractor.

C. Demonstrate the following procedures as part of instruction for operating equipment.

1. Start-up.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2 FINAL CLEANING

A. General. General cleaning during construction is required by the General Conditions.

B. Cleaning. Employ experienced workers or professional cleaners for final cleaning. Clean all work areas to original condition or to satisfaction of Owner and Engineer.

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.

2. Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

C. Removal of Protection. Remove temporary protection and facilities installed for protection of the work during construction.

D. Compliance. Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remaining after completion of associated work have become the Owner's property, arrange for disposition of these materials as directed.

END OF SECTION

SECTION 01 78 36

WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturer's standard warranties on products and special warranties.

1. General closeout requirements are included in Section 01 78 00, Project Closeout.

2. Specific requirements for warranties for the work and products and installations that are specified to be warranted, are included in the individual sections of Divisions 2 through 49.

B. Disclaimers and Limitations. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

C. Separate Prime Contracts: Each Prime Contractor is responsible for warranties related to its own contract.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3 DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

A. Standard Warranty: Warrant all equipment, materials, products, and workmanship provided under these Contract Documents for a period of 12 months after the date of substantial completion established by the Engineer.

B. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

C. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty.

D. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. Complete warranty work as soon as possible after receipt of notice from the Owner for a warranty claim. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefitted from use of the work through a portion of its anticipated useful service life.

E. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

2. If the required repairs or replacements have not been completed or if positive and good faith efforts have not been made to complete the repairs or replacements within 30 consecutive calendar days after receipt of notice from the Owner of the warranty claim, the Owner shall be authorized to proceed with the repairs or replacements and the cost thereof shall be assessed against the Contractor's Performance Bond. Evidence of positive and good faith efforts shall include, as a minimum, joint visits by the Contractor and affected equipment vendors and manufacturers, and certified copies of purchase orders or invoices.

F. The Owner reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.

G. Multiple Equipment Failures. In the event of multiple equipment failures of major consequence prior to the expiration of the one-year warranty described above, disassemble, inspect, and modify or replace the affected equipment as necessary to prevent further occurrences. As used herein, "multiple equipment failures" shall be interpreted to mean two or more successive failures of the same kind in the same item of equipment or failures of the same kind in two or more items of similar equipment. Major equipment failures may include, but are not limited to, cracked or broken housings, piping, or vessels, excessive deflections, bent or broken shafts or structural members, broken or chipped gear teeth, overheating, premature bearing failure, excessive wear, or excessive leakage around seals. Should multiple equipment failures occur in a given item or type of equipment, disassemble, inspect, modify or replace, as necessary, all equipment of the same size and type, and rewarrant for 12 months.

1.5 SUBMITTALS

A. Submit written warranties to the Engineer prior to the date certified for substantial completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of substantial completion for the work, or a designated portion of the work, submit written warranties upon request of the Engineer.

1. When a designated portion of the work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within fifteen days of completion of that designated portion of the work.

B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier, or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Engineer for approval prior to final execution.

1. Refer to individual sections of Divisions 2 through 49 for specific content requirements, and particular requirements for submittal of special warranties.

C. Form of Submittal. At final completion, compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Contract Documents.

1. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable).

PART 3 - EXECUTION (Not Applicable).

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies administrative and procedural requirements for project record documents.

B. Project record documents required include:

1. Marked-up copies of Contract Drawings.
2. Marked-up copies of approved shop drawings.
3. Newly prepared drawings.
4. Marked-up copies of Specifications, Addenda, and Change Orders.
5. Marked-up product data submittals.
6. Construction photographs.
7. Field records for variable and concealed conditions.

C. Specific record copy requirements that expand requirements of this section are included in the individual sections of Division 2 through 49.

D. General project closeout requirements are included in Section 01 78 00, Project Closeout.

E. Maintenance of Documents and Samples. Store record documents and samples in the field office apart from Contract Documents used for construction. Do not permit project record documents to be used for construction purposes. Maintain record documents in good order, and in a clean, dry, legible condition. Make documents and samples available at all times for inspection by the Engineer.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and other Division 1 specification sections, apply to this section.

1.3 RECORD DRAWINGS

A. Mark-up Procedure. During the construction period, maintain a set of blue- or black-line prints of Contract Drawings and shop drawings for project record document purposes.

1. Mark these Drawings to indicate the actual installation where the installation varies appreciably from the installation shown originally. Give particular attention to information on concealed elements which would be difficult to identify or measure and record later. Items required to be marked include but are not limited to:
   a. Dimensional changes to the Drawings.
   b. Revisions to details shown on the Drawings.
   c. Depth of rock.
   d. Locations and depths of underground utilities.

e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Locations of concealed internal utilities.
i. Changes made by Change Order.
j. Details not on original Contract Drawings.

2. Mark completely and accurately record prints of Contract Drawings or shop drawings, whichever is most capable of showing actual physical conditions. Where shop drawings are marked, show cross-reference on Contract Drawings location.

3. Mark record sets with red erasable colored pencil; use other colors to distinguish between changes for different categories of the work at the same location.

4. Mark important additional information which was either shown schematically or omitted from original Drawings.

5. Note construction change directive numbers, alternate numbers, Change Order numbers, and similar identification.

6. Responsibility for Markup: Where feasible, the individual or entity who obtained record data, whether the individual or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on record drawings.

   a. Accurately record information in an understandable drawing technique.

   b. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.

7. At time of final acceptance, submit record drawings to Engineer for Owner's records. Organize into sets, bind, and label sets for Owner's continued use.

1.4 RECORD SPECIFICATIONS

A. Maintain one copy of the project Specifications, including addenda and modifications issued, for project record document purposes during the construction period.

   1. Mark the Specifications to indicate the actual installation where the installation varies substantially from that indicated in Specifications and modifications issued. Note related project record drawings information, where applicable. Give particular attention to substitutions, selection of product options, and information on concealed installations that would be difficult to identify or measure and record later.

1.5 RECORD PRODUCT DATA

A. Maintain one copy of each product data submittal for project record document purposes during the construction period.

   1. Mark project data to indicate the actual product installation where the installation varies substantially from that indicated in product data submitted. Include

significant changes in the product delivered to the site, and changes in manufacturer's instructions and recommendations for installation.

2. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

3. Note related Change Orders and mark-up of record drawings, where applicable.

4. Upon completion of mark-up, submit a complete set of record product data to the Engineer for the Owner's records.

5. Where record product data are required as part of maintenance manuals, submit marked-up product data as an insert in the manual, instead of submittal as record product data.

1.6 MISCELLANEOUS RECORD SUBMITTALS

A. Refer to other specification sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to final acceptance, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Engineer for the Owner's records.

1. Categories of requirements resulting in miscellaneous records include, but are not limited to the following:

a. Field records on excavations and foundations.
b. Field records on underground construction and similar work.
c. Survey showing locations and elevations of underground lines.
d. Invert elevations of drainage piping.
e. Surveys establishing building lines and levels.
f. Authorized measurements utilizing unit prices or allowances.
g. Inspections and certifications by governing authorities.
h. Leakage and pressure test.
i. Disinfection test results.
j. Final inspection and correction procedures.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 RECORDING

A. Post changes and modifications to the documents as they occur. Do not wait until the end of the project. The Engineer will periodically review record documents to ensure compliance with this requirement.

END OF SECTION

DIVISION 03

CONCRETE

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SCOPE

A. This section specifies cast-in-place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions or General Provisions and Division 1 specification sections, apply to this section.

1.3 SUBMITTALS

A. General. Submit the following in accordance with conditions of contract and Division 1 specification sections.

B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, and others as requested by Engineer.

C. Shop drawings for detailing, fabricating, bending, and placing concrete reinforcement. Comply with ACI 315R “Guide to Presenting Reinforcing Steel Design Details” showing bar schedules, bent bar diagrams, arrangement, and support of concrete reinforcement. Include special reinforcing required for openings through concrete structures. Splices, clearances, and tolerances shall comply with ACI 318 and 350 requirements.

D. Shop drawings for formwork, prepared by a registered professional engineer, for fabrication and erection of forms for suspended slabs, beams, and other elevated concrete elements.

1. Engineer's review is for general design compliance only. Design of formwork for structural stability and efficiency is Contractor's responsibility.

E. Laboratory test reports for concrete materials and mix design test.

F. Materials certificates for the items listed below. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification for admixture manufacturers that chloride content complies with specification requirements.

1. Aggregates.
2. Cement.
3. Admixtures.
4. Reinforcement (including welds).
5. Curing compounds.
6. Waterstops.
7. Bonding compounds.

1.4 QUALITY ASSURANCE

A. Codes and Standards. Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 318, "Building Code Requirements for Reinforced Concrete."

2. Tanks and process structures containing water, wastewater, or similar liquids shall comply with ACI 350, “Code Requirements for Environmental Engineering Concrete Structures.”

3. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."

B. Concrete Testing. The Owner will engage an independent testing laboratory to conduct testing of materials and concrete to ensure compliance with this Specification.

C. Materials and installed work may require testing and retesting at any time during progress of work. Tests, including retesting, of rejected materials or installed work which fails its initial testing, shall be done at Contractor's expense.

1.5 CONCRETE PRE-CONSTRUCTION MEETING

A. A mandatory pre-construction meeting is required after the mix design has been accepted by the Engineer but prior to any concrete placement.

B. Attendees must include, but are not limited to, representatives from the following:

1. General Contractor.
2. Ready Mix Plant .
3. Concrete Sub-contractor.
4. Testing Agency
5. Project Manager or Design Engineer.
6. Resident Project Representative (RPR).

C. The meeting will be conducted by the project manager or the RPR

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Exposed Finish Concrete. Plywood, metal, metal-framed plywood-faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings.

1. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class 1.

2. Plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class 1, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete. Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns and Supports. Metal, fiberglass-reinforced plastic, or paper or fiber tubes. Provide paper or fiber tubes of laminated plies with water-resistant adhesive and wax-impregnated exterior for weather and moisture protection. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.

D. Form Coatings. Provide commercial formulation form-coating compounds with a maximum VOC of 350 g/l that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

E. Form Ties. Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will leave no metal closer than 1½ inches to exposed surface. Provide ties that, when removed, will leave holes not larger than 1-inch diameter in concrete surface. Tie holes shall be filled with non-shrink grout.

2.2 REINFORCING MATERIALS

A. Reinforcing Bars. ASTM A 615, Grade 60, deformed.

B. Epoxy-Coated Reinforcing Bars. ASTM A 775.

C. Steel Wire. ASTM A 82, plain, cold-drawn steel.

D. Welded Wire Fabric. ASTM A 185, welded steel wire fabric.

E. Welded Deformed Steel Wire Fabric. ASTM A 497.

F. Supports for Reinforcement. Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire-bar-type supports complying with CRSI specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.3 CONCRETE MATERIALS

A. Portland Cement. ASTM C 150, Type I. Use one brand of cement throughout project unless otherwise acceptable to Engineer.

B. Fly Ash. ASTM C 618, Type C or Type F.

C. Coarse Aggregate. ASTM C 33, Class Designation 3S, Grading Size No. 67, and as herein specified. Provide coarse aggregate from a single source for all exposed concrete.

D. Fine Aggregate. Natural siliceous river sand, consisting of hard, clean, sharp, strong, durable, and uncoated particles, conforming to the requirements of ASTM C 33.

1. Fine aggregate shall have a fineness modulus of 2.40 minimum and 3.00 maximum and the material passing the No. 200 sieve shall not exceed 3.0 percent by weight of the total sample. Coal and lignite shall not exceed 0.5 percent by weight of the total sample for all concrete. The fineness modulus of fine aggregate incorporated in the work shall not vary more than 0.10 plus or minus from the fineness modulus of the fine aggregate in the appropriate preliminary mix design approved by the Engineer.

E. Water: Drinkable.

F. Admixtures, General. Provide admixtures for concrete that contain not more than 0.1 percent chloride ions.

1. Available Manufacturers: Provide admixtures from single source manufacturer for air entrainment and water reducing admixtures. Manufacturers of admixtures shall include but not be limited to the following provided single source availability requirements are met:
   a. Master Builders, Inc.
   b. W. R. Grace and Company.
   c. Euclid Chemical Company.

2. Air-Entraining Admixture. ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

3. Water-Reducing Admixture: ASTM C 494, Type A.

4. High-Range Water-Reducing Admixture (Super Plasticizer). ASTM C 494, Type F or Type G.

5. Water-Reducing, Accelerating Admixture. ASTM C 494, Type E. Accelerating admixtures must be nonchloride type and are for use only when specifically authorized by the Engineer. Submittal of separate mix design using accelerating admixture will be required.

6. Water-Reducing, Retarding Admixture. ASTM C 494, Type D. Retarding admixtures must be nonchloride type and are for use only when specifically authorized by the Engineer. Submittal of separate mix design using retarding admixture will be required.

2.4 RELATED MATERIALS

A. Waterstops. Provide waterstops at construction joints and other joints as indicated on the Drawings.

1. Polyvinyl Chloride Waterstops. Corps of Engineers CRD-C 572.
   a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following:
      1) The Burke Company.
      2) Greenstreak Plastic Products Company.
      3) W. R. Meadows, Inc.
      4) Progress Unlimited.
      5) Schlegel Corp.
      6) Vinylex Corp.

2. Bentonite Clay Waterstops. Specially formulated joint sealant, manufactured in coils with a rectangular cross section, which swells upon contact with water. Adhesive supplied by the water stop manufacturer shall be used to secure the waterstop to existing concrete prior to placing adjoining concrete.

B. Granular Base. Evenly graded and compacted washed coarse aggregate conforming to ASTM C33, Class Designation 3S, Grading Size No. 57.

C. Sand Cushion. Clean, manufactured, or natural sand.

D. Vapor Retarder. Provide polyethylene sheet vapor retarder cover not less than 8 mils thick over prepared base material where indicated below slabs on grade. Use only materials that are resistant to deterioration when tested in accordance with ASTM E 154.

E. Liquid Membrane-Forming Curing Compound. Liquid-type membrane-forming curing compound with fugitive dye complying with ASTM C 309, Type I-D, Class A. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers whose products may be incorporated in the work include, but are not limited to, the following:
   a. Dayton Superior Corp.
   b. Euclid Chemical.
   c. Sonneborn Rexnord.

F. Epoxy Bonding Agent. ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material "Type," "Grade," and "Class" to suit project requirements.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
   a. "Burke Epoxy M.V.," The Burke Company.
   b. "Euco Epoxy System #452 or #620," Euclid Chemical Co.
   c. "Sikadur 32 Hi-Mod," Sika Corporation.

G. Chemical Hardener. U.S. Army Corps of Engineers Specification 204, liquid hardener composed of magnesium and zinc fluorosilicates combined with an anionic surfactant to improve wetting penetration. Hardener to be colorless, nontoxic, nonflammable, and compatible with and providing good adhesion for subsequent topping and/or coatings. Install hardener in accordance with manufacturer's recommendations on interior concrete floors of shops, garages, vehicle service areas, and elsewhere as indicated on the Drawings.

H. Joint Filler. At joints in slabs and elsewhere as indicated on the Drawings, use preformed strips of asphalt saturated fiberboard (½-inch nominal thickness) complying with ASTM D 1751.

1. All joints to be placed using an expansion board cap or “zip” cap to allow joint to be properly sealed, unless shown otherwise on drawings.

2. See Section 07 90 00, Joint Sealants, for proper sealant material.

2.5 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

1. Fly ash may be substituted for cement in amounts not to exceed 20 percent of the specified cement content by weight providing that the mix conforms with all other requirements.

B. Submit written reports to Engineer of each proposed mix for each class of concrete at least 15 days prior to start of concrete placement. Do not begin concrete production until proposed mix designs have been reviewed by Engineer.

C. Design mixes to provide normal weight concrete with the following properties:

Property	Concrete Class	
	A	B
28-day Compressive Strength: Average of Three Consecutive Specimens Minimum Any One Specimen	 4,000 psi 3,200 psi	 2,500 psi 2,000 psi
Minimum Cement Content (sacks/cubic yard)	6.5	5.0
Maximum Water-to-Cement Ratio: By Weight (pound/pound) By Sack (gallon/sack)	 0.49 5.5	 0.54 6.0
Air Content** (percent by volume): Minimum Maximum	 4.0 6.0	 4.0 6.0
Ratio of Coarse to Fine Aggregate (by weight): Minimum Maximum	 1.0 2.0	 1.0 2.5
Class “A” concrete shall be used for all concrete work unless Class “B” is specifically called for on the Drawings **Air Entrainment may be omitted for interior slabs		

D. Adjustment to Concrete Mixes. Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work.

2.6 ADMIXTURES

A. Use water-reducing admixture or high-range water-reducing admixture (Superplasticizer) in all concrete.

B. Use nonchloride accelerating admixture in concrete placed at ambient temperatures below 50°F (10°C) when authorized by the Engineer.

C. Use high-range water reducing admixture (HRWR) in pumped concrete.

D. Admixtures. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.

2.7 SLUMP LIMITS.

A. Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Ramps, slabs, and sloping surfaces: Not more than 3 inches.

2. Walls: 2½ to 4 inches.

3. Floors and slabs: 2 to 3 inches.

4. Beams: 2 to 3 inches.

5. Blocks and Footings: 2 to 4 inches.

B. Concrete having a slump greater than 1 inch over the specified maximum shall be rejected.

C. Pumped Concrete: the maximum slump of the concrete at the suction of the pump may be increased above the maximum specified slump by the amount of slump loss in the pumping system up to a maximum of 1 inch.

D. Congested Placement. When specifically requested in writing by the Contractor and approved by the Engineer, increases in discharge slumps may be considered in placements that include congested areas of reinforcement or areas otherwise deemed to be difficult to place concrete and achieve necessary consolidation. The increases in slump, if approved, shall be achieved by the addition of high range water reducing agent at the site in accordance with the manufacturer’s instructions. The request shall include the proposed amount of slump increase and the amount of high range water reducer to be added. The Engineer will evaluate each request independently.

2.8 CONCRETE MIXING

A. Job-Site Mixing. Only allowed when specifically authorized by the Engineer.

B. Ready-Mix Concrete. Comply with requirements of ASTM C 94, and as specified.

1. When air temperature is between 85°F (30°C) and 90°F (32°C), reduce mixing and delivery time from 1½ hours to 75 minutes, and when air temperature is above 90°F (32°C), reduce mixing and delivery time to 60 minutes.

2.9 EPOXY ANCHORS AND DOWELS

A. Anchors. Unless shown otherwise, dowels or anchors placed in existing or hardened concrete shall be stainless steel Type 316 ASTM F 593 and ASTM F 594, threaded rod with hex nuts.

B. Epoxy adhesive shall be as follows:

1. Two component, 100% solid (containing no solvents), non-sag paste, insensitive to moisture.

2. Conform to NSF Standard 61 for use in conjunction with drinking water systems.

3. Adhesive shall have been tested and qualified in accordance with ACI 355.4 and ICC-ES Acceptance Criteria 308 for cracked concrete and seismic applications. Design bond strength has been based on cracked concrete, ACI 355.4 Temperature Range B, and installations into dry holes drilled into concrete that has cured for at least 21 days using a carbide drill bit qualified by the manufacturer. Adhesive shall be installed by a certified adhesive anchor installer when required per ACI 318. Installations requiring certified installers shall be inspected per ACI 318.

4. Epoxy adhesive shall be:

   a. Red Head C-6+-, manufactured by ITW Construction Products.

   b. Simpson Strong-Tie SET-3G.

   c. Hilti HIT-RE 500 V3.

   d. Or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

B. All slabs on grade to have a minimum 6-inch granular base unless noted otherwise on Drawings. Granular base to be saturated with water just prior to placement of concrete.

3.2 FORMS

A. General. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.

D. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete.

Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

E. Chamfer exposed corners and edges at ¾ inch unless indicated otherwise on the Drawings, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

F. Provisions for Other Trades. Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

G. Cleaning and Tightening. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.

3.3 VAPOR RETARDER/BARRIER INSTALLATION

A. General. Following leveling and tamping of granular base for slabs on grade, place vapor retarder/barrier sheeting with longest dimension parallel with direction of pour.

B. Lap joints 6 inches and seal vapor barrier joints with manufacturers' recommended mastic and pressure-sensitive tape.

C. After placement of vapor retarder/barrier, cover with sand cushion and compact to depth as shown on Drawings.

3.4 PLACING REINFORCEMENT

A. General. Comply with ACI 318 and the CRSI's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein specified.

1. Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.

2. Field bending of reinforcement using heat and/or welding of reinforcement is NOT permitted.

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

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Engineer.

D. Place reinforcement to obtain at least minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

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

3.5 JOINTS

A. Construction and Control Joints. Locate and install construction and control joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Engineer, and to comply with applicable code requirements (see Paragraph 1.4, herein).

1. Provide keyways at least 1½ inches deep with a width of approximately one-half the thickness of the thinnest section being joined at construction and control joints in walls, slabs, between walls and slabs, and between walls and footings unless otherwise indicated. Acceptable bulkheads designed for this purpose may be used for slabs.

2. Place construction and control joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated. Do not continue reinforcement through sides of strip placements or at control joints.

3. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete at construction joints.

B. Waterstops. Provide waterstops in construction and control joints as indicated. Install waterstops to form continuous diaphragm in each joint. Make provisions to support and protect exposed waterstops during progress of work. Field-fabricate joints in waterstops in accordance with manufacturer's printed instructions.

C. Isolation Joints in Slabs-on-Ground for Floors of Buildings, Sidewalks, and Driveways. Construct isolation joints in slabs-on-ground at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundation walls, grade beams, and elsewhere as indicated. Construct isolation joints using preformed joint filler board.

D. Contraction Joints in Slabs-on-Ground for Floors of Buildings, Sidewalks, and Driveways. Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts ⅛ inch wide by ¼ of slab depth or inserts ¼ inch wide by ¼ of slab depth, unless otherwise indicated.

1. Form contraction joints by inserting premolded plastic, hardboard, or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. Tool slab edges round on each side of insert. After concrete has cured, remove inserts and clean groove of loose debris.

2. Begin saw cutting of contraction joints in floor slabs as soon as possible after slab finishing as may be safely done without dislodging aggregate. Saw cutting must be completed within 8 hours following slab placement.

3. If joint pattern is not shown, provide joints not exceeding 15 feet in either direction and locate to conform to bay spacing wherever possible (at column centerlines, half bays, third bays).

3.6 INSTALLATION OF EMBEDDED ITEMS

A. General. Set and build into work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use

setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

B. Forms for Slabs. Set edge forms, bulkheads, and intermediate screed strips for slabs to obtain required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

C. Conduits, Pipes, and Sleeves

1. Must be located within the middle third of the overall thickness of slab, wall, or beam.

2. Shall not be spaced closer than three diameters or widths on center.

3. Do not tie or support on concrete reinforcement. Provide chairs or stands as required.

3.7 PREPARATION OF FORM SURFACES

A. General. Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before reinforcement is placed.

B. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

C. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.8 CONCRETE PLACEMENT

A. Inspection. Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.

B. General. Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.

C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms. Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.

2. One operable, back-up, mechanical vibrator shall be on site prior to beginning concrete placement.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

E. Placing Concrete Slabs. Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

3. Maintain reinforcing in proper position during concrete placement.

F. Cold-Weather Placing. If permitted by the Engineer, comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen or is expected to fall below 40°F (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50°F (10°C) and not more than 80°F (27°C) at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless authorized by the Engineer.

4. Provide adequate means for maintaining the temperature of the air surrounding the concrete at 70°F for three days, or 50°F for five days, or for as long as is necessary to ensure proper curing of the concrete. Rapid cooling of the concrete shall be prevented. Housing, covering, or other protection used in connection with heating shall remain in place and intact at least 24 hours after the artificial heat is discontinued.

G. Hot-Weather Placing. When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 85°F. Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

3. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, when acceptable to Engineer.

3.9 FINISH OF FORMED SURFACES

A. Coordinate finish requirements with surface preparation requirements for concrete to be coated in accordance with Section 09 91 00, Painting, if applicable.

B. Provide rough form finish for formed concrete surfaces not exposed to view in the finish work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material, with tie holes and defective areas repaired and patched and fins and other projections exceeding ¼-inch in height rubbed down or chipped off.

C. Provide smooth form finish for formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

D. Grout-Cleaned Finish. Provide grout-cleaned finish as follows to concrete surfaces that have received smooth form finish treatment not to be coated with paint, waterproofing, dampproofing, or other similar system.

1. Combine one part portland cement to 1½ parts fine sand by volume, and a 50:50 mixture of acrylic-based bonding admixture and water to consistency of thick paint. Blend standard portland cement and white portland cement, amounts determined by trial patches, so that final color of dry grout will match adjacent surfaces.

2. Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

3. A polymer-modified, Portland-cement based waterproofing coating may be substituted for the cement sand grout finish specified above. A two-coat application is required. Surface preparation, product mixing, product application, and product curing shall be in strict accordance with the manufacturer’s written recommendations.

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

3.10 MONOLITHIC SLAB FINISHES

A. Coordinate finish requirements with surface preparation requirements for concrete to be coated in accordance with Section 09 91 00, Painting, if applicable.

B. Float Finish. Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and as otherwise indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance of plus or minus ¼-inch as measured from a 10-foot straight edge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish. Apply trowel finish to monolithic slab surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system.

D. Trowel and Fine Broom Finish. Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

E. Nonslip Broom Finish. Apply nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

3.11 CONCRETE CURING AND PROTECTION

A. General. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Initial Curing. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

C. Curing Methods. Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified. Select curing method appropriate for subsequent coating and finishing requirements. Coordinate curing methods with Section 09 91 00, Painting, for concrete to be painted.

1. Provide moisture curing by either of the following methods or combination thereof, maintaining concrete surface moisture for seven days:
   a. Keep concrete surface continuously wet by covering with water.

b. Use continuous water-fog spray.
c. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

2. Moisture-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape. Maintain concrete surface moisture for seven days.

3. Curing and sealing compound, when utilized, shall be applied as follows:
   a. Flatwork: Apply curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within two hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   b. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.
   c. Formed Surfaces: Apply curing and sealing compound upon removal of form work.

4. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

5. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces, by application of appropriate curing method.
   a. Cure concrete surfaces to receive liquid floor hardener or other finish by use of moisture-retaining cover, unless otherwise directed.

3.12 REMOVAL OF FORMS

A. General. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50°F (10°C) for 72 hours after placing concrete, provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beams, soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days and until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.13 REUSE OF FORMS

A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces except as acceptable to Engineer.

3.14 MISCELLANEOUS CONCRETE ITEMS

A. Filling In. Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs. Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations. Provide machine and equipment bases and foundations, as shown on Drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

D. Reinforced Masonry. Provide concrete grout for reinforced masonry lintels and bond beams where indicated on Drawings and as scheduled. Maintain accurate location of reinforcing steel during concrete placement.

E. Concrete Embedment and Encasement of Pipe. Install concrete for embedment and encasement where indicated on the Drawings and at such locations where installation conditions require such pipe support as determined by the Engineer. Embedment and encasement of pipe shall be preceded by the following preliminary steps:

1. Remove all loose material from the trench prior to placing concrete. All concrete shall have a continuous contact with undisturbed soil on sides and bottom of trench.

2. Accurately place a base course of concrete to such grade and elevation that the pipe will be at specified grade when pipe bells are supported on, and in contact with, the top surface of the base course.

3. Restrain each length of pipe to maintain alignment and prevent floatation in a manner acceptable to the Engineer.

3.15 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas. Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Engineer.

1. Cut out honeycomb, rock pockets, voids over ¼-inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1-inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched

with specified bonding agent. Place patching mortar before bonding compound has dried.

2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

B. Repair of Formed Surfaces. Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry-pack mortar, or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

C. Repair of Unformed Surfaces. Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having required slope.

1. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.01-inch wide or that penetrate to reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete.

4. Repair defective areas, except random cracks and single holes not exceeding 1-inch-diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least ¾-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

D. Repair isolated random cracks and single holes not over 1-inch-diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2½ parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack before bonding compound has dried. Compact

dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

E. Perform structural repairs with prior approval of Engineer for method and procedure, using specified epoxy adhesive and mortar.

F. Repair methods not specified above may be used, subject to acceptance of Engineer.

3.16 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General. The Owner will employ a testing laboratory to perform tests and to submit test reports.

B. Field Sampling and Testing. During concreting operations, the Engineer will periodically require additional field inspection, sampling, and testing of cement, aggregate, and/or concrete by an independent testing laboratory in order to determine if the requirements of this specification section are being satisfied.

1. Field sampling and testing of cement, aggregate, and concrete will be performed according to the following ASTM standards at a frequency determined by the Engineer:
   a. Aggregate
      1) Sampling — ASTM D 75
      2) Testing — Any test specified in ASTM C 33
   b. Cement
      1) Sampling — ASTM C 183
      2) Testing — Any test specified in ASTM C 150
   c. Concrete
      1) Sampling — ASTM C 172
      2) Slump Test — ASTM C 143
      3) Air Content Test — ASTM C 231
      4) Making and Curing Test Cylinders — ASTM C 31
      5) Compression Strength Tests — ASTM C 39

2. Compressive strength testing will consist of making, curing, and testing cylinders of concrete. A total of six test cylinders will be prepared from each sample of concrete to be tested. Two test cylinders will be broken at an age of 7 days, three test cylinders will be broken at an age of 28 days, and the remaining test cylinders will be held in reserve. The minimum number of samples and test cylinders to be taken is as follows:

Total Size of Pour (CY)	Number of Samples	Number of Cylinders
1 – 100	1	6
101 – 200	2	12
201 – 300	3	18
Over 300	1/100 CY	6/100 CY

3. Test cylinders will normally be laboratory-cured. However, the Engineer may require tests on field-cured specimens to check the adequacy of curing operations.

4. A slump test and an air content test will be performed on each sample of concrete tested for compressive strength.

5. Cement and aggregate will be subject to inspection, sampling, and field testing at the batching plant. Concrete will be subject to inspection, sampling, and field testing at the place of concrete placement.

6. All field sampling, field testing, making and curing of field test cylinders, and laboratory testing performed during concreting operations for the purpose of determining if the requirements of this specification section are being satisfied shall be conducted by an independent testing laboratory selected by the Owner and paid for directly by the Owner and not as a part of this Contract.

7. Furnish the testing laboratory representative satisfactory samples of cement, aggregate, and concrete for inspection and testing purposes. The Contractor shall furnish any barrows, shovels, mixing boards, shaded area for preparing test cylinders, and similar equipment required by the testing laboratory representative for securing samples, making test cylinders, and conducting field tests.

C. Test results will be reported in writing to Engineer, Ready-Mix Producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. Nondestructive Testing. Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

E. Additional Tests. The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for any and all such tests.

3.17 LOADS APPLIED TO NEW CONCRETE

A. Loads including, but not limited to, earth loads, loads exerted from bracing or shoring, wind loads, hydrostatic or hydraulic loads, equipment or vehicle loads, or loads exerted by stacked materials, shall not be applied to fresh concrete until the concrete has reached its specified 28-day strength.

B. Concrete which has cracked due to overloading, loading before required strength has developed, or otherwise damaged shall be repaired or replaced as determined by the Engineer.

3.18 INSTALLATION OF EPOXY ANCHORS AND DOWELS

A. Verify number, size, depth, and location of anchors or dowels to be installed.

B. Drill holes in concrete to the depth specified on the Drawings using methods as instructed by the epoxy manufacturer. The diameter of holes shall be as instructed by the epoxy manufacturer for the anchor or dowel being installed. Clean holes as instructed by the epoxy manufacturer.

C. Install epoxy in strict accordance with the manufacturer's instructions using guns with self-mixing nozzles provided by the manufacturer. Verify epoxy is mixed prior to placement into the hole using methods per manufacturer's instructions. Insert dowel or anchor into the hole and hold steady as instructed by the manufacturer.

END OF SECTION

DIVISION 31

EARTHWORK

SECTION 31 20 00

EARTHWORK

PART 1 - GENERAL

1.1 SCOPE

A. This section includes earthwork and related operations, including but not limited to clearing and grubbing the construction site; dewatering; excavating all classes of material encountered; pumping, draining, and handling of water encountered in the excavations; handling, storage, transportation, and disposal of all excavated and unsuitable material; construction of fills and embankments; backfilling around structures and pipe; backfilling all trenches and pits; compacting; all sheeting, shoring, and bracing; preparation of subgrades; surfacing and grading; and any other similar, incidental, or appurtenant earthwork operation which may be necessary to properly complete the work.

B. Provide all services, labor, materials, and equipment required for all earthwork and related operations necessary or convenient to the Contractor for furnishing a complete work as shown on the Drawings or specified in these Contract Documents.

1.2 GENERAL

A. The elevations shown on the Drawings as existing are taken from the best available data and are intended to give reasonable, accurate information about the existing elevations. They are not precise, and the Contractor should satisfy himself as to the exact quantities of excavation and fill required.

B. Perform earthwork operations in a safe and proper manner taking appropriate precautions against all hazards.

C. Maintain in good condition at all times all excavated and fill areas for structures, trenches, fills, topsoil areas, embankments, and channels until final acceptance by the Owner. Repair all damage caused by erosion or other construction operations using material of the same type as the damaged materials.

D. If soil borings are available for the area of this work, they will be on file at the Owner's address where they will be made available for review. This information is made available for such use as Contractor may choose to make of it in the preparation of his bid, but the Owner gives no guarantee, either expressed or implied, that it represents a true or complete cross section of all of the material to be encountered in performing the excavation and earthwork on this project.

E. Earthwork operations within the rights-of-way of the State Department of Transportation, the County Road Department, and the respective cities shall be conducted in accordance with the requirements and provisions of the permits issued by those agencies for the construction within their respective rights-of-way. Such requirements and provisions, where applicable, shall take precedence over and supersede the provisions of these Specifications.

F. Control grading to prevent water running into excavations. Obstruction of surface drainage shall be avoided and a means shall be provided whereby storm water can be

uninterrupted in existing gutters, other surface drains, or temporary drains. Material for backfill or for protection of excavation in public roads from surface drainage shall be neatly placed and kept shaped so as to cause the least possible interference with public travel. Free access must be provided to all fire hydrants, valves, meters, and private drives.

G. No classification of excavated materials will be made. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work, regardless of the type, character, composition, or condition thereof.

H. Tests for compaction and density shall be conducted by the Engineer or by an independent testing laboratory selected by him. Costs of compaction tests performed by an independent testing laboratory shall be paid for directly by the Owner and not as a part of this contract. Make all necessary excavations and supply any samples of materials necessary for conducting compaction and density tests. Pay the cost of all retests made necessary by the failure of materials to conform to the requirements of these Contract Documents.

I. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, "Excavations, Trenching, and Shoring," and Subpart O, "Motor Vehicles, Mechanized Equipment, and Marine Operations," and shall be conducted in a manner acceptable to the Engineer.

J. It is understood and agreed that a thorough investigation by the Contractor has been made of the surface and subsurface conditions of the site and any special construction problems which might arise as a result of nearby watercourses and floodplains, particularly in areas where construction activities may encounter water-bearing sands and gravels or limestone solution channels. Provide all services, labor, equipment, and materials necessary or convenient for completing the work.

PART 2 - EXECUTION

2.1 INITIAL SITE PREPARATION

A. Preparatory to beginning construction operations, remove from the site all vegetative growth, trees, brush, stumps, roots, debris, and any other objectionable matter, including fences, buildings, and other structures shown on the Drawings in the construction areas which are designated for removal or which, if left in place, would interfere with the proper performance or completion of the contemplated work, would impair its subsequent use, or would form obstructions therein.

B. Grub and remove stumps and roots to a depth not less than 5 feet below grade. Fill all holes or cavities which extend below the subgrade elevation of the proposed work with compacted layers of crushed rock or earth backfill conforming to the requirements specified here for backfill. Do not incorporate organic material from clearing operations in excavation backfill or embankment material.

C. Exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, buildings, and other structures located in the construction area but not within designated clearing limits as shown on the Drawings or within the limits of embankments, excavations, or proposed structures. Repair or replace any of the aforementioned items damaged by Contractor's operation or construction activities.

D. Remove and dispose of any excess material resulting from clearing or site preparation operations. Dispose of such materials in a manner acceptable to the Engineer and at an approved location where such materials can be lawfully placed.

2.2 DEWATERING

A. Provide and maintain at all times during construction ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the work. Dewatering shall be accomplished by methods which will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. Methods of dewatering may include sump pumps, well points, deep wells, or other suitable methods which do not damage or weaken structures, foundations, or subgrades. Shallow excavations may be dewatered using open ditches, provided such ditches are kept open and free-draining at all times. The actual dewatering methods used shall be acceptable to the Engineer.

B. Do not place concrete or mortar in water nor allow water to rise over newly placed concrete or mortar for at least 24 hours after placement, unless specifically authorized by the Engineer. No concrete structure shall be exposed to unequal hydrostatic forces until the concrete has reached its specified 28-day strength. Do not allow water to rise above bedding during pipe-laying operations. Exercise care to prevent damage to pipelines or structures resulting from flotation, undermining, or scour. Dewatering operations shall commence when ground or surface water is first encountered and shall be continuous until water can safely be allowed to rise in accordance with the provisions of this section. Protect excavations from the entrance of surface water to the extent possible by the use of dikes and/or covers.

C. Standby pumping equipment shall be on the jobsite. A minimum of 1 standby unit (a minimum of 1 for each 10 in the event well points are used) shall be available for immediate installation should any pumping unit fail. The design and installation of well points or deep wells shall be suitable for the accomplishment of the work. Submit drawings or diagrams on proposed well point or deep well dewatering systems to the Engineer for review.

D. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, excavate and replace the affected areas with crushed rock at no cost to the Owner.

E. Dispose of the water from the work in a suitable manner without damage to adjacent property. Conveyance of the water shall not interfere with traffic flow or treatment facilities operation. Do not drain water into work built or under construction without prior consent of the Engineer. The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.

F. Provide sedimentation and desilting basins as necessary or when directed by the Engineer to prevent the entrance of excessive or injurious amounts of sand and silt from surface runoff or dewatering operations into storm drains or receiving waters. The system used for desanding or desilting the water shall be a baffled structure and shall provide not less than 5 minutes detention time and shall be designed to have a "flow-through" velocity not exceeding 0.2 foot per second at the anticipated peak flow. The method of desanding or desilting and the point of disposal shall be subject to the approval of the Engineer.

G. Dispose of water safely and in accordance with applicable Environmental Protection Agency, U.S. Army Corps of Engineers, and State Water Quality Control Division standards and permits.

2.3 SHEETING, SHORING, AND BRACING

A. The sides of all excavations shall be sufficiently sheeted, shored, and braced as necessary to prevent slides, cave-ins, settlement, or movement of the banks; to maintain the excavation clear of all obstructions; and to provide safe working conditions. Wood or steel sheeting shall be used in wet, saturated, or flowing ground. All sheeting, shoring, and bracing shall have sufficient strength and rigidity to withstand the pressure exerted and to maintain shape and position under all circumstances.

B. Correctly assessing the need for sheeting, analyzing the stresses induced, and maintaining regulatory compliances shall be totally the responsibility of the Contractor. Since the Engineer does not dictate or determine the Contractor's sequence or limits of excavation, the Engineer assumes no responsibility for sheeting and shoring. The Contractor must employ or otherwise provide for adequate professional structural and geotechnical engineering supervision to assess the need for sheeting and shoring and design same. Results of sheeting and shoring analysis and design shall be submitted to the Engineer on request.

C. Excavations adjacent to existing or proposed buildings and structures, or in paved streets or alleys, shall be sheeted, shored, and braced adequately to prevent undermining beneath or subsequent settlement of such structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition. Any damage to structures or pavements occurring through settlements, water or earth pressures, slides, caves, or other causes due to failure or lack of sheeting or bracing, or improper bracing or occurring through negligence or fault of the Contractor in any other manner shall be repaired by the Contractor at his own expense.

D. Sheeting, shoring, or bracing materials shall not be left in place unless otherwise specified or shown on the Drawings or ordered by the Engineer in writing. Such materials shall be removed in such manner that no danger or damage will occur to new or existing structures or property, public or private, and so that cave-ins or slides will not take place. Trench sheeting shall be left in place until backfill has been brought to a level 12 inches above the top of the pipe. It shall then be cut off and the upper portion removed. Sheeting for structures shall be left in place until backfill has been brought to a level 12 inches above the top of the bottom footing. It shall then be cut off and the upper portion removed.

E. All holes and voids left in the work by the removal of sheeting, shoring, or bracing shall be filled and thoroughly compacted.

2.4 EXCAVATION

A. General

1. Excavation shall include the removal of all material from an area necessary for the construction of a pipeline or structure. Excavations shall provide adequate working space and clearances for the work to be performed therein.

2. All material excavated below the bottom of concrete walls, footings, and foundations shall be replaced, by and at the expense of the Contractor, with Class B concrete to the lines and grades shown on the Drawings, except where otherwise shown on the Drawings, specified herein, or authorized by the Engineer.

3. Where quicksand, soft clay, spongy or swampy earth, or other materials unsuitable for subgrade or foundation purposes are encountered below the excavation limits, they shall be removed and disposed of to the level of suitable material. Areas so excavated shall be backfilled with Class B concrete or with compacted layers of crushed rock, sand, or other approved material conforming to the requirements specified herein for backfill to the lines and grades shown on the Drawings.

4. Place barriers at each end of all excavation and at such places as may be necessary along excavations to warn all pedestrian and vehicular traffic of such excavations. Place lights along excavations from sunset each day to sunrise of the next day until the excavations are backfilled. Barricade all excavations in such a manner as to prevent persons from falling or walking into any excavation.

B. Rock Excavation

1. Rock excavation is defined as the removal of all materials which, by actual demonstration, cannot in the Engineer's opinion, be reasonably excavated with a 3/4 yard 225 Caterpillar Backhoe equipped with a 30-foot boom, general duty dipper and rock points, or similar approved equipment and which is in fact, systematically drilled and blasted. Hardpan or cemented gravel, even though it may be advantageous to use explosives in its removal, shall not be classified as solid rock excavation.

2. The Contractor shall notify the Engineer at least 24 hours prior to any blasting. All blasting shall be done in accordance with local, county, and state regulations governing this class of work. Any damage to persons or property resulting from blasting operations shall be the sole responsibility of the Contractor and his surety.

3. Excavate rock and large boulders in trenches over the horizontal limits of excavation and to depths as shown on the Drawings.

4. Backfill the space below grade for pipelines to the proper grade with compacted layers of crushed rock or sand conforming to the requirements specified herein for backfill. Where pipe sewers are constructed on concrete cradles, excavate rock to the bottom of the cradle as shown on the Drawings.

5. Excavate rock under structures to lines and grades shown on the Drawings. Unless specified otherwise, where rock excavation has been carried below grade, the Contractor shall backfill to grade with Class B concrete at his own expense.

6. Where rock foundation is obtained at grade for over 50 percent of the area of any one structure, the portion of the foundation that is not rock shall be excavated below grade to reach a satisfactory foundation of rock. The portion below grade shall be backfilled with Class B concrete.

7. Where rock foundation is obtained at grade for less than 50 percent of any one structure and satisfactory rock cannot be found over the remaining area by

reasonable additional excavation, the rock shall be removed for a depth of 12 inches below grade and the space below grade shall be backfilled to the proper grade with compacted layers of crushed rock conforming to the requirements specified herein for backfill.

8. Drilling and blasting operations shall be conducted with due regard for the safety of persons and property in the vicinity and in strict conformity with requirements of all ordinances, laws, and regulations governing blasting and the use of explosives. Conduct rock excavation near existing pipelines or other structures with the utmost care to avoid damage. Promptly repair injury or damage to other structures and properties to the satisfaction of the Owner by the Contractor at his own expense. The Contractor is advised to hire qualified consultants to perform a "preblast survey" in area where damage could occur due to blasting.

9. Complete rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation directed by the Engineer before construction of any structure is started in the vicinity.

C. Borrow Excavation

1. Wherever the backfill of excavated areas or the placement of embankments or other fills requires specified material not available at the site or material in excess of suitable material available from the authorized excavations, such materials shall be obtained from other sources. This may require the opening of borrow pits at points not immediately accessible from the work. In such cases make suitable arrangements with the property owner and pay all costs incident to the borrowed material including royalties, if any, for the use of the material. Before a borrow pit is opened, the quality and suitability of the material to be obtained therefrom shall be approved by the Engineer.

2. Borrow pits shall be cleared, grubbed, and finish-graded in accordance with the requirements specified herein.

D. Roadway Excavation. Roadway excavation shall consist of excavation for roadways and parking areas in conformity with lines, grades, cross sections, and dimensions shown on the Drawings. After shaping to line, grade, and cross section, the subgrade shall be rolled until compacted to a depth of at least 6 inches to 100 percent of the maximum density at optimum water content as determined by AASHTO T99, Method A. This operation shall include any reshaping and wetting required to obtain proper compaction. All soft or otherwise unsuitable material shall be removed and replaced with suitable material.

E. Trench Excavation

1. Trench excavation shall consist of the removal of materials necessary for the construction of water, sewer, and other pipelines and all appurtenant facilities including manholes, inlets, outlets, headwalls, collars, concrete saddles, piers, and pipe protection called for on the Drawings.

2. Excavation for pipelines shall be made in open cut unless shown otherwise on the Drawings. Trenches shall be cut true to the lines and grades shown on the Drawings or established by the Engineer on the ground. The banks of trenches shall be cut in vertical, parallel planes equidistant from the pipe centerline. From

an elevation 12 inches above the top of the pipe to the bottom of the trench, the horizontal distances between vertical planes for different sizes of pipe shall not exceed those shown on the Drawings. When sheeting is used, the width of the trench shall be considered as the distance between the inside faces of the sheeting. The bottom of the trench shall be cut carefully to the required grade of the pipe except where bedding materials or cradles are shown, in which case the excavation shall extend to the bottom of the bedding or cradles as shown on the Drawings. Minimum pipe cover shall be as shown on the Drawings or specified in these Contract Documents.

3. The use of a motor-powered trenching machine will be permitted, but full responsibility for the preservation, replacement, and/or repair of damage to any existing utility services and private property shall rest with the Contractor.

4. Bell holes for bell and spigot pipe and/or mechanical joint pipe shall be excavated at proper intervals so the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of all joints in the pipe. Bell holes shall not be excavated more than 10 joints ahead of pipe laying. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.

5. Excavation for manholes, outlets, collars, saddles, piers, and other pipeline structures shall conform to the additional requirements specified herein for structural excavation.

6. Pipe trenches shall not be excavated more than 400 feet in advance of pipe laying and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic.

7. Wherever pipe trenches are excavated below the elevation shown on the Drawings, the Contractor, at his own expense, shall fill the void thus made at the proper grade with Class B concrete or with compacted layers of crushed rock or sand conforming to the requirements specified herein for backfill, unless otherwise specified herein or shown on the Drawings.

8. In all cases where materials are deposited along open trenches, they shall be placed so that no damage will result to the work and/or adjacent property in case of rain or other surface wash.

F. Structural Excavation

1. Structural excavation shall consist of the removal of all materials necessary for the construction of structures, including tanks, foundations, footings, wet wells, dry wells, box culverts, flumes, channels, buildings, and other miscellaneous structures.

2. The bottoms of structural excavations shall be true to the lines and grades shown on the Drawings. Faces of excavations shall not be undercut for extended footings. Except as provided herein for excavation of unsuitable material or rock, where the excavation is carried below the grade elevation shown on the Drawings, the Contractor shall backfill the void thus made to the proper grade with Class B concrete at his own expense.

2.5 BACKFILLING

A. Materials for backfilling shall conform to the following requirements:

1. Select Earth Backfill: Fine, sound, loose earth containing optimum moisture content for compaction to 90 percent of maximum density, free from all wood, vegetable matter, debris, and other objectionable material, and having scattered clods, stones, or broken concrete less than 2 inches in maximum dimension except that the maximum particle size shall be ½ inch when used with PVC or other flexible thermoplastic pipe.

2. Common Earth Backfill: Sound, loose earth containing optimum moisture content for compaction to 90 percent of maximum density, free from all wood, vegetable matter, debris, and other objectionable material, and having scattered clods, stones, or broken concrete and pavement less than 6 inches in maximum dimension.

3. Sand: Natural or imported sand conforming to ASTM D 1073.

4. Crushed Rock:

   a. Crushed Stone Bedding: Crushed stone conforming to Section 800, Size No. 7 (½-inch to No. 4) of the Georgia Department of Transportation's Standard Specifications - Construction of Transportation Systems (latest edition.)

   b. Crushed Stone Backfill: Mineral aggregate base conforming to Section 815 of the Georgia Department of Transportation's Standard Specifications - Construction of Transportation Systems (latest edition.)"

5. Class B Concrete: Class B concrete as specified elsewhere in these Specifications or on the Drawings.

B. General

1. Earth backfill shall be compacted to not less than 90 percent of the maximum density as determined by ASTM D 698 at a moisture content within 3 percentage points, unless otherwise specified herein. Crushed stone and sand shall be compacted to not less than 83 percent of the solid volume density as determined from the bulk specific gravity by AASHTO T-84 and T-85 and the dry weight of the aggregate.

2. Material that is too dry for adequate compaction shall receive a prior admix of sufficient water to secure optimum moisture content. Material having excessive water content shall not be placed at any time.

3. Backfill material required to be compacted shall be placed in horizontal layers not to exceed 6 inches in thickness (before compaction) and compacted in place by ramming, tamping, or rolling, unless otherwise specified herein. Compaction shall be accomplished by power-driven tools and machinery wherever possible. Compaction and consolidation of sand and crushed stone backfill shall be accomplished using vibrating equipment in a manner acceptable to the Engineer.

C. Backfilling Trenches

1. The backfilling of sewers, water, and other pipeline trenches shall be started immediately after the construction of same has been inspected and approved by the Engineer. Select backfill or crushed stone as shown on the Drawings shall be placed in the trench under and on each side of the pipe in 6-inch layers for the full width of the trench and thoroughly and uniformly compacted by ramming and/or tamping to a minimum of 90 percent of the maximum density determined as specified herein. Select earth backfilling or crushed stone as shown on the Drawings shall start above the pipe bedding. Sufficient select backfill or crushed stone as shown on the Drawings shall be placed around the pipe and compacted to provide a cover of not less than 12 inches over the top of the pipe. Mechanical compactors or tampers shall not be used within 12 inches of pipe. Compaction in this area shall be accomplished by hand methods. Sand or specified crushed stone bedding material shall be substituted for select earth backfill when the pipe material is other than ductile iron or when crushed stone trench backfill is required. Backfilling shall proceed simultaneously on both sides of the pipe to prevent lateral displacement.

2. Caution shall be used during backfill operations for PVC or other flexible thermoplastic pipe to prevent pipe deformation. PVC or other flexible thermoplastic pipe shall not be subjected to roller or wheel loads until a minimum of 30 inches of backfill has been placed over the top of the pipe. A hydrohammer shall NOT be used until a minimum depth of 48 inches of backfill has been placed over the top of the pipe.

3. Backfilling of PVC pressure pipe or other flexible thermoplastic pipe (water pipe) shall be as described in Paragraph 1 above.

4. In streets and alleys, across sidewalks and driveways, and at any other places subject to vehicular traffic or other superimposed loads, crushed rock backfill shall be placed and compacted in 12-inch layers from the bottom of the trench upward for the full depth of the trench. Crushed rock backfill shall be compacted by use of a hydrohammer or approved vibratory compactor. The top 6 inches of the finished subgrade shall be equal to not less than 100 percent of the maximum density as determined by ASTM D 698 at a moisture content of within 3 percentage points of optimum. When field tests show failure to meet the density requirement, the subgrade shall be loosened by disking, harrowing, or other approved methods to a depth of not less than 6 inches, then reshaped and recompacted as indicated in this paragraph.

5. Trenches under concrete slabs and footings of structures shall be completely backfilled with compacted sand or crushed rock or filled with Class B concrete as shown on the Drawings.

6. All backfilling shall be done in such a manner that the pipe or structure over or against which it is being placed will not be disturbed or injured. Any pipe or structure injured, damaged, or moved from its proper line or grade during backfilling operations shall be removed and repaired to the satisfaction of the Engineer and then rebackfilled.

D. Backfilling Around Structures

1. Backfilling around structures shall consist of common earth backfill placed in 6-inch layers and compacted by tamping to a minimum of 90 percent of the maximum density determined as specified herein for the full depth of the excavation from the bottom to the finished grade. No backfill shall be placed against concrete structures until the concrete has reached its specified 28-day compressive strength. Where practical, compaction of structural backfill shall be accomplished by power-driven tamping equipment.

2. Where crushed rock mats under slabs and foundations are called for on the Drawings, excavate below grade to the depth of the crushed rock mat as shown on the Drawings and install a compacted crushed rock bed. This shall be finished to a true line or plane and even with the subgrade of the concrete foundations, piers, footings, or slabs. Before placing any crushed stone, remove all loose earth or debris. This crushed rock mat shall extend 12 inches beyond all slabs and foundations or to edges of sheet piling.

3. Crushed rock mats 12 inches or less in thickness shall be constructed of compacted layers of crushed rock conforming to AASHTO M43, Size 7 (½-inch to No. 4).

4. Crushed rock mats of thickness greater than 12 inches shall have the top 12 inches constructed of compacted layers of crushed rock as specified above. That portion below the top 12 inches shall be constructed of compacted layers of crushed rock conforming to Section 800, Georgia Department of Transportation Specifications, with a modified gradation of 6 inches to dust as received from the crusher.

5. The use of earth backfill to support footings, foundations, and structures shall not be permitted, unless otherwise shown on the Drawings.

2.6 FILLS AND EMBANKMENTS

A. Fills and embankments shall consist of all earth fills except backfills in trenches or around structures. Unless special material is specified or shown on the Drawings, material for fills and embankments shall consist of excavated material from structures or of a mixture of such excavated materials and materials borrowed from other sources by the Contractor. All material used for fills and embankments shall be free from wood, vegetable matter, debris, soft or spongy earth or clay, large rock, or other objectionable material and shall be acceptable to the Engineer.

B. Materials shall be placed in the fill or embankment in successive layers 8 inches or less in thickness before compaction, each layer being approximately horizontal and extending to the full limit of the required cross section, and shall be compacted over the entire surface to not less than 95 percent of the maximum density as determined by ASTM D 698 at a moisture content of within 3 percentage points of optimum. The process shall be repeated for each layer of material until the fill or embankment conforms to the plan lines, grades, and cross sections. The degree of compaction and moisture content required, the method of tamping, and the equipment used shall be approved by the Engineer.

C. The area over which the fill or embankment is to be constructed shall first be cleared of all vegetation, debris, and other objectionable material and, if the ground is in a loose, uncompacted condition, it shall be compacted to a minimum 95 percent of maximum density determined as specified herein.

D. No material shall be placed beyond the sloping lines of embankment unless so ordered by the Engineer. Material allowed to be placed beyond the lines of embankment shown on the Drawings will be compacted as required above unless otherwise authorized by the Engineer.

E. Material for embankments or roadway fills shall be placed in 6-inch maximum lifts and shall be compacted by rolling with power rollers weighing not less than 10 tons, with sheepsfoot rollers, with vibrating rollers, or with pneumatic tire rollers, as required to accomplish the work. While and as each layer is deposited, water shall be applied in sufficient amount to ensure optimum moisture to secure the compaction specified.

F. The use of trucks, carryalls, scrapers, tractors, or other heavy hauling equipment shall not be considered as rolling in lieu of rollers, but the traffic of such hauling equipment shall be distributed over the fill in such a manner as to make the use of the compaction afforded thereby as an addition to compaction by the use of rollers.

G. Wherever a trench passes through a fill or embankment, the fill or embankment material shall be placed as compacted to an elevation 12 inches above the top of the pipe before the trench is excavated.

H. Subgrades for all roadbeds shall meet the requirements of Subsection 2.5 C.4.

2.7 DISPOSAL OF WASTE AND UNSUITABLE MATERIALS

A. All materials removed by excavation which are suitable for the purpose shall be used to the extent possible for backfilling pipe trenches, foundations, and footings and for making embankment fills or for such other purposes as may be shown on the Drawings. All materials not used for such purposes shall be considered as waste materials and the disposal thereof shall be made in a manner and at locations approved by the Engineer.

B. Waste materials shall be spread in uniform layers and neatly leveled and shaped. Spoil banks shall be provided with sufficient and adequate openings to permit surface drainage of adjacent lands.

C. Unsuitable materials, consisting of wood, vegetable matter, debris, soft or spongy clay, peat, and other objectionable material so designated by the Engineer, shall be removed from the work site and disposed of in a manner and at a location approved by the Engineer.

D. No unsuitable or waste material shall be dumped on private property unless written permission is furnished by the owner of the property and unless a dumping permit is issued from the local jurisdiction.

E. The Contractor is responsible for any and all permits and other requirements, such as sediment runoff control necessitated by the disposal of waste material.

2.8 FINAL GRADING

A. After other earthwork operations have been completed, the sites of all structures, roads, and embankments shall be graded within the limits and to the elevations shown on the Drawings. Grading operations shall be so conducted that materials shall not be removed or loosened beyond the required limits. The finished surfaces shall be left in smooth and uniform planes such as are normally obtainable from the use of hand tools. If Contractor is able to obtain the required degree of evenness by means of mechanical equipment, the use of hand labor methods will not be required. Neatly trim and finish slopes and ditches to slopes shown on the Drawings unless otherwise approved by the Engineer.

B. Grade and dress all finished ground surfaces to present a surface varying not more than plus or minus 0.10 foot as regards local humps or depressions, unless otherwise specified or shown on the Drawings, and shall be acceptable to the Engineer.

2.9 TOPSOIL

A. All areas to be planted with trees or shrubs, or with sprigged grass as shown on the plans, **and all areas disturbed by the installation of the water and sewer lines**, shall be prepared by grading to a smooth, even surface to a level 4 inches below the elevation of the finished grade shown on the Drawings. It shall then be brought to a neat and finished grade by the addition of 4 inches of approved topsoil.

B. Topsoil removed from the construction area may be stockpiled and reused or topsoil may be obtained from approved borrow areas. If obtained from borrow areas, make suitable arrangements with the property owner and pay all costs incident to the borrowed material including royalties.

2.10 SETTLEMENT

A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within 1 year after final acceptance of the work by the Owner.

B. Make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from the Engineer or Owner.

2.11 DUST CONTROL

A. The Contractor shall use all means necessary to control dust on and near the work and all off-site borrow areas.

B. The Contractor shall thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors and concurrent performance of work on the site.

END OF SECTION

SECTION 31 25 00

SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.1 SCOPE

A. This section shall consist of temporary control measures as shown in the plans or directed by the Engineer during the life of the Contract to control erosion and water pollution through the use of berms, dikes, dams, sediment basins, fiber mats, netting, mulches, grasses, slope drains, temporary silt fences, and other control devices.

B. 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 periods.

C. All designs will conform to and all work will be performed in accordance with the standards and specifications of the publication entitled “Manual for Erosion and Sediment Control in Georgia.”

D. Implementation and Maintenance. Contractor shall designate one individual to be responsible for implementation and maintenance of erosion and sedimentation controls on 24-hour, everyday basis. Contractor shall furnish the individual’s name, address, and 24-hour telephone number. Contractor shall update contact information as necessary.

PART 2 - PRODUCTS

2.1 TEMPORARY BERMS

A. 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.

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

2.2 TEMPORARY SLOPE DRAINS

A. A temporary slope drain is a facility consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt 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.

2.3 SEDIMENT STRUCTURES

A. 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.

2.4 CHECK DAMS

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

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

2.5 TEMPORARY SEEDING AND MULCHING

A. Temporary 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.

2.6 BRUSH BARRIERS

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

B. 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.

2.7 BALED HAY OR STRAW CHECKS

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

B. 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 siltation, erosion, or water run-off is a problem.

2.8 TEMPORARY SILT FENCES

A. Silt fences shall be Type C utilizing woven wire reinforcement attached to posts with filter cloth composed of plastic filter fabric attached to the upstream side of the fence to retain the suspended silt particles in the run-off water. Fence and fabric shall meet the minimum standards set forth in the Department of Transportation, State of Georgia, Standard Specification, current edition.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION CONFERENCE

A. At the Preconstruction Conference, submit for acceptance the schedule for accomplishment of temporary and permanent erosion control work as applicable for clearing and grubbing, grading, bridges and other structures at watercourses, construction, and paving. Also submit for acceptance the proposed method of erosion control on haul roads and borrow pits and the plan for disposal of waste materials. No work shall be started until the erosion control schedules and methods of operation have been accepted by the Engineer.

3.2 CONSTRUCTION REQUIREMENTS

A. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, and the surface of erodible earth material exposed by excavation, borrow, and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds, or other water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, or slope drains, and the use of temporary 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.

B. Incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the 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.

C. 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. Preconstruction vegetation ground cover shall not be destroyed, removed, or disturbed more than 20 calendar days prior to grading or earth moving unless approval is granted otherwise.

D. The Engineer will limit the area of excavation, borrow, and embankment operations in progress commensurate with the Contractor's capability and progress to keep the finish grading, mulching, seeding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

E. Under no conditions shall the amount of surface area or erodible earth material exposed at one time by excavation or fill within the project area exceed 50,000 square feet without prior approval by the Engineer.

F. The Engineer may increase or decrease the amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, and borrow and fill operations as determined by his analysis of project conditions.

G. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

3.3 CONSTRUCTION MANAGEMENT TECHNIQUES

A. Clearing and grubbing must be held to the minimum necessary for grading and equipment operation.

B. Construction must be sequenced to minimize the exposure time of cleared surface area.

C. Construction must be staged or phased for large projects. 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.

D. Erosion and sediment control measures must be in place and functional before earth moving operations begin, and must be constructed and maintained throughout the construction period. Temporary measures may be removed at the beginning of the work day, but must be replaced at the end of the work day.

E. All control measures shall be checked, and repaired as necessary, weekly in dry periods and within 24 hours after any rainfall of 0.5 inch within a 24-hour period. During prolonged rainfall, daily checking and repairing is necessary. The Contractor shall maintain records of checks and repairs.

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

3.4 CONSTRUCTION OF STRUCTURES

A. 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 minimum 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 minimum 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 drains on only one side of the embankment.

B. Temporary Slope Drains

1. Temporary slope drains shall 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.

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

3. 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.

C. Sediment Structures

1. 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 ditchlines atop waste sites, and in the ditchlines 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.

2. 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.

D. Check Dam

1. Utilize check dams 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.

2. Key all check dams into the sides and bottom of the channel a minimum depth of 2 feet. A design is not needed for check dams but some typical designs are shown in the standard plans.

3. Do not use stone check dams where the drainage area exceeds 50 acres. Log and pole structures should generally not be used where the drainage area exceeds five acres.

E. Temporary Seeding and Mulching. Perform seeding and mulching in accordance with Section 32 92 00, Seeding.

F. Brush Barriers. Brush barriers shall consist of brush, tree trimmings, shrubs, plants, and other approved refuse from the clearing and grubbing operation. The brush barriers shall be constructed approximately parallel to original ground contour. Each brush barrier shall be compressed to an approximate height of 3 to 5 feet and approximate width of 5 to 10 feet. The embankment shall not be supported by the construction of brush barriers.

G. Baled Hay or Straw Erosion Checks. Hay or straw shall be embedded in the ground 4 to 6 inches to prevent water flowing underneath. 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. Keep the checks in good condition by replacing broken or damaged bales immediately after damage occurs. Normal debris clean-out will be considered routine maintenance.

H. Temporary Silt Fences

1. 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.

2. 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.

3.5 MAINTENANCE

A. The temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.

B. 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 are ordered by the Engineer, such work shall be performed by the Contractor at his own expense.

C. Where the work to be performed is not attributed to the Contractor's negligence, carelessness, or failure to install permanent controls and falls within the specifications for a work item that has a contract price, the units of work shall be paid for at the proper contract prices.

3.6 EROSION CONTROL OUTSIDE PROJECT AREA

A. Temporary erosion control shall include construction work outside the project area where such work is necessary as a result of construction such as borrow pit operations, haul roads, and equipment storage sites. Bid price in such cases shall include all necessary clearing and grubbing, construction incidentals, maintenance, and site restoration when no longer needed.

END OF SECTION

DIVISION 32

EXTERIOR IMPROVEMENTS

SECTION 32 10 00

NEW AND REPLACEMENT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes provisions for hot-mixed asphalt paving and mineral aggregate subbase over prepared subgrade for trench width, full pavement width paving, and other areas as shown on the Drawings.

B. Prepared subgrade is specified in Section 31 20 00, Earthwork.

C. Proof rolling of prepared subgrade is included in this section.

D. Saw-cutting of edges of existing pavement is required to minimize subsidence of the pavement into the trench and to minimize the width of pavement replacement.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplemental Conditions and Division 1 Specification sections, apply to this section.

1.3 SUBMITTALS

A. General. Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. Material certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

C. Pavement marking plan indicating lane separations and defined parking spaces. Note dedicated handicapped spaces with international graphics symbol.

1.4 SITE CONDITIONS

A. Weather Limitations. Apply prime and tack coats when ambient temperature is above 50°F (10°C) and when temperature has not been below 35°F (1°C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct hot-mixed asphalt surface course when atmospheric temperature is above 40°F (4°C) and when base is dry. Base course may be placed when air temperature is above 30°F (-1°C) and rising.

C. Grade Control. Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General. Use locally available materials and gradations that exhibit a satisfactory record of previous installations.

B. Coarse Aggregate. Sound, angular crushed stone, crushed gravel, or properly cured crushed blast furnace slag, complying with ASTM D 692-88.

C. Fine Aggregate. Sharp-edged natural sand or sand prepared from stone, properly cured blast furnace slag, gravel, or combinations thereof, complying with ASTM D 1073.

D. Mineral Filler. Rock or slag dust, hydraulic cement, or other inert material complying with ASTM D 242.

E. Asphalt Cement. ASTM D 3381 for viscosity-graded material; ASTM D 946 for penetration-graded material.

F. Prime Coat. Cut-back asphalt type, ASTM D 2027; MC-30, MC-70, or MC-250.

G. Tack Coat. Emulsified asphalt; ASTM D 977.

H. Graded Aggregate Subbase (GAB). GAB per Georgia Department of Transportation (GDOT) standard specifications.

I. Geotextile Fabric. 6 oz/sy, woven, polypropylene fabric; Mirafi, Inc., Type 600x, or equal.

J. Lane Marking Paint. Alkyd-resin type, ready-mixed complying with AASHTO M 248, Type I.

1. Color: White.
2. Color: Yellow.

2.2 TYPES OF PAVEMENT

A. Replace all existing pavement in streets, driveways, or parking areas which is removed, destroyed, or damaged by construction of sewage or water works as specified below, **as shown on the Drawings**, or as called for in the Bid Schedule. Unless otherwise shown or specified, all paved surfaces shall be replaced using the applicable pavement replacement Type 1 through 5 as shown on the Drawings. Pavement shown or specified to be replaced for the full width of the street shall be Type 6,7, or 8 as applicable and as shown on the Drawings. Materials, equipment, and construction methods used for paving work shall conform to the Specifications applicable to the particular type required for replacement, repair, or new pavements.

1. Type 1 asphaltic concrete pavement for heavy-duty use shall have a minimum thickness of 3 inches placed in two equal layers. Type 1 pavement shall be composed of plant mix, asphaltic concrete Grading E conforming to "Hot Mix Asphaltic Concrete Construction," Section 400 of the GDOT specifications.

2. Type 2 asphaltic concrete pavement for light-duty use shall have a minimum thickness of 2 inches of Type “B” binder over 6 inches of compacted GAB to 100 percent of Standard Proctor placed in one layer. Type 2 pavements shall be composed of hot plant mix base Grading “B” conforming to Section 400, "Hot Mix Asphaltic Concrete Construction,” GDOT specifications.

3. Type 3 pavement replacement shall consist of 2 inches of asphaltic concrete over a portland cement concrete base and shall be constructed according to the detail shown on the Drawings.

    a. Replace portland cement concrete base courses with Class "A" concrete in accordance with Section 03 30 00, Cast-In-Place Concrete. The surface of the replaced concrete base course shall be left rough. The slab shall be of depth equivalent to the existing concrete base course, but in no case less than 7 inches thick. Replace expansion joints removed. Concrete base courses shall be reinforced and conform to details shown on the Drawings and applicable specifications of Section 326, "Portland Cement Concrete Subbase," GDOT specifications.

    b. Asphaltic concrete shall be constructed on one layer and shall be the same as described for Type 2 paving above or Type 8 paving below.

4. Type 4 bituminous penetration pavement shall be a minimum of 1 inch in thickness and shall conform to Section 424, "Bituminous Surface Treatment," GDOT specifications.

5. Type 5 portland cement concrete pavement shall be Class "A" concrete conforming to Section 03 30 00, Cast-In-Place Concrete. The surface finish of the concrete pavement replaced shall conform to that of the existing pavement. The slab shall be of depth equivalent to the existing concrete pavement, but in no case less than 7 inches thick. Replace expansion joints removed. Concrete pavements shall be reinforced and shall conform to details shown on the Drawings and applicable specifications of Section 430, "Portland Cement Concrete Pavement," GDOT specifications.

6. Type 6 asphaltic concrete pavement for heavy-duty use for full street width replacement shall consist of one 2-inch layer of bituminous plant mix base (hot mix), Grading C, conforming to Section 400, "Hot Mix Asphaltic Concrete Construction,” GDOT specifications; and one 1-inch layer of asphaltic concrete pavement, Grading E, conforming to Section 400, "Hot Mix Asphaltic Concrete Construction,” GDOT specifications.

7. Type 7 asphaltic concrete pavement for light-duty use where designated by Engineer for full street width replacement shall consist of one 2-inch layer of Grading C, conforming to Section 400, "Hot Mix Asphaltic Concrete Construction," GDOT specifications.

8. Type 8 asphaltic concrete pavement for light-duty use where designated by Engineer for full-width replacement shall consist of one 2-inch layer of asphaltic concrete pavement, Grading E, conforming to Section 400, "Hot Mix Asphaltic Concrete Construction,” GDOT specifications.

9. Where sewerage or water lines and appurtenances are constructed in or across unpaved, chert, or crushed stone surfaced streets, roadways, driveways, or parking areas, repair or replace the surface removed or damaged with a minimum of 6 inches of crushed stone in accordance with Section 310, "Graded Aggregate Construction," GDOT specifications.

10. Temporary paving shall consist of a single application of bituminous surface treatment. The bituminous surface treatment pavement shall conform to Section 424, "Bituminous Surface Treatment," GDOT specifications.

B. In no case shall paving repair be commenced without prior approval of the Engineer of the type of pavement, the equipment to be used, and the method or procedure to be used. The designation of "light-duty" or"heavy-duty" use as applied to Type 1, Type 2, Type 6, Type 7, or Type 8 pavement replacement shall be determined by the Engineer.

C. The pavement mixture shall not be spread until the designated surface has been previously cleaned and prepared, is intact, firm, properly cured, dry, and the tack coat has been applied.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. General. Remove loose material from compacted subgrade surface immediately before applying subbase.

B. Roll prepared subgrade surface to check for unstable areas and areas requiring additional compaction.

C. Do not begin paving work until deficient subgrade areas have been corrected and are ready to receive subbase.

D. Place mineral aggregate subbase and compact in accordance with the applicable GDOT specifications to provide a minimum of 6 inches or as shown on Drawings. Subbase thickness greater than 8 inches shall be placed in two or more layers.

E. Roll prepared subbase surface to check for unstable areas and areas requiring additional compaction.

F. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

G. Prime Coat. Apply at rate of 0.20 to 0.50 gallon per square yard over compacted subbase. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile components.

H. Tack Coat. Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into hot-mixed asphalt pavement. Distribute at rate of 0.05 to 0.15 gallon per square yard of surface.

I. Allow to dry until at proper condition to receive paving.

J. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

3.2 PLACING MIX

A. General. Place hot-mixed asphalt mixture on prepared surface, spread, and strike off. Spread mixture at minimum temperature of 225°F (107°C). Place areas inaccessible to equipment by hand. Place each course to required grade, cross-section, and compacted thickness.

B. Paver Placing. Place in strips not less than 10 feet wide, unless otherwise acceptable to Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

C. Immediately correct surface irregularities in finish course behind paver. Remove excess material forming high spots with shovel or lute.

D. Joints. Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of hot-mixed asphalt course. Clean contact surfaces and apply tack coat.

E. Curbs. Construct curbs over compacted pavement surfaces. Apply a light tack coat unless pavement surface is still tacky and free from dust.

F. Place curb materials to cross-section indicated or, if not indicated, to local standard shapes, by machine or by hand in wood or metal forms. Tamp hand-placed materials and screed to smooth finish. Remove forms as soon as material has cooled.

3.3 ROLLING

A. General. Begin rolling when mixture will bear roller weight without excessive displacement.

B. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

C. Breakdown Rolling. Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling and repair displaced areas by loosening and filling, if required, with hot material.

D. Second Rolling. Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been evenly compacted.

E. Finish Rolling. Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained 95 percent laboratory density.

F. Patching. Remove and replace paving areas mixed with foreign materials and defective areas. Cut out such areas and fill with fresh, hot-mixed asphalt. Compact by rolling to specified surface density and smoothness.

G. Protection. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.4 TRAFFIC AND LANE MARKINGS

A. General. Provide traffic and lane markings in all areas where markings have been damaged due to trench width pavement. On full width pavement, provide markings in all areas were markings were present at beginning of project or where markings are designated to be provided on the Drawings.

B. Cleaning. Sweep and clean surface to eliminate loose material and dust.

C. Striping. Use chlorinated-rubber base traffic lane-marking paint, factory-mixed, quick-drying, and nonbleeding.

D. Do not apply traffic and lane marking paint until layout and placement have been verified with Engineer.

E. Apply paint with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates to provide minimum 12 to 15 mils dry thickness.

3.5 WHEEL STOPS

A. General. Secure wheel stops to hot-mixed asphalt surface with not less than two 3/4-inch-diameter galvanized steel dowels embedded in precast concrete at 1/3 points. Size length of dowel to penetrate at least 1/2 hot-mixed asphalt depth.

3.6 FIELD QUALITY CONTROL

A. General. Testing in-place hot-mixed asphalt courses for compliance with requirements for thickness and surface smoothness will be done by Owner's testing laboratory. Repair or remove and replace unacceptable paving as directed by Engineer.

B. Thickness. In-place compacted thickness tested in accordance with ASTM D 3549 will not be acceptable if exceeding following allowable variations:

1. Base Course: Plus or minus ½-inch.
2. Surface Course: Plus or minus 1/4-inch.

C. Surface Smoothness: Test finished surface of each hot-mixed asphalt course for smoothness, using 10-foot straightedge applied parallel with and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness:

1. Base Course Surface: 1/4-inch.
2. Wearing Course Surface: 3/16-inch.
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4-inch.

D. Check surface areas at intervals as directed by Engineer.

END OF SECTION

SECTION 32 92 19

SEEDING

PART 1 - GENERAL

1.1 SCOPE

A. The work covered by this section consists of furnishing all labor, equipment, and material required to place topsoil, seed, commercial fertilizer, agricultural limestone, and mulch material, including seedbed preparation, harrowing, compacting, and other placement operations on graded earthen areas as described herein and/or shown on the Drawings. In general, seeding operations shall be conducted on all newly graded earthen areas not covered by structures, pavement, or sidewalks; all cleared or grubbed areas which are to remain as finish grade surfaces; and on all existing turf areas which are disturbed by construction operations and which are to remain as finish grade surfaces. Areas disturbed by borrow activities shall also be seeded according to these Specifications, Georgia D.O.T. Section 700 and related sections, and the Manual for Erosion and Sedimentation Control in Georgia, latest edition.

B. Temporary Seeding and Erosion Control

1. This practice is applicable on areas subject to erosion for up to 12 months or until establishment of finished grade or permanent vegetative cover. Temporary vegetative measures shall be coordinated with permanent measures to assure economical and effective stabilization.

2. Temporary seeding shall be applied to exposed soil surfaces which are not to be fine-graded for periods from 30 days to one year. Such areas include denuded areas, soil stockpiles, dikes, dams, sides of sediment basins, temporary roadbanks, backfilled and rough graded utility line trenches, and disturbed areas along utility lines, etc.

3. Temporary seeding shall be in accordance with the temporary seeding schedule and shall meet the same requirements for seed bed preparation and mulching with the exception that lime and fertilizer need not be applied unless the soil is very low fertility and low pH.

1.2 QUALITY ASSURANCE

A. Prior to seeding operations, furnish to the Engineer labels or certified laboratory reports from an accredited commercial seed laboratory or a state seed laboratory showing the analysis and germination of the seed to be furnished. Acceptance of the seed test reports shall not relieve the Contractor of any responsibility or liability for furnishing seed meeting the requirements of this section.

B. Prior to topsoil operations, obtain representative samples and furnish soil test certificates including textural, pH, and organic ignition analysis from the State University Agricultural Extension Services or other certified testing laboratory.

PART 2 - PRODUCTS

2.1 TOPSOIL

A. Place a minimum of 4 inches of topsoil over all graded earthen areas and over any other areas to be seeded. Sources of topsoil shall be approved by the Engineer prior to disturbance.

B. Topsoil shall be a friable loam containing a large amount of humus and shall be original surface soil of good, rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than 1/2 inch in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips, or other undesirable material harmful or unnecessary to plant growth. Topsoil shall be reasonably free from perennial weeds and perennial weed seeds, and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements, or vegetable debris undesirable or harmful to plant life.

C. Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classifiable as loam, silt loam, clay loam, sandy loam, or a combination thereof. The pH shall range from 5.5 to 7.0. Topsoil shall contain not less than 5 percent nor more than 20 percent, by weight, of organic matter as determined by loss on ignition of samples oven-dried to 65°C.

2.2 SEED

A. Deliver seed in new bag or bags that are sound and labeled in accordance with the U.S. Department of Agriculture Federal Seed Act.

B. All seed shall be from the last crop available at time of purchase and shall not be moldy, wet, or otherwise damaged in transit or storage.

C. Seed shall bear the grower's analysis testing to 98 percent for purity and minimum 85 percent for germination. At the discretion of the Engineer, samples of seed may be taken for check against the grower's analysis.

D. Species, rate of seeding, fertilization, and other requirements are shown in the Seeding Requirements Table.

2.3 FERTILIZER AND LIMING MATERIALS

A. Fertilizer and liming materials shall comply with applicable state, local, and federal laws concerned with their production and use.

TEMPORARY SEEDING REQUIREMENTS TABLE					
			Rates per 1,000 Square Feet		
Area	Sowing Season	Species	Seed	Fertilizer*	Limestone**
All Areas	4/15 to 8/15	Sudangrass (Sorghum Sudanese)	1.5 lbs.	10 lbs. 10-20-20	100 lbs.
	8/16 to 4/14	Annual Ryegrass (Lolium Temulentum)	1 lb.	10 lbs. 10-20-20	100 lbs.
*Fertilizer is not required on fertile soils. Apply on very low fertility soil. **Apply limestone on highly acidic soils (pH 5.5 and lower).					

PERMANENT SEEDING REQUIREMENTS TABLE					
			Rates per 1,000 Square Feet		
Area	Sowing Season	Species	Seed	Fertilizer	Limestone
Flat to rolling terrain with slopes less than 3:1	3/1 to 6/1	Kentucky 31 Fescue Ladino White Clover*	4 lbs. 1/4 lb.	30 lbs. 6-12-12	100 lbs.
	8/1 to 11/1	Kentucky 31 Fescue Ladino White Clover* Annual Ryegrass	4 lbs. 1/4 lb. 2 lbs.	30 lbs. 6-12-12	100 lbs.
Embankments with slopes greater than 3:1	3/1 to 6/1	Hulled Sericea Lespedeza* Kentucky 31 Fescue Weeping Lovegrass	1 lb. 3 lbs. 1/4 lb.	30 lbs. 6-12-12	100 lbs.
	8/1 to 11/1	Unhulled Sericea Lespedeza* Kentucky 31 Fescue Annual Ryegrass	1 lb. 3 lbs. 2 lbs.	30 lbs. 6-12-12	100 lbs.
*Requires inoculation.					

B. Commercial fertilizer shall be a ready-mixed material and shall be equivalent to the grade or grades specified in the Seeding Requirements Table. Container bags shall be labeled with the name and address of the manufacturer, brand name, net weight, and chemical composition.

C. Agricultural limestone shall be a pulverized limestone with a calcium carbonate content not less than 85 percent by weight. Agricultural limestone shall be crushed so that at least 85 percent of the material will pass a No. 10 mesh screen and 50 percent will pass a No. 40 mesh screen.

2.4 MULCH MATERIAL

A. All mulch materials shall be air-dried and reasonably free of noxious weeds and weed seeds or other materials detrimental to plant growth.

B. Mulch shall be composed of wood fiber, straw, or stalks, as specified herein. Mulch shall be suitable for spreading with standard mulch-blowing equipment.

C. Wood fiber mulch shall be as manufactured by Conwed Corporation, or equal.

D. Straw mulch shall be partially decomposed stalks of wheat, rye, oats, or other approved grain crops.

E. Stalks shall be the partially decomposed, shredded residue of corn, cane, sorghum, or other approved standing field crops.

2.5 MULCH BINDER

A. Mulch on slopes exceeding a 3 to 1 ratio shall be held in place by the use of an approved erosion control fabric, such as Curlex I as manufactured by American Excelsior Company, or approved equal. Fabric shall consist of strips of biodegradable paper interwoven with yarn that is subject to degradation by ultraviolet light.

2.6 INOCULANTS FOR LEGUMES

A. All leguminous seed shall be inoculated prior to seeding with a standard culture of nitrogen-fixing bacteria that is adapted to the particular seed involved.

2.7 WATER

A. Water shall be clean, clear, and free from any objectionable or harmful chemical qualities or organisms and shall be furnished by the Contractor.

PART 3 - EXECUTION

3.1 SECURING AND PLACING TOPSOIL

A. Topsoil shall be secured from areas where topsoil has not been previously removed, either by erosion or mechanical methods. Topsoil shall not be removed to a depth in excess of the depth approved by the Engineer.

B. The area or areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage, and other characteristics as to offer assurance that when removed the product will be homogeneous in nature and will conform to the requirements of these Specifications.

C. All areas from which topsoil is to be secured shall be cleaned of all sticks, boards, stones, lime, cement, ashes, cinders, slag, concrete, bitumen or its residue, and any other refuse which will hinder or prevent growth.

D. When securing topsoil from a designated pit or elsewhere, should strata or seams of material occur which do not come under the requirements for topsoil, such material shall be removed from the topsoil or if required by the Engineer, the pit shall be abandoned.

E. Before placing or depositing topsoil upon any area, all improvements within the area shall be completed, unless otherwise approved by the Engineer.

F. The areas in which topsoil is to be placed or incorporated shall be prepared before securing topsoil for use.

3.2 SEEDBED PREPARATION

A. Before fertilizing and seeding, the topsoil surfaces shall be trimmed and worked to true line free from unsightly variations, bumps, ridges, and depressions, and all detrimental material, roots, and stones larger than 3 inches in any dimension shall be removed from the soil.

B. Not earlier than 24 hours before the seed is to be sown, the soil surface to be seeded shall be thoroughly cultivated to a depth of not less than 2 inches with a weighted disc, tiller, pulvimixer, or other equipment, until the surface is smooth and in a condition acceptable to the Engineer.

C. If the prepared surface becomes eroded as a result of rain or for any other reason, or becomes crusted before the seed is sown, the surface shall again be placed in a condition suitable for seeding.

D. Ground preparation operations shall be performed only when the ground is in a tillable and workable condition, as determined by the Engineer.

3.3 FERTILIZATION AND LIMING

A. Following seedbed preparation, fertilizer shall be applied to all areas to be seeded so as to achieve the application rates shown in the Seeding Requirements Table.

B. Fertilizer shall be spread evenly over the seedbed and shall be lightly harrowed, raked, or otherwise incorporated into the soil for a depth of 1/2 inch.

C. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment. The seed shall not remain in water containing fertilizer for more than 30 minutes when a hydraulic seeder is used.

D. Agricultural limestone shall be thoroughly mixed into the soil according to the rates in the Seeding Requirements Table. The specified rate of application of limestone may be reduced by the Engineer if pH tests indicate this to be desirable. It is the responsibility of the Contractor to obtain such tests and submit the results to the Engineer for adjustment in rates.

3.4 SEEDING

A. Seed of the specified group shall be sown as soon as preparation of the seedbed has been completed. No seed shall be sown during high winds, nor until the surface is suitable for working and is in a proper condition. Seeding shall be performed during the dates shown in the Seeding Requirements Table unless otherwise approved by the Engineer. Seed mixtures may be sown together, provided they are kept in a thoroughly mixed condition during the seeding operation.

B. Seeds shall be uniformly sown by any approved mechanical method to suit the slope and size of the areas to be seeded, preferably with a broadcast type seeder, windmill hand seeder, or approved mechanical power-drawn seed drills. Hydroseeding and hydromulching may be used on steep embankments, provided full coverage is obtained. Care shall be taken to adjust the seeder to the proper rate before seeding

operations are started and to maintain the adjustment during seeding. Seed in hoppers shall be agitated to prevent segregation of the various seeds in a seeding mixture.

C. Immediately after sowing, the seeds shall be covered and compacted to a depth of 1/8 to 3/8 inch by a cultipacker or suitable roller.

D. Leguminous seeds shall be inoculated prior to seeding with an approved and compatible nitrogen-fixing inoculant in accordance with the manufacturer's mixing instructions.

3.5 MULCHING

A. All seeded areas shall be uniformly mulched in a continuous blanket immediately after seeding. The mulch shall be applied so as to permit some sunlight to penetrate and air to circulate, and at the same time shade the ground, reduce erosion, and conserve soil moisture. Approximately 25 percent of the ground shall be visible through the mulch blanket.

B. One of the following mulches shall be spread evenly over the seeded areas at the following application rates:

1.	Wood Fiber	1,400 lbs/acre
2.	Straw	4,000 lbs/acre
3.	Stalks	4,000 lbs/acre

These rates may be adjusted at the discretion of the Engineer at no additional cost to the Owner, depending on the texture and condition of the mulch material and the characteristics of the seeded area.

C. Mulch on slopes greater than a 3 to 1 ratio shall be held in place by the use of an approved erosion control fabric. Fabric shall be installed immediately after seeding and fertilizing area (mulch shall not be used under fabric).

D. Erosion control fabric shall be installed and applied in accordance with the manufacturer's recommendations. Any fabric which becomes torn, broken loose from securing staples, or undermined shall be immediately and satisfactorily repaired. Areas where seed is washed out before germination shall be fertilized, reseeded, and restored. Any required restoration work shall be performed without additional compensation.

3.6 WATERING

A. Maintain the proper moisture content of the soil to ensure adequate plant growth until a satisfactory stand is obtained. If necessary, watering shall be performed to maintain an adequate water content in the soil.

B. Watering shall be accomplished by hoses, tank truck, or sprinklers in such a way to prevent erosion, excessive runoff, and overwatered spots.

3.7 MAINTENANCE

A. Upon completion of seeding operations, the Contractor shall clear the area of all equipment, debris, and excess material, and the premises shall be left in a neat and orderly condition.

B. Maintain all seeded areas without additional payment until final acceptance of the work by the Owner. Regrading, refertilizing, reliming, reseeding, or remulching shall be done at Contractor's expense. Seeding work shall be repeated on defective areas until a satisfactory uniform stand is achieved. Damage resulting from erosion, gullies, washouts, or other causes shall be repaired by filling with topsoil, compacting, and repeating the seeding work. Grass areas will be considered acceptable when a viable stand of grass covers at least 98% of the total area with no bare spots exceeding one square foot and the ground surface is fully stabilized against erosion.

END OF SECTION

DIVISION 33

UTILITIES

SECTION 33 05 23

UTILITY CROSSINGS OF HIGHWAYS

PART 1 - GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, materials, service, and equipment required to properly complete sewer and/or water pipeline construction under federal or state highways, as described herein and/or shown on the Drawings.

1.2 SHOP DRAWINGS AND ENGINEERING DATA

A. Complete engineering data and product information shall be submitted to the Engineer in accordance with the requirements of these Specifications.

1.3 STORAGE AND DELIVERY

A. All materials shall be stored and protected with strict conformance to the manufacturer's recommendations and as approved by the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel casing pipe for sizes 6 inches and smaller shall conform to ASTM A 120 (standard weight), of the latest standard specifications.

B. Steel casing pipe, sizes 8 inches through 54 inches, shall be straight-seam welded steel pipe conforming to ASTM A 139, Grade B of the latest standard specification.

C. Steel casing pipe for railroad crossings shall be bituminous coated inside and out.

D. Structural steel liner plates shall be used for excavated tunnels where the casing pipe is 54 inches or greater in diameter. Liner plates shall be of the thickness shown on the Drawings. The liner plates shall be of the two-flange, lap-joint type. The corrugations shall be 3½ inches center to center. Bolts and nuts used shall be a minimum of ⅝-inch diameter and shall conform to the latest revision of ASTM A 307 for plate thickness less than 0.209 inch, and ASTM A 449 for plate thickness equal to or greater than 0.209 inch. Each plate shall have one 2-inch-diameter half coupling and plug for grouting.

E. The void behind the casing pipe shall be filled with sand-cement grout. The sand-cement content shall be 1 part portland cement to 3 parts fine aggregate. The water-cement ratio shall be 0.62 by weight.

F. An end-of-casing boot shall be used on each end of the casing to seal the space between the carrier and casing pipe. End seals shall be Cascade Model CCES End Seal, or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Any solidification of embankments, boring headings, or tunnel headings or sides shall be the Contractor's responsibility and shall be done at his own expense.

B. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.

C. The casing pipe shall be jacked into the boring as soon as possible after the boring is made. Lengths of casing pipe as long as practical shall be used. Joints between sections shall be completely welded as recommended for joining the particular type of pipe.

D. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.

E. Any replacement of carrier pipe in an existing casing shall be considered a new installation, subject to the applicable requirements of these Specifications.

F. Open-cut installations, where permitted, shall be in accordance with the details and procedures shown on the Drawings.

G. Steel liner plates shall be installed in excavated tunnels when called for on the Drawings. The liner plates shall be installed progressively as excavation proceeds. Excavation shall not continue more than 24 inches past the end of the liner plate already in place. At this time, an additional section of liner shall be installed before excavation shall continue. Grout shall be placed under pressure in the annular void as the excavation proceeds. Grout should be continuously placed as close to the heading as possible, using grout stops if necessary. Grout shall be injected in the lower holes first, moving upward as the back space is filled. Threaded plugs shall be installed after filling each grout hole.

H. Care shall be taken to ensure that casing pipe installed by boring and jacking or open-cut method will be at the proper alignment and grade.

I. Maintain and operate pumps, well points, and drainage system equipment to keep work dewatered at all times.

J. Adequate sheeting, shoring, and bracing for embankments, operating pits, and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring, and bracing shall be left in place, cut off, or removed, as designated by the Engineer.

K. Trench excavation; mining for tunnels; all classes and types of excavation; the removal of rock, muck, and debris; the excavation of all working pits; and backfill requirements of Section 31 20 00, Earthwork, are included under this section.

L. Carrier pipe for all lines 4 inches and larger shall have push-on joints and fittings.

M. After the casing pipe or tunnel liner is installed, install the carrier pipe, exercising care at all times to protect the interior of the casing pipe and to maintain tight, full-seated joints in the carrier pipe. The carrier pipe shall be installed at the proper line and grade without any sags or high spots.

N. The carrier pipe shall be held concentric with the casing pipe by the use of blocks spaced radially around the pipe and secured together so that they remain firmly in place. The spacing of such blocks longitudinally in the casing pipe may not be greater than 10 feet. Blocks used with sand or grout fill may be hardwood. Approved stainless steel blocks must be used when no sand or grout fill is used.

O. Sand or grout shall be forced under pressure into the annular space between the carrier pipe and the casing pipe, except where prohibited. This shall begin at the center of the crossing and completely fill the space to each end. Care shall be exercised at all times to maintain the carrier pipe at its proper line and grade.

3.2 HIGHWAY CROSSINGS

A. The Contractor shall be held responsible and accountable for the coordinating and scheduling of all construction work within the state highway right-of-way.

B. Work along or across the state highway department rights-of-way shall be under the supervision of the Engineer and state highway department engineer.

C. All water and sewer pipelines installed under paved roads and paved crossroads within the rights-of-way of the state highway department shall be encased. **This includes, but is not limited to, all water and sewer service lines.**

D. For open trench cut installations, make satisfactory arrangements to detour traffic around the area of highway where work is in progress, with minimum inconvenience placed on the traveling public Provide suitable flagmen, watchmen, safety devices, and other services and facilities as may be required by the state highway department. The cost of the same shall be borne by the Contractor.

E. Encasement shall be installed with 4 feet of cover below pavement and roadway surface and shall extend 5 feet beyond the highway embankment or back of side ditch, unless otherwise shown. On curbed portions of conventional highways, the casing pipe shall extend 3 feet beyond the back of curb or sidewalk.

F. For open trench cut installations, the Contractor shall be responsible for scheduling and coordinating all construction work. All work at one particular crossing shall be completed, with the trench backfilled, compacted, and a temporary crushed stone surface provided for traffic, before any work is started on another such crossing.

G. All installations shall be designed to leave free flows in drainage ditches, pipes, culverts, or other surface drainage facilities of the highway, street, or its connections.

H. Where sodding is disturbed by excavation or backfilling operation, such areas shall be replaced by mulch sodding on slopes 5 percent or less. All slopes over 5 percent shall be replaced with block sodding. No separate payment shall be made for sodding, which shall be included in the bid prices for installation of pipe.

I. All trench excavation within the right-of-way, but not under pavement, shall be backfilled by tamping in 6-inch layers.

J. All surplus material shall be removed from the right-of-way and the excavation finished flush with surrounding ground.

K. Grout backfill shall be used for unused holes or abandoned pipes.

L. Boring, jacking, or driving of carrier or casing pipes under existing highways shall be accomplished without jetting, sluicing, or wet-boring.

M. No excavated material or equipment shall be placed on the pavement or shoulders of the highway without the express approval of the state highway department engineer.

N. In no instance will the Contractor be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed which are placed on the right-of-way in advance of construction shall be placed in such a manner as not to interfere with the safe operation of the highway.

END OF SECTION

SECTION 33 11 00.17

POLYETHYLENE WRAP

PART 1: GENERAL

1.01 SECTION INCLUDES

A. The minimum requirements for polyethylene wrap to be used for external corrosion protection of buried ductile iron pipe, fittings, and appurtenances and for cast iron and ductile iron fittings on PVC pipe, and for barrier valves.

1.02 SUBMITTALS

A. Conform to requirements of Section 01 33 23 – Shop Drawings, Product Data, and Samples.

B. Submit product data for proposed film and tape for approval.

PART 2: PRODUCTS

2.01 MATERIALS

A. Polyethylene Film: Tubular or sheet form without tears, breaks, holidays, or defects; conforming with requirements of AWWA C105, 2.5 to 3 percent carbon black content, either low or high density:

1. Low-density polyethylene film shall be manufactured from virgin polyethylene material conforming to the following requirements of ASTM D4976.

a. Raw material.

1) Group: 2 (linear)

2) Class: C (black).

3) Density: 0.910 to 0.935 g/cm^3

4) Dielectric strength: Volume resistivity, 10^{15} ohm-cm, minimum

b. Physical properties.

1) Tensile strength: 3600 psi, minimum.

2) Elongation: 800 percent, minimum.

3) Dielectric strength: 800 V/mil thickness, minimum.

c. Thickness: Low-density polyethylene film shall have normal thickness of 0.008 inch. Minus tolerance on thickness is 10 percent of nominal thickness.

2. High-density, cross laminated polyethylene film shall be manufactured from virgin polyethylene material conforming to the following requirements of ASTM D4976.

a. Raw material.

1) Group: 2 (linear)

2) Density: 0.940 to 0.960 g/cm^3

3) Class: C (black)

4) Dielectric strength: Volume resistivity, 10^{15} ohm-cm, minimum.

b. Physical properties.

1) Tensile strength: 6300 psi, minimum.

2) Elongation: 100 percent, minimum.

3) Dielectric strength: 800 V/mil thickness, minimum.

c. Thickness: Film shall have nominal thickness of 0.004 inch. Minus tolerance of thickness is 10 percent of nominal thickness.

B. Polyethylene Tape: Provide minimum 2-inch-wide (3-inch typical), plastic-backed, adhesive tape.

PART 3: EXECUTION

3.01 PREPARATION

A. Remove lumps of clay, mud, and cinders from pipe surface prior to installation of polyethylene encasement. Prevent soil or embedment material from becoming trapped between pipe and polyethylene.

B. Fit polyethylene film to contour of pipe to affect snug, but not tight fit; encase with minimum space between polyethylene and pipe. Allow sufficient slack in contouring to prevent stretching polyethylene where it bridges irregular surfaces, such as bell-spigot interfaces, bolted joints, or fittings, and to prevent damage to polyethylene due to backfilling operations. Secure overlaps and ends with adhesive tape to hold polyethylene encasement in place until backfilling operations are complete.

C. For installations below water table or in areas subject to tidal actions, seal both ends of polyethylene tube with adhesive tape at joint overlap.

3.02 INSTALLATION

A. Tubular Type (Method A):

1. Cut polyethylene tube to length approximately 2 feet longer than pipe section. Slip tube around pipe, centering tube to provide 1-foot overlap on each adjacent pipe section and bunching it accordion-fashion lengthwise until it clears pipe ends.

2. Lower pipe into trench and make up pipe joint with preceding section of pipe. Make shallow bell hole at joints to facilitate installation of polyethylene tube.

3. After assembling pipe joint, make overlap of polyethylene tube. Pull bunched polyethylene from preceding length of pipe, slip it over end of adjoining length of pipe, and secure in place. Then slip end of polyethylene from adjoining pipe section over end of first wrap until it overlaps joint at end of preceding length of pipe. Secure overlap in place. Take up slack width at top of pipe to make snug, but not tight, fit along barrel of pipe, securing fold at quarter points.

4. Repair cuts, tears, punctures, or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

B. Tubular Type (Method B):

1. Cut polyethylene tube to length approximately 1 foot shorter than pipe section. Slip tube around pipe, centering it to provide 6 inches of bare pipe at each end. Take up slack width at top of pipe to make snug, but not tight, fit along barrel of pipe, securing fold at quarter points; secure ends.

2. Before making up joint, slip 3-foot length of polyethylene tube over end of preceding pipe section, bunching in accordion-fashion lengthwise. After completing joint, pull 3-foot length of polyethylene over joint, overlapping polyethylene previously placed on each adjacent section of pipe by at least I foot; make each end snug and secure.

3. Repair cuts, tears, punctures, or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

C. Sheet Type:

1. Cut polyethylene sheet to length approximately 2 feet longer than pipe section. Center length to provide 1-foot overlap on each adjacent pipe section, bunching sheet until it clears pipe ends. Wrap polyethylene around pipe so that sheet circumferentially overlaps top quadrant of pipe. Secure cut edge of polyethylene sheet at intervals of approximately 3 feet.

2. Lower wrapped pipe into trench and makeup pipe joint with preceding section of pipe. Make shallow bell hole at joints to facilitate installation of polyethylene. After completing joint, make overlap and secure ends.

3. Repair cuts, tears, punctures, or other damage to polyethylene. Proceed with installation of next section of pipe in same manner.

D. Pipe-shaped Appurtenances: Cover bends, reducers, offsets, and other pipe-shaped appurtenances with polyethylene in same manner as pipe.

E. Odd-shaped Appurtenances: When it is not practical to wrap valves, tees, crosses, and other odd-shaped pieces in tube, wrap with flat sheet or split length of polyethylene tube by passing sheet around appurtenance and encasing it. Make seams by bringing edges together, folding over twice, and taping down. Tape polyethylene securely in place at valve stem and other penetrations.

F. Openings in Encasement: Create openings for branches, service taps, blow-offs, air valves, and similar appurtenances by making X-shaped cut in polyethylene and temporarily folding back film. After appurtenance is installed, tape slack securely to appurtenance and repair cut, as well as other damaged area in polyethylene, with tape. Service taps may also be made directly through polyethylene, with resulting damaged areas being repaired as specified.

G. Junctions between Wrapped and Unwrapped Pipe: Where polyethylene-wrapped pipe joins adjacent pipe that is not wrapped, extend polyethylene wrap to cover adjacent pipe for distance of at least 3 feet. Secure end with circumferential turns of tape. Wrap service lines of dissimilar metals with polyethylene or suitable dielectric tape for minimum clear distance of 3 feet away from cast or ductile iron pipe.

3.03 REPAIRS

A. Repair cuts, tears, punctures, or damage to polyethylene with adhesive tape or with short length of polyethylene sheet or cut open tube, wrapped around pipe to cover damaged area, and secured in place.

END OF SECTION

SECTION 33 11 30

STEEL PIPE AND COPPER TUBING

PART 1 - GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to furnish, install, and test steel pipe and copper tubing, including all fittings, sleeves, unions, and accessories, as specified herein and/or shown on the Drawings.

B. The Contractor's attention is called to the fact that all steel and alloy piping or copper tubing is not necessarily shown completely on the Drawings, which are more or less schematic. However, the Contractor shall furnish and install all pipe and fittings and do all piping work indicated or required for the proper operation of all equipment and services requiring such piping.

1.2 GENERAL DESIGN REQUIREMENTS

A. All such work shall be done by competent workmen in a thorough workmanlike manner according to best practice and in compliance with all codes and applicable regulations, with proper provisions for uncoupling, draining, expansion, and contraction.

B. Process piping furnished as an integral part of an item of equipment shall conform to the requirements of the latest edition of ANSI B16.3, "Code for Petroleum Refining Piping," or ANSI B16.4, "Code for Refrigeration Piping," as applicable.

1.3 QUALITY CONTROL

A. Prior to its incorporation into the work, submit to the Engineer written evidence that the pipe furnished under this Specification is in conformance with the material and mechanical requirements specified herein. Certified copies of independent laboratory test results or mill test results from the pipe supplier may be considered evidence of compliance, provided such tests are performed in accordance with the appropriate ASTM, AWWA, or NSF testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the Engineer may require that the Contractor furnish test reports from an independent testing laboratory on samples of pipe materials.

1.4 SHOP DRAWINGS AND ENGINEERING DATA

A. Complete shop drawings and engineering data on fabricated piping shall be submitted to the Engineer in accordance with the requirements of these Specifications.

1.5 STORAGE AND PROTECTION

A. Piping and accessories shall be stored and protected in accordance with the requirements of these Specifications.

B. All piping, tubing, and accessories shall be stored above ground fully supported so as not to bend or deflect excessively under their own weight. Piping shall be stored with slope so as to be free draining.

1.6 SHOP PAINTING

A. All ferrous piping not specified to be galvanized or otherwise coated shall be cleaned and shop primed or coated in accordance with the requirements of these Specifications.

1.7 GUARANTEE

A. Provide a guarantee against defective equipment and workmanship in accordance with the requirements of Section 01 78 36, Warranties and Bonds.

PART 2 - PRODUCTS

2.1 GENERAL

A. Unless otherwise shown or specified on the Drawings, all piping 2½ inches and smaller shall be copper tubing, except that Schedule 40 red brass threaded nipples with 125-pound forged bronze threaded fittings per ANSI B16.15 are acceptable for short branches to pressure gages and drains. Carbon steel pipe shall be used only where approved by the Engineer or where specifically indicated on the Drawings.

B. No broken, cracked, deformed, misshapen, imperfectly coated, or otherwise damaged or defective pipe or fittings shall be used. All such materials shall be removed from the site of the work.

2.2 STEEL PIPE

A. Steel pipe in sizes 2½ inches and smaller shall be seamless carbon steel pipe conforming to the requirements of ASTM A 120. Steel pipe in sizes 3 inches through 10 inches shall be seamless carbon steel pipe conforming to the requirements of ASTM A 53, Grade B.

B. Steel pipe 6 inches and smaller shall be screwed, Schedule 40, unless otherwise specified or shown. Steel pipe for process piping in sizes 3 inches through 6 inches shall be welded, Schedule 40. Steel pipe in sizes 8 inches through 10 inches shall be welded, Schedule 20 exposed, Schedule 40 buried.

C. Screwed fittings 2½ inches and smaller shall be 150-pound malleable iron conforming to ASTM A 197 and ANSI B16.3. Unions shall be 300-pound malleable iron.

D. Welded fittings shall be of the butt-welded type of wrought carbon steel conforming to ASTM A 234, Grade WPB and ANSI B16.9. Reducing branch connections shall be made using threadolets or weldolets.

E. Flanges shall be 150-pound forged steel conforming to ASTM A 181, Grade I, and ANSI B16.5. Bolts shall be ASTM A 307, Grade B, cadmium plated. Nuts shall be heavy hex nuts conforming to ASTM A 307, Grade B, cadmium plated. Gaskets shall

be of red rubber or compressed asbestos, 1/16 inch thick, conforming to ANSI B16.21. Gaskets for piping operating at temperatures in excess of 150°F shall be compressed asbestos or soft corrugated metal.

F. Steel pipe and fittings 6 inches and smaller in size shall be hot-dip galvanized in accordance with the requirements of ASTM A 153, unless otherwise shown or specified. Exposed steel piping shall be field primed and painted in accordance with the requirements of these Specifications.

2.3 COPPER TUBING

A. Exposed copper tubing for water shall be seamless hard-drawn copper tube conforming to the requirements of ASTM B 88, Type L. Buried copper tubing shall be seamless, annealed copper tube conforming to the requirements of ASTM B 88, Type K. Annealed copper tube may be furnished in straight lengths or coils.

B. Fittings for copper tube shall be wrought copper conforming to ASTM B 75 and ANSI B16.22 for silver brazed joints. Fittings for annealed copper tube in instrument air service shall be of the flareless, compression type, Hoke "Gyrolok," Crawford "Swagelok," Parker "Trible-Lok," or equal, conforming to ASTM B 16 or B 124.

2.4 UNIONS

A. Unions shall be of the ground joint type. Unions in carbon steel piping shall be 300-pound galvanized malleable iron conforming to ASTM A 197 and ANSI B16.3 with bronze to iron seats. Unions in stainless steel piping shall be 3,000-pound forged stainless steel conforming to ASTM A 182, Grade F304 and ANSI B16.11. Unions in copper piping shall be cast red bronze with bronze-to-bronze seats.

2.5 PIPE DOPE

A. All threaded connections shall be made up using Teflon pipe dope applied to the male threads only.

B. Virgin Teflon thread tape shall be Hercules Packing Company "Herculon," 3-M Company "Scotch No. 48," Crane Packing Company "Teflon Thread Tape," or equal.

C. Teflon thread paste may be used in place of tape on very large or very small joints.

2.6 EXPANSION COUPLINGS

A. Expansion couplings for steel and alloy pipe shall conform to the requirements of these Specifications.

B. Expansion couplings shall be furnished where shown on the Drawings, required, or directed by the Engineer.

2.7 COATINGS

A. Buried steel piping shall be furnished with a coal tar enamel coating or cold-applied, plastic tape wrap coating as described herein.

B. Coal tar enamel coatings shall consist of a primer, a hot-applied coating of coal tar enamel, a bonded wrap of coal tar saturated asbestos felt, and a protective wrapping of 75-pound Kraft paper. Pipe to be coated shall be given a solvent cleaning followed by a commercial blast cleaning in accordance with SSPC SP-6. Primer shall be applied immediately after blasting. Except for specials, fittings, and field joints, all pipe shall be coated in the shop by mechanical means. Coal tar enamel coatings shall conform to the requirements of AWWA C 203.

C. Cold-applied, plastic tape wrap coatings shall consist of a primer, a cold-applied wrap of laminated polyethylene tape, and a protective wrapping of 90-pound Kraft paper or 50-50-50-pound laminated Kraft paper. Pipe to be coated shall be given a solvent cleaning followed by a commercial blast cleaning in accordance with SSPC SP-6. Primer shall be applied immediately after blasting. Laminated tape wrap shall have an overall thickness of not less than 30 mils and shall overlap each preceding wrap by at least ½ inch. Except for specials, fittings, and field joints, all pipe shall be coated in the shop by mechanical means. Cold-applied plastic tape wrap coatings shall comply with the requirements of AWWA C 210. Plastic tape coatings and materials shall be as manufactured by the Tapecoat Company, Republic Steel Corporation, Polyken Division of Kendall Company, or equal, subject, however, to the requirements of these Specifications.

D. The manufacturers of the coated pipe and field coating materials shall provide the Engineer with written certifications that the pipe coating systems conform to all applicable requirements of AWWA C 203 or AWWA C 210, as appropriate.

PART 3 - EXECUTION

3.1 GENERAL

A. All exposed piping shall be firmly anchored and supported by pipe supports or anchors as shown or required. Pipe supports shall be furnished as shown on the Drawings or in accordance with the requirements of these Specifications. All pipe shall be carefully placed to the proper lines and grades as shown on the Drawings or specified in the shop drawings.

B. Full lengths of pipe shall be used wherever possible. Short lengths of pipe with couplings will not be permitted. Pipe shall be cut to exact measurement and shall be installed without forcing or springing.

C. Lines which slope shall have the right-of-way over lines whose elevations can be changed. Offsets, transitions, and changes in direction in pipes shall be made as required to maintain proper head room, slope, etc.

D. Piping shall be installed in such manner and at such times as will require a minimum of cutting and repairing of building structures. In case any such cutting or repairing is necessary, it shall be done only with the permission of the Engineer. Cutting and repairing shall be performed by craftsmen of the trade which originally executed the work, and repairs shall match the original condition.

E. Except for annealed tubing, all changes in direction in piping systems shall be made with suitable fittings. Annealed tubing shall be bent using suitable bending tools.

F. When storing and installing piping, care shall be taken to prevent damage to the pipe coatings. Steel pipe with an exterior bituminous or plastic coating or wrapping shall be handled using rubber or canvas slings. All damaged coatings shall be repaired to the satisfaction of the Engineer.

G. A liberal number of unions and/or flanged joints shall be used to permit the ready removal of any section. Unions shall be installed in all piping connections to equipment, to regulating valves, and wherever necessary to facilitate the dismantling of piping and removal of valves and other items requiring maintenance. Flanges on equipment may be considered as unions.

H. Installed piping shall not interfere with the operation of or accessibility to doors and/or windows; shall not encroach on aisles, passageways, and equipment; and shall not interfere with the servicing or maintenance of any equipment.

I. The interior of all piping shall be free from obstructions and protrusions. All burrs shall be removed from the inside and outside edges of all cut pipe by reaming. Cutting shall be done in such a manner so as to leave a smooth end at right angles to pipe threads. Tool marks and unnecessary pipe threads shall be avoided. Cuttings and other foreign material shall be removed from the inside of the pipe prior to installation.

J. Suitable galvanized steel pipe sleeves of adequate inside diameter shall be provided where piping or tubing passes through walls and structures. Inside diameter of sleeve shall be approximately ½ inch larger than outside diameter of pipe or insulation. A welded steel plate waterstop with a minimum dimension 4 inches larger than outside diameter of sleeve shall be furnished for use in underground walls. Sleeves shall be built into the concrete wall. Under no circumstances will blocking out or breaking of walls be permitted for later insertion. After installation of piping, the space between the pipe and the sleeve shall be caulked airtight and watertight. Caulking shall be oakum and lead in concrete and masonry construction, and rope asbestos in wood or plaster construction.

K. After installation, the interior of all piping shall be cleaned as necessary to remove flux, slag, scale, rust, dirt, oil, and other foreign material. As piping is installed, open ends shall be covered or plugged as necessary to prevent the entrance of foreign matter and to maintain the required cleanliness.

L. Piping and tubing shall be supported as shown on the Drawings and/or specified in these Specifications.

M. Changes in pipe size shall be made using reducing fittings, not bushings. If centerline elevation is not specified, use eccentric reducers in horizontal piping. On liquid lines, eccentricity shall be down with top of pipe level. On vapor and gas lines, eccentricity shall be up with bottom level.

N. Indicated locations and sizes of equipment connections are approximate; exact locations and sizes of piping, valves, etc., shall conform to approved shop drawings. Connection sizes shall not be smaller than scheduled size or equipment outlet size, whichever is larger.

3.2 INSTALLATION OF STEEL PIPING

A. Pipe threads shall be concentric with the outside of the pipe and shall conform to ANSI B2.1. When threading stainless steel pipe, dies shall have 20° to 30° hook. Finished joints shall have no more than three threads exposed. Before assembly, pipe ends and threads shall be inspected and any defective pieces replaced. All joints shall be properly aligned before connection to prevent thread damage. Pipe dope shall be used on the male threads of all threaded connections. Teflon thread tape shall be applied two threads back from the end of the pipe or fitting to prevent shredding. Excess pipe dope shall be trimmed or cleaned off to provide adherence for paints or coatings. After joining, exposed threads in underground piping shall be given a heavy coat of bituminous paint or other suitable protective compound prior to backfilling.

B. All flanges shall be faced and drilled and shall be true and perpendicular to the axis of the pipe. Flanges shall be cleaned of all burrs, deformations, or other imperfections before joining. Flanged joints shall be installed so as to ensure uniform gasket compression. All bolting shall be pulled up to the specified torque by crossover sequence. Where screwed flanges are used, the pipe edge shall not extend beyond the face of the flange, and the flange neck shall completely cover the threaded portion of the pipe. Where slip-on flanges are used, the distance from the end of the pipe to the gasket face of the flange shall not exceed "t" plus ¼ inch, where "t" is the pipe wall thickness. Unless otherwise required, bolt holes shall straddle the vertical and horizontal axes of the pipe. Connections to equipment shall be made in such a way that no strain is placed on the equipment flanges.

C. For flanged connections between steel or alloy piping and cast or ductile iron piping or valves, steel flanges shall be flat-faced and furnished with full-face gaskets, insulating bushings, and, when buried, stainless steel bolts.

D. Where steel or alloy pipe is connected to copper tubing, insulating bushings or couplings shall be used to prevent galvanic corrosion.

3.3 INSTALLATION OF COPPER TUBING

A. Annealed copper tubing shall be cut square, and ends reamed using suitable tools. Bending tools shall be used in making bends. Minimum bend radii shall be 1 inch for ¼-inch O.D. tubing and 1½ inches for tubing ⅜-inch O.D. and larger. Compression fittings shall be installed in conformance with the manufacturer's instructions. Plastic coatings shall be cut back only far enough to permit installation of fittings. When a section of tubing is cut from a coil, the end of the unused portion shall be crimped closed.

B. Hard drawn copper tubing and fittings shall be assembled using silver brazing alloy and flux as recommended by the manufacturers. Tubing shall be properly cut square, ends reamed, and both fitting and tubing polished with steel wool before fluxing. Joints shall be properly heated, care being taken not to overheat. After the brazing alloy has been run in, the joint shall be wiped clean. Brazing wire shall be fluxed before using. Unless otherwise specified, copper tubing shall be installed in conformance with the manufacturer's instructions.

3.4 FIELD TESTING

A. Testing. Pressure and leakage tests shall be performed in accordance with the latest edition of AWWA Standard C600.

B. After all piping has been placed and backfilled between the joints, each run of newly laid pipe, or any valved section thereof, shall be tested by the Contractor in the presence of the Engineer, and tests shall be continued until all leaks have been made tight to the satisfaction of the Engineer.

C. All piping carrying liquids under pressure shall be subjected to a hydrostatic gauge pressure of 150 percent of the maximum expected operating pressure or 150 psig, whichever is greater, based on the elevation of the lowest point of the section under test, corrected to the elevation of the pressure gauge. All piping carrying air shall be subjected to a hydrostatic gauge pressure of at least 150 percent of the maximum expected operating pressure or 15 psig, whichever is greater. The above pressures shall be maintained for a minimum of two consecutive hours. No leakage will be allowed. Leakage may be determined by loss of pressure, soap solution, or other methods approved by the Engineer.

D. Take all precautions necessary to protect any equipment that might be damaged by the pressures used in the tests. Delicate equipment shall be valved off, removed, or otherwise protected.

E. All piping shall be securely anchored and restrained against movement prior to application of test pressures. Prior to the pressure test, pipe laid in trenches shall be partially backfilled to adequately secure the pipe during the test. All joints, fittings, and valves will be left open where possible. All exposed pipe, fittings, valves, and joints shall be carefully examined during the pressure test.

F. Before applying the specified test pressure during a test using water as the pressurizing medium, all air shall be expelled from the pipe. If hydrants, blow-offs, or air release valves are not available at the high places, the Contractor shall make the necessary taps at points of highest elevation before the test is made and insert plugs after the test has been completed.

G. Subject welded joints to hammer tests while under pressure.

H. Any leakage developing during the test shall be corrected at the Contractor's expense by tightening, replacing packing or gaskets, or replacing defective portions of the piping system. No caulking will be permitted. If the defective portion cannot be located, the Contractor, at his expense, shall remove and reconstruct as much of the original work as necessary to obtain a piping system tested without leakage.

I. After all tests on any section have been completed to the satisfaction of the Engineer, carefully clean, blow out, and drain the line of all water to prevent freezing of the same. Demonstrate to the satisfaction of the Engineer that any and all lines are free from obstructions and foreign material.

J. The Contractor shall bear the complete cost of the tests, including set-up, labor, temporary piping, blocking, gauges, bulkheads, water, air soap solutions, and other materials required to conduct the tests.

3.5 FIELD PAINTING

A. All exposed piping shall be field primed and painted, following installation and testing, in accordance with the requirements of these Specifications.

3.6 DISINFECTION

A. Potable water lines shall be disinfected, following installation and testing, in accordance with the requirements of these Specifications.

END OF SECTION

SECTION 33 12 13

WATER SERVICE METERING

PART 1 - GENERAL

1.1 SCOPE

A. The work described by this section includes furnishing all labor, materials, and equipment required to install new water meters, including all meter boxes and covers, meter yokes, valves, fittings, accessories, etc., as specified herein and/or shown on the Drawings.

PART 2 - PRODUCTS

2.1 The service assembly shall include a corporation stop, copper service pipe gooseneck, meter yoke, meter, meter box, and tapping saddle as required.

2.2 SERVICE TUBING

A. Service tubing shall be 3/4-inch Type K copper meeting ASTM B88. Goosenecks shall be a minimum of 5 feet long.

2.3 METER FITTINGS AND ACCESSORIES

A. Service saddles shall be utilized in connecting corporation stops and service lines to all ductile iron, cast iron, or PVC water mains. Service saddles shall be Ford, S-70 Series with 3/4-inch outlet, or equivalent.

B. Corporation stops shall be provided on each service connection to the water main. Corporation stops shall be of the plug type and shall be designed and manufactured in accordance with AWWA Standard C800 and shall be constructed of red brass. Corporation stop shall be Ford, Series F-1000, or equivalent, for 1-inch service and shall have compression fittings.

C. Water meters shall be 5/8-inch Badger M25 and shall be frost-proof, sealed register, displacement type with bronze cast as manufactured by Badger Meters, Inc. Meters shall be straight reading in cubic feet.

D. Meter yokes shall be Ford Linesetter (LSVBHH41-133W-Q style) 5/8 inch with angle ball valve by angle dual check valve, double purpose union swivel outlet and quick joints for copper tubing (CTS).

E. Meter boxes for 5/8-inch by 3/4-inch assemblies shall be 18-inch deep plastic meter boxes and plastic lids with cast iron readers as manufactured by NDS, Inc.

PART 3 - EXECUTION

A. A complete meter service shall be installed on each existing connection (where applicable) and all new connections to the water distribution system. Service lines shall be installed between the water main and the property line. Meter boxes shall be set at the property line by the Utility and connected to the new service line. The exact field location of the meter box shall be determined by the Utility and shall be located to provide easy access to the meter reader and serviceman; not be a hazard to the customer or public; and be reasonably well protected against frost, mechanical damage, and tampering.

B. Water meters shall not be installed in meter boxes until construction of the residence has been completed and all pipelines have been flushed clean of all mud and grit deposits, and have been disinfected.

C. Meter boxes and meters shall be installed in a neat and workmanlike manner. The elevation of the boxes shall be carefully adjusted so that the lid is flush with the ground surface or sidewalk. Soil around the meter box shall be tamped or settled in place so that hazard is eliminated and further settling is minimized.

D. All service lines crossing new residential streets shall be installed within a minimum two (2) inch diameter Schedule 40 PVC casing pipe. All service lines crossing existing paved roads shall be bored and jacked and installed within a minimum two (2) inch diameter Schedule 40 PVC casing pipe.

E. The customer valve box consist of a pressure reducing valve and gate valve. It shall be installed between the meter box and the house in a neat and workmanlike manner. The elevation of the boxes shall be carefully adjusted so that the lid is flush with the ground surface or sidewalk and is aligned with the adjacent box to allow easy access to both boxes. The customer box shall include the pressure reducing valve and a 3/4-inch gate valve.

END OF SECTION

SECTION 33 12 19

FIRE HYDRANTS

PART 1 - GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all materials, labor, and equipment required to furnish, install, and test fire hydrants and yard hydrants and accessories as specified herein and/or shown on the Drawings.

1.2 QUALITY ASSURANCE

A. The manufacturer of the fire hydrants shall furnish a written certification to the Engineer that all hydrants furnished comply with all applicable requirements of AWWA C502, latest edition.

PART 2 - PRODUCTS

2.1 FIRE HYDRANTS

A. Fire hydrants shall be of the dry-barrel, compression type and shall conform to the applicable requirements of AWWA C502, latest edition. Fire hydrants shall be cast iron, bronze mounted, suitable for a working pressure of 250 psi. The name of the manufacturer and size of the main valve shall be cast upon the hydrant in raised letters.

B. Hydrants shall be constructed in a manner that will permit withdrawal of internal working parts without disturbing the barrel or casing. Valve shall be compression type, opening against pressure and so constructed that the main valve will remain closed should the hydrant be broken off by traffic accident. Valve opening shall be at least 5¼ inches in diameter and shall have a net area of waterway at the smallest part of not less than 120 percent of the valve opening when the valve is wide open. There shall be no chattering or water hammer under any conditions of operation.

C. Barrel shall be made in two pieces with flanged joint above the finished grade or ground line. Lower barrel shall be fluted for strength and tapered to prevent frost heave. Ground live flange shall be of the break-away type. Two positive acting, bronze fitted drain valves shall be provided in the hydrant shoe automatically to open and provide rapid and complete drainage of the hydrant barrel when the main valve is closed.

D. Hydrant bonnet shall be designed to protect the operating head against rust, corrosion, and dirt. The stuffing box shall be bronze glands and O-ring seal. Suitable means shall be provided for lubricating the stem threads. O-ring, and bearing surfaces in the bonnet.

E. The main valve rod shall be of steel and shall be bronze sheathed where it passes through the stuffing box. Stem shall be equipped with a two-piece safety or breakable

stem coupling to prevent damage to the stem when hydrant is hit by a vehicle. A positive stop shall be provided to permit full opening of the valve and prevent overtravel of the stem.

F. Direction of opening shall be counterclockwise and shall be cast on the head. Operating nut shall be National Standard, 1½-inch, pentagon shaped.

G. Two 2½-inch hose nozzles and one 4½-inch pumper nozzle shall be provided on each hydrant. Hose and pumper nipples shall be of bronze or noncorrosive metal, and threads shall be National Standard in accordance with NFPA Standard No. 1963. Nipple caps shall be securely chained to the barrel with galvanized, non-kinking chains.

H. Hydrants that are to be connected to ductile iron pipe shall be equipped with mechanical joint inlet with gland, gaskets, bolts, and nuts. Suitable ringtight or fluidtight inlets shall be provided on hydrants that are to be connected to cement asbestos pipe. Inlet bell shall have two lugs for harness restraint.

I. After fabrication, all exterior above-ground ferrous surfaces shall be blast-cleaned and painted at the shop with one coat of zinc chromate primer conforming to Federal Specification TT-P-636 and one coat of compatible alkyd enamel. All interior and below ground, nonmachined ferrous surfaces shall be blast-cleaned and painted at the shop with two coats of asphaltic varnish conforming to Federal Specification TT-V-51c.

J. Fire hydrants shall be as manufactured by U. S. Pipe or equal.

K. Fire hydrants shall include “Storz” connector for 4-1/2-inch pump nozzle.

2.2 YARD HYDRANTS

A. Yard hydrants shall be nonfreezing, compression, post type hydrant with self-draining barrel suitable for 150 psi working pressure.

B. Yard hydrants shall have a cast iron bonnet and base, bronze seats, resilient-faced disc, O-ring stem seal, bronze or stainless steel stem, and galvanized steel barrel.

C. Furnish yard hydrants with 1-inch threaded inlet connection per ANSI B2.1 and threaded 1-inch male outlet hose connection with suitable cap and chain. Furnish a ball-wheel handle to operate the valve.

D. All internal working parts shall be readily accessible and removable through the top for ease of maintenance.

E. Shop primed and paint hydrant in accordance with Part 2.1 I. of this section.

2.3 BLOW-OFF HYDRANTS

A. Blow-off hydrants shall be full draining and shall have a 2-inch inlet, 2½-inch nozzle with cap, locking valve, and brass working parts.

B. Hydrants shall be designed for underground installation in a meter box. Internal working parts shall be accessible through the top for ease of maintenance.

C. Hydrant shall be Kupferle Main Guard No. 78, or approved equal.

PART 3 - EXECUTION

3.1 FACTORY TESTING

A. Each hydrant shall be tested at the factory at a hydrostatic pressure of 300 psig in accordance with AWWA C502, Section 5. Hydrants shall be tested in both the open and closed positions. Hydrants shall be completely drained and closed before shipment.

3.2 INSTALLATION

A. Hydrants shall be installed at the locations and in the manner shown on the Drawings. Hydrants shall be inspected, cleaned, and tested for operation prior to installation.

B. Fire hydrants shall be isolated from the water supply main with a buried gate valve not less than 6 inches in size. Hydrants shall be installed in a suitable rock drain and anchored against thrust as shown on the Drawings. Upper barrel joint shall be located approximately 2 inches above ground level. Barrel extensions shall be furnished as necessary.

C. Isolate each yard hydrant from the water supply by a 1-inch curb stop as shown on the Drawings.

D. After installation, each valve shall be tested in the presence of the Engineer for proper operation and leaktightness. Any leaks shall be corrected.

E. Following installation and testing, exposed ferrous surfaces of hydrants shall be field painted with alkyd system ferrous metal finish in accordance with manufactures recommendations.

END OF SECTION

SECTION 33 13 00

DISINFECTION OF POTABLE WATER LINES AND WATER STORAGE TANKS

PART 1 - GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, materials, and chemicals required to disinfect all potable water lines and water storage tanks in accordance with the procedures specified herein.

B. Disinfect all plant units, piping, pumps and connections thereto, all distribution system piping and storage tanks and any surfaces that shall be in contact with potable water, upon completion of the construction and installation of equipment.

C. No portion of new work shall be placed in service until disinfection has been completed and approved by the Engineer. Should the initial treatment fail to result in acceptable water, the chlorination procedure shall be repeated until satisfactory results are obtained.

1.2 STANDARDS

A. Procedures for disinfecting potable water lines, unless otherwise modified herein, shall conform to the requirements of AWWA C651.

B. Procedures for disinfecting water storage facilities, unless otherwise modified herein, shall conform to the requirements of AWWA C652.

PART 2 - PRODUCTS

2.1 DISINFECTION AGENT

A. The disinfection agent shall be free chlorine or chlorine compound. The method of application and type of disinfecting agent shall both be acceptable to the Engineer.

PART 3 - EXECUTION

3.1 DISINFECTION PROCEDURE

A. All new water mains, as well as those taken out of service for inspection, repair or other activities that might lead to contamination of water shall be disinfected before they are placed in or returned to service. Disinfection of the new mains and the disposal of the heavily chlorinated water, following the disinfection, shall be accomplished in accordance with the latest edition of AWWA Standard C651. The "tablet method" of disinfection which consists of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water when installation is complete is not allowed. Before the main is chlorinated, it shall be filled

to eliminate air pockets and shall be flushed to remove particulates. A flushing velocity of not less than 2.5 feet/second is usually maintained in pipe sizes less than 24 inches in diameter. For larger diameter mains, alternative to flushing, such as broom-sweeping of the main, is acceptable prior to chlorinating the main. During disinfection of the water mains, an appropriate cross-connection control device, consistent with the degree of hazard, shall be provided for backflow protection of the active distribution system. Quality of the water used during the disinfection procedures shall meet the required drinking water standards.

The chlorine solution used for disinfection of water mains shall have a free chlorine residual concentration not less than 25 mg/L. This heavily chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants shall be operated to ensure disinfection of the appurtenances. At the end of the 24-hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L free chlorine. Re-chlorinate if required results are not obtained on all samples.

After the applicable retention period, the heavily chlorinated water must not be disposed in a manner that will harm the environment. Neutralizing chemicals, such as Sulfur Dioxide, Sodium Bisulfite, Sodium Sulfite or Sodium Thiosulfate can be used to neutralize the chlorine residual remaining in the water to be wasted. Flush all lines until residual is equal to existing system. After final flushing and before the water main is placed into service, water samples shall be collected from the main and tested for microbiological quality in accordance with the Georgia Rules for Safe Drinking Water, Chapter 391-3-5. The laboratory results must show the absence of coliform organisms in the water. Reflush and redisinfect the lines, as necessary, until satisfactory bacteriological results are obtained.

B. Prior to disinfection, all surfaces shall be thoroughly flushed with clear water. Disinfection of water storage facilities (including clearwells) shall be accomplished by the following AWWA standard method:

1. Chlorination Method No. 3. Water and chlorine shall be added to the storage facility in amounts such that initially the solution will contain 50 mg/l available chlorine and will fill approximately 5 percent of the total storage volume. This solution shall be held in the storage facility for a period of not less than 6 hours. The storage facility shall then be filled to the overflow level by flowing potable water into the highly chlorinated water. It shall be held full for a period of not less than 24 hours. The actual volume of the 50 mg/l chlorine solution shall be such that, after the solution is mixed with filling water and the storage facility is held full for 24 hours, there will be a free chlorine residual of not less than 2 mg/l.

C. Following these procedures, two bacteriological tests shall be taken and the results of the tests be negative before the facility is put into service. If either of the samples is positive, the disinfection procedure must be repeated.

D. In the process of chlorinating newly constructed units and newly installed pipe, all valves or other appurtenances shall be operated at least five times while the units and pipelines are filled with the chlorinating agent.

END OF SECTION

SECTION 33 32 00

TELEVISION INSPECTION OF NEW SEWERS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section shall apply to all extensions to the public sewer system and covers the internal inspection of all new sewers installed by Contractor or Subcontractor by a closed-circuit television camera to observe the conditions in the new sewer lines. The Sewer Inspection Contractor shall furnish all necessary material, labor, equipment, and services required for the internal inspection of 100% of the sewer lines, including but not limited to, all recording and playback equipment, material, and supplies. Inspections shall be performed in the presence of the Engineer and/or Resident Project Representative (RPR).

1.2 GENERAL

A. The Contractor shall determine by internal inspection the location, condition, and estimated flow rate for each source of infiltration and/or inflow within each sewer section. During the inspection, all the infiltration and/or inflow sources, structural defects, service connections, abnormal conditions, and other pertinent observations shall be recorded.

B. All inspections will be witnessed by the Engineer or his RPR and performed one manhole section at a time. Inspection will be performed prior to putting flow into the new sewer.

1.3 EQUIPMENT

A. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera shall be of a 360-degree radial view design capable of operating in 100 percent humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 700-line resolution video picture. Picture quality and definition shall be to the satisfaction of the Engineer’s representative and if unsatisfactory, shall be re-televised at the Contractor’s expense.

B. All video media shall be a standard digital copy for use with DVD, thumbdrive, or other devices as requested by the Owner.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 PROCEDURE

A. The camera shall be moved through the line in either direction at a uniform rate stopping when necessary to insure proper documentation of the sewer’s condition but in no case will the television camera be pulled at a speed greater than 30 feet per

minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If, during the inspection operation the television camera will not pass through the entire manhole section, the Contractor shall re-setup his equipment in a manner so that the inspection can be performed from the opposite manhole.

B. Whenever non-remote powered and controlled winches are used to pull the television camera through the line, telephones, or other suitable means of communication shall be set up between the two manholes of the section being inspected to insure good communications between members.

C. Movement of the television camera shall be temporarily halted at each visible point of interest (service line, defects, etc.) so that the radial view camera may better examine each object.

3.2 RECORDING OF FIELD OBSERVATIONS

A. Television Inspection Logs. Information obtained shall be recorded on internal inspection logs with a format furnished or approved by the Engineer. The following information shall be recorded for each reach inspected:

1. Location and length of reach.

2. Pipe size and material.

3. Location and descriptions of service connections.

4. Locations and descriptions of defects such as obstructions, intrusions, offset joints, hole, breaks, cracks, collapses, bends, or dips in alignment, protruding service connections, etc.

5. Items video-recorded and/or photographed.

B. Photographs. Instant developing, 35 mm or other standard size photographs of the television monitor or problem areas shall be taken by the Contractor upon the request of the Engineer or his Representative to document unusual, questionable, or severe conditions found during the course of the work.

C. Digital Video Recording. The purpose of video recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed both daily and at future presentations by the Owner. All video recordings shall be made at standard speed (SP) for maximum clarity. Slow motion or stop motion play back features shall be supplied at the option of the Contractor. All video recordings and logs are considered property of the Owner and shall be submitted prior to release of retainage. The Owner may at their own expense perform selected or all warranty inspection prior to the end of the warranty period. The Contractor shall be responsible for all the repairs necessary at that time.

D. The Engineer or his RPR to ensure acceptability of work and record-keeping procedures of the Contractor shall witness all television inspection. The Engineer or his RPR shall verify preparatory cleaning records.

END OF SECTION

DIVISION 40

PROCESS INTEGRATION

SECTION 40 05 13.53

DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to furnish, install, and test ductile iron piping, including all fittings, wall pipe and sleeves, couplings, tappings, anchor blocks, and accessories, as specified herein and/or shown on the Drawings.

1.2 QUALITY ASSURANCE

A. Submit to the Engineer written evidence that the pipe furnished under this Specification is in conformance with the material and mechanical requirements specified herein. Certified copies of independent laboratory test results or mill test results from the pipe supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate ASTM or AWWA testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the Engineer may require that the Contractor furnish test reports from an independent testing laboratory on samples of pipe materials.

B. Clearly mark each ductile iron pipe length and fitting with the pressure rating, metal thickness class, heat mark, net weight (excluding lining or coating), and name of the manufacturer. In addition, each item of piping shall be marked with an identifying mark corresponding to the appropriate mark on the shop drawings for that particular item of piping.

1.3 SHOP DRAWINGS AND ENGINEERING DATA

A. Submit complete shop drawings and engineering data on all piping and accessories to the Engineer in accordance with the requirements of Section 01 33 23 - Shop Drawings, Product Data, and Samples.

B. Shop drawings shall indicate piping layout in plan and elevations as may be required and shall be completely dimensioned. The Drawings shall include a complete schedule of all pipe, fittings, specials, hangers, and supports. Special castings shall be clearly detailed showing all pertinent dimensions.

C. Furnish the Engineer with lists, in duplicate, of all pieces of pipe and fittings in each shipment received. These lists shall give the serial or mark number, weight, class, size, and description of each item received.

1.4 STORAGE AND PROTECTION

A. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel, and sheet construction products shall be stored with one end elevated to facilitate drainage.

1.5 SHOP PAINTING

A. All ductile iron pipe and fittings shall be cleaned and provided with a bituminous coating and cement lining applied at the factory, unless otherwise specified herein.

1.6 GUARANTEE

A. Provide a guarantee against defective materials and workmanship in accordance with the requirements of Section 01 78 36, Warranties and Bonds.

1.7 ACCEPTABLE MANUFACTURERS

A. **Ductile iron pipe and fittings must be the products of member companies of the Ductile Iron Pipe Research Association (DIPRA). Products from manufacturers who are not DIPRA member companies shall not be utilized in the work covered by these Specifications.**

PART 2 - PRODUCTS

2.1 GENERAL

A. No broken, cracked, deformed, misshapen, imperfectly coated, or otherwise damaged or defective pipe or fittings shall be used. All such material shall be removed from the site of the work.

B. Minimum pipe wall thickness and pressure class of pipe shall be as follows, unless otherwise shown on the Drawings or directed by the Engineer:

Pipe Size	Pressure Class (psi)	Metal Wall Thickness in Inches
3-Inch Ductile Iron	350	0.25
4-Inch Ductile Iron	350	0.25
6-Inch Ductile Iron	350	0.25
8-Inch Ductile Iron	350	0.25
10-Inch Ductile Iron	350	0.26
12-Inch Ductile Iron	350	0.28
14-Inch Ductile Iron	350	0.31
16-Inch Ductile Iron	350	0.34
18-Inch Ductile Iron	300	0.34
20-Inch Ductile Iron	300	0.36
24-Inch Ductile Iron	250	0.37
30-Inch Ductile Iron	250	0.42
36-Inch Ductile Iron	250	0.47
42-Inch Ductile Iron	250	0.52
48-Inch Ductile Iron	250	0.58
54-Inch Ductile Iron	250	0.65
60-Inch Ductile Iron	250	0.68
64-Inch Ductile Iron	250	0.72

2.2 DUCTILE IRON PIPE

A. Ductile iron pipe shall be designed in accordance with ANSI/AWWA C150/A21.50, "Thickness Design of Ductile Iron Pipe," using 60,000-psi tensile strength, 42,000-psi yield strength, and 10 percent elongation. Additionally, ring bending stress is limited to 48,000 psi to provide a 2.0 safety factor based upon ultimate bending stress.

B. Ductile iron pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51, "Ductile Iron Pipe Centrifugally Cast for Water," and shall be made of ductile iron having a minimum tensile strength of 60,000 psi, a minimum yield strength of 42,000 psi, and 10 percent minimum elongation.

2.3 DUCTILE IRON FITTINGS

A. All fittings shall conform in every respect to ANSI/AWWA C110/A21.10, "Ductile Iron Compact Fittings for Water Service" or ANSI/AWWA C153/A21.53, "3 Inch through 16 Inch for Water and Other Liquids."

B. All fittings shall be for pressure rating of 250 psi, unless otherwise shown on the Drawings, directed, or specified.

C. Flanged fittings, in general, shall be ANSI pattern using long radius elbows except where space limitations prohibit the use of same. Design of all fittings, whether long or short pattern, shall be as indicated or dimensioned on the Drawings. Special fittings, wall pipes, and sleeves shall conform to the dimensions and details shown on the Drawings.

2.4 JOINTS FOR DUCTILE IRON PIPE AND FITTINGS

A. General

1. Joints for ductile iron pipe and fittings shall be mechanical joints, flanged joints, push-on joints, or bell and spigot joints, as shown on the Drawings or specified herein.

2. All ductile iron pipe laid underground shall be joined using mechanical joints or push-on type joints, unless otherwise shown on the Drawings, specified, or directed.

B. Mechanical Joints

1. Mechanical joints shall consist of a bolt joint of the stuffing box type as detailed in ANSI A21.10 and described in ANSI A21.11.

2. Mechanical joints shall be thoroughly bolted in accordance with the manufacturer's recommendations with Tee Head Bolts and bolts of high strength, low-alloy steel having a minimum yield point strength of 40,000 psi and an ultimate tensile strength of 70,000 psi.

3. Gaskets, bolts, and nuts shall conform to ANSI A21.11. Gaskets shall be of neoprene or rubber of such quality that they will not be damaged by the liquid or gases with which they will come into contact.

4. Glands shall be of high strength ductile iron.

C. Flanged Joints

1. Flanged joints shall conform to ANSI B16.1, Class 125, in accordance with Table 10.23 of ANSI A21.10.

2. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolts and nuts shall conform in dimensions to the American Standard heavy series. Nuts shall be hexagonal, cold pressed. Bolts and nuts shall be cadmium plated, cold pressed, steel machine bolts, conforming to ASTM A 307, Grade B. Cadmium plating shall be by an approved process and shall be between 0.003 and 0.0005 inch thick. After each joint has been made, all bolts, heads, and nuts shall be coated with two coats of coal tar epoxy (total of 16 mil thickness D.F.T.), or approved equal coating.

3. Gaskets shall be full face type, 1/16 inch thick, conforming to the requirements of AWWA C111.

4. Flanged ductile iron pipe approximately 12 inches or less in length shall have flanges cast solidly to the pipe barrel. Flanges on ductile iron pipe longer than 12 inches may be of the screw type. Pipe threads shall be of such length that with flanges screwed home, the end of the pipe shall project beyond the face line of the flange. Flange and pipe shall then be machined to give a flush finish to the pipe and the flange and surface shall be normal to the axis of the pipe. Ductile iron flanges shall be of such design that the flange neck completely covers the threaded portion of the pipe to protect same against corrosion. All pipe with screw type flanges shall be assembled, faced, and drilled at the point of manufacture, unless otherwise approved by the Engineer.

5. Where tap or stud bolts are required, flanges shall be drilled and tapped accordingly.

D. Push-On Joints

1. Push-on joints shall conform to ANSI A21.11. Details of the joint design shall be in accordance with the manufacturer's standard practice.

2. Gaskets shall be in accordance with ANSI A21.11 and shall be of such quality that they will not be damaged by the liquid or gases with which they will come into contact.

2.5 PIPE COATING AND LINING

A. All ductile iron pipe and fittings buried underground shall have a standard bituminous outside coating conforming to ANSI A21.6 or A21.51. All exposed or immersed ductile iron pipe and fittings shall have an outside shop coating of epoxy coating, TNEMEC Series N 140-1211 Potapox Plus (or equal) at 4 to 6 mils dry film thickness (DFT) and two coats of TNEMEC Series 69, Hi-Build Epoxoline II at 4 to 6 mils DFT per coat.

B. All ductile iron pipe used for water or wastewater shall have cement mortar lining of standard thickness in accordance with ANSI A21.4. Cement mortar

lining for ductile iron fittings shall be double the standard thickness under ANSI A21.4.

C. Where a special lining is indicated on the Drawings for resistance to corrosive wastewater, all ductile iron pipe and fittings for wastewater shall have a ceramic filled, amine-cured, novolac epoxy lining. Coating shall be Induron Protecto 401 Ceramic Epoxy, by Induron Coatings, Inc., Novocoat SP-2000W by Superior Environmental Products, Inc. or approved equal. Surface preparation shall be in accordance with NAPF 500. Coating shall be applied at 40-mil dry film thickness. Follow manufacturers recommendations for lining bell sockets, spigot ends, flange faces, etc. and for touch up and repair of field cuts.

D. No lining shall be provided for ductile iron piping and fittings used for air.

E. Surface preparation of ductile iron prior to coating/lining application shall be in accordance with the following:

1. NAPF 500-03-01 “Solvent Cleaning”: Solvent cleaning is a method for removing all oil, small deposits of asphalt paint, grease, soil, drawing and cutting compounds and other soluble contaminants from iron surfaces.

2. NAPF 500-03-04 “Abrasive Blast Cleaning of Ductile Iron Pipe”: An abrasive blast cleaned, exterior pipe surface when view without magnification, shall be free of all visible dirt, dust, loose annealing oxide, loose rust, loose mold coating and other foreign matter. All oils , small deposits of asphalt paint and grease shall have been removed by solvent cleaning per NAPF 500-03-01. After the entire surface to be coated has been struck by the blast media, tightly adherent annealing oxide, mold coating and rust staining may remain on the surface provided they cannot be removed by lifting with a dull putty knife.

3. Ductile and Cast Iron

a. Immersion, Interior and Exterior Exposed: “Solvent Cleaning” and “Abrasive Blast Cleaning of Ductile Iron Pipe” in accordance with NAPF 500-03-01 and -04, respectively. Abrasive blasting shall achieve an anchor pattern or blast profile as recommended by the coatings manufacturer.

b. Field Preparation of Shop Primed Surfaces: “Solvent Cleaning” in accordance with NAPF 500-04-01. Shop primed iron surfaces which have been damaged or which show signs of corrosion shall be abrasive blasted and/or cleaned in accordance with the specifications given above for both asphaltic and non-asphaltic coating systems.

2.6 PIPE COUPLINGS

A. Pipe couplings shall be installed where shown on the Drawings, required for installation, or directed by the Engineer.

B. Pipe couplings shall conform to the requirements of Section 40 95 01, Pipe Couplings and Expansion Joints.

2.7 WALL PIPE AND WALL SLEEVES

A. Furnish and install ductile iron wall pipe or wall sleeves where ductile iron piping connects with or passes through concrete walls or floors and in locations where small piping and electric wiring and conduits connect with or pass through concrete walls or floors.

B. Where wall pipes or sleeves are to be installed flush with the wall or slab, the flange or bell shall be tapped for studs. Where the flange or bell will project beyond the wall, the projection shall be sufficient to allow for installation of connecting bolts.

2.8 SPARE PARTS

A. Furnish 4 spare gaskets for each size and type of joint requiring the use of a gasket. Furnish 8 bolts and nuts of each size and type used for ductile iron pipe joints.

PART 3 - EXECUTION

3.1 LAYING

A. Proper and suitable tools and appliances for safe and convenient handling and laying of pipe and fittings shall be used. Great care shall be taken to prevent the pipe coating from being damaged, particularly cement linings on the inside of the pipes and fittings. Any damage shall be remedied as directed by the Engineer.

B. Carefully examine all pipe and fittings for defects just before laying and no pipe or fitting shall be laid which is defective. If any defective pipe or fitting is discovered after having been laid, it shall be removed and replaced in a satisfactory manner with a sound pipe or fitting by the Contractor at his own expense.

C. Thoroughly clean all pipes and fittings before they are laid and keep clean until they are used in the completed work. Open ends of pipe shall be kept plugged with a bulkhead during construction.

D. Pipe laid in trenches shall be laid true to line and grade on a firm and even bearing for its full length at depths and grades as shown on the Drawings. Adequate precautions shall be taken to prevent flotation of pipelines prior to backfilling. Installation of ductile iron pipe in underground pressure piping systems shall conform to the requirements of AWWA C600. Excavation of trenches and backfilling around pipes shall conform to the requirements of the Section 31 20 00, Earthwork.

E. All ductile iron piping laid underground shall have a minimum of 36 inches of cover above the top of the pipe unless otherwise shown on the Drawings.

F. All elbows, tees, branches, crosses, and reducers in pressure piping systems shall be adequately restrained against thrust. Underground pressure piping shall be restrained by thrust restrained joints (EBAA Meg-a-Lug Series 1100SD, or approved equal). Install restraints in accordance with manufacturer's recommendations. Install number of restraints recommended by manufacturer for size of pipe, type of fitting, and type of soil.

G. All ductile iron pipes entering buildings or basins shall be adequately supported between the structure and undisturbed earth as shown on the Drawings to prevent breakage resulting from settlement of backfill around the structure.

H. Wall pipe and wall sleeves shall be accurately located and securely fastened in place before concrete is poured. All wall pipe and wall sleeves shall have wall collars properly located to be in the center of the wall where the respective pipes are to be installed.

I. Wall pipe and wall sleeves shall be installed when the wall or slab is constructed. Blocking out or breaking of the wall for later insertion shall not be permitted.

J. Cutting or weakening of structural members to facilitate pipe installation shall not be permitted. All piping shall be installed in place without springing or forcing.

K. Sufficient couplings and flanged joints shall be provided to facilitate equipment installation and removal.

L. Exposed ductile iron piping shall be supported as shown on the Drawings.

3.2 CUTTING

A. Whenever pipe requires cutting to fit the lines, the work shall be done in such manner as to leave a smooth end at right angles to the axis of the pipe. When a piece of pipe is cut to fit into the line, no payment will be made for the portion cut off and not used.

B. Whenever existing pipe requires cutting to install new fittings, the work shall be done in such manner as to leave a smooth end at right angles to the axis of the pipe and special care shall be exercised to guard against breaking or splitting the existing piping.

C. All cutting of ductile iron pipe shall be done with a cutting saw. All burrs shall be removed from the inside and outside edges of all cut pipe.

3.3 JOINING

A. Mechanical Joints

1. The successful operation of the mechanical joint specified requires that the spigot be centrally located in the bell and that adequate anchorage be provided where abrupt changes in direction and dead ends occur.

2. The surfaces with which the rubber gasket comes in contact shall be brushed thoroughly with a wire brush just prior to assembly to remove all loose rust or foreign material which may be present and to provide clean surfaces which shall be brushed with a liberal amount of soapy water or other approved lubricant just prior to slipping the gasket over the spigot end and into the bell. Lubricant shall be brushed over the gasket prior to installation to remove loose dirt and lubricate the gasket as it is forced into its retaining space.

3. Joint bolts shall be tightened by the use of approved wrenches and to a tension recommended by the pipe manufacturer. When tightening bolts, it is essential that the gland be brought up toward the pipe flange evenly, maintaining approximately

the same distance between the gland and the face of the flange at all points around the socket. This may be done by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, and last, the remaining bolts. This cycle shall be repeated until all bolts are within the range of acceptable torques. If effective sealing is not attained at the maximum torque indicated above, the joint shall be disassembled and reassembled after thorough cleaning. Overstressing of bolts to compensate for poor installation shall not be permitted.

4. After installation, bolts and nuts in buried or submerged piping shall be given 2 heavy coats of a bituminous paint.

B. Flanged Joints

1. All flanges shall be true and perpendicular to the axis of the pipe. Flanges shall be cleaned of all burrs, deformations, or other imperfections before joining. Flanged joints shall be installed so as to ensure uniform gasket compression. All bolting shall be pulled up to the specified torque by crossover sequence. Where screwed flanges are used, the finished pipe edge shall not extend beyond the face of the flange, and the flange neck shall completely cover the threaded portion of the pipe.

2. Connections to equipment shall be made in such a way that no strain is placed on the equipment flanges. Connecting flanges must be in proper position and alignment and no external force may be used to bring them together properly.

3. After installation, bolts and nuts in buried or submerged piping shall be given 2 heavy coats of a bituminous paint.

C. Push-On Joints

1. The inside of the bell and the outside of the pipe from the plain end to the guide stripe must be wiped clean immediately before assembling the pipe joint. Then the rubber gasket shall be inserted into a groove or shaped recess in the bell. Both the bell and spigot ends to be joined shall be wiped again to ensure they are thoroughly clean. A liberal coating of special lubricant furnished by the pipe manufacturer shall be applied to the outside of the pipe from the plain end to the yellow guide stripe and to the inside of the gasket. The plain end shall be centered in the bell and the spigot pushed home. Wherever possible the pipe shall be socketed by hand; however, jacking may be required to push the spigot in place on the larger sizes of pipe. The completed joint shall be permanently sealed and watertight.

2. Whenever the pipe is cut in the field, the cut end shall be conditioned so it can be used in making up a joint by filing or grinding the cut end to remove burrs or sharp edges that might damage the gasket.

D. Permissible Deflection of Joints

1. Deflection of ductile iron pipe at joints for long radius curves or for avoiding obstacles shall be permitted only upon approval of the Engineer.

2. Where deflection of joints is permitted, such deflection shall be made in accordance with and shall not exceed limits provided in Section 9b.5 and Section 9c.4, as applicable, of AWWA C600.

E. Joints of Dissimilar Metals. When a flanged joint consists of a ductile iron flange mated to a steel or alloy flange, the steel flanges shall be flat-faced and furnished with full-faced gaskets, insulating bushings, and stainless steel bolts.

3.4 SERVICE CONNECTIONS

A. Small service lines and branches shall connect to larger ductile iron mains using ductile iron tapped tees and crosses, in general and unless otherwise shown.

B. Tapped tees and crosses shall have minimum 2-inch NPT branch connections and shall be furnished with mechanical joint ends.

3.5 CUT-INS TO EXISTING PIPING

A. Cut-ins to existing ductile iron piping for installation of new mechanical joint fittings and valves shall be made using ductile iron cutting-in sleeves, in general and unless otherwise shown.

B. Cutting-in sleeves shall have a pressure rating not less than that of the existing pipeline and shall be furnished with a mechanical joint end on one end and a plain end on the other.

3.6 DRILLING AND TAPPING

A. Wherever required, ductile iron pipe and fittings shall be drilled and tapped to receive drainage or any other piping. All holes shall be drilled accurately at right angles to the axis of any pipe or fitting. Where plugs are drilled, holes shall be at right angles to the face of the plug.

B. Where the size of the pipe to be connected is such as to require bosses for connection and when the pipe wall thickness is too thin to permit the effective length of pipe threads to be utilized as necessary for the size pipe being connected by threads, furnish such pipe with cast-on bosses suitable for drilling, tapping, and connecting such pipe. Alternately, where shown or specified, a tapped saddle clamp may be used in lieu of a cast-on boss. Saddle clamp shall be of the heavy-duty type with O-ring gaskets and 2 heavy U-bolt clamps.

C. All tapping shall be carefully and neatly done by skilled workmen with suitable tools.

D. Where connections are made between new and old piping, the connections shall be made in a thorough and workmanlike manner using proper fittings and specials to suit actual conditions.

E. Cut-ins to existing and operating pipelines shall be done at times agreeable to the Owner upon approval of the Engineer.

F. Existing pipelines that may be cut or damaged during the performance of work under this item shall be repaired, reconnected, and returned to service in equal or better

condition in which they were found and in accordance with the requirements of this Specification.

G. No separate payment will be made for drilling, tapping, making connections, cut-ins, repairs to damaged existing pipelines, and reconnections in existing pipelines.

3.7 AIR RELIEF AND FLUSHING

A. Expel all air from the pipe before applying the specified hydrostatic test. If hydrants, blow-offs, or air release valves are not available at the high points, make the necessary taps at points of highest elevation before the test is made and insert plugs after the test has been completed.

B. Thoroughly flush the lines after expelling all the air to remove foreign material in the pipe during installation. Flush the lines at hydrants and blow-offs to maintain a minimum velocity in the main of 2.5 fps.

3.8 HYDROSTATIC TESTING

A. After all piping has been placed, backfilled, and flushed, each run of newly laid pipe, or any valved section thereof, shall be tested by the Contractor in the presence of the Engineer, and tests shall be continued until all leaks have been made tight to the satisfaction of the Engineer.

B. All piping shall be subject to a hydrostatic gauge pressure equal to 150 percent of the maximum operating pressure of the pipe section under test or 150 psig, whichever is greater, based on the elevation of the lowest point of the section of pipe under test and corrected to the elevation of the test gauge. The test shall be maintained for a minimum of two consecutive hours. The test pressure shall not exceed the rated pressure of the valves when the pressure boundary of the test section includes closed gate or butterfly valves.

C. The specified test pressure shall be applied by means of a pump connected to the pipe.

D. Allow the system to stabilize at the test pressure before conducting the test.

E. The hydrostatic test (AWWA C600) shall be based upon leakage and pressure. Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time.

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

$$L = \frac{SD\sqrt{P}}{133200}$$

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)

This formula is based on an allowable leakage of 11.65 gpd/mi/in. of nominal diameter at a pressure of 150 psi.

2. When testing against closed metal-seated valves, an additional leakage per closed valve of 0.0078 gal/h/in. of nominal valve size shall be allowed.

3. When hydrants are in the test section, the test shall be made against the main valve in the hydrant.

F. Acceptance of Installation. Acceptance shall be determined on the basis of allowable leakage. If any test of laid pipe discloses leakage greater than that specified, repairs or replacements shall be corrected at the Contractor's expense by tightening, replacing packing or gaskets, or replacing defective portions of the piping system. Caulking will not be permitted. If the defective portion cannot be located, the Contractor, at his expense, shall remove and reconstruct as much of the original work as necessary to obtain an acceptable installation.

G. All visible leaks are to be repaired regardless of the amount of leakage.

H. The Contractor shall bear the complete cost of the tests, including set-up, labor, temporary piping, blocking, gauges, bulkheads, water, and any other materials required to conduct the tests.

3.9 DISINFECTION

A. Potable water lines shall be disinfected in accordance with the requirements of Section 33 13 00, Disinfection of Potable Water Lines and Water Storage Tanks, following installation and testing.

END OF SECTION

SECTION 40 05 33

PIPE COUPLINGS AND EXPANSION JOINTS

PART 1 - GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to furnish and install pipe couplings and expansion joints, including grooved couplings, flanged adaptors, expansion couplings, and rubber expansion joints, as shown on the Drawings, specified herein, and/or required for proper installation of piping and equipment.

1.2 SHOP DRAWINGS AND ENGINEERING DATA

A. Complete shop drawings and engineering data shall be submitted to the Engineer in accordance with the requirements of the Section 01 33 23 - Shop Drawings, Product Data and Samples.

1.3 STORAGE AND PROTECTION

A. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel, and sheet construction products shall be stored with one end elevated to facilitate drainage.

1.4 SHOP PAINTING

A. Clean, shop prime, and shop paint all pipe couplings as specified herein.

1.5 GUARANTEE

A. Provide a guarantee against defective materials and workmanship in accordance with the requirements of the applicable provisions of Section 01 78 36, Warranties and Bonds.

PART 2 - PRODUCTS

2.1 EXPANSION COUPLINGS

A. Unless otherwise shown or specified, expansion couplings shall be of a gasketed, short sleeve type, with a diameter to fit the pipe properly. Expansion couplings shall have a working pressure of not less than 150 psig.

B. Each short sleeve coupling for joining ductile iron or steel pipe shall consist of one cylindrical steel middle ring without pipe stop, two steel follower rings, two rubber-compound, wedge section gaskets, and a sufficient number of track head, electroplated steel bolts to compress the gaskets properly. Steel couplings shall be Dresser Style 38, Rockwell Style 411, or equal.

C. Where expansion couplings are required for joining ductile iron pipe to steel pipe of the same nominal size, steel transition couplings, Dresser Style 62, Rockwell Style 413, or equal, shall be used.

D. Rubber gaskets shall be composed of a resilient synthetic rubber compound suitable for use in wastewater containing oil and grease.

2.2 GROOVED COUPLINGS

A. Grooved couplings for ductile iron pipe shall consist of two or more ductile iron housing clamps, a single rubber-compound gasket and electroplated oval-neck track bolts with heavy hex nuts. Housing shall be ribbed for strength and self-centering. Rubber gasket shall be composed of a resilient synthetic rubber compound suitable for use in wastewater containing oil and grease.

B. Grooved couplings shall provide for a pipe end separation of not less than 3/32-inch and a deflection of not less than 0°45'.

C. Grooved couplings shall engage two circumferential grooves cut at the ends of the pipe sections to be joined. The grooves shall provide a positive mechanical grip that locks the pipe ends together such that they cannot blow apart under pressure, vibration, or sag. Grooves shall be cut with a radius at the inside corners of the grooves.

D. Grooved couplings for joining ductile iron pipe shall be Vitaulic Style 31, Gustin-Bacon Gruvajoint No. 500, or equal.

2.3 FLANGED ADAPTORS

A. Flanged adaptors shall be used for joining plain end ductile iron pipe to flanged valves, pumps, and fittings. Flanged adaptors shall be suitable for working pressures to 150 psig.

B. Flanged adaptors in sizes 12-inch and smaller shall consist of an ASTM A 126, Class B cast iron flanged body drilled to mate with a 125-pound cast iron flange per ANSI B16.1, a cast iron follower ring, a rubber-compound, wedge section gasket, and a sufficient number of track head, electroplated steel bolts to compress the gasket properly.

C. Flanged adaptors in sizes 14-inch and larger shall consist of a high strength steel flanged body drilled to mate with a 125-pound cast iron flange per ANSI B16.1, a high strength steel follower ring, a rubber-compound, wedge section gasket, and a sufficient number of electroplated steel bolts to compress the gasket properly.

D. Rubber gasket shall be composed of a resilient synthetic rubber compound suitable for use in wastewater containing oil and grease.

2.4 FLANGED RUBBER EXPANSION JOINTS

A. Flanged rubber expansion joints shall be standard spool-type single or multiple arch expansion joints constructed of abrasion-resistant rubber reinforced with high tensile strength synthetic fabric and steel rings.

B. Ends of the expansion joint shall be integral with the body and shall be full faced and drilled per ANSI B16.1 for 125-pound flanges. Beveled and split, galvanized steel retaining rings shall be provided to prevent damage to flanges and to distribute bolting stresses during assembly.

C. Tube, body, and flanges shall be constructed using Buna-N for wastewater, natural rubber for clean water, and Buna-N or neoprene for air. For working temperatures in excess of 180°F or for chemical service, tube, body, and flanges shall be constructed of Viton. The exterior of the expansion joint shall be coated with Hypalon to resist weathering.

D. When used to convey slurries, raw water, or untreated wastewater in horizontal piping, arches shall be filled with a special soft rubber compound integrally cured in the arches.

E. In unrestrained piping systems or pipe systems subject to excessive longitudinal deflection, joints shall be furnished with two plated steel control rods fitted with nuts to limit compression and extension and prevent damage to the joint.

F. Rubber expansion joints shall be "Redflex," as manufactured by Red Valve Company, "Invincible Expansion Joint," as manufactured by Mercer Rubber Company, or equal, subject to the requirements of this section.

2.5 SLIP-ON RUBBER EXPANSION JOINTS

A. Slip-on rubber expansion joints for low pressure applications (less than 15 psig) up through 6-inch diameter in size shall be sleeve-type, single-arch expansion joints constructed of abrasion resistant rubber reinforced with high tensile strength synthetic fabric.

B. Ends of the joint shall be designed to slip over pipe ends and shall be secured in place with adjustable stainless steel clamps. Two (2) clamps shall be provided on each end of the joint.

C. Joint shall be constructed of Buna-N for wastewater and Buna-N or neoprene for air at working temperatures up to 180°F.

2.6 SHOP COATINGS

A. Couplings and adaptors shall have finish as follows:

Material	Location	Primer	Finish
Ductile Iron	Buried, Submerged, or Exposed	Epoxy Primer Interior	Epoxy
Ductile Iron	Buried, Submerged, or Exposed	Epoxy Primer (Exterior)	Epoxy
Steel	Buried, Submerged, or Exposed	Epoxy Primer Interior	Epoxy Finish

Material	Location	Primer	Finish
Steel	Buried, Submerged, or Exposed	Epoxy Primer (Exterior)	Coal Tar Epoxy

B. Coatings used for couplings and adaptors in potable water shall be approved for use with potable water.

2.7 SPARE PARTS

A. Furnish 2 spare gasket sets and 2 spare track head bolt sets for each size and type of coupling.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Pipe couplings and expansion joints shall be installed where shown on the Drawings, required, or directed by the Engineer. Couplings and joints shall be installed in strict conformance with the manufacturer's instructions.

B. Pipe ends shall be cleaned, brushed, or filed to produce a mating surface for the gasket that is free from dirt, rust, chuck marks, mill scores, dents, burrs or other foreign substances that would impede proper gasket seating.

C. Grooves for grooved couplings shall be accurately located and cut with a suitable grooving tool.

D. A lubricant recommended by the coupling manufactured shall be used in seating all gaskets.

E. On expansion couplings and flanged adaptors, bolts shall be tightened diametrically opposite each other and in progression so that the inner rims project an equal distance over the flares of the middle ring at all points. Bolts shall be tightened sufficiently to ensure a watertight joint but shall not be tightened beyond the point of stretching.

F. On grooved couplings, bolts shall be tightened alternately and uniformly so the housing clamps come together evenly and the gasket is not pinched. Bolts shall be tightened until the housing clamps meet.

G. Couplings shall be field painted, following installation and testing, in accordance with the requirements listed previously in this section. Rubber expansion joints shall not be painted.

END OF SECTION

SECTION 40 05 61

VALVES

PART 1 - GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to furnish and install all metal valves, including operators, boxes, and accessories, as specified herein, shown on the Drawings, or required for proper completion of the work under these Contract Documents.

B. The Contractor's attention is called to the fact that all valves, especially in the smaller sizes, are not necessarily shown completely on the Drawings, which are more or less schematic. Furnish and install all valves indicated or required for proper operation of the equipment or services requiring such valves.

1.2 SHOP DRAWINGS AND ENGINEERING DATA

A. Submit complete shop drawings and engineering data to the Engineer in accordance with the requirements of Section 01 33 23 - Shop Drawings, Product Data and Samples.

1.3 STORAGE AND PROTECTION

A. Store and protect valves and accessories in accordance with the requirements of the valve manufacturer or as directed by the Engineer.

B. Completely drain valves prior to shipment. Protect ends of flanged and mechanical joint valves with full size wooden baffles securely bolted to the valve ends. Size of baffles shall be at least equal to outside diameter of flange. Secure valves 24 inches in size and larger to a wooden skid to facilitate handling and storage.

1.4 SHOP PAINTING

A. Clean, shop prime, and shop paint valves and accessories in accordance with the requirements of these Specifications.

B. All interior and exterior nonmachined, nonbearing ferrous surfaces on iron body valves, gates, and accessories shall be blast-cleaned and painted at the factory with two coats of asphaltic varnish conforming to Federal Specification TT-V-51c, unless otherwise specified. Exterior nonmachined, nonbearing ferrous surfaces on valve operators and on nonsubmerged or nonburied butterfly and eccentric plug valves shall be blast-cleaned and painted at the factory with one coat of zinc chromate primer conforming to Federal Specification TT-P-645 and one coat of compatible alkyd enamel. Other paint systems may be proposed by the valve supplier, subject to the Engineer's approval.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit complete operation and maintenance data on the valves in accordance with the requirements of Section 01 78 23, Operating and Maintenance Data.

1.6 QUALITY ASSURANCE

A. The valve manufacturers shall furnish a written certification to the Engineer that all valves and operators furnished comply with all applicable requirements of the governing AWWA standards specified herein.

1.7 GUARANTEE

A. Provide a guarantee against defective equipment and workmanship in accordance with the requirements of Section 01 78 36, Warranties and Bonds.

PART 2 - PRODUCTS

2.1 GENERAL

A. All castings, regardless of material, shall be free from surface defects, swells, lumps, blisters, sandholes, or other imperfections.

B. All valves shall have the name of the manufacturer, rated working pressure, and size of the valve cast upon the body or bonnet in raised letters. Alternately, the name of the valve manufacturer, rated working pressure, and size may be stamped on a stainless steel identification plate permanently attached to the valve body or bonnet. Valves specified to conform with AWWA requirements shall have the letters "AWWA" cast upon the valve body or bonnet in raised letters.

C. Valves and operating mechanisms shall be of the proper size and dimensions to fit the pipe connections thereto and shall be installed in the position and within the space shown on the Drawings.

D. The direction of rotation of the operator to open the valve shall be to the left (counterclockwise), unless otherwise specified. Each valve body or operator shall have cast thereon the word OPEN and an arrow indicating the direction to open.

E. A union or coupling shall be provided within 2 feet on each side of a threaded end valve unless the valve can be otherwise easily removed from the piping. This shall not apply to soldered end valves in copper plumbing.

F. All exposed bolts and nuts on buried or submerged valves and operators shall be brass or stainless steel for corrosion resistance. Exposed bolts and nuts on exposed valves and operators shall be of corrosion-resistant materials or shall be zinc or cadmium plated.

G. Valves and operators shall be of the proper size to fit the pipe connections and shall fit in the position and space as shown on the Drawings.

H. Valve operators shall be of sufficient size and capacity to seat, unseat, and operate the valve under the maximum specified differential pressure. Where no maximum differential pressure is specified, the operator shall be designed for a differential pressure equal to the maximum working pressure of the valve. Additional allowances shall be made for the lubricating and/or scale-forming tendencies of the fluid.

2.2 GATE VALVES

A. All gate valves smaller than 2 inches and those larger than 24 inches shall be of the single disc, double sealed, solid tapered wedge type, unless otherwise specified. Gate valves in sizes 2 through 24 inches shall be of the single disc, resilient seated type, unless otherwise specified. Valves shall have non-rising stems and be capable of being repacked under pressure when valve is fully open. Minimum working pressures shall be 200 psi for valves through 14 inches in size and 150 psi for valves 16 inches and larger. Resilient wedge gate valves shall be Mueller 2360 Series, or equal.

B. Gate valves smaller than 2 inches shall be bronze body, bronze fitted valves, and have 150-pound, cast bronze body, union bonnet, Teflon-impregnated asbestos packing, and threaded ends per ANSI B2.1. Bronze shall conform to ASTM B62. Brass for nuts and gland shall conform to ASTM V16. Valve discs shall be reversible. Bronze gate valves shall be Stockham Fig. B-130, Nibco Fig. T-136, or equal. For use in copper plumbing, furnish gate valves with solder ends per ANSI B16.18.

C. Gate valves larger than 24 inches in water and wastewater shall be iron body, bronze mounted valves conforming in all respects to the applicable material and dimensional requirements of AWWA C500. Gate valves shall have an O-ring or self-adjusting chevron packing stem seal, and 125-pound flanged ends per ANSI B16.1, except for valves to be buried underground, which shall have mechanical joint ends per ANSI A21.11 (AWWA C111). Body seat rings shall be ASTM B62 bronze and be screwed into the body so as to be field replaceable. Disc faces and all moving parts shall be bronze or bronze mounted. Cast iron for body and bonnet shall conform to ASTM A126, Grade B. Iron body gate valves with solid wedge discs shall be M&H (Dresser) Fig. 2067, or equal. Iron body gate valves with double discs shall be M&H (Dresser) Fig. 67, Mueller Fig. A-2380, or equal.

D. Gate valves in sizes 2 through 24 inches for use in water and wastewater shall be of the ductile iron body, resilient seated type, manufactured in conformance with AWWA C509. Gate shall be of ductile iron with bonded resilient seat and integral flush drain. Minimum working pressure shall be 200 psi when unbalanced pressure is applied to either side of the gate. Gate valves shall have a minimum of two O-ring stem seals; one above and one below the integral stem collar. The area between the O-rings shall be filled with permanent lubricant. Valve shall have no metal fasteners or screws exposed in the wetted portion of the valve. All ferrous surfaces shall be shot-blasted to a white metal finish. All interior and exterior valve surfaces, including the interior of the gate and all bolt holes shall be coated with an epoxy coating in accordance with AWWA C550. The minimum thickness of the coating shall be 8 mils. Valve ends shall be of the type required for the installation as specified herein or shown on the Drawings and meet the requirements as specified in Paragraph C of this section.

E. Gate valves 3 inches in size and larger in steam service shall have 125-pound cast iron body, bronze trim, and outside stem and yoke.

F. Furnish gate valves with nut, wrench, chain, or handwheel operators as shown on the Drawings. Unless otherwise shown or specified, valves shall have operators as specified in this section. Extension stems, floor stands, and valve boxes and covers shall be furnished where shown or required.

G. Resilient wedge valves for buried service 16-inch-diameter and larger shall have bevel gear operators, unless otherwise noted.

2.3 BUTTERFLY VALVES

A. Unless otherwise shown or specified, butterfly valves shall be of the resilient seated, tight-closing type and conform in all respects to the applicable material and dimensional requirements of AWWA C504. Wafer-type butterfly valves in sizes 24 inches and larger shall conform to all general requirements of AWWA C504 except laying length. Butterfly valves shall operate from fully open to fully closed with a 90-degree rotation of the valve stem.

B. Valves shall be designed for the working pressures and/or pressure class designations shown on the Drawings or specified in these Specifications. If a working pressure or pressure rating is not given, the following requirements shall apply:

Service	**AWWA Pressure Rating**
Low Pressure Air	25B
Wastewater or Sludge	150B
Potable or Plant Water	150B

Wafer type valves shall have a pressure rating of not less than 150 psi. Valves shall be drip-tight and bubble-tight at rated pressure differential across the valve in both directions.

C. Valve body shall be one-piece, constructed of cast iron conforming to ASTM A126, Class B. The diameter of the opening shall be not less than the diameter of the corresponding pipe size. Unless otherwise specified, valve body shall be of the short-body style in accordance with Table 2 of AWWA C504. This requirement shall not apply to wafer type valves. No part of the valve internals shall extend beyond the valve ends when the valve is in the closed position. Short-body valves shall have 125-pound flanged ends per ANSI B16.1. Wafer type valves shall be designed to fit between 125-pound flanges per ANSI B16.1.

D. Disc shall be cast bronze conforming to ASTM B143, Alloy 1A, cast iron conforming to ASTM A126, Class B, Ni-resist cast iron conforming to ASTM A436, Type 1 or 2, or Ni-resist ductile iron conforming to ASTM A439, Type D2. When used in wastewater or raw water, disc shall be streamlined with no exterior ribbing or openings.

E. Shafts shall be polished stainless steel conforming to ASTM A276, Type 304 or Type 316. All keys and pins used in securing valve disc to shafts shall be stainless steel or monel.

F. Valve seat shall be one-piece, molded synthetic rubber, Buna-N (Hycar) for wastewater and Buna-N or neoprene for air. Where temperatures exceed 180°F, EPT or Viton seats shall be used. Retaining rings, if used, shall be stainless steel. The method of

mounting valve seat shall conform to the applicable requirements of AWWA C504, Section 3.5. Valve seats in sizes 24 inches and larger shall be field replaceable without necessity of chipping, burning, or cutting. Seats secured with retaining rings shall be fully adjustable. Metal seat mating surfaces shall be smoothly contoured and polished 18-8 stainless steel or monel. Alloy cast iron will not be acceptable as a seat mating surface. Sprayed or plated seat mating surfaces will not be acceptable.

G. Shaft seals shall be O-ring or self-adjusting chevron packing of Buna-N or neoprene. Shaft seals shall conform to the requirements of AWWA C504, Section 3.7, and shall be of a design that allows replacement of the seal without removing the valve shaft. Alternately, pull-down packing is acceptable if the packing is adjustable and replaceable without removing valve operator.

H. Valve bearings shall be self-lubricating, sleeve-type bearings of corrosion resistant materials. Bearing load shall not exceed 2,500 psi. Provide valves 24 inches in size and larger with an adjustable, two-way thrust bearing to center the disc in the valve and allow the valve to be installed with the valve stem vertical. Bearing shall be easily accessible for adjustment.

I. Where the valve is installed adjacent to a fitting, flow meter, another valve, or similar items, furnish a spool piece or adaptor coupling as a spacer so that valve disc does not interfere with the operation of the adjacent meter or valve or contact cement linings on pipe or fittings.

J. Furnish valve with a lever operator, rotary manual operator, electric motor operator, or pneumatic cylinder operator as shown on the Drawings. Unless otherwise shown or specified, furnish a lever operator on valves 6 inches and smaller and a rotary manual operator on valves 8 inches and larger. Furnish extension stem and floorstand where shown or required.

K. Butterfly valves for drinking water service shall be coated interior and exterior with 10 mils, minimum, of TNEMEC Potapox 20, fully compliant with AWWA C550.

L. Butterfly valves shall be as manufactured by Dezurik, Pratt, or equal.

2.4 TWO-WAY PLUG VALVES

A. Two-way plug valves, unless otherwise shown or specified, shall be of the eccentric, non-lubricated type with resilient, neoprene-faced or epoxy-coated plugs providing drip-tight shut-off at rated pressure. Port area shall not be less than 80 percent of the corresponding full pipe area in sizes 16 inches and smaller and 100 percent of the corresponding full pipe area in valves 18 inches and larger. Two-way valves shall operate from fully open to fully closed with a 90 degree rotation of the valve stem.

B. Valves shall be designed for a working pressure of not less than 175 psi in sizes through 16 inches and 150 psi in sizes 18 inches and larger. Valves shall be drip-tight at rated pressure differential in both directions.

C. Valves shall have bodies of ASTM A126, Grade B or ASTM A48, Grade 40 cast iron. Valves 4 inches and larger in size shall have bolted bonnet.

D. Body seats for resilient-faced plugs shall be welded in and contain a minimum of 90 percent nickel. Welded-in seats shall conform to the applicable requirements of AWWA C507, Section 3.2 and AWWA C504, Section 3.5.

E. Plugs without a resilient coating or facing shall be epoxy coated and shall have a field replaceable, full-circle rubber seat securely attached to the plug. Body seats shall be nylon coated.

F. Shaft seal shall be of the self-adjusting or split-V type of Buna-N and shall comply with the applicable requirements of AWWA C504, Section 3.7 and AWWA C507, Section 3.2. Seals requiring adjustment shall be adjustable and replaceable without bonnet or shaft removal.

G. Supply bearings in both the upper and lower journals. Bearings shall be permanently lubricated and replaceable with stainless steel, bronze, or specially coated corrosion-resistant sleeves and bushings. Bearings shall conform to the applicable requirements of AWWA C504, Section 9 and AWWA C507, Section 8.

H. Valves sized 2½ inches and smaller shall have threaded ends per ANSI B2.1. End connections for valves sized 3 inches and larger shall be 125-pound flanged per ANSI B16.1, except for valves to be buried underground, which shall have mechanical joint ends per ANSI A21.11 (AWWA C111). Flanged end valves in sizes 12 inches and smaller shall have a laying length equal to that of an AWWA gate valve of the same size.

I. Valves intended for buried or submerged service shall be sealed against the entrance of water and dirt.

J. Furnish valves with a lever operator, rotary manual operator, or electric motor operator as shown on the Drawings. Unless otherwise shown or specified, a lever operator shall be furnished on valves 6 inches and smaller, and a rotary manual operator with handwheel shall be furnished on valves 8 inches and larger. Extension stem, floorstand, and valve box shall be furnished where shown or required.

K. Two-way plug valves shall be DeZurik "Series 100 Eccentric Plug Valve," Dresser "X-Centric," or equal.

2.5 CURB STOPS AND CORPORATION STOPS

A. Curb stops shall be of all-bronze construction with straight-through unobstructed pattern flow, Teflon-coated plug, top and bottom O-ring plug seals, O-ring port seals, and solid tee handle. Valves shall be suitable for 175-psi minimum working pressure. A quarter turn shall operate the valve from fully open to fully closed position. Valves shall comply with the applicable requirements of AWWA C800.

B. Furnish curb stops with cast iron foot pieces to permit the curb box to rest on a solid surface without bearing on the curb stop or piping.

C. Curb boxes shall be of cast iron, have a 2-inch inside diameter, and be of the extension type with lid and plug. One compatible steel shut-off rod of suitable length shall be furnished. Coat curb boxes and bases with a suitable bituminous coating.

D. Corporation stops for service line connections shall be precision fitted, individually lapped, ground joint key stops of all bronze construction. For tapped connections to water mains, inlet threads shall be of the steep taper, corporation stop type. Corporation stops shall conform to the applicable requirements of AWWA C800.

2.6 AIR RELEASE VALVES

A. Air release valves shall have cast iron body and cover, stainless steel float, stainless steel or bronze trim, and Buna-N seat. All other attaching parts or internal parts shall be stainless steel or bronze.

B. Valve shall be designed for a working pressure of 0 to 150 psi unless otherwise shown or specified and shall be equipped with an orifice appropriate to the venting needs of the pipeline.

C. Sewage valves shall be equipped with an elongated body, a 2-inch NPT inlet connection, and a ½-inch NPT outlet connection and shall be provided with 2-inch inlet shut-off valve, 1-inch blow-off valve, and ½-inch back-flush valve with quick-disconnect coupling and flushing hose with quick-disconnect connections.

D. Pressure water valves shall be installed in valve pit, complete with tapping saddle and connecting line to main, gate valve, etc., and at the location(s) shown on the Drawings. Clean, prime, and paint valve exterior with bituminous paint. Valves 2 inches and smaller shall have NP screwed inlet. Combination air vacuum/air release valve shall be Valve and Primer Corporation, APCO Air Release Valve (Standard), Crispin Universal Air Valve, or equal.

2.7 PRESSURE REDUCING VALVES FOR WATER

A. Pressure reducing valves shall automatically reduce a higher inlet pressure to a preset, steady outlet pressure. The reducing valve shall be very sensitive to slight pressure changes and immediately control the main valve to maintain the desired pressure. Valve outlet pressure shall be adjustable between 25 and 75 psi.

B. The main valve shall be direct acting, single seated, spring-loaded, diaphragm-actuated, globe type valve. When the downstream pressure exceeds the pressure setting, the main valve shall close drip-tight. Piston actuators will not be acceptable. Main valve shall be guided at two locations. No external packing glands shall be used and the diaphragm shall not be used as a seating surface.

C. Pressure reducing valves sized 2 inches and smaller shall have cast bronze body; stainless steel seat ring; Teflon, Buna-N, or composition disc and diaphragm; and outside screw adjustment. Valves shall be suitable for 230-psi inlet pressure. Valves shall be furnished with threaded ends per ANSI B2.1. Bronze pressure reducing valves shall be Watts Regulator No. 223SLP, or equal.

D. Pressure reducing valves 2½ inches and larger shall have cast iron body, bronze trim, bolted cover, and pilot-controlled main valve. The pilot control system shall be external, connected to the valve with union fittings. Pressure setting shall be adjustable by a single screw adjustment enclosed in a tamperproof housing. Valve shall be suitable for an inlet pressure of not less than 175 psi. Valves sized 2½ inches shall have threaded ends per ANSI B2.1. Valves 3 inches and larger shall have 125-pound, flanged ends

per ANSI B16.1. Valve body and cover shall be of cast iron conforming to ASTM A48. Valve trim and pilot control shall be of ASTM B61 or B62 bronze. Pilot control trim shall be stainless steel. Pilot valve shall be supplied with an integral strainer constructed of heavy and fine mesh monel screens to protect the pilot control system from foreign particles. Pilot-controlled valves shall be Clayton Fig. 90G-01, GA Industries Fig. 45-D, or equal.

E. A separate Y-pattern strainer with threaded or bolted cleanout shall be furnished and installed immediately upstream of each pressure reducing valve. Area through the screen shall be not less than 4 times the full pipe area. Strainers shall have a pressure rating not less than that of the protected pressure regulating valve.

F. A 2-inch pressure gauge with tee-head, bronze gauge cock shall be installed on the upstream and downstream side of each pressure regulating valve unit. Pressure gauges on the upstream side shall have a range of approximately 0 to 160 psi. Pressure gauges on the downstream side shall have a range of approximately 0 to 80 psi.

2.8 CHECK VALVES

A. Check valves shall be of the swing type suitable for use in either horizontal or vertical piping, unless otherwise shown or specified. Disc shall swing entirely clear of the path of flow when in the open position. All internal parts shall be readily accessible and easily replaced in the field.

B. Check valves in sizes 2½ inches and smaller shall be Y-pattern, regrinding, bronze body, bronze mounted valves. Valves shall have 200-pound cast bronze body, renewable bronze disc, screwed cap, and threaded ends per ANSI B2.1. Bronze for body and cap shall conform to ASTM B61. Brass nuts and pin shall conform to ASTM B16. Valves shall have a hinge bumper capable of preventing the valve from sticking in the open position and an arrow cast on the valve body to indicate direction of flow. Bronze check valves shall be Powell Fig. 560Y, Stockham Fig. B-345, Nibco Fig. T-453-B, or equal.

C. Check valves in sizes 3 inches and larger shall be iron body, bronze mounted valves conforming to AWWA C508, epoxy-coated inside and outside. Valves shall have 125-pound cast iron body, bolted and gasketed cover, stainless steel or bronze hinge pin, rubber faced, renewable, bronze or cast iron resilient disc, renewable bronze seat ring, outside lever and adjustable weight, and 125-pound flanged ends per ANSI B16.1. Cast iron for body and cap shall conform to ASTM A126, Grade B. Bronze for disc and seats shall conform to ASTM B584. Iron body check valves shall be Mueller Fig. A2600-6-01, Clow F-5345, or equal.

D. Valves shall be installed with pressure under the disc.

E. Check valves in air or gas piping sized 2½ inches or smaller shall be bronze, swing type check valves conforming to the requirements of Item B above, except that the disc shall have a replaceable, resilient seat of Buna-N or Teflon. Bronze check valves for air or gas service shall be Nibco Fig. T-453-W, Kennedy Fig. 442, or equal.

F. Check valves in air or gas piping sized 3 inches and larger shall be of the double plate, spring-loaded, clapper type with cast iron body, aluminum bronze or bronze plates,

stainless steel hinge pin and springs, and Buna-N seats. When operating temperatures exceed 180°F, Viton seats shall be used. Check valves shall be wafer style bodies suitable for mounting between two 125-pound ANSI B16.1 flanges. Check valves shall be rated for a working pressure of not less than 150 psi. Clapper style check valves shall be Mission "Duo-Check," FMC, or equal. Install clapper style check valves in horizontal piping with the pin in a vertical position.

2.9 HOSE BIBBS

A. Hose bibbs shall be angle hose valves of bronze construction suitable for 125 psi minimum working pressure. Valves shall have a renewable Teflon or resilient disc and shall be furnished with a ¾-inch male hose outlet connection. Body and bonnet shall be ASTM B62 bronze. Valves shall be furnished with a suitable cap and chain. Inlet connection shall be threaded per ANSI B2.1.

2.10 ALTITUDE VALVES

A. Altitude valves shall be single-acting, hydraulically operated, pilot actuated, diaphragm or piston type globe valves designed for ground level control of water level in storage tanks. Valve shall be of the non-throttling differential type and shall be air and water cushioned on closing to prevent surges on shutoff. Valve shall be suitable for 175 psi working pressure. Operating point and closing speed shall be adjustable.

B. Valve shall have a cast iron body and bolted bonnet conforming to ASTM A126, Class B, bronze pilot control valve and main valve trim, resilient seat disc, stainless steel pilot trim, and reinforced synthetic rubber diaphragm. Seat ring, disc, and diaphragm shall be removable without removing the valve from the line. Piston type valves shall be constructed with removable resilient seals and guides to prevent metal-to-metal contact. No external packing glands shall be used and the diaphragm shall not be used as a seating surface. Main valve stem shall be guided at both ends. Pilot control shall be three-way, hydraulically balanced, diaphragm type.

C. An indicator rod shall be provided to show valve position. A fine mesh stainless steel or Monel strainer shall be provided in the control piping. A 4½-inch pressure gauge calibrated in both psi and feet of water shall be provided on both sides of the altitude valve.

D. Valve shall be furnished with flanged ends drilled per ANSI B16.1.

E. A standard repair kit shall be supplied for the altitude valve. Kit shall include liner cap, seat ring, cover gasket, indicator packing, vent packing, and piston cup for main valve, seat ring, lower packing, upper packing, stem gasket, and diaphragm for pilot.

F. Altitude valves shall be GA Industries Figure 3200-D; Clayton Figure 206, OCV Series 3331; or approved equal.

2.11 FLAP VALVES

A. Flap valves shall be designed to withstand the stresses resulting from high-head seating applications and to maintain sensitivity to unseating heads.

B. Flap valves shall have iron bodies and shall be bronze mounted. Valves shall be furnished with bronze hinge pins, flap rings, and seat rings.

C. Valves shall be furnished with 125-pound flanged ends per ANSI B 16.1.

D. Flap valves shall be Clow F-3012, Mueller A-2540-6, M&H (Dresser) Figure 47, or equal.

2.12 KNIFE GATE VALVES

A. Knife gate valves shall be of the flanged wafer type with outside stem and yoke and a metal-seated, knife-blade gate with a beveled edge designed to push aside or cut through solids in its path. Knife gate valve shall have full round port opening and shall have a working pressure of at least 125 psi in sizes 24 inches and smaller and 50 psi in sizes 30 inches and larger. Valves shall be capable of providing bi-directional, drip tight shutoff.

B. Knife gate valves shall have a heavy, one-piece body and end flanges of steel or cast iron. Valves shall be lined throughout with stainless steel, including the chest and packing areas. Liner shall extend beyond flange to form raised face mating surface. Knife gate shall be of ground and polished stainless steel of sufficient thickness to resist deformation of rated pressure across the gate. A full circle, raised-face seat with machined gate jambs at the sides and bottom shall be provided to hold the gate and assure positive seating. Seat shall have a neoprene or BNA-N elastomer D shaped ring recessed into the face of the valve seat for a driptight shutoff. All wetted parts of the valve shall be of Type 304 stainless steel.

C. Knife gate shall be sealed with a minimum of four rings of Teflon or neoprene-impregnated asbestos packing. Gland shall be of corrosion-resistant material or shall be specially coated for corrosion resistance. Gland bolts and nuts shall be stainless steel.

D. A heavy, fabricated, angular steel yoke assembly with stainless steel rising stem and bronze yoke sleeve shall be provided on the valve. Valve shall be provided with handwheel operator or extension stem and floorstand as shown on the Drawings. Valves 24 inches and larger shall have a geared operator.

E. Ends of the valve shall be flanged and shall be drilled to mate with 125-pound cast iron flanges per ANSI B16.1.

F. Knife gate valves shall be Dezurik, Fabri-Valve "Figure 371," or equal.

2.13 MANUAL VALVE OPERATORS

A. All gate valves shall be furnished with manual operators as follows, unless otherwise shown or specified:

1.	Buried	Extension stem and valve box with standard operating nut
2.	Submerged or Located in Deep Vault	Extension stem with floor stand and handwheel operator

B. Operating nuts for buried or submerged valves shall be standard 2-inch-square nuts and shall conform to AWWA C500, Section 19. Extension stems, valve boxes, and stem guides shall be furnished where shown, specified, or required for proper operation.

C. Manual rotary operators for buried or submerged service shall be totally enclosed and completely sealed to prevent the entrance of water and dirt. Buried or submerged operators shall be finished on the outside with a bituminous or other approved coating. Rotary operators for buried or submerged service shall be capable of withstanding 300 foot-pounds of torque on the operating nut or handwheel. A corrosion-resistant, dial type valve position indicator shall be provided at the operating nut on the extension stem of buried operators to provide a remote indication of valve position.

D. All manual rotary and lever operators shall be capable of seating or unseating the valve disc under the most adverse conditions in the particular application with not more than an 80-pound pull on the handwheel or lever. Valve operators shall be capable of holding the valve in any position between fully open and fully closed without creeping or fluttering. Operators shall be provided with adjustable, mechanical, stop-limiting devices to prevent over-travel of the valve disc in the open and closed positions. Manual rotary and lever operators shall comply with all applicable requirements of AWWA C540, Sections 11.1, 11.2, and 11.3.

2.14 VALVE BOXES

A. All buried valves shall be provided with three-piece, cast iron, extension sleeve type valve boxes suitable for the depth of cover shown on the Drawings.

B. Valve boxes shall not be less than 5 inches in diameter, shall have a minimum thickness of 3/16 inch at any point, and shall be provided with suitable cast iron bases and covers. Covers shall have cast thereon an appropriate name designating the service for which the valve is intended ("W" for water, "S" for drain or waste lines). Covers in roadways shall be of the deep locking type.

C. All parts of valve boxes, bases, and covers shall be heavily coated with a suitable bituminous finish.

D. Valves and boxes shall be set plumb. Each valve box shall be placed directly over the valve it serves with the top of the box flush with the finished grade.

E. Valve box lids shall be provided with the word “Water” embossed in the lid surface.

2.15 T-HANDLE OPERATING WRENCH

A. Furnish two T-handle, steel valve operating wrenches with sockets compatible with standard 2-inch-square valve operating nuts.

B. The operating wrenches shall be at least 36 inches in length.

2.16 SPARE PARTS

A. Furnish the following spare parts where applicable for the valves specified herein:

1.	Stem packing	One set each type and size of valve
2.	Renewable stainless steel or bronze seat ring	One each type and size of valve
3.	O-ring stem or shaft seals	One set each type and size of valve
4.	Resilient seat or disc	One each type and size of valve
5.	Shaft bearings or bushings	One set each type and size of valve
6.	Hinge pin, disc, spring, and disc bolts	One set each type and size of check valve
7.	Gaskets	One set each type and size of valve
8.	Special tool or seat wrench required for valve servicing and maintenance	One each

B. Suitably protect spare parts against corrosion and impact to withstand long-term storage. All parts shall be clearly labeled and identified by manufacturer's name and number and the valve to which they belong.

PART 3 - EXECUTION

3.1 FACTORY TESTS

A. Test all valves at the point of manufacture for proper and unobstructed operation and for leakage and adequacy of design.

B. Test iron body gate valves in accordance with AWWA C500, Section 5.

C. Test butterfly and plug valves in accordance with AWWA C504, Section 5.

D. Test iron body check valves in accordance with AWWA C508, Section 5.

E. All other valves shall be given an operation test, a leakage test at rated pressure differential, and a hydrostatic test at two times rated pressure. During the hydrostatic test, there shall be no leakage through the metal, the end joints, or the shaft or stem seal, nor shall any part be permanently deformed. During the leakage test, leakage shall not exceed that permitted by ANSI B16.104, Class IV for metal seated valves and Class VI for resiliently seated valves.

3.2 INSTALLATION

A. Install all valves in strict conformance with the Drawings and approved shop drawings and manufacturer's instructions.

B. Install all underground valves using a concrete valve box with cast iron frame and cover or in a cast iron valve box as specified herein.

C. Install valves in such a way that operators and packing are easily accessible. Valves with field replaceable seats shall be installed with sufficient clearance to permit removal of valve bonnet and stem without removing valve from the line.

3.3 FIELD TESTING

A. Following installation, test all valves under the anticipated operating conditions. The ability of the valves to operate properly without leakage, binding, sticking, fluttering, or excessive operating torque shall be demonstrated to the satisfaction of the Engineer. At Contractor's expense, adjust and/or replace any valve as necessary to ensure satisfactory operation.

END OF SECTION