

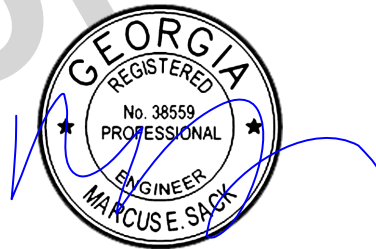


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BID DOCUMENTS

2023 WATER & SEWER EXTENSIONS
FOR
CITY OF PEMBROKE



Unofficial

August 8, 2023
MES No. 2023-58

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SECTION I: INVITATION FOR BIDS

Sealed proposals will be received by the City of Pembroke, located at 353 N. Main Street, Pembroke, Georgia, on September 18, 2023 until 10:00 a.m. local time for the 2023 Water and Sewer Extensions.

The work to be performed consists of furnishing all labor and materials to complete the 2023 Water and Sewer Extensions. More specifically, the project will consist of installing approximately 2,650 LF 8" water line, 320 LF 8" sewer line, as well as the tie-in of new and existing services.

Plans, Specifications, and Contract documents are open to public inspection at the Georgia Procurement Registry, ConstructConnect, Dodge Construction Network, and www.mesack.com. Copies of the Plans, Specifications, and Contract Documents may be obtained by contacting M.E. Sack Engineering, bidning@mesack.com, 515 North Main Street, P.O. Box 649, Hinesville, Georgia 31310, (912) 368-5212, and by depositing a non-refundable one hundred fifty dollars (\$150) for each set of plans requested.

Each Contractor must prequalify for bid by submitting a completed "Statement of Bidder Qualifications" form supplied by the Engineer. Bids will be accepted from prequalified bidders only.

Bids must be accompanied by a certified check or bid bond in an amount equal to at least five percent (5%) of total amount bid for the completed work.

No bids may be withdrawn for a period of sixty (60) days after the closing time schedule for receipt of bids.

The Owner reserves the right to accept or reject any or all bids and to waive informalities. Award of the contract, if it is awarded, will be to the lowest responsible bidder.

NOTE: Plans and Specifications must be obtained no later than five (5) working days before the bid date. No exceptions.

SECTION II: INSTRUCTIONS TO BIDDERS

A. SUBMISSION OF PROPOSALS:

1. Sealed proposals will be received by the City of Pembroke at 353 N. Main Street, Pembroke, Georgia 31321 until 10:00 a.m. local time, on September 18, 2023 for all labor and materials required to fully complete the work identified in the plans and specifications for the 2023 Water and Sewer Extensions.
2. At the time and place noted above, the proposals will be publicly opened and read aloud.
3. The proposal (including Statement of Bidder's Qualifications) shall be submitted in duplicate on an exact copy of the proposal form bound herein. Both copies of the Proposal Form must be signed. All blank spaces on the forms shall be filled in and all information called for shall be provided. The terms "NO BID" may be used to fill in a blank space on the Proposal Form. All signatures shall be in ink and in longhand, and the completed forms shall be without alterations or corrections; any interlineations must be initialed by the Bidder.
4. Failure to submit a proposal in the form requested or the inclusion of any alternates, conditions, limitations, or provisions not called for, will render the bid irregular, and shall be considered sufficient cause for rejection of the bid.
5. Proposal shall be in opaque, sealed envelope and marked "2023 Water & Sewer Extensions" and shall bear the name of the Bidder. Proposal is to reach the above address no later than the hour and date named above, or authorized extension thereof. No proposal will be received after that time.
6. Proposals, together with the full bid bond, may be withdrawn by Bidders prior to the time set for official opening. After time has been called, no proposal may be withdrawn for a period of sixty (60) days after the time and date of the opening.

B. INTERPRETATIONS:

1. Neither Owner nor Engineer will be responsible for any oral instructions or interpretations of the Drawings and Specifications.
2. Requests for interpretations of Drawings and Specifications must be made in writing to the Engineer no later than seven (7) days prior to date set for receipt of bids, and failure

on the part of the successful bidder to do so shall not relieve him as Contractor of the obligation to execute such work in accordance with a later interpretation by the Engineer.

3. All interpretations made to bidders will be issued in the form of an addendum to the Plans and Specifications will be sent to all bidders. The requirements of such an addendum are to be included in the bids, and in closing the contract, the addenda will become a part thereof.

C. BASIS OF CONTRACT AWARD:

1. The competency and responsibility of a bidder will be considered in making the award. Owner does not obligate himself to accept the lowest bid or any other bid.
2. The Owner reserves the right to reject any or all proposals and to waive any technicalities.

D. FORMS AND BONDS:

1. The Bidder's attention is directed to the Proposal Form and the Performance and Labor and Materials Payment Bond section.
2. The bond shall be accompanied with the agents and underwriters name, address, and telephone number.

E. INSPECTING AND TESTING OF MATERIALS:

1. Whenever, in these Contract Documents, inspecting, testing, or certification of material(s) is called for, the selection of bureaus, laboratories and/or agencies for such inspecting and testing shall be made by an Independent Testing Laboratory and the character of the test shall be stipulated by the Engineer. Documentary evidence satisfactory to the Engineer that the materials have passed the required inspection and test must be furnished in quadruplicate to the Engineer by the bureau, agency, or laboratory selected. Materials satisfactorily meeting the requirements of the inspection or tests shall be approved by the Engineer and the Contractor notified of the results. The cost of such inspecting and testing shall be paid for by the Contractor.

F. CONSTRUCTION SCHEDULE:

1. The Contractor will be required to submit a construction schedule in writing identifying milestones and completion dates at the preconstruction conference. He shall also be required to submit a resume' of the proposed job superintendent for approval by the Engineer.

G. INSURANCE:

1. The Contractor's attention is directed to Article 5 of the Supplemental General Conditions, "Bonds & Insurance." He should review these requirements and be prepared to submit insurance certificates providing the coverage identified. On the insurance certificates, the "Certificate Holder" should be listed as **both** the Owner **and** M.E. Sack Engineering.

H. CONSTRUCTION STAKING:

1. The Owner will provide horizontal and vertical control. The Contractor will be responsible for construction staking.

I. UTILITY CONTRACTOR LICENSING LAW:

1. Effective December 31, 1993, a new law took effect which has an indirect effect on engineers. As of that date all utility contractors must be licensed; a utility contractor is anyone who digs five (5) feet or deeper on a public or private project and where the cost of work exceeds \$100,000.
2. Effective July 1, 2004, the law was modified where the cost of work has no dollar amount therefore anyone who digs five (5) feet or deeper on a public or private project must have a utility license.
3. "It shall be unlawful for any person to contract with any other person for the performance of utility contracting work who is known by such person to not have a current, valid license as a utility contractor pursuant to this chapter." (O.C.G.A. 43-14-8.2(h)) Bids or proposals for utility contracting work will NOT be opened or considered unless the Utility Contractor License number is written on the face of the bid or proposal.

SECTION III: BID SUBMISSION FORMS**A. BIDDER DECLARATION, PART 1**

City of Pembroke
353 N. Main Street
Pembroke, Georgia 31321

Submitted: _____ , _____

The undersigned, as Bidder, hereby declares that the only person or persons interested in the Proposal as principal or principals is or are named herein and that no other person that herein mentioned has any interest in this Proposal or in the contract to be entered into; that this Proposal is made without connection with any other person, company or parties making a bid or Proposal; and that it is in full respect fair and in good faith without collusion or fraud.

The Bidder further declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the Plans and Specifications for the work and Contractual Documents relative thereto, and has read all Special Provisions and General Conditions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed.

The Bidder proposes and agrees, if the Proposal is accepted, to contract with the City of Pembroke in the form of contract specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of the work, in full and in complete accordance with the shown, noted, described, and reasonably intended requirements of the Specifications and Contract Documents, to the full and entire satisfaction of the City of Pembroke with a definite understanding that no money will be allowed for extra work except as set forth in the attached General Conditions and Contract Documents, for prices on the following pages.

B. BID FORM

Bid Item	Quantity	Units	Description	Unit Price	Cost
A. Willie Drive Water Extension					
1	2,650	LF	8" Water Line	\$	\$
2	3	EA	Connect to Existing 2" / 6" Water Line	\$	\$
3	2	EA	Connect to Existing 8" Water Line With Meter and Backflow Preventer (Jumper)	\$	\$
4	6	EA	8" Gate Valve	\$	\$
5	1	TN	Fittings	\$	\$
6	2	EA	Fire Hydrant (6" Lead, Valve and Hydrant)	\$	\$
7	65	LF	Tie 1" Poly Service To Existing Meter With Direct Bury	\$	\$
8	170	LF	1" Poly Service With Direct Bury	\$	\$
9	60	LF	Tie 1" Poly Service To Existing With Impact Molding	\$	\$
10	1	LS	Structure Relocation	-	\$
11	113	SY	Asphalt Removal and Replacement	\$	\$
12	50	SY	Concrete Driveway Removal and Replacement	\$	\$
13	1	LS	Traffic Control	-	\$
14	1	LS	Erosion Control	-	\$
15	1	LS	Mobilization (5% Max)	-	\$
SUBTOTAL					\$
B. T Field Street Sewer Extension					
16	1	EA	Manhole (Doghouse)	\$	\$
17	2	EA	Manhole	\$	\$
18	320	LF	8" Sanitary Sewer	\$	\$
19	60	LF	Sanitary Service (Connection to Main and Clean Out at R/W)	\$	\$
20	494	SF	6" Aggregate Base	\$	\$
21	494	SF	2.0" 9.5mm Asphalt Overlay	\$	\$
22	494	SF	Crack Proof Interlayer	\$	\$

B. BID FORM continued

Bid Item	Quantity	Units	Description	Unit Price	Cost
23	110	SF	Concrete with Leveling Course	\$	\$
24	604	SF	Trench Backfill	\$	\$
25	1	EA	Sign Removal and Replacement	\$	\$
26	1	LS	Traffic Control	-	\$
27	1	LS	Erosion Control and Grassing	-	\$
28	1	LS	Mobilization (5% Max)	-	\$
				SUBTOTAL	\$
				TOTAL BID	\$

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C. BIDDER DECLARATION, PART 2

The Bidder further proposes and agrees hereby to commence work under his Contract, with adequate force and equipment, on a date to be specified in written order of the ENGINEER and shall fully complete all work hereunder within forty-five (45) consecutive days from and including said date.

The Bidder declares that he understands that the quantities shown for unit price items, are approximate only, are valid only upon written authorization of the ENGINEER, and are subject to either increase or decrease and that should the quantities of any items of work be increased, the Bidder proposes to do the additional at the unit prices stated herein; and should the quantities be decreased, the Bidder also understands that payment will be made on the basis of actual quantities at the unit price bid and will make no claim for anticipated profits for any decrease in quantities, and that actual quantities will be determined upon completion of the work, at which time adjustment will be made to the Contract amount by direct increase or decrease.

The undersigned further agrees that, in case of failure on his part to execute the Construction Contract and the bond within ten (10) consecutive calendar days after written notice being given of the award of the Contract, the check or bond accompanying this bid, and the monies payable thereon, shall be paid into the funds of the City of Pembroke as liquidated damages for such failure, otherwise the check or bid bond accompanying this proposal shall be returned to the undersigned.

Attached hereto is a certified check on the _____ Bank of _____ or a Bid Bond by the _____ in the amount of _____ Dollars (\$) made payable to the City of Pembroke, in accordance with the conditions of the advertisement and provisions herein.

Submitted:

By:

Title:

D. BONDING AGENT AND UNDERWRITER

Bidder's Address: _____

City, State, Zip Code: _____

Telephone Number: _____

Bonding Agent: _____

Physical Address: _____

Telephone Number: _____

Underwriter Name: _____

Physical Address: _____

Telephone Number: _____

FAILURE TO COMPLETE THIS SECTION IS GROUNDS FOR REJECTION

E. ADDENDUM ACKNOWLEDGEMENT

Bidder Acknowledges Receipt of the Following Addendum:

No.: _____

Date: _____

No.: _____

Date: _____

No.: _____

Date: _____

No.: _____

Date: _____

F. BIDDER QUALIFICATION FORM*

*The statements below must be subscribed and sworn to before a Notary Public

Bidder's legal name:	
Business Address:	
Business Phone Number:	
Form of Ownership (Corporation, Partnership, Individual Proprietorship, Other (Specify)):	
Organization Date:	
Incorporation Date:	
In case of Partnership or other association, legal name of each partner:	
Years in business in present form:	
If requested by the Owner, will you furnish to them your most recent Financial Statement within 48 hours after bid taking?	
If yes, give date of statement:	
Credit available for this contract:	\$ _____
Contracts now in hand (gross amount):	\$ _____
Have you ever refused to sign a contract at your original bid? If yes, explain.	
Do you have a Georgia Utility Contractor's License?	
If yes, provide number:	
Have you ever defaulted on a contract? If yes, explain.	

Sworn to and subscribed before me, this _____ day of _____, 20____

(Notary Public)

Firm Name: _____

By: _____

Its: _____

G. BIDDER EXPERIENCE AND REFERENCES

Provide references for work done, minimum of six (6), three (3) within the last twelve (12) months of similar size and nature, and a listing of all jobs performed in the last twelve (12) months. References will afford the Owner opportunity to judge as to capabilities and performance of the contractor.

Provide name, brief description of work performed, address, phone number, and contact person for each project listed. Failure to complete this section in its entirety will be grounds for rejection.

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H. SITE VISIT CERTIFICATION

This document is to be executed by the Bidder and submitted with the bid for the construction of the **2023 Water & Sewer Extensions (Project #2023-58)** for the City of Pembroke in order to be considered for award.

Check the option that applies:

_____ I certify that I visited the Site of the proposed Work on _____ (date of visit) and became fully acquainted with the conditions relating to construction and labor. I fully understand the facilities, difficulties, and restrictions attending the execution of Work under contract.

_____ I certify that _____ (Bidder's representative) visited the Site of the proposed Work on _____ (date of visit) and became fully acquainted with the conditions relating to construction and labor. The Bidder's representative fully understood the facilities, difficulties, and restrictions attending the execution of the Work under contract.

Bidder fully indemnifies the City of Pembroke, its Engineer, its Construction Manager, and all of their respective officers, agents, employees, and consultants from any damage or omissions related to conditions that could have been identified during my visit and/or the Bidder's representative's visit to the Site.

I certify under penalty of perjury under the laws of the State of Georgia that the foregoing is true and correct.

Company Name

By

Title

Date

I. UTILITY CERTIFICATION

This document is to be executed by the Bidder and submitted with the bid for the construction of the **2023 Water & Sewer Extensions (Project #2023-58)** for the City of Pembroke in order to be considered for award.

Bidder recognizes the supplied plans may not identify all underground improvements or their locations, and the information upon which the Engineer rely may contain errors or may not be complete. Bidder agrees, to the fullest extent permitted by law, to defend, indemnify and hold harmless the City of Pembroke, its Engineer, and all of their respective officers, agents, employees, and consultants from all liability (including reasonable attorneys' fees and court costs) of Bidder, its contractors or all other persons for delay or additional compensation relating to the identification, removal, relocation, or restoration of utilities, or damages to underground improvements resulting from subsurface penetration locations established by the supplied plans.

It shall be the responsibility of the awarded Contractor to have all underground utilities located before any work begins. The repairs of any damaged underground utilities as a result of the work being performed by the awarded Contractor shall be the responsibility of the awarded Contractor. The proper utility company shall be contacted immediately to expedite the repairs if damage has occurred. Awarded Contractor will notify the City of Pembroke and its Engineer, M.E. Sack Engineering, and provide a written explanation of the incident within two (2) days of the damage to any underground utilities.

I certify under penalty of perjury under the laws of the State of Georgia that I have read and will fully comply with the foregoing.

Company Name

By

Title

Date

J. LAWFUL PRESENCE AFFIDAVIT

Pursuant to O.C.G.A. § 50-36-1, all persons who - either on behalf of themselves or on behalf of an individual, business, corporation, partnership, or other private entity - apply for certain public benefits must (1) be eighteen years of age or older and (2) submit an affidavit that they are lawfully present in the United States. Public benefits, as defined by O.C.G.A. § 50-36-1(a)(3)(A), include any grant, contract, loan, professional license, or commercial license provided by an agency of State or local government or by appropriated funds of a State or local government.

I, _____, swear or affirm under penalty of perjury under the laws of the State of Georgia that I am 18 years of age or older and (check one):

- I am a United States citizen, or
- I am a legal Permanent Resident of the United States, or
- I am a qualified alien (other than as a permanent resident) or nonimmigrant in the United States pursuant to Federal law.

The secure and verifiable document provided with this affidavit can best be classified as: _____

I understand that this sworn statement is required by law because I have applied for a public benefit and/or a business license on my behalf as an individual or on behalf of a business, corporation, partnership, or other private entity. I understand that state law required me to provide proof that I am lawfully present in the United States prior to receipt of this public benefit as listed above. I further acknowledge that making a false, fictitious, or fraudulent statement or representation in this sworn affidavit is punishable under the criminal laws of Georgia under O.C.G.A. § 16-10-20 and it shall constitute a separate criminal offense each time a public benefit is fraudulently received.

Signature Date

Title *Alien Registration # for Non-citizens

Business Name TIN or SSN

If this affidavit is not presented in person, applicant must submit a notarized copy of this affidavit.

Notarized this ____ Day of _____, 20____, in the State of _____, County of _____

Notary Commission Expires

*Note: O.C.G.A § 50-36-1(e) (2) requires that aliens under the Federal Immigration and Nationality Act., Title 8 U.S.C., as amended, provide their alien registration number. Because legal permanent residents are included in the federal definition of "alien", legal permanent residents must also provide their alien registration number. Qualified aliens that do not have an alien registration number may supply another identifying number: _____

K. 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 Pembroke 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/E-verify User Number

Date of Authorization/Date of contract between Contractor and Public Employer

Legal Name of Contractor (please print)

Legal Address of Contractor

City, State, & Zip Code

2023 Water and Sewer Extensions

Name of Project

City of Pembroke

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 ____ DAY OF _____, 20__.

Notary Public

Commission Expires

L. SUBCONTRACTOR AFFIDAVIT under O.C.G.A. § 13-10-91(b)(3)

By executing this affidavit, the undersigned subcontractor 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 under a contract with _____ (name of contractor) on behalf of the City of Pembroke 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 subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the subcontractor with the information required by O.C.G.A. § 13-10-91(b). Additionally, the undersigned subcontractor will forward notice of the receipt of an affidavit from a sub-subcontractor to the contractor within five business days of receipt. If the undersigned subcontractor receives notice of receipt of an affidavit from any sub-subcontractor that has contracted with a sub-subcontractor to forward, within five business days of receipt, a copy of such notice to the contractor. Subcontractor 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 Subcontractor

2023 Water and Sewer Extensions

Name of Project

City of Pembroke

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

Commission Expires

SECTION IV: SAMPLE CONTRACT

THIS AGREEMENT, made this _____ day of _____, 20____, by and between the City of Pembroke, herein called "OWNER" acting herein through Judy B. Cook and _____, of _____, County of _____, and State of _____, herein called "CONTRACTOR".

WITNESSETH: that for and in consideration of the payments and agreement hereinafter mentioned, to be made and performed by the OWNER, and the CONTRACTOR hereby agrees with the OWNER to commence and complete the construction described as follows:

2023 WATER & SEWER EXTENSIONS
FOR
CITY OF PEMBROKE

hereinafter called the project, for the sum of _____ Dollars (\$_____) and all extra work in connection therewith, under the terms as stated in the General and Special Conditions of the Contract; and at his (it's or their) own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the Proposal; the General Conditions, Supplemental General Conditions and Special Conditions of the Contract, the plans, which include all maps, plats, blue prints and other drawings and printed or written explanatory matter thereof, the specifications and Contract Documents therefore as prepared by M.E. Sack Engineering, herein entitled the ENGINEER, and as enumerated in Paragraph 1 of the Supplementary General Conditions, all of which are made a part hereof and collectively evidence and constitute the Contract.

The Contractor hereby agrees to commence work under this Contract on or before a date to be specified in a written "Notice to Proceed" from the Owner and to fully complete the project within forty-five (45) consecutive calendar days thereafter.

The Contractor further agrees to pay, as liquidated damages, the sum of \$300 for each consecutive calendar day thereafter as hereinafter provided in Section 01001, Paragraph 1.11.

The owner agrees to pay the contractor in current funds for the past performance of the contract subject to additions and deductions as provided in the General Conditions, Article 14 of the contract. Retainage on progress payments shall be ten (10) percent until the project is substantially complete (80% or more) at which point retainage may be reduced to 5% depending on the contractor's progress related to schedule and workmanship.

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IN WITNESS WHEREOF, the parties present have executed this contract in four (4) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

ATTEST:

City of Pembroke

(Owner)

(Secretary)

By _____

(Witness)

Mayor
(Title)

(Secretary)

(Contractor)

By _____

(Witness)

(Title)

(Address and Zip Code)

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A. PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

1. REFERENCE

By reference, "The Performance Bond and Payment Bond", E.J.C.D.C. Document C-610 and C-615, 2007 Edition, pages 1 through 2 of each inclusive, is a part of this Contract.

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SECTION V: OTHER CONDITIONS OF CONTRACT BY ATTACHMENT

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A. SUPPLEMENTAL CONDITIONS

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SUPPLEMENTAL CONDITIONS

01. GENERAL CONDITIONS:

The "Standard General Conditions of the Construction Contract", Engineers Joint Contract Documents Committee, 2007 Edition, Articles 1 through 17 inclusive, included herein preceding these supplements, is a part of this Contract.

ARTICLE 5 - BONDS & INSURANCE

5.04 B 1& 2 Contractor's protective liability insurance, with minimum limits as follows:

General Liability – \$1,000,000 per occurrence;

Damage to rented premises – \$100,000 per occurrence;

Personal injury including death – \$1,000,000 for each occurrence;

General aggregate – \$2,000,000 per project;

Property damage - \$100,000 for each and \$200,000. for the aggregate for operations.

Contractor's automobile liability insurance (including contractual liability insurance as applicable to the Contractor's obligations under paragraph 6.20) with minimum limits as follows:

Automobile liability – \$1,000,000 per occurrence;

Workers compensation – Statutory coverage and \$1,000,000 Employers liability limit.

- (a) Any exclusion of so-called underground damage to pipes, collapse of structures or damage resulting from explosion or blasting, shall be deleted.
- (b) The policy shall provide completed operations coverage, and such coverage shall be maintained by the Contractor for a period of one year from the date of payment of the final amounts owed the Contractor by the Owner, whichever occurs first.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.02 Progress Payments

A. Applications for Payments

1. Add a sentence after the second sentence stating, "Each payment request shall be accompanied with record drawings showing as-built conditions of all work requested during the pay period."

ARTICLE 16 - DISPUTE RESOLUTION

16.01 Any dispute arising under this agreement shall first be resolved by utilizing non-binding mediation, however, should the dispute not be resolved by this method it shall be heard in the Superior Court of the County in which the owner resides, and the parties consent to jurisdiction and venue in that Court. The parties waive any defense they may have to lack of jurisdiction or improper venue and agree to have all disputes resolved in the Superior Court of the County in which the owner resides.

B. GENERAL CONDITIONS

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This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by

ACEC

AMERICAN COUNCIL OF ENGINEERING COMPANIES



ASCE American Society
of Civil Engineers

P/E National Society of
Professional Engineers
Professional Engineers in Private Practice

AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE

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NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

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CONSTRUCTION SPECIFICATIONS INSTITUTE

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 6. *Bidder*—The individual or entity who submits a Bid directly to Owner.
 7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
 10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.
 11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.
15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.
16. *Cost of the Work*—See Paragraph 11.01 for definition.
17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.
18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
19. *Engineer*—The individual or entity named as such in the Agreement.
20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.
21. *General Requirements*—Sections of Division 1 of the Specifications.
22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.
24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.
28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.
29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
30. *PCBs*—Polychlorinated biphenyls.
31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.
33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.
34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.
35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.
37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.
42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.
43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.
44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion thereof.
45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.
46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
49. *Unit Price Work*—Work to be paid for on the basis of unit prices.
50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 Terminology

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word “furnish,” when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 2. The word “install,” when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.
 4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, “provide” is implied.
- F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

- A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.
- B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

- A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

- A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

- A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on

Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.
- C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

- A. Standards, Specifications, Codes, Laws, and Regulations
 1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.
2. *Contractor's Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:
 - a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;
2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or
3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.
- C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

**ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS;
HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS**

4.01 *Availability of Lands*

- A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.
- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

- A. *Reports and Drawings:* The Supplementary Conditions identify:
 - 1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and
 - 2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 - 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
 - 2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

- A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:
1. is of such a nature as to establish that any “technical data” on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
 2. is of such a nature as to require a change in the Contract Documents; or
 3. differs materially from that shown or indicated in the Contract Documents; or
 4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

- B. *Engineer’s Review:* After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner’s obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer’s findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor’s cost of, or time required for, performance of the Work; subject, however, to the following:
 - a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and
 - b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
 - a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or
 - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and

contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

- c. Contractor failed to give the written notice as required by Paragraph 4.03.A.
3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

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

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the

consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.
- G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

- H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 Performance, Payment, and Other Bonds

- A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.
- B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 Licensed Sureties and Insurers

- A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also

meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

- A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.
- B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.
- C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.
- D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.
- E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

- A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 - 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 - 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;
 - 3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
 - 4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

- a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or
 - b. by any other person for any other reason;
5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and
 6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.
- B. The policies of insurance required by this Paragraph 5.04 shall:
1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;
 2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;
 3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;
 4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);
 5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and
 6. include completed operations coverage:
 - a. Such insurance shall remain in effect for two years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

- A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

- A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:
1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;
 2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.
 3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
 4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
 5. allow for partial utilization of the Work by Owner;
 6. include testing and startup; and
 7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.
- B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors,

members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

- C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.
- D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.
- E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

- A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.
- B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and
 2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.
- C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

- A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.
- B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

- A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's

interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

- A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

- A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.
- B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner’s written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

- B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.
 - 1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
 - 3) it has a proven record of performance and availability of responsive service.
- b. Contractor certifies that, if approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

- a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.
- c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.
- d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design,
 - b) be similar in substance to that specified, and
 - c) be suited to the same use as that specified;
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

- c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;
 - 3) will identify:
 - a) all variations of the proposed substitute item from that specified, and
 - b) available engineering, sales, maintenance, repair, and replacement services; and
 - 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.
- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.
- C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.
- D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.
- E. *Engineer's Cost Reimbursement:* Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

- A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be

required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

- B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.
- C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:
1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor
 2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.
- F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.
- G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner,

Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

- A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.
- C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

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

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.
3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought

by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
- C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.
- D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and

shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

- C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.
- D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

- A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is

required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

- a. Submit number of copies specified in the General Requirements.
- b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

- a. Submit number of Samples specified in the Specifications.
- b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

- a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
- b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;
- c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
- d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.
3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

- A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 - 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or
 - 2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
 - 1. observations by Engineer;
 - 2. recommendation by Engineer or payment by Owner of any progress or final payment;
 - 3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;
 - 4. use or occupancy of the Work or any part thereof by Owner;
 - 5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;
 - 6. any inspection, test, or approval by others; or
 - 7. any correction of defective Work by Owner.

6.20 *Indemnification*

- A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

- B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.
- C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:
 - 1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or
 - 2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.
- C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

- E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 Related Work at Site

- A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:
 - 1. written notice thereof will be given to Contractor prior to starting any such other work; and
 - 2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 Coordination

- A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
 - 1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 - 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 - 3. the extent of such authority and responsibilities will be provided.

- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

- A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.
- B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.
- C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

- A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

- A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

- A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

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

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or

continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

- A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

- A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

- A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

- A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.
- B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.
- C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.
- D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

- A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.
- B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.
- C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.
- D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

- A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise

or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

- B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.
- D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.
- E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

- A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).
- B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:
 - 1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
 - 2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and
 - 3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

- A. *Engineer's Decision Required:* All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.
- B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data

shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

- C. *Engineer's Action:* Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:
1. deny the Claim in whole or in part;
 2. approve the Claim; or
 3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.
- D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.
- E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 Cost of the Work

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
5. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of

said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
- g. The cost of utilities, fuel, and sanitary facilities at the Site.
- h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.
- i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not

limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.
- C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.
- D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 *Allowances*

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:*
 1. Contractor agrees that:
 - a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance:*
 1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to

the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:
 - 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - 2. there is no corresponding adjustment with respect to any other item of Work; and
 - 3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 Change of Contract Price

- A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:
 - 1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or
 - 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee*: The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or
2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;
 - b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;
 - c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;
 - d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;
 - e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and
 - f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.
- B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

- A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or

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

- B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
- C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.
- D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

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

13.01 Notice of Defects

- A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 Access to Work

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

- A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:
 - 1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;
 - 2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and
 - 3. as otherwise specifically provided in the Contract Documents.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.
- D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.
- B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

- C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.
- D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or
 2. correct such defective Work; or
 3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and
 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.
- C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

- A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

- 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an

Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. Review of Applications:

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or

- involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or
- b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.
4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:
 - a. to supervise, direct, or control the Work, or
 - b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or
 - c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or
 - d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or
 - e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.
 5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:
 - a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - b. the Contract Price has been reduced by Change Orders;
 - c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or
 - d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. Payment Becomes Due:

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:
 - a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;
 - b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;
 - c. there are other items entitling Owner to a set-off against the amount recommended; or
 - d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.
2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.
3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.
- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before

final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

- D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.
- E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:
 - 1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.
 - 2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
 - 3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all Claims against Owner that Contractor believes are unsettled; and
 - d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.
3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying

documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

- A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

- A. The making and acceptance of final payment will constitute:
 1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and
 2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of Engineer; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
- B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
 2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and
 3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when

so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

- D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
- E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.
- F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

- A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;
 - 3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and
 - 4. reasonable expenses directly attributable to termination.
- B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

- A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days

to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 Methods and Procedures

- A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.
- B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.
- C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:
1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or
 2. agrees with the other party to submit the Claim to another dispute resolution process; or
 3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 Giving Notice

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

- A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

C. TECHNICAL SPECIFICATIONS

Unofficial

**SECTION 01001
GENERAL REQUIREMENTS**

PART 1 - GENERAL

1.01 COMMENCEMENTS AND PROSECUTION OF WORK

- A. Contract time shall begin at which time the Owner will issue a written Notice to Proceed. The Contractor must commence construction within ten (10) days of issuance of a written Notice to Proceed. The Contractor shall maintain sufficient labor and supervision on the job until all items have been completed and the Engineer's Final Certification has been issued.

1.02 COOPERATION

- A. The General Contractor and Sub-Contractors shall cooperate with one another and with other Contractors doing related work and shall coordinate their work with the work of other trades and other Contractors so as to facilitate the general progress of the work. Each trade shall afford all other trades and all other Contractors every reasonable opportunity for the installation of their work and for the storage of their materials.

1.03 SANITARY FACILITIES, TEMPORARY

- A. Do not allow any sanitary nuisances to be committed in or about work; enforce sanitary regulations of Local and State Health authorities.

1.04 SITE EXAMINATION OF EXISTING CONDITIONS

- A. The Contractor, in undertaking the work under this Contract, is assumed to have visited the premises and to have taken into consideration all conditions which might affect his work. No consideration will be given to any claim based on a lack of knowledge of existing conditions, except where the Contract Documents make definite provisions for adjustment of cost or extension of time due to existing conditions that cannot be readily ascertained.

1.05 SPECIFICATIONS EXPLANATION

- A. Attention is directed to the fact that the detailed specifications and separate sections may be written in short or abridged form. In regard to every section of the specifications and all parts thereof, mentioned therein or indications on the drawings or articles, materials, operations, or methods required that the Contractor:
 - 1. Provide each item mentioned and indicated (of quality or subject to qualifications notes).
 - 2. Perform (according to the conditions stated) each operation prescribed.
 - 3. Provide therefore all necessary labor, equipment, and incidentals.

- B. Wherever in these specifications or on the drawings the words "directed", "required", "ordered", or words of like import are used, it shall be understood that the directions, requirements, permission, or order of the Engineer is intended; and similar words "approved", "accepted", "satisfactory", or words of like import shall mean approved, acceptable to, or satisfactory to the Engineer.
- C. For the convenience of reference and to facilitate the letting of Contracts or Sub-Contracts, these specifications are separated into titled sections. Such separation shall not, however, operate to make the Engineer an arbiter to establish limits to the Contracts between the Contractor and Sub-Contractors, nor shall such operation be interpreted as superseding normal union functions.
- D. Notwithstanding the appearance of such language in the various divisions of the specifications as "The Electrical Contractor", "The Roofing Contractor", etc., the Contractor is responsible to the Owner for the entire Contract and the execution of all work referred to in the Contract Documents.

1.06 STANDARD

- A. Wherever reference is made to the standard specifications of nationally known organizations and specific articles, sections, divisions, or headings are not given, such specifications shall apply in full. Standard specifications were included herein by abbreviation or otherwise shall form a part of this specification the same as if quoted in full.
- B. The Engineer may require, and the Contractor shall furnish if required to do so, certificates from manufacturers to the effect that the products or materials furnished by them for use in the work comply with the applicable specified requirements for the materials or products being furnished.

1.07 TELEPHONE, TEMPORARY

- A. Contractor shall provide mobile telephone numbers for the Project Superintendent and Project Foreman either prior to or during the Preconstruction Meeting.

1.08 TEMPORARY UTILITIES

- A. Contractor shall furnish water, electricity, and heating fuel necessary for construction. The contractor shall provide necessary temporary piping, faucets, valves, wiring, switches, outlets, etc., to carry services to the work. The Contractor shall make all temporary utility connections for his own use and remove temporary services on completion of the Contract.

1.09 WORK OUTSIDE OF THE PROPERTY LINE

- A. All work outside of the property line called for by the Contract Documents shall be performed by the Contractor and all costs for same shall be included in the Contract.

1.10 AS-BUILT DRAWINGS

- A. The Contractor shall, upon completion of the work, furnish a marked set of drawings showing field changes affecting the various mechanical trades, utilities, and electrical, as actually installed and as specified under those sections of the specifications, and deliver them to the Engineer. The engineer will furnish prints to the Contractor for marking.

1.11 LIQUIDATED DAMAGES

- A. Substantial Completion - If the Contractor neglects, fails, or refuses to achieve Substantial Completion of the work by not later than 12 A.M. (Midnight), the Contractor shall pay to the Owner, Liquidated Damages in the amount of three hundred dollars (\$300.00) per calendar day for each and every day that the Contractor is in default after the date indicated on the Notice to Proceed.
- B. Final Completion - If the Contractor neglects, fails, or refuses to complete the work by not later than 12 A.M. (Midnight), the Contractor shall pay to the Owner, Liquidated damages, in the amount of three hundred dollars (\$300.00) per calendar day for each and every day that the Contractor is in default after the date indicated on the Notice to Proceed. Liquidated Damages for Substantial Completion and Final Completion are cumulative.
 - 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 an 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 Progress Payment should the construction progress fall behind schedule.
 - 2. Time is of the essence of each and every portion of this Contract and of the specification wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall be of the essence of this Contract.
 - 3. Extensions of time apply to Liquidated Damages only and shall be allowed only for conditions over which the Contractor has no control, such as acts of God, transportation strikes affecting the delivery of materials or equipment which are used in the project, manufacturing strikes affecting the production of materials or equipment which are used in the project, and weather above and beyond the normally expected loss of time-based on historical climatological conditions over the last 10 years. For any time requested over what should be expected based on historical climatological conditions the amount of rain or temperature must meet the following conditions. To get credit for delays due to temperature the temperature must be at a level that would prevent construction in accordance with the other sections in these specifications. In order to get credit for rain delay the rain event must be persistent for more

than four hours during that day and rainfall must be in excess of 0.5" for that 4-hour period or more than 1" during the day.

1.12 MATERIALS PRIOR APPROVAL AND SUBSTITUTIONS

- A. Where items of equipment and/or materials are specifically identified herein by a manufacturer's name, model, or catalog number, only such specific item may be used in the base bid, except as hereinafter provided.
- B. If Contractors wish to use items of equipment and/or materials other than those specifically identified in the Specifications, Contractor shall apply in writing to the Engineer for approval of substitution at least seven (7) days prior to the opening of bids, submitting with his request for approval complete descriptive and technical data on the item(s) he proposes to furnish.
- C. Approved substitutions will be listed in an addendum issued to all General Contractors prior to the opening of bids.
- D. Unless requests for changes in the Specifications are approved prior to the opening of bids, as defined above, the successful Contractor will be held to furnish specified items. After the contract is awarded, changes in specifications will be made only as defined under "Substitution of Equipment".

1.13 SUBSTITUTION OF EQUIPMENT AND MATERIALS

- A. After execution of the contract, substitution of equipment and/or materials other than those specifically named in the Contract Documents will be approved by the Engineer for the following reasons only:
 - 1. That the equipment or material is no longer available.
 - 2. That the equipment or material does not perform the function for which it was intended.
 - 3. That the equipment or material cannot be delivered due to conditions beyond the Contractor's control.
- B. To receive consideration, requests for substitutions must be in writing accompanied by documentary proof of equality, and difference in price and delivery, if any.
- C. In case of a difference in price, the Owner shall receive all benefits of the difference in the cost involved in any substitutions, and the contract altered by change order to credit the Owner with any savings so obtained.

1.14 INSPECTING AND TESTING OF MATERIALS

- A. Wherever in these Contract Documents inspecting and testing of material is called for, the selection of bureaus, laboratories, and/or agencies for such inspecting and testing shall be made by the Engineer, and the character of the test shall be stipulated by the Engineer. Documentary evidence satisfactory to the Engineer

that the materials have passed the required inspection and tests must be furnished in quadruplicate to the Engineer by the bureau, agency or laboratory selected. Materials satisfactorily meeting the requirements of the inspection or tests shall be approved by the Engineer and the Contractor notified of the results. The cost of such inspecting and testing shall be paid for by the Contractor.

1.15 ON-ITE TESTING AND INSPECTING

- A. Wherever in these Contract Documents testing or inspecting is called for, the selection of bureaus, laboratories, and/or agencies for such testing or inspecting shall be made by the Engineer. Documentary evidence satisfactory to the Engineer that the materials have passed the required tests or inspections shall be furnished in quadruplicate to the Engineer. The cost of such tests and inspections shall be paid for by the Contractor.

1.16 MEASUREMENTS AND DIMENSIONS

- A. Before ordering materials or doing work which is dependent on the proper size of installation upon coordination with site conditions, the Contractor shall verify all dimensions by taking measurements at the site and shall be responsible for the correctness of same. No consideration will be given to any claim based on differences between the actual dimensions and those indicated on the drawings. Any discrepancies between the drawings and/or specifications and the existing conditions shall be referred to the Engineer for adjustment before any work affected thereby is begun.

1.17 SHOP DRAWINGS

- A. Shop drawings shall be dated and contain: Name of the project; description and names of equipment, materials, and items; and complete identification of locations at which material or equipment is to be installed, reference to the section of the specifications where it is specified and drawings number, where shown. In addition to the above, the Shop drawings shall: (1) show complete information for checking and for fabrication, installation, and erection, without reference to other drawings or notes; (2) shall be of drafting line work and lettering that is easily readable under field conditions; (3) have plane oriented the same as plans on the Contract Drawings; (4) list grade, class, or strength of materials; (5) be checked and initialed by the suppliers drafting room checker; (6) be checked and coordinated with other phases of the work, by a person in the Contractor's employ who is experienced and qualified in the checking and coordination of shop drawings.
 1. No exceptions taken. (If checked here, fabrication may be undertaken. Approval does not authorize a change to contract sums unless stated in a separate letter or by change order.)
 2. Note markings. (If checked here, fabrication may be undertaken. The contractor is to coordinate markings noted.)
 3. Revise and resubmit.

4. Rejected.
 5. Engineer review is for conformance with the design concept of the project and compliance with the information given within the Contract Documents only. The Contractor is responsible for dimensions being confirmed and correlated at the site; for information that pertains solely to the fabrication processes or to means, method, techniques, sequence, and procedures of construction; and for coordination of the work of all trades.
 6. Failure to note a noncompliance will not prevent later rejection when the noncompliance is disclosed.
- B. Shop drawings shall not, after having been submitted, be later issued with revised or additional materials, except for items corrected during the checking by the Contractor or reviewed by the Engineer.
 - C. The following notation will be used by the Engineer in his review.
 - D. Submission of Shop drawings shall be accompanied by a transmittal letter in duplicate, containing the project name, Owner's project number, Contractor's name, and a number of drawings, title, and other pertinent data.
 - E. The Contractor shall promptly submit to the Engineer, five copies of Architectural items and six copies of Engineering items, required by the Contract Documents in accordance with the aforesaid schedule so as to cause no delay in his work or in the work of any other Contractor.
 - F. For standard items not requiring special shop drawings for manufacture, submit six copies of the manufacturer's product data showing illustrated cuts of the items to be furnished, scaled details, size dimensions, performance characteristics, capabilities, wiring diagrams, control, and all other pertinent information.
 - G. The Contractor shall: (1) check, coordinate, correct, stamp, date, and sign all copies of each drawing, and deliver them to the Engineer for his review; (2) identify the set of drawings he has checked; this set shall be shown by checked marks or correction that every item has been verified and with the requirements of the Contract Documents.

1.18 MAINTENANCE MANUAL

- A. Contractor shall, prior to completion of the contract, deliver to the Engineer, three copies of the manual, assembled and bound with a hardcover, for the Owner's guidance, full details for care and maintenance of visible surfaces and of equipment included in the contract.
- B. Contractor shall, for this manual, obtain from subcontractor, literature of manufacturers relating to equipment, including motors; also furnish cuts, wiring diagrams, control diagrams, instruction sheets, and other information pertaining to same that will be useful to Owner in overall operation and maintenance.

- C. Where the above-described manuals and data are called for under separate sections of the specifications, they are to be included in the manual description in this article.

1.19 ELECTRONIC MEDIA

- A. Contractor may request an electronic file of construction plans in its native AutoCAD format for convenience during construction. The initial cost for preparation of the file shall be \$1,000.00, due prior to receipt of the file. The contractor must subscribe to obtain all updates to the file when and if plans are modified. The cost for each update provided to the Contractor shall be \$200.00. Prior to receipt of the file, the Contractor must execute an Indemnification Agreement with P.C. Simonton and Associates, Inc. Transmission of the file to, or use by, any third party is prohibited.

END OF SECTION

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**SECTION 01150
MEASUREMENT AND PAYMENT**

PART 1- GENERAL

1.01 QUANTITIES

- A. Quantities: Quantities listed in the Proposal are approximate only and are intended to serve as a guide in comparing bids and may be increased or decreased without invalidating the unit price bid.
- B. Payment: The contractor shall be paid for actual in-place quantities as determined by the Engineer's field measurements.
- C. Discrepancies: In case of discrepancies between the figures shown in the unit prices and totals, the unit prices shall apply, and the totals shall be corrected to agree with the unit price.

PART 2 - MEASUREMENT AND PAYMENT

2.01 WATER MAIN

- A. Measurement: Measurement will be made along the centerline of the pipe trench and through fittings and specials. No deduction in length will be made for fittings or specials.
- B. Payment: Payment will be made on the basis of unit price bid per linear foot for specific line size. Unit price bid shall include all materials, labor, and equipment necessary to complete the water line installation. Work shall include, but not be limited to, trenching and excavation, necessary shoring and sheeting, furnishing and installing pipe, tracer wire, marker tape, backfilling and compaction, concrete blocking, bedding, pressure testing, disinfection, complete surface restoration, and cleanup.

2.02 CONNECT TO EXISTING WATER LINE

- A. Measurement: Measurement shall be made on the basis of each completed connection to the existing water line.
- B. Payment: Payment will be made on the basis of the unit price stated in the bid. The unit price bid shall include all materials, equipment, and labor necessary to complete the task. The task shall include, but is not limited to, locating the existing water line, excavation, connection to the existing including any fittings required, complete backfill and compactions and preparation of the surface for stabilization.

2.03 CONNECT TO EXISTING WATER LINE WITH METER AND BACKFLOW PREVENTER

- A. Measurement: Measurement shall be made on the basis of each completed connection to the existing water line.
- B. Payment: Payment will be made on the basis of the unit price stated in the bid. The unit price bid shall include all materials, equipment, and labor necessary to complete the task. The task shall include, but is not limited to, locating the existing water line, excavation, connection to the existing including meter, backflow preventer, any fittings required for the jumper connection, complete backfill and compactions and preparation of the surface for stabilization.

2.04 GATE VALVES

- A. Measurement: Measurement shall be made on the basis of each unit installed in accordance with the construction plans and specifications.
- B. Payment: Payment will be made at the unit price bid for a specific valve size. Unit price bid shall include furnishing all materials, labor, and equipment necessary to complete the gate valve installation. Work shall include, but not be limited to, excavation, necessary shoring, sheeting, backfilling, concrete valve box collar, furnishing and installing gate valves, valve boxes, pressure testing, disinfection, and complete surface restoration and cleanup.

2.05 FITTINGS

- A. Measurement: Measurement will be made on the basis of each ton of fittings installed based on the weight of the fitting and the accessory kit.
- B. Payment: Payment will be made at the unit price bid per ton of fittings installed in accordance with the plans or directed by the engineer. The price shall include all labor, equipment, and materials to complete the task. Work shall include, but is not limited to, furnishing the fitting, all bolts, accessories, trench, excavation, thrust blocking, pressure testing, surface restoration, and stabilization.

2.06 FIRE HYDRANTS

- A. Measurement: Measurement shall be made on the basis of each unit installed in accordance with the construction plans and specifications.
- B. Payment: Payment will be made at the unit price bid for each unit. Unit price bid shall include furnishing all materials, labor, and equipment necessary to complete the installation of the fire hydrants. Work shall include, but not be limited to, trenching, excavation, furnishing and installing hydrants including necessary barrel

extensions, concrete thrust blocking, thrust bracing with threaded rods, crushed stone, backfill, pressure testing, furnishing spare parts and wrenches as specified, disinfection, complete surface restoration, and cleanup.

2.07 TIE 1" POLY SERVICE TO EXISTING METER WITH DIRECT BURY

- A. Measurement: Measurement will be made on the basis of each linear foot of poly line service lateral installed and tie to the existing water meter using direct bury at the locations shown on the plans.
- B. Payment: Payment will be made at the unit price stated in the bid. The unit prices bid shall include all labor, materials, and equipment necessary to complete the installation, including, but not limited to, excavation, trenching, shoring and sheeting, dewatering, service Tees, Poly piping, pipe connections, reducers, backfill, compaction, and complete surface restoration.

2.08 TIE 1" POLY SERVICE WITH DIRECT BURY

- A. Measurement: Measurement will be made on the basis of each linear foot of poly line service lateral installed and tie to new water meter using direct bury at the locations shown on the plans.
- B. Payment: Payment will be made at the unit price stated in the bid. The unit prices bid shall include all labor, materials, and equipment necessary to complete the installation, including, but not limited to, excavation, trenching, shoring and sheeting, dewatering, service Tees, Poly piping, pipe connections, reducers, backfill, compaction, and complete surface restoration.

2.09 TIE 1" POLY SERVICE TO EXISTING WITH IMPACT MOLING

- A. Measurement: Measurement will be made on the basis of each linear foot of poly line service lateral installed and tie to new water meter using impact moling at the locations shown on the plans.
- B. Payment: Payment will be made at the unit price stated in the bid. The unit prices bid shall include all labor, materials, and equipment necessary to complete the installation, including, but not limited to, pit excavation, trenching, shoring and sheeting, dewatering, impact moling (torpedo bore), casing, service Tees, Poly piping, pipe connections, reducers, backfill, compaction, and complete surface restoration.

2.10 STRUCTURE RELOCATION

- A. Measurement: Measurement shall be made on the basis of the lump sum of the items to be removed or relocated.

- B. Payment: Payment will be made on the basis of the lump sum bid and the completion of the project. Partial payments will not be made. The project's completion will be determined by the engineer. Work shall include, but is not limited to, relocating existing structures to include mailboxes, signage, posts, and other structures that may impede construction, and includes the provision of temporary mailboxes throughout the construction process, and the replacement of damaged mailboxes or signs and posts, cleanup, and surface restoration.

2.11 PAVEMENT AND CONCRETE DRIVEWAYS REMOVAL AND REPLACEMENT

- A. Measurement: Measurement shall be made on the basis of each square yard of pavement and concrete driveway removed in accordance with the plans, specifications and bid documents.
- B. Payment: Payment will be made on the basis of the unit price stated in the bid. the work shall include, but is not limited to marking, cutting, and removal of pavement, concrete, or other material that exist and will not be used as part of this project, excavation, disposal at an approved site, backfill, compaction and surface restoration.

2.12 TRAFFIC CONTROL

- A. Measurement: Measurement shall be made on the basis of the percentage complete of the lump sum bid in accordance with the construction plans and bid items.
- B. Payment: Payment shall be made on the basis of the percentage complete of the lump sum price stated in the bid as determined by the project engineer. The lump sum shall include furnishing all labor, materials, and equipment necessary to complete the task. The task shall include, but is not limited to, the placing, moving, and maintenance of all signage, barricades, cones, barrels, flagging, flag men, and guide vehicles throughout the construction process to safely reroute traffic from existing traffic patterns. Traffic control shall be done in a manner to safely warn, reroute, and lead vehicles to their destination. Additional signage will be required if the engineer deems that the traffic control in place does not fully meet the required intent of the task. Changing of existing traffic patterns shall be communicated with the engineer no less than 48 hours prior to.

2.13 EROSION CONTROL AND GRASSING

- A. Measurement: Measurement will be made on the basis of the completed item of work. All hay bales and check dams will be measured by each item built and maintained in accordance with the plans and specifications.

- B. Payment: Payment will be made on the basis of the price bid for each item. Work shall include all equipment, material, and labor to complete the installation. This item will include but is not limited to trenching, grading, furnishing, and installing hay bales, and check dams; temporary and final stabilization; maintaining erosion and sediment control structures and facilities, and establishing a final stand of cover in accordance with the plans and specifications. Retainage on final grassing will be based on the engineer's estimate of the cost to complete the task, which may not be reflected in the contractor's bid price.

2.14 DOGHOUSE MANHOLE AND CONNECTION TO EXISTING SEWER SYSTEM

- A. Measurement: Measurement shall be made on the basis of the completed item in accordance with the construction plans and the technical specifications.
- B. Payment: Payment will be made at the price bid for the manhole installed and the connection to the existing sewer line. The price bid shall include all materials, equipment, and labor necessary to complete the task. The task shall include but is not limited to the location of the existing sewer line, excavation, shoring, sheeting, dewatering, gravel bedding, manhole doghouse, manhole cored with boot (required) to ensure a watertight connection, filling the bottom with concrete to form invert between all connections, complete backfill, and compactions, clean up, surface restoration and testing that may be required.

2.15 MANHOLE

- A. Measurement: Measurement shall be made on the basis of the manhole installed in accordance with the construction plans and the technical specifications.
- B. Payment: Payment will be made for each manhole installed at the unit prices stated in the bid. The unit price bid shall include all labor, materials, and equipment necessary, including, but not limited to, excavation, shoring, sheeting, dewatering, gravel bedding, manholes, riser sections, castings, inverts, stub outs, plugs, pipe connections, backfill, compaction, and complete surface restoration.

2.16 GRAVITY SEWERS

- A. Measurement: Measurement shall be made on the basis of each linear foot of gravity sewer line installed at the elevation and location designated on the construction plans.
- B. Payment: Payment for gravity sewers will be made at the unit price bid per linear foot. Unit price bid shall include furnishing all labor, materials, and equipment necessary to complete the sewer installation, including, but not limited to, trenching, bedding, PVC sewer pipe, shoring, and sheeting, dewatering, testing, backfill, trench compaction, complete surface restoration.

2.17 SEWER LATERALS, CONNECTIONS, AND CLEANOUTS

- A. Measurement: Measurement will be made on the basis of each lateral installed at the locations shown on the plans.
- B. Payment: Payment will be made at the unit price stated in the bid. The unit prices bid shall include all labor, materials, and equipment necessary to complete the

installation, including, but not limited to, excavation, trenching, shoring and sheeting, dewatering, PVC service Tees, PVC cleanouts with caps, pipe connections, reducers, backfill, compaction, and complete surface restoration.

2.18 GRASSING

- A. Measurement: Measurement shall be made on the basis of the completed item in accordance with the construction plans and bid items.
- B. Payment: Payment will be made in accordance with the price stated in the bid. The unit price shall include, but is not limited to, furnishing all labor, materials, and equipment necessary for the satisfactory growth of grass in all disturbed areas in accordance with plans and specifications. Work shall include, but not be limited to, furnishing all materials, fertilizer, soil samples, grass seed, raking, leveling, watering, maintenance, and final surface restoration. Final payment will not occur until permanent grass is established.

2.19 MOBILIZATION

- A. Payment: Payment will be made for the price as stated in the Contract once the Contractor has established his construction yard and met the requirements established in the Contract Documents. Mobilization will be recognized as complete once the Contractor has provided a construction schedule and moved his equipment and a substantial amount of material to the job site. Construction must be underway and progressing. Payment for mobilization will be limited to a maximum amount not to exceed 5.0% of the bid price.

END OF SECTION

SECTION 02221
TRENCH EXCAVATION, BACKFILL, AND COMPACTION

PART 1 – GENERAL

1.01 SCOPE, STANDARDS & DEFINITIONS

- A. Work under this section shall consist of furnishing all materials, equipment and labor for excavation, trenching and backfilling for utility systems. "Utility systems" shall include underground piping and appurtenances for water distribution systems, storm water drains, sewage collection systems, force mains, spray irrigation system and all other pipes and appurtenances shown on the drawings.

- B. Applicable Standards and Reference
 - I. ASTM D2321 Soil Classification and Restrictions
 - a. Class IA = Manufactured crushed stone, shell, crushed slag or rock, open graded, clean, large voids, contains no fines, can allow sand migration to create excessive settling. Suitable as drainage blanket.
 - b. Class IB = Manufactured aggregate dense graded, clean, crushed stone with sand and gradation present. Closer void so little migration of sand, little fines. Minimal migration of sand. Suitable as drainage blanket.
 - c. Class II = Coarse grained soils and sand, graded gravel and sandy mix, minimal migration of silt or sand, Use as drainage blanket and drains limited.
 - d. Class III = Coarse grain sand with fines, silty gravel, gravel-sand-silt mixture, clayey gravels, silty sand mixture. Not to be used in the presence of water.
 - e. Class IVA = Fine grain soils, inorganic, Inorganic silts and very fine sand, silty clayey fine sands, inorganic clay with minor plasticity, lean clay. Use only where no water exists and shallow fills.
 - f. Class IVB = Fine Grained soils inorganic, micaceous fine sand, silty soil, fat clay, clay with high plasticity. Use requires geotechnical evaluation.
 - g. Class V = Organic soils, clay and silt with organics. No permitted use other than top 6" outside roadways for soil amendment for grassing.

1.02 EXISTING UTILITIES

- A. Before opening trenches, the Contractor shall examine all available records and explore for the location of all sub-surface pipes, valves or other structures and reference such locations on the surface.
- B. In opening trenches, every effort shall be made not to interfere with these utilities structures. Expose existing piping by hand before excavating by machine. Excavate existing utilities sufficiently in advance of pipe laying to determine crossing arrangement. Slight deviations may be permitted in order to clear such structures. The Contractor shall be entirely responsible for the preservation of all underground or overhead utility lines and structures, such as gas, water, sewer lines, telephone conduit, power lines, etc., and shall replace, adjust or repair, without additional compensation, any such lines damaged or interfered with as a result of this construction.
- C. Schedule work to keep roads and utilities in usable condition; coordinating all operation with the Owner to avoid inconvenience insofar as practicable.

1.03 EXCAVATED MATERIAL

- A. All material to be excavated shall be classified as earth.

1.04 BORROW MATERIAL

- A. Any borrow material required to accomplish all levels, lines and grades indicated shall be furnished by the Contractor at no expense to the Owner.
- B. Borrow material shall be obtained from borrow pits off site.
- C. The Contractor shall pay for all soils analysis for borrow material.

1.05 TESTING

- A. All soil testing shall be performed by an Independent Testing Laboratory selected by the Engineer and paid for by the Contractor.

1.06 QUALITY ASSURANCE

- A. All excavation within the rights of way of city streets and county, State or Federal roadways, shall be backfilled in accordance with the then prevailing requirements of the Georgia Department of Transportation, Highway Division.

- B. Reference Standards: Methods of Sampling and Testing of American Association of State Highway and Transportation Officials (AASHTO).

PART 2 – EXECUTION

2.01 GENERAL EXCAVATION

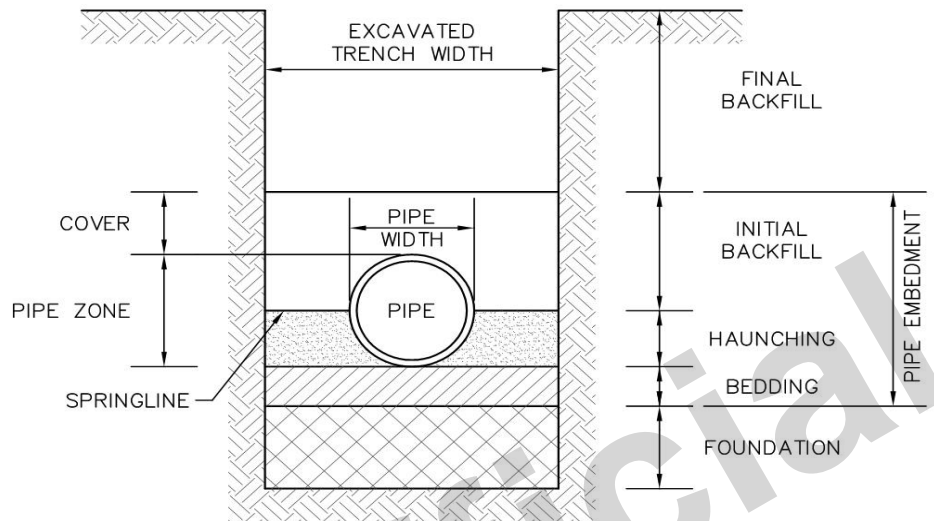
- A. The Contractor shall do all excavation of whatever substances encountered to depth shown on plans. Excavated materials not required for fill or backfill shall be removed from site as directed by the Engineer.
- B. Contractor is to excavate to provide 3 foot minimum cover over utility.
- C. Excavation for manholes and other accessories to have 12 inches minimum and 24 inch maximum clearance on all sides.
- D. Excavation shall not be carried below the required level.
- E. Where excavation is carried below grades indicated, the Contractor shall refill same to the proper grade with compacted earth or stone, or as directed by the Engineer.
- F. Banks of trenches shall be vertical.
- G. Width of trench shall be as shown on the plans. The bottom of trench for sewers and culverts shall be rounded so that an arc of the circumference equal to 0.6 of the outside diameter of the pipe rests on undisturbed soil.
- H. Bell holes shall be excavated accurately to size by hand.

2.02 UNSUITABLE BEARING MATERIALS

- A. Should unsuitable bearing materials be encountered at levels indicated and found to have insufficient bearing values the Engineer may order the excavation carried to lower depth.
- B. Compensation for the removal and/or replacement of unsuitable bearing materials shall be in accordance ASTM D2321 requirements.
- C. Excavation of unsuitable bearing materials shall not proceed until the conditions have been observed by the Engineer and written approval is given by the Owner.

2.03 PIPE BEDDING

- A. The following detail provides trench & pipe zone terminology.



PIPE BEDDING DETAIL
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- B. The trench floor should be constructed to provide firm, stable, and uniform support for the full length of the pipe. This can be accomplished by bringing the entire trench floor level grade and then creating bell holes at each joint to permit proper joint assembly, alignment and support. Portions of the trench that are excavated below grade should be returned to grade and compacted as required to provide proper support. If native trench soil is not suitable for pipe bedding, the trench should be over excavated and refilled with suitable foundation material either local sandy material compacted to 90% Std. Proctor or #57 stone depending on the presence of water and, as approved by the engineer. Bedding material shall be Class IB or II as defined in ASTM D2321. Large rocks or hard material should not be contained in the bedding area (minimum of 6") below the pipe.
- C. The most important factor in assuring proper pipe-soil interaction is the haunching material and its density. This material provides the majority of the support that the pipe requires to function properly in regards to deflection and performance. The

haunching material shall be placed and compacted under the pipe haunches as shown in the detail above. Proper control should be exercised to avoid deflecting the pipe from proper alignment. The same material that is used for bedding should be used for haunching and compacted to the same standards. Haunching material shall be Class IB or II as defined in ASTM D2321.

- D. Initial backfill, as shown in the detail above, shall be accomplished with suitable, compactable material and compacted in 6" layers. Material shall meet the requirements of Class Ib, II or III as restricted in ASTM D2321.
- E. Final Backfill will be accomplished by placing material in 12" lifts and compacting to a level determined by the final use of the area above the pipe. Final backfill in roadways shall require placement of suitable Class IA, IB, II and III backfill material, placed in 12" lifts and compacted to 100% standard proctor (ASTM Test D-698). Final Backfill outside of roadways shall be Class II, III or IVA and lightly compacted to avoid settling in the future. The top 6" of the final backfill, outside of roadways, shall be suitable for establishing a final grassed surface.
- F. Material used in the "trench & pipe zone" shall be restricted as per the limitations and restrictions as outlined in ASTM D2321

2.04 BRACING AND SHORING

- A. The Contractor shall do all bracing, sheeting and shoring necessary to perform and protect all excavations as required for safety.
- B. Sheeting driven alongside the pipe should be cut off and left in place to an elevation 1.5 feet above the top of the pipe.
- C. All other sheeting shall be removed as directed by the Engineer.

2.05 DEWATERING FOR EXCAVATION

- A. The Contractor shall pump or remove any water accumulated in any excavated area and shall perform all work necessary to keep excavations clear of water while foundations, structures or any masonry are being constructed or while pipe is being laid.
- B. No structure or pipe shall be laid in water, and water shall not be allowed to flow over or rise upon any concrete or masonry or piping until same has been inspected and the mortar or joint material has cured.

- C. No extra compensation will be allowed for removal of water.
- D. All water pumped or bailed from the trenches or other excavation shall be conveyed to a point of discharge where it will neither cause a hazard to the public health, nor damage to the public or private property, or to work completed or in progress.

2.06 BACKFILL

- A. The soil at the sides of a pipe and above it is the backfill.
- B. Prior to backfilling any excavation, all piping and structures shall be observed by the Engineer.
- C. After pipes have been tested and approved, backfilling shall be done with approved material free from large clods or stones.
- D. Backfill shall be placed in uniform layers, four inches thick, on both sides of the pipe and thoroughly compacted with pneumatic or hand tampers. The backfill shall be brought up uniformly on both sides of the pipe and compacted to an elevation of one foot above the top of the pipe, after which the fill shall be placed in eight inch lifts. No rock will be allowed in the backfill within a distance of one foot from the pipe, and rock larger than six inches in the greatest dimension will not be permitted in any part of the trench or backfill.
 - 1. Backfill shall be compacted to not less than 95% of the maximum dry weight per cubic foot as determined by AASHTO Method T-99 (Standard Proctor Test).
 - 2. The top 18 inches of backfill under any paved area shall be compacted to 100% Standard Proctor.
 - 3. Water settling will not be permitted in clay soils. It may be required at the option of the Engineer in sandy soils.

2.07 REPLACING PAVEMENTS

- A. Subgrades shall be compacted with a mechanical tamper.
- B. The minimum width of replaced concrete pavements shall be 4 feet at interiors and 6 feet at joints and constructed as shown on Standard Details. Avoid cutting pavements at joints; if unavoidable, reconstruct same as original joint. Depth shall be equal to the original thickness. Existing pavements edges shall be cut vertical.
- C. Use high-early-strength cement if road is to be opened in less than 3 days.
- D. The minimum width of replaced bituminous pavements shall be 3 feet with 8 inch concrete patch. The existing pavement shall be cut vertically and horizontally to a straight line. The 8 inch concrete patch shall be minimum 3,000 psi concrete containing black dye and shall be flush with the existing pavement.

END OF SECTION

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**SECTION 02520
STORM DRAINAGE AND APPURTENANCES**

PART 1 - GENERAL

1.01 APPLICABLE STANDARDS

- A. Appurtenances shall be constructed in accordance with the referenced Georgia Department of Transportation Standard Drawings.
- B. American Society for Testing and Materials (ASTM):
 - C- 32 Specification for Sewer and Manhole Brick.
 - C- 76 Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
 - C-144 Aggregate for Masonry Mortar.
 - C-270 Mortar for Unit Masonry
 - C-443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
 - C-913 Specification for Precast Concrete Water and Wastewater Structures
 - C-536 Test for Continuity of Coatings in Glassed Steel Equipment by Electrical Testing.
- C. Only reinforced concrete pipe will be allowed under roadways or frequently traveled areas.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Roadway Storm Drainage Pipe: Pipe shall be reinforced Concrete Pipe which conforms to ASTM Specification C-76 and shall be of sizes shown. Pipe shall be Class III minimum and as indicated on GA. D.O.T. Standard 1030 D.
- B. Non-Roadway Storm Drainage Pipe: Pipe shall be one of the following:
 - 1. Corrugated metal pipe shall conform to AASHTO designation M-36, AREA Manual 1-4 requirements for corrugated metal culverts, or Federal Specification QQ-C- 806, with the following applicable requirements:
 - a. The outside and inside surfaces of the corrugated metal pipe shall be completely coated with bituminous material with a minimum thickness of 0.05 inch at the crest of the corrugations. Immediately prior to the application of the bituminous coating, the corrugated metal pipe shall be cleaned of all dirt, grease, mill scale, or loose rust and shall be dry.

- b. The outside and inside surfaces of the corrugated metal pipe shall be completely coated with a pure aluminum coating metallurgically bonded by an alloy layer between the steel and the aluminum. The coating shall be applied at a minimum of 1 oz./sq.ft., 2 mils. each side. The weight of aluminum (total both sides) shall be as follows: Minimum check limit triple-spot test=1.00 oz/sq feet, minimum check limit single-spot test=0.90 oz/sq feet. The aluminized steel pipe shall be Armco Aluminized Steel Type 2 or equal.
 - c. All rivets shall be placed in the inside valley of the corrugations. The interior coating shall be protected against damage from insertion or removal of struts or tie wires. Lifting lugs, where used, shall be so placed as to facilitate moving the pipe without damage to the exterior or interior coating. All lateral pipe shall be sixteen (16) gauge. All pipe under possible traffic areas will be twelve (12) or fourteen (14) gauge as indicated.
 - d. To facilitate field jointing, the ends of pipes with helical corrugations shall be rerolled to form circumferential corrugations from the end. The diameter of the reformed ends shall not exceed that of the pipe barrel by more than the depth of the corrugation.
2. Polyvinyl chloride (PVC) pipe shall be manufactured and tested in accordance with specification for "Poly (Vinyl Chloride) PVC Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter." The pipe and fittings shall be made of PVC plastic and shall have a smooth (not ribbed or corrugated) inside surface.
- a. All pipe shall be bell and spigot. The bell shall consist of an integral wall section or an internal plastic sleeve. The solid cross section rubber ring shall be factory assembled on the spigot. Size and dimensions shall be as shown on the plans. Standard laying length shall be 13 feet \pm 1 inch.
 - b. All fittings and accessories shall be as manufactured and furnished by the pipe supplier or approved equal and have bell and/or spigot configurations compatible with that of the pipe.
 - c. Pipes shall be designed to pass all tests described herein at 73° F (\pm 3° F).
 - d. The pipe stiffness shall equal or exceed 10 psi when tested in accordance with ASTM D 2412.
3. High density Polyethylene (HDPE) pipe shall be manufactured for use in nonpressure storm sewer. The pipe shall be manufactured to meet AASHTO M294, Type 'S' for 12" through 36" and AASHTO MP6-96, Type 'S' OR 'D' for 42" and 48" pipe. The pipe and fittings shall be made from HDPE material and shall have a smooth (not ribbed or corrugated) inside surface.
- a. All pipe shall be bell and spigot. The bell shall be an integral part of the pipe. The joint shall use a gasket to form a water tight connection meeting ASTM D3212. Gaskets shall be installed in the bell or in the spigot by the manufacturer. The use of Silt tight fittings may be requested in lieu of water tight connection if approved by the engineer.

- b. All fittings shall conform to AASHTO M294 or MP6-95. Fabricated fittings shall be welded on the interior and exterior at all junctions.
- c. Pipe and fittings material shall be high-density polyethylene meeting ASTM D3350.
- d. Installation shall be in accordance with ASTM D2321.
- e. Pipe may be Advanced Drainage System, Inc., N-12 or N-12 HC or Hancor Sure Lok 10-8 pipe.
- f. HDPE end sections are NOT allowed.

C. Pipe Joints:

- 1. Joints for concrete pipe shall be one of the following types:
 - a. Bell and spigot with rubber gaskets.
 - b. Tongue and groove with rubber gaskets.
 - c. Tongue and groove with preformed plastic gaskets.
- 2. Rubber Gaskets shall conform to ASTM Specification C443. Only a neutral agent shall be used as a lubricant. Preformed Plastic Gaskets shall conform to Federal Specification SS-S210, Type I-rope form.
- 3. Field joints of corrugated steel pipe shall maintain pipe alignment during construction and prevent infiltration of side material during the life of the installation. Circumferential and longitudinal strength shall be provided in accordance with the structural joint performance criteria of Division 2, Section 23 of the AASHTO standard specification for Highway Bridges. The bands shall be constructed in such a manner that will effectively engage the pipe ends. Coupling bands shall not be more than 3 nominal sheet thicknesses lighter than the thickness of the pipe to be connected and in no case lighter than 0.052 inches. Bolts and nuts for coupling bands shall conform to the requirements of ASTM Designation: A307.

Bands shall be furnished to lock with the circumferential corrugations, including rerolled end helical pipe. The corrugated bands shall be not less than 7 inches wide for diameter 4 to 36 inches, inclusive, and not less than 10 1/2 inches wide for all other pipe diameters.

NO DIMPLE BANDS WILL BE ALLOWED.

- 4. Joints for PVC pipe must be an integral bell gasketed joint which forms a silt tight joint.

D. Precast Concrete Manhole Sections:

ASTM C913, except that spacing of manhole steps or ladder rungs shall not exceed 12 inches.

- E. Masonry Manholes: Shall be constructed of the following materials:
 - 1. Brick: ASTM C32, Grade MS
 - 2. Mortar of Masonry: ASTM C279, Type M.
 - 3. Aggregate for Masonry Mortar: ASTM C144.
 - 4. Water for Masonry Mortar shall be fresh, clean and potable.
- F. METALS
 - 1. Frames, Covers, and Grating: Frames, covers, and grating shall conform to AASHTO M-306-07 and shall be of grey iron castings.
 - 2. Manhole Steps: Manhole steps shall be constructed of a number of 3 reinforcing bar encapsulated in polypropylene plastic with a non-skid tread. Finished dimensions of the steps shall be identical to that of malleable iron manhole steps. Steps to have a minimum tread width of 12 inches.

2.02 DELIVERY AND STORAGE

- A. Storm Drainage Pipe: Care shall be exercised in loading and unloading pipe, fittings, specials and castings at all times in order to avoid shock and damage to the materials. Lifting shall be by hoist or by rolling on skids. Dropping will not be permitted. The Contractor shall be responsible for the safe handling of all materials and no damaged materials shall be used in the work. Materials shall be inspected upon arrival at the site, and any damaged or defective materials shall be immediately removed from the site. All materials shall be stored above grade.
- B. Cementitious Materials: Cementitious materials in bags shall be stored in enclosed structures; floors shall be elevated above the ground a distance sufficient to prevent the absorption of moisture.
- C. Metal Items: Metal items, including reinforcing steel, shall be stored above grade in a manner which will not cause excessive rusting or coating with grease or other objectionable materials.
- D. PVC Pipe: PVC pipe shall be stored protected from sun light by means of covering the pipe or storing inside a building or under a covered shed. Any pipe showing signs of prolonged outside storage (i.e., faded exterior color or signs of drying) shall be rejected.
- E. Aggregates: Aggregates shall be stored on areas to prevent the inclusion of foreign material. Aggregates of different sizes shall be stored in separate piles. Stockpiles of coarse aggregate shall be built in horizontal layers not exceeding 4 feet in depth to minimize segregation. Should the coarse aggregate become segregated, it shall be remixed to conform to the grading requirements.
- F. Brick, Concrete Masonry Units and Precast Concrete Manholes: Brick, concrete masonry units and precast concrete manholes shall be handled with care to avoid chipping and breakage, and shall be stored to protect them from contact with the earth and exposure to the weather, and shall be kept dry until used. Masonry units or precast concrete containing frost or ice shall not be used.

PART 3 - EXECUTION

3.01 DRAINAGE PIPE

- A. Each section of pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used.
- B. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. Pipe shall be laid true to line and grades indicated and shall rest upon the pipe bed for the full length of each section. Runs of pipe shall be laid with outside bells or grooved ends up-grade beginning at the lower end of the pipe line. Pipe having its grade and/or joint disturbed after laying shall be removed, cleaned, and relayed.
- C. When pipes are protected by head walls or connect with drainage structures, the exposed ends of the pipe shall be placed or cut flush with the inside face of the structure. After the pipe is cut the rough edges shall be smoothed up in an approved manner. All pipe shall be laid so that markings are on top and the inner surfaces abut neatly, tightly and smoothly.
- D. All pipe in place shall be observed by the Engineer before being covered and concealed unless this requirement is waived by the City Inspector and the Design Engineer. Contractor shall clear all pipe of silt debris prior to final acceptance.

3.02 CORRUGATED METAL PIPE JOINTS

- A. Corrugated metal pipe shall be butted to form a smooth joint; the space between the pipe and coupling bands shall be kept free from dirt and grit so that the corrugations fit snugly. The coupling band while being tightened shall be tapped with a soft head mallet of wood, rubber or plastic to take up slack and insure a tight joint. Coupling band bolts and damaged areas of the coupling bands and pipe shall be given a coating of bituminous cement. Pipe on which the asphalt coating has been damaged to such extent that satisfactory field repairs cannot be made will be replaced.

3.03 CONCRETE PIPE JOINT

- A. Joint installation shall be in accordance with the recommendations of the manufacturer of the joint material. Surfaces to receive lubricants, cements or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installation of the pipe, and any loose or improperly affixed gaskets and jointing materials shall be removed and replaced.
- B. The pipe shall be aligned with the previously installed pipe, and the joint pulled together. If, while making the joint, the gasket or jointing material becomes loose and can be seen through the exterior joint recess when the joint is pulled up to within one inch of closure, the pipe shall be removed and the joint remade.

3.04 MASONRY WORK

- A. Mortar for Masonry: Mortar for brick masonry, rubble stone masonry, and for bedding cast iron frames in masonry shall be Type M, conforming to ASTM C270.
- B. Mortar for pargetting Masonry Walls: Mortar for pargetting masonry walls below grade shall be Type M, conforming to ASTM C270.
- C. Brickwork: Brick in circular walls shall be laid in all header courses to form full and close mortar joints, ends and sides in one operation. Vertical joints shall be radial from the center. Brickwork around pipe inlets and outlets shall not be allowed. Gaps shall be poured with concrete.
- D. Masonry Structures: Masonry structure walls shall be constructed of brick, concrete masonry units or precast concrete structural sections.

3.05 PRECAST CONCRETE

- A. Walls shall be constructed on a footing of cast-in-place concrete, except that precast concrete base sections may be used for precast concrete structure risers. Precast base sections shall conform to the applicable requirements for precast risers and tops in ASTM C913. Mortar that has hardened to the extent that it cannot be made workable without the addition of water shall not be used. Thickness of parget shall be not less than 1/2 inch. No pargetting will be permitted on the inside of structures. Pargetting will not be required for precast concrete structures. Joint work inside masonry structures shall be smooth.
- B. One course of brick work is allowed for leveling and adjustment. All other adjustments must be poured in place concrete with a maximum height of 24 inches.
- C. For single and double wing catch basins a concrete pad shall be poured 4 inches thick with a minimum slope of 1" per foot away from the curb and gutter and towards the box.

3.06 METAL WORK

- A. Iron and steel shall be formed to shape and size with sharp lines and angles. Shearing and punching shall produce clean true lines and surfaces. Casting shall be sound and free from warp, cold shuts, and blow holes that may impair their strength or appearance. Exposed surfaces shall have a smooth finish and sharp well-defined lines and arises. The necessary rivets, lugs, and brackets shall be provided.

3.07 FIELD TEST

- A. A light held in a drainage structure shall show a practically full circle of light through the pipe when viewed from the adjoining end of the line.
- B. Lines under pavements shall be tested for infiltration by means of a suitable weir or other measurement device as directed by the Owner. When determination of infiltration is not practicable because of dry trench conditions, an exfiltration test shall be applied by filling with water so that the hydraulic head will be at least 6 inches above the crown of the upper end and of the section being tested. The amount of

leakage (infiltration or exfiltration) shall not exceed 100 gallons per inch of diameter per day per mile of pipe.

END OF SECTION

Unofficial

**SECTION 02530
SANITARY SEWER COLLECTION SYSTEM**

PART 1 – GENERAL

1.01 SCOPE

- A. This section of the Specifications describes products to be incorporated into the sanitary sewer collection system and requirements for the installation and use of these items. The Contractor shall furnish all products and perform all labor necessary to fulfill the requirements of these Specifications. It includes but is not limited to the construction of the following items.
 - 1. Sewer pipes and force mains
 - 2. Manholes
 - 3. Connection to Sewerage System
 - 4. All necessary appurtenances to collect the wastewater and deliver it to the wastewater treatment plant.

1.02 RELATED WORK

- A. Section 01700 — Restoration of Improvements
- B. Section 02300 — Earthwork
- C. Section 02315 — Excavation, Trenching & Backfilling for Utilities
- D. Section 02350 — Sheeting, Shoring, and Bracing
- E. Section 02370 — Soil Erosion & Sediment Control
- F. Section 02920 — Grassing

1.03 REFERENCES

- A. ASTM D 3740-94a — Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction.
- B. ASTM E 329-93b — Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
- C. ASTM D 3034-94 — Type PSM PVC Sewer Pipe and Fittings.
- D. ASTNI D 2321-89 — Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Installations.
- E. ANSI/AWWA C 150/A-21.50-96 — Thickness Design of Ductile Iron Pipe.

- F. ANSI/AWWA C 151/A-21.51-91 — Ductile Iron Pipe, Centrifugally Cast, for Water or Other Liquids.
- G. ASTM A 746-95 — Ductile Iron Gravity Sewer Pipe.
- H. ASTNI D 3212-92 — Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- I. ASTN F 477-95 — Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- J. ASTM D 3139-95 — PVC Pressure-Rated Pipe (SDR-Series).
- K. ASTM D 3139-95 — Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seams.
- L. ASTM D 139-93a — Electric-Fusion (Arc) Welded Steel Pipe (NPS 4 and over).
- M. ASTM C 478-94 — Precast Reinforced Concrete Manhole Sections.
- N. ASTN C 443-94— Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
- O. ACI 318-89 — Building code Requirements for Reinforced Concrete.
- P. ASTM C 39-94 — Compressive Strength of Cylindrical Concrete Specimens.
- Q. ASTN C 890-91 — Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
- R. ASTM C 891-90 — Installation of Underground Precast Concrete Utility Structures.
- S. ASTNI C 913-89 — Precast Concrete Water and Wastewater Structures.
- T. ASTM A 615/A 615 M-95b — Deformed and Plain Billet — Steel Bars for Concrete Reinforcement.
- U. ANSI/AWWA C-500-93 — Metal-Seated Gate Valves for Water Supply Service.
- V. ANSI/AWWA C-509-94 — Resilient-Seated Gate Valves for Water Supply Service.
- W. AASHTO T 191-91 — Density of Soil in-Place by the Sand-Cone Method.
- X. ASTM D 2922-91— Test Methods for Density of Soil and Soil Aggregate in Place By Nuclear Methods (Shallow Depths).
- Y. ASTM D 1557-91 — Laboratory Compaction Characteristics of Soil Using Modified Effort.
- Z. ASTNI D 1556-90 — Density and Unit Weight of Soil in Place by the Sand Cone Method.

- AA. ASTM D 714-87 (Re-approved 1994) — Evaluation Degree of Blistering Paints.
- BB. ASTM D 2794-93 — Resistance of organic Coatings to the Effects of Rapid Deformation (Impact).
- CC. ASTM E 96-95 — Water Vapor Transmission of Materials.
- DD. ANSI/AWWA C 111/A 21.11-95 — Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
- EE. ASTM A 377-95 — Index and Specifications for Ductile Iron pressure Pipe and Fittings.
- FF. ANSI/AWWA C 600-93 — Installation of Ductile Iron Water Mains and their appurtenances.
- GG. ASTM C890-73 (Latest Revision) — Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete for Water and Wastewater Structures.
- HH. ASTM C891-78 (Latest Revision) — Standard Practice for Installation of Underground Precast concrete Utility Structures.
- II. ASTM C913-79 (Latest Revision) — Precast Concrete Water and Wastewater Structures.
- JJ. 1990 Edition of the Recommended Standards for Wastewater Facilities, Great Lakes— Upper Mississippi River Board of State Public Health and Environmental Manages, Section 38.31.

1.04 OPTIONS

- A. The specifications describe several materials. Where manufacturers and models of equipment are named in the specification, it is intended that these are to describe the quality and function required. The Contractor may use equipment or materials of other manufacturers provided they are reviewed and accepted by the Engineer and the Owner as meeting the specifications.
- B. The Contractor will furnish the Engineer and the Owner a description of all materials before ordering. The Engineer will review the Contractor's submittals and provide in writing an acceptance or rejection of material. However, an acceptance of any material by the Engineer does not relieve the Contractor of this responsibility to meet the requirements of the construction plans or these specifications.

1.05 QUALITY ASSURANCE

- A. Material and equipment shall be the standard product of a manufacturer who has manufactured them for a minimum of 2 years and who provides published data on the quality and performance of the project.

- B. A Subcontractor for any part of the work must have experience on similar work and if required, furnish the Engineer with a list of projects and the Owners or Engineers who are familiar with his competence.
- C. Devices, equipment, structures, and systems not designated by the Engineer that the Contractor wishes to furnish shall be designed either by a registered professional engineer or by someone the Engineer approved as qualified. If required, complete design calculations and assumptions shall be furnished to the Engineer or the Owner before acceptance.
- D. All testing of the piping shall be made by the Contractor with equipment qualified by the Owner, Engineer, or utility company and in the presence of the Engineer, Owner and utility company. The Engineer or his representative reserves the right to accept or reject testing equipment.
- E. Soil testing shall be done by a testing laboratory regularly engaged in soil testing and shall be approved by the Engineer prior to engagement. Mill certificates of test on materials made by manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test.
- F. The details of all welded joints shall comply with all of the requirements for joints, which are accepted without qualification test under the "Code of Arc and Gas Welding in Building Construction of the American Welding Society". Workmanship shall conform to A.I.S.C. Specifications for Fabrication and Erection. All work shall be executed by skilled workmen under experienced supervision. All welding shall be done by welders who have been previously qualified by tests as prescribed in the "American Welding Society Standard Qualification Procedure" to perform the type of work required. Welders shall have passed the qualification test (Qualification tests using procedures covered in AWSS B3.0 Part II) within the preceding 12 months.

1.06 PRODUCT DELIVERY, STORAGE & HANDLING

- A. The Contractor shall be responsible for handling and storage of all materials and damaged materials shall not be used in the work. Materials delivered to the site shall be promptly inspected for damage upon arrival. Damaged or defective materials to be immediately removed from the site.
- B. All materials to be stored at least 12 inches above grade. Inside of pipes and fittings shall be kept free of dirt and debris. Rubber gaskets and plastic pipe not used immediately shall be protected from direct sunlight. Manhole units shall be handled with care to avoid chipping or breakage.

1.07 ALTERNATIVES

- A. The intention of these specifications is to produce the best system for the Owner. If the Contractor suggests that alternate material, equipment or procedures will improve the results at no additional costs, the Engineer and the Owner will

examine the suggestion and if it is accepted, it may be used. The basis upon which acceptance of an alternative will be given is its value to the Owner, and not for the convenience of the Contractor.

1.08 GUARANTEE

- A. The contractor shall guarantee the quality of the materials, equipment, and workmanship for 12 months after acceptance of the completed Project. Defects discovered during that period shall be repaired by the Contractor, at no cost to the Owner. The Performance Bond shall reflect this guarantee.

1.09 EXISTING UTILITIES

- A. All known utility facilities are shown schematically on plans and are not necessarily accurate in location as to plan or elevation. Utilities such as service lines or unknown facilities not shown on plans will not relieve the contractor of his responsibility under this requirement. "Existing Utilities Facilities" means any utility that exists on the projects in its original, relocated or newly installed position. The Contractor will be held responsible for the cost of repairs to damaged underground facilities, even when such facilities are shown on the plans. The Contractor shall contact all utility companies prior to beginning work and request an accurate field location of their respective utility lines.
- B. Damage to any part of the existing utilities by the Contractor or Subcontractors that is repaired by the user's and/or Owner's forces shall be charged to the Contractor on the basis of time and material, plus 15% for overhead and administration.

1.10 SEQUENCING AND SCHEDULING

- A. The Contractor shall arrange his work so that sections of sewers between manholes are backfilled and tested, pavement replaced if required, and the section placed in service as soon as reasonable after it is installed.

1.11 ACCEPTANCE OF PORTIONS OF WORK

- A. The Owner reserves the right to accept and use any portion of the work whenever it is considered in the public interest to do so.

1.12 RECORD DATA

- A. It will be required of the Contractor to keep accurate, red-lined legible records of the location of any deviations from the construction drawings, any additional items or structures to the construction drawings. These records will be made available to the Engineer before his inspection for incorporation into the Engineer's Record Drawings.

1.13 ENVIRONMENTAL PROTECTION

- A. The bypassing of raw wastewater onto the ground or into a receiving stream is prohibited.

1.14 CONFINED SPACE ENTRY

- A. The Contractor shall be responsible for conforming to all rules and regulations and providing all necessary safety equipment, harnesses, hoists, gas detectors, etc. to comply with O.S.H.A. confined space entry requirements.

PART 2 - PRODUCTS

Products and materials used in the work shall conform to the following:

2.01 SANITARY SEWER PIPE

A. Ductile Iron Pipe

1. Ductile Iron Pipe shall conform to ANSI A21.50 (AWWA C-150) latest revision, ANSI A21.51 (AWWA C-151) latest revision, and ASTM A746. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. All ductile iron pipes and fittings shall be bituminous coated on the outside, and lined with Protecto 401 Ceramic Epoxy or equivalent on the inside. Sizes shall be as shown on the drawings. Pipe 4" — 12" in diameter shall be Pressure Class 350, pipe 14" — 20" in diameter shall be Pressure Class 250, pipe 24" in diameter shall be Pressure Class 200, and pipe larger than 24" in diameter shall be Pressure Class 150.
2. Coating on the outside shall be an asphaltic coating approximately 1 mil thick in accordance with AWWA C151. The finished coating shall be continuous, smooth, neither brittle when cold or sticky when exposed to the sun, and shall be strongly adherent to the iron.
3. Protecto 401 Ceramic Epoxy or equivalent interior lining is a two component, modified epoxy formulated for corrosion control and shall conform to the following requirements:
4. Conform to ASTNI E96, ASTM D714, ASTN D2794, and ASTM G53.
5. The ability to build at least 40 mils dry in one coat.
6. The material shall be recoatable with itself for at least seven days with no additional surface preparation when exposed to direct summer sun and a temperature of 90 degrees F.
7. The material shall contain at least 20 percent by volume of ceramic quartz
8. A test and service history demonstrating the ability of the material to withstand the service expected.
9. Possesses a minimum solids volume content of 88 percent, + one percent.

10. Possesses a maximum drying time to allow recoating as follows: 50 degrees F-72 hours; 75 degrees F-18 hours; 90 degrees F-8 hours. If recoating cannot be accomplished within seven days, a light brush blast shall be performed to improve intercoat adhesion.

B. Polyvinyl Chloride (PVC) Pipe

1. Polyvinyl Chloride (PVC) Pipe — Shall be unplasticized polyvinyl chloride with integral wall bell and spigot joints with a rubber ring gasket. Pipe and fittings shall meet the requirements of ASTM-D 3034 SDR 26 for use as a gravity sewer main. Pipe 18" and larger shall conform to ASTM F679. Sewer laterals shall meet the requirements of ASTM-D 3034 SDR 35. All pipe must be installed in accordance with ASTM D 2321, with additional bedding as required in these specifications or project details. All sewer pipe shall be green. Sizes and dimensions shall be as shown in the following table.

Nominal Size	Outside Diameter		Minimum Wall Thickness SDR-35 (Laterals only)	Minimum Wall Thickness SDR-26
	Average	Tolerance		
4"	4.215	A0.007	0.120	0.162
6"	6.275	TO.009	0.180	0.241
8"	8.400	60.010	0.240	0.323
10"	10.500	TO.013	0.300	0.404
12"	12.500	TO.016	0.360	0.481
15"	15.300	TO.210	0.437	0.588

2. Minimum pipe stiffness (F/Y) at 5% deflection shall be 46 psi for all sizes when tested in accordance with ASTM D2412.
3. PVC gravity sewer pipe shall be supplied in lengths no longer than 13 feet.
4. Each length of pipe shall be marked with the manufacturer's name, trade name, nominal size, class, hydrostatic test pressure, manufacturer's standard symbol to signify it was tested, and date of manufacture. Each rubber ring shall be marked with the manufacturer's identification, the size, the year of manufacture, and the classes of pipe with which it can be used.

2.02 PIPE JOINTS (GRAVITY SEWER)

- A. Ductile Iron Pipe (D.I.) — Shall be flexible rubber gasket Type II, or mechanical joint Type III, conforming to ASA Specification A21.11.
- B. Polyvinyl Chloride (PVC) Pipe — Shall be flexible gasket joints for PVC sewer pipe and shall be compression type conforming to ASTM D-3212. The gasket shall conform to ASTM F-477.
- C. Transition Joints — The transition between sewer pipes of different materials shall be made by special adapters made for that purpose. Adapters shall be flexible couplings as manufactured by "Fernco" or "Mission" or approved equal. Concrete

collars will only be permitted only if flexible couplings are not available in sizes needed.

2.03 FORCE MAINS

- A. Polyvinyl Chloride (PVC) Pipe — Shall conform to ASTM D 2241 and C-900. The pipe shall have a Standard Dimensional Rating (SDR) of 21 and be of Class 200 psi. PVC pipe shall be the color green and be supplied in 20-foot nominal lengths. C900 is also acceptable.
- B. Pipe shall be extruded from clean rigid, approved class 12454-A PVC compound conforming to ASTM resin Specification D-1784. Pipe shall have single rubber gasket push-on joint conforming to ASTM D3139.
- C. Ductile Iron Pipe (D.I.) — Shall be in accordance with paragraph 2.1-A of this section and conform to ASTM A 377. Joints shall be flexible rubber gaskets Type II, or mechanical joint Type III, conforming to ASA Specification A21.11.
- D. Fittings — All fitting shall be ductile iron, epoxy lined with P401 epoxy, compact in weight and size, meeting the requirements of AWWA C110/ANSI A21.10, or AWWA C153/ANSI A21.4, and with a minimum rated working pressure of 250 psi. Fittings shall be mechanical joint or flange joint where indicated on the Drawings. They shall be furnished with a bituminous outside coating. Special adapters shall be provided, as recommended by the manufacturer, to adapt PVC pipe to mechanical jointing with cast or ductile iron pipe, fittings or valves.
- E. Thrust Blocking — Thrust blocks should only be used when restraining joints are not an option. Concrete having compressive strength of not less than 3000 psi shall be used as a cradle or thrust blocking where shown on the plans or where directed by the Engineer. Bends exceeding 22-1/4 degrees, crosses with one opening plugged, and all tees shall be backed with concrete as a thrust block. Blocking shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on ground in each instance shall be that shown on the plans. The blocking shall be so placed that the pipe fitting joints will be accessible for repair. No extra payment will be made for the thrust blocks.
- F. Restrained Joint — Restrained joints for pipe, valves and fittings shall be mechanical joints with ductile iron retainer glands equivalent to “Megalug” or push-on type joints equivalent to “Lok-Ring”, “TR Flex” or “Super Lock” and shall have a minimum rated working pressure of 250 psi. The joints shall be in accordance with the applicable portions of AWWA C 111. The manufacturer of the joints shall furnish certification, witnessed by an independent laboratory, that the joints furnished have been tested at a pressure of 500 psi without signs of leakage or failure. Restrained joints shall be capable of being deflected after assembly.

2.04 MANHOLES

- A. Precast Concrete Manholes — shall be Precast reinforced concrete manholes that meet the requirements of ASTM C478 and the details contained in the project drawings. The minimum compressive strength of the concrete in Precast sections shall be 4000 psi. A 1/10' minimum drop shall be required through all manholes.

1. Joints — shall be tongue and groove sealed with flexible gaskets or mastic sealant. Gaskets shall be O-Ring or Type A or B “Tylox” equivalent to ASTI\C443; mastic shall be “Ram-nek” with primer. The “Ram-nek” primer shall be applied to all contact surfaces of the manhole joint at the factory in accordance with the manufacturer’s instructions.
2. Manhole Boots — Provide Neoprene boot seal where sewer enters the manhole. Holes for pipes entering and leaving the manholes shall be core-drilled at the plant location or in the field. Knocking out of holes in the field shall not be permitted.
3. External Joint Seals
 - a. All external manhole joints shall be sealed with a flexible rubber seal made of EPDM rubber with a minimum thickness of 65 mils. Each unit shall have a 2” wide by 1/4” mastic strip on the top and bottom of the rubber wrap. The seal shall be designed to prevent leakage of water through the manhole joint. The flexible rubber seal shall be Infi-shield Wrap Cetex or approved equal.
 - b. Manhole adjustment rings shall be sealed with a flexible rubber seal acceptable products include Infi-Shield External Unibrand, Ceter Ching Seals or an approved equal.
- B. Brick and Mortar — Brick shall be whole and hard burned, conforming to ASTN C 32 Grade MS. Mortar shall be made of one part Portland cement and two parts clean sharp sand. Cement shall be Type I and shall conform to ASTM C 150. Sand shall meet ASTM C 144.
- C. Frames and Covers — Cast iron manhole frames and covers shall meet the requirements of ASTM A 48 for Class 30 gray iron and all applicable local standards. All castings shall be tough, close grained, smooth and free from blow holes, blisters, shrinkage, strains, cracks, cold shots and other imperfections. No casting will be accepted which weighs less than 95 percent of the design weight. Shop drawings must indicate the design weight and provide sufficient dimensions to permit checking. All castings shall be thoroughly cleaned in the shop and given two coats of approved bituminous paint before rusting begins.
 1. Manhole frames and covers shall be as shown on the Standard Detail Drawings. Rings shall have (2) non penetrating pick holes and an O-Ring seal.
 2. All frames and covers shall have machined horizontal bearing surfaces with “SANITARY SEWER” printed on them.
 3. All manholes shall have standard frames and covers except where specifically shown otherwise on the Drawings.
 4. Manhole frames and covers shall be US Foundry and Mfg. Corp USF 195E- ORS or approved equal.

5. Manhole frames shall be cast in cone if located in non-traffic areas.
 6. Once in place, manhole frames shall be temporarily fixed to the manhole with a minimum of two bolts during all subsequent phases of construction.
 7. Manhole frames shall be sealed to the concrete structure.
 8. The frame and cover shall also meet ASSHTO-H2O loading requirement.
 9. The frame and cover shall have a clear opening of 24 inches and be 4 inches in height.
- D. Manhole Steps — provide steps in bases, risers, cones, transition cones, and transition top sections aligned vertically on 16" centers. Secure steps to the wall with a compression fit in tapered holes or cast in place. Steps shall not be vibrated or driven into freshly cast concrete or grouted in place. The steps shall be $\frac{1}{2}$ " diameter grade 60 bar and have serrated tread and tall end lugs. Step pullout strength shall be a minimum of 2000 lbs when tested according to ASTM C497. The manhole steps shall meet the requirements of ASTM C478, A615 and D4101. Steps shall be equal to "Sure Foot" by Oliver Tire and Rubber Company or "PSI-PF" by M.A. Industries.
- E. Pipe Connections — Shall have flexible watertight joints at the point of entry of any sewer main into the manhole. Joint shall be either lock-in "Kor-N-Seal" type as manufactured by National Pollution Control Systems, Inc. or cast-in type as manufactured by Interpace Division of Ball Rubber, Inc. Boot shall be sized to suit the outside diameter of the pipe being used
- F. Manhole Foundation — The manhole base shall be set on a compacted mat of size #57 crushed stone graded level at the thickness shown on the standard detail drawings. In wet areas, the crush stone mat shall be thickened as needed to provide a non-yielding foundation.
- G. Coatings — All pump station wet wells shall have all interior surfaces coated with a factory applied coal tar epoxy. The coating shall be 300 M as manufactured by Koppers Company, Inc., Raven, or an accepted equivalent. The coating shall be applied in two coats to achieve a dry film thickness of at least 10 mils per coat in accordance with the manufacturer's recommendations. Surfaces shall be cleaned of dust, form oils, curing compounds and other foreign matter prior to the coating application.

2.05 SERVICE TEES

- A. Tees shall be 4-inches and the same diameter as the run of the pipe. They shall be of the same material as the sewer main.

2.06 LATERALS

- A. Shall be SDR 35 PVC conforming to paragraph 2.1, with push-on joints or Polyvinyl Chloride pipe with bells and natural rubber rings for jointing, conforming, to Paragraph 2.1, PVC Pipe.

2.07 STONE BACKFILL

- A. Shall be graded crushed granite with the following gradation:

Square Opening Size	Percent Passing
1"	100%
3/4"	90 to 100%
3/8"	0 to 65%
No. 4	0 to 25%

2.08 SAND BACKFILL

- A. Shall be clean sand free of clay and organic material. Not more than 10% shall pass the No. 100 sieve.

2.09 BORROW

- A. Where it is determined that sufficient suitable material is not available from the site to satisfactorily backfill the pipe to at least 2 feet above the top of the pipe, the Contractor shall furnish suitable sandy borrow material to accomplish the requirements. The materials shall have not more than 60% passing the No. 100 sieve, nor more than 20% passing the No. 200 sieve.

2.10 METAL DETECTION TAPE

- A. Detectable marking tape shall consist of a metalized foil laminated between two layers of color-coded inert plastic film suitable for lasting as long as the pipe and shall be resistant to alkalis, acids, and other destructive agents found in the soil. The plastic film shall be imprinted with a continuous message: "Caution Sewer Line Buried Below". The message shall be in "green" color permanent ink. Marking tape shall be not less than 2" wide and not less than 5.5 mil thick with a tensile strength of not less than 120 grams per 1.5 mil. Detectable marking tape shall be the type that can be located by any standard electronic pipe locator. A continuous warning message repeated every 16" to 36" shall be imprinted on the tape surface.

Detectable marking tape shall be installed on all PVC and ductile iron pipes.

2.11 TRACING WIRE

- A. Tracer wire shall be installed sewer laterals and Force main Pipelines in a continuous fashion. It shall be brought to the surface at each manhole and clean-out location. At locations tracer wire surfaces between manholes, regular valve box with plain lid and collar shall be installed between a pipeline marker pair. Tracer wire shall be 12 GA single strand or up to 7 strands, copper with insulation UL rated for direct bury underground service. Splices shall be UL rated for direct bury and shall be minimized.

PART 3 – EXECUTION

3.01 ON-SITE OBSERVATION

- A. The Engineer shall have the right to require that any portion of the work be done in his presence and if any work is covered up after such instruction, it shall be exposed by the Contractor for observation. However, if the Contractor notifies the Engineer that such work is scheduled and the Engineer fails to appear within 48 hours, the Contractor may proceed without him. All work done and materials furnished shall be subject to review by the Engineer or Project Representative. All improper work shall be reconstructed and all materials which do not conform to the requirements of the specifications shall be removed from the work upon notice being received from the Engineer for the rejection of such materials. The Engineer shall have the right to mark rejected materials so as to distinguish them as such.

3.02 HANDLING MATERIALS

- A. Unloading: Furnish equipment and facilities for unloading, handling, distributing, and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. All materials dropped or dumped will be subject to rejection without additional justification.
- B. Handling: Handle pipe, fittings, valves, and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front loader. Do not use material damaged in handling.
- C. Distribution: Distribute and place pipe and materials to not interfere with traffic. Do not string pipe more than 400 feet beyond the area where pipe is being laid. Do not obstruct drainage ditches.
- D. Storage: Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas. Do not interfere with other contractors right to access.

3.03 CONSTRUCTION ALONG HIGHWAYS, STREETS, AND ROADWAYS

Install pipelines and accessories along highway, streets, and roadways in accordance with the applicable regulations of the County, City and/or the Department of Transportation with reference to construction operations, safety, traffic control, road maintenance and repair.

- A. Protection of Traffic: Provide and maintain suitable signs, barricades, and lights for protection of traffic. Replace all highway signs removed for construction as soon as possible. Do not close or block any highway, street, or roadway without first obtaining permission from the proper authorities.

Provide flagmen to direct and expedite the flow of traffic.

- B. Construction Operations: Perform all work along highways, streets, and roadways to least interfere with traffic.

1. Stripping: Where the pipeline is laid along road shoulders, strip and stockpile all sod, topsoil and other material suitable for shoulder restoration.
 2. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.
 3. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations, Replace topsoil, sod and any other materials removed from shoulders.
- C. Excavated Materials: Do not place excavated material along highways, streets and roadways in a manner which obstructs traffic. Sweep all scattered excavated materials off of the pavements.
- D. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material and free to drain at all times.
- E. Maintaining Highways, Streets, Roadways and Driveways: Maintain streets, highways, and roadways in suitable condition for movement of traffic until completion and final acceptance of the work. Use steel running plate to maintain traffic until pavement is completed.

3.04 EXISTING UNDERGROUND UTILITIES AND OBSTRUCTIONS

- A. It is the responsibility of the Contractor to locate all existing utilities along the path of his construction. The drawings shall indicate underground utilities or obstructions that are known to exist. Where these or unforeseen underground utilities are encountered, the location and alignment of the watermain may be changed, upon written approval of the Engineer and Owner, to avoid interference.

3.05 CONNECTIONS TO EXISTING PIPELINES

- A. Before laying pipe, the Contractor shall locate the points of connection to existing pipelines and uncover as necessary for the Engineer and Owner to confirm the nature of the connections to be made. The Contractor shall furnish materials and make the connection to all existing pipelines. The Contractor will be observed during construction of tie-ins by the Owner and the Engineer. The Contractor shall use all available practices and resources to minimize the time the customers are without sewer service. The Contractor shall notify affected customers of a sewer service outage at least 24 hours in advance by placing a sign on each door of each affected customer.

3.06 PIPE DISTRIBUTION

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic or City operations at their wastewater treatment plant.
- B. No pipe shall be strung further along the route than 400 feet beyond the area in which the Contractor is actually working without written permission from the

Owner and/or Engineer. The Owner and/or Engineer reserves the right to reduce this distance to a maximum distance of 200 feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.

- C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the Owner. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- D. No distributed pipe shall be placed inside drainage ditches.
- E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge-to-edge.
- F. Contractor shall not excavate sanitary sewer trenches more than 400 feet in advance of pipe laying.

3.07 LOCATION AND GRADE

- A. The Drawings show the alignment and grade of the gravity sewer and the position of manholes and other appurtenances. The slope shown on the gravity sewer profile and/or called for in the Specifications is the slope of the invert of the pipe.
- B. After the Contractor locates and marks the manhole centerlines or baselines of the gravity sewer, the Contractor shall perform clearing and grubbing.

3.08 LAYING AND JOINT PIPE AND ACCESSORIES

- A. Lay all pipe and fittings to accurately conform to the lines and grades established by the construction drawings.
- B. Pipe Installation:
 - 1. Proper implements, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings and valves shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to sewer materials and protective coatings and linings. Under no circumstances shall sewer or force main pipe or other materials be dropped or dumped into the trench.
 - 2. All pipe, fittings, valves, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Owner and/or Engineer, who may prescribe corrective repairs or reject the materials.
 - 3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe which contains dirt shall be laid.

4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.
 5. As each length of pipe is placed in the trench, the joint shall be assembled, and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
 6. It is common practice to lay pipe with the bells facing the direction in which work is progressing.
 7. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted.
 8. Polyethylene Encasement: Installation shall be in accordance with AWWA C105 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired to the satisfaction of the Owner and/or Engineer.
 9. The minimum cover over PVC gravity sewer lines shall be 36-inches. If the soil cover is less than 36-inches, then ductile iron pipe shall be furnished and installed.
- C. Alignment and Gradient:
1. pipe straight in alignment and gradient or follow true curves, where shown on the Drawings, as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.
 2. Maintain a transit, level, and accessories on the job to lay out angles and ensure that deflection allowance is not exceeded.
 3. The Contractor shall check the invert elevation at each manhole and the gravity sewer invert elevation at least three times daily, start, mid-day and end of day. Elevations shall be checked more frequently if more than 100 feet of pipe is installed in a day or if the gravity sewer is being constructed at minimum slope.
 4. The Contractor shall check the horizontal alignment of the gravity sewer at the same schedule as for invert elevations.
 5. Should any installed pipe have its alignment, grade, or joints disturbed after placement, it shall be taken up and re-laid.
- D. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary, to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint or as approved by the Owner and/or Engineer.

- E. Joint Assembly:
1. Push-on, mechanical, flange and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.
 2. Each restrained joint shall be inspected by the Contractor to ensure that it has been "homed" 100%.
- F. Cutting Pipe:
1. Cut ductile iron pipe using an abrasive wheel saw,
 2. Cut PVC pipe using a suitable saw.
 3. Remove all burrs and smooth the end before jointing.
 4. The Contractor shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories and closure pieces in the correct location. Only push-on or mechanical joint pipe shall be cut.
- G. Service Connections: Install wyes or tees in locations designated by the Owner and/or Engineer for future connection of service lines. Plug the branch of the wye or tee. Record the location of fittings installed on the Record Drawings.
- H. Valve, Fitting and Pressure Gauge Installation:
1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the Owner and/or Engineer. Valves shall be closed before being installed.
 2. Valves, fittings, plugs and caps shall be set and joined to the pipe in the manner specified in this Section for cleaning, laying and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve.
 3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut, and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belted portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be installed where depth of bury places the operating nut in excess of 30-inches beneath finished grade so as to set the top of the operating nut 30-inches below finished grade. The valve box cover

shall be flush with the surface of the finished area or such other level as directed by the Owner and/or Engineer.

4. Three pressure gauges shall be installed within valve vault. Pressure gauges shall have bronze or stainless bourbon tube elements. Lens shall be heavy glass, with an oil-resistant gasket seal. The dial shall be a minimum of 4.5 inches in diameter with white coated metal lithographed with black metal graduations and numerals; graduations shall be in feet; mount as required. Connection shall be 1/2-inch NPT with square wrench surface. Provide cartridge snubber, diaphragm seal unit and polished brass gauge cock. Range shall be 0 to 150 feet. Accuracy shall be + 0.5 percent.
5. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

3.09 SEPARATION BETWEEN WATER & SANITARY SEWER

- A. Parallel separation shall be 10 feet horizontal between sanitary sewers and any existing or proposed water mains. Deviation may be authorized for closer installation provided that the sewer is laid in a separate trench such that the bottom of the water main is at least 18 inches above the top of the sewer. Sanitary sewers crossing water mains shall be laid to provide a minimum vertical distance of 18 inches of vertical clearance.
- B. Special Conditions: When it is impossible to obtain proper horizontal and vertical separation as stipulated above, both the water and sewer lines shall be ductile iron pipe for one full length each side of the crossing with the water pipe joints located as far as possible from the sewer crossing.

3.10 EXCAVATING, TRENCHING AND BACKFILLING

- A. Refer to Section 02315 — Excavation, Trenching & Backfill for Utility Systems

3.11 CONNECTION TO AN EXISTING MANHOLE AND OTHER CONCRETE STRUCTURES

- A. Connection to an existing manhole or other concrete structure shall be made by mechanically coring into the wall of the manhole or other structure. Cored opening shall be sized to properly accommodate a rubber boot seal as specified in this section or a Link Seal or approved equal.

3.12 CONNECTION AND REPAIRS TO AN EXISTING SEWER MAIN

- A. Where connections or repairs are required, Contractor shall only use solid sleeves and provide all materials and labor necessary to make the connection or repair to the existing pipeline, excluding service lines 6" or smaller.

3.13 MANHOLE AND PRECAST CONCRETE PRODUCT CONSTRUCTION

- A. Construct manholes as shown on the Standard Detail Drawings.

- B. Precast Concrete: Handle sections carefully to prevent cracking or chipping. Provide uniform bedding of the bottom section to prevent uneven loading. Install gaskets and joint sealants in accordance with manufacturer's recommendations to produce a watertight structure.
- C. Brick: Bed the bottom and sides of every brick in mortar. Apply a smooth coat of mortar, */ -inch thick, on the inside and outside.
- D. Inverts: Form channels as shown on the Drawings, rounded, and troweled smooth. Maintain consistent grade through the invert. Use sand-cement grout.
- E. Top Elevations: Build manholes outside of paved areas to 3-inches above finished grade unless otherwise shown on the Drawings or directed by the Owner and/or Engineer. Build manholes in paved areas to existing grades.
- F. Drop Connections: Manholes requiring drop connections are shown on the Drawings. Construct drop connections of the same materials as the upstream sewer and in accordance with the details shown on the Drawings.
- G. Frames and Covers: Unless frame and cover are at grade, the frame shall be cast into the cone section.
- H. Seal all manhole joints and lift holes, both inside and out, with grout. Between Precast sections, this is in addition to joint sealant.
- I. Invert Elevations: The invert elevations shown on the Drawings shall be for the invert at the centerline of the Precast concrete manhole. Prior to setting the laser or other vertical alignment control system for the sewer upstream of the manhole, the Contractor shall verify the elevation of the sewer installed at the manhole.
- J. Manholes shall be constructed such that their walls are plumb.
- K. Floor doors shall be integrally cast into the top slab and shall be cast into the concrete in accordance with the manufacturer's recommendations.
- L. Precast manholes shall be bedded on 6-inches of compacted crushed stone.

3.14 CONCRETE COLLARS

- A. Construct collars as shown on the Drawings.

3.15 DETECTION TAPE & WIRE

- A. Detection tape and wire shall be provided over all sewers and force mains constructed by the open cut method. Tracing wire shall be installed on all PVC pipelines and force mains and shall be terminated at all manholes, clean-outs or other connections.

3.16 THRUST RESTRAINT

- A. Provide restraint at all points where hydraulic thrust may develop.

- B. Retainer Glands: Provide retainer glands where shown on the Drawings and all associated fittings, valves and related piping. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the setscrews. The Contractor shall furnish a torque wrench to verify the torque on all set screws which do not have inherent torque indicators.
- C. Harnessing: Provide harness rods only where specifically shown on the Drawings or directed by the Owner and/or Engineer. Harness rods shall be manufactured in accordance with ASTM A 36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, provide 90-degree bend eye bolts. Eye bolts shall be of the same diameter as specified in AWWA C111 for that pipe size. The eye shall be welded closed. Where eye bolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eye bolts shall be of the same material and coating as the harness rods.
- D. Concrete Blocking:
 - 1. Provide concrete blocking for all other bends, tees, valves, and other points where thrust may develop, except where other means of thrust restraint are specifically shown on the Drawings.
 - 2. Form and pour concrete blocking at fittings as shown on the Drawings and as directed by the Owner and/or Engineer. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation.
- E. Thrust Collars: Collars shall be constructed as shown on the Drawings. Concrete and reinforcing steel shall meet the requirements specified in Article 2.03 of this Section. The welded-on collar shall be attached to the pipe by the pipe manufacturer.
- F. Restrained pipe may be used as an alternative thrust block.

3.17 INSPECTION AND TESTING

- A. Clean and flush lines prior to testing. Clean and test lines before requesting final acceptance. Where any obstruction is met, clean the sewers by means of rods, swabs, or other instruments. When requested by the Owner and/or Engineer, flush out lines and manholes before final inspection.
- B. Gravity Sewers: Pipelines shall be straight and show a uniform grade between manholes. Correct any discrepancies discovered during inspection.
- C. Testing:
 - 1. Infiltration Tests: Use only when groundwater is more than two feet above the top of the pipe. The testing procedure shall be in accordance with ASTM C1091 (infiltration Testing) or ASTM C969.

Install suitable weirs in manholes selected by the Owner and/or Engineer to determine the leakage of ground water into the sewer. The maximum length of line for each infiltration test shall be 5,000 feet. Measure leakage only when all visible leaks have been required and the ground water is two feet above the top of the pipe. If leakage in any section of the sewer line exceeds 25 gpd/inch diameter/mile, locate, and repair all visual or audible leaks. Chemical grouting may be used to repair leaks in joints only. Repair methods must be approved by the Owner and/or Engineer. After repairs are completed, re-test for leakage.

Furnish, install, and remove the necessary weirs, plugs, and bulkheads required to perform the leakage tests. Where continuous monitoring of flow level is required, the Owner and/or Engineer will provide and operate monitoring equipment.

2. Exfiltration Tests: Choose one of the following when groundwater is less than two feet above the top of the pipe.

3. Hydrostatic Test:

a. Test pipe between manholes with a minimum of 10 feet hydrostatic pressure, measured at the center of the pipe at the upstream manhole.

b. The ends of the pipe in the test section shall be closed with suitable watertight bulkheads. Inserted into the top of each bulkhead shall be a 2-inch pipe nipple with an elbow. At the upper end of the test section, a 12-inch riser pipe shall be connected to the 2-inch nipple. The test section of pipe shall be filled through the pipe connection in the lower bulkhead which shall be fitted with a valve, until all air is exhausted and until water overflows the riser pipe at the upper end.

Water may be introduced into the pipe 24 hours prior to the test period to allow complete saturation. House service lines, if installed, shall also be fitted with suitable bulkheads having provisions for the release of air while the test section is being filled with water.

c. During the test period, which shall extend over a period of two hours, water shall be introduced into the riser pipe from measured containers at such intervals as are necessary to maintain the water level at the top of the riser pipe. The total volume of water added during the test period shall not exceed that specified for infiltration.

4. Low-Pressure Air Test:

a. Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the Contractor's option, sewers may be tested in lengths between manholes or in short sections (25 feet or less) using inflatable balls pulled through the line from manhole to manhole. Air shall be slowly supplied to

the plugged sewer section until internal air pressure reaches approximately 4.0 psi. After this pressure is reached and the pressure allowed to stabilize (approximately two to five minutes), the pressure may be reduced to 3.5 psi before starting the test. If a 1.0 psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the Contractor will be required to locate the failure, make necessary repairs, and retest the line. Minimum test time for various pipe sizes, in accordance with ASTM F-1417 is as follows:

Pipe Diameter (in)	Minimum Time (min: sec)	Length for Minimum Time (ft)	Time for Longer Length (sec)
4	3:46	597	.380L
6	5:40	398	.854L
8	7:34	298	1.520L
10	9:26	239	2.374L
12	11:20	199	3.418L
15	14:10	159	5.342L
18	17:00	133	7.692L
21	19:50	114	10.470L
24	22:40	99	13.674L

- b. Required test equipment, including inflatable balls, braces, air hose, air source, timer, rotameter as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge, 0-5 psi pressure gauge with gradations in 0.1 psi and accuracy of \pm two percent, shall be provided by the Contractor. Testing equipment shall be equal to Cherne Air-Loc Testing Systems.

The Contractor shall keep records of all tests made. Copy of such records will be given to the Owner and/or Engineer. Such records shall show date, line number and stations, operator, and such other pertinent information as required by the Owner and/or Engineer.

- c. The Contractor is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs be properly secured, and that care be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the sewer line.

3. Deflection Test:

Test PVC gravity sewer for excessive deflection by passing a mandrel through the pipe. Deflection of the pipe shall not exceed the following:

Nominal Pipe Diameter	Maximum Allowable Deflection
< 12-inches	5%
15 to 30-inches	4%
> 30-inches	3%

The mandrel size shall be based upon the maximum possible inside diameter for the type of pipe being tested, taking into account the allowable manufacturing tolerances of the pipe. The mandrel shall have an odd number of legs, or vanes, with a quantity of such equal to or greater than nine. The legs of the mandrel shall be permanently attached to the mandrel. A mandrel with variable sizes shall not be allowed. The mandrel shall be constructed of steel aluminum or other material approved by the Owner and/or Engineer and shall have sufficient rigidity so the legs of the mandrel will not deform when pulling through a pipe. The mandrel dimensions shall be checked by the Owner and/or Engineer before use by the Contractor.

Excavate and install properly any section of pipe not passing this test. Re-test until results are satisfactory.

The test shall be performed no less than 30 days of installation and during final inspection, at the completion of this contract. The mandrel shall be performed in accordance with ASTM D 3034, F679, or 2122.

4. Closed Circuit Television: If deemed necessary by the Owner and/or engineer, the interior of the gravity sewers shall be subjected to a televised inspection. Prior to Final Acceptance the Owner and/or Engineer shall be provided with one copy of the TV inspection report and video cassette of DVD showing the entire length of gravity sewer being tested. The report shall contain the condition of pipe, type of pipe, depth, location of services, length, type joint, roundness, and distance between manholes. Any pipe found to be cracked, leading, misaligned, bellied or otherwise defective shall be removed and replaced.
 5. Flashlight and Mirror Test
- D. Manholes: Prior to testing manholes for water tightness, all lift holes shall be plugged with a non-shrink grout, all joints between Precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced. Each manhole shall pass one of the following tests:
1. Exfiltration Tests: The manhole, after proper preparation as noted above, shall be filled with water. The maximum allowable leakage shall be eight gallons per foot of depth per 24 hours for 48-inch diameter manholes. Tests shall last a minimum of eight hours. The manholes may be backfilled prior to testing.
 2. Vacuum Tests: The manhole, after proper preparation as noted above, shall be vacuum tested in accordance with ASTM C 1244 prior to backfilling. The test head shall be placed at the inside of the top of the cone section and the compression head inflated to 40 psi to affect a seal between the vacuum base and the manhole structure. Connect the vacuum pump to the outlet port with the valve open. A vacuum of 10-inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to 9-inches. The manhole shall pass if the time for the

vacuum reading to drop from 10 in. to 9 in. of mercury meets or exceeds the values below:

**Minimum Test Times for Various Manhole Diameters
in Seconds**

		Diameter, in.									
Depth (ft)											
	30	33	36	42	48	54	60	66	72		
Time, in seconds											
8	11	12	14	17	20	23	26	29	33		
10	14	15	18	21	25	29	33	36	41		
12	17	18	21	25	30	35	39	43	49		
14	20	21	25	30	35	41	46	51	57		
16	22	24	29	34	40	46	52	58	67		
18	25	27	32	38	45	52	59	65	73		
20	28	30	35	42	50	53	65	72	81		
22	31	33	39	46	55	64	72	79	89		
24	33	36	42	51	59	64	78	87	97		
26	36	39	46	55	64	75	85	94	105		
28	39	42	49	59	69	81	91	101	113		
30	42	45	53	63	74	87	98	108	121		

If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc.

E. Force Mains:

1. Pressure During Test: Immediately after the pipe has been laid and backfilled, but prior to the placement of pavement, each section of newly laid pipe shall be subjected to a leakage and pressure test. For any section being tested the pressure applied shall be such that at the highest point in the section, the pressure shall be 100 pounds per square inch.
2. Duration of Test: The duration of each pressure test shall be two (2) hours.
3. Procedures: Each section of pipe shall be slowly filled with water and the specified test pressure, measured at the point of highest elevation shall be supplied by means of a pump connected to the pipe in a satisfactory manner. The pump, pipe connection, and all necessary apparatus, gauges, and meters shall be furnished by the contractor. The Contractor shall furnish all necessary labor, hoses, piping and assistance in conducting the tests. The Owner will furnish water for filling the force main for making the first test.

4. Expelling Air Before Tests: Before applying the specified test pressure, all air shall be expelled from the pipe.
5. Examination Under Pressure: At intervals during the test, the route of the pipeline shall be inspected to locate any leaks or breaks. Any cracked or defective joints, cracked or defective pipe, fittings or valves discovered in consequence of this pressure test shall be removed and replaced with sound material in the manner provided and the test shall be repeated until satisfactory results are obtained.
6. Permissible Leakage: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, of any section thereof, to maintain the specified leakage test pressure after the pipe has been filled with water and the air in the pipeline has been expelled. No installation will be accepted if leakage is greater than that determined by the formula:

For PVC Installations:
$$L = \frac{ND (P)^{0.5}}{148,000}$$

For Ductile Iron Installations:
$$L = \frac{ND (P)^{0.5}}{133,200}$$

L is the allowable leakage in gallons per hour; N is the length of pipeline tested in feet; D is the nominal diameter of the pipe in inches; and P is the average test pressure during the leakage test in pounds per square inch gauge.

Leakage values determined by the above formula are to be found in the following Table.

Allowable Leakage for Force Main Installation (Per 1,000 ft) in Gallons per hour

Nominal Pipe Diameter (in)	Average Test Pressure in Pipeline	
	<u>PVC</u>	<u>DI</u>
4	0.27	0.30
6	0.41	0.45
8	0.54	0.60
10	0.68	0.75
12	0.81	0.90

- F. Re-Testing: Any alterations made to pipeline or manholes performed after initial testing shall be re-tested and pass again, regardless of initial test results.
- G. Notification: Owner and/or Engineer shall be notified 24-hours in advance prior to Contractor performing any testing.

3.18 PROTECTION AND RESTORATION OF WORK AREA

- A. General: Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is started.
- B.
 - 1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.
 - 2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.
 - 3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.
 - 4. The Department of Transportation's engineer shall be authorized to stop all work by the Contractor when restoration and cleanup are unsatisfactory and to require appropriate remedial measures for work conducted within the DOT's right-of-way or affecting their right-of-way.
- C. Man-Made Improvements: Protect, or remove and replace with the Owner and/or Engineer's approval, all fences, walkways, mailboxes, pipelines, drain culverts, power and telephone lines and cables, property pins and other improvements that may be encountered in the work.
- D. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by the Owner and/or Engineer. Any such trees or shrubbery which must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
- E. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. Repair any damaged tree over 3-inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the Contractor. No stumps, wood piles, or trash piles will be permitted on the work site.
- F. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the project in accordance with the applicable codes and rules of the appropriate city and/or county, state, and federal regulatory agencies.

G. Swamps and Other Wetlands:

1. The Contractor shall not construct permanent roadbeds, berms, drainage structures or any other structures which alter the original topographic features within the easement.
2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding swamp or wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the Contractor.
3. The Contractor shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland or stream which may be temporarily divided by construction.
4. The Contractor shall not spread, discharge, or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent swamps or wetlands.

END OF SECTION

Unofficial

**SECTION 02540
EROSION CONTROL**

PART 1 – GENERAL

1.01 The work specified in this Section consists of furnishing, installing and maintaining temporary erosion controls and temporary sedimentation controls.

1.02 DEFINITIONS

- A. Temporary erosion controls shall include grassing, mulching, watering and reseeding on-site sloped surfaces, providing berms at the top of the slopes and providing interceptor ditches at the ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or minimized.
- B. Temporary sedimentation controls shall include silt dams, traps, barriers and appurtenances at the toe slopes.

PART 2 – MATERIALS

2.01 Hay bales shall be clean, seed free cereal hay type, securely bound.

2.02 Netting shall be 1/2 inch, galvanized steel chicken wire mesh.

2.03 Filter stone shall be crushed stone conforming to the Department of Transportation - State of Georgia-Standard Specifications – Construction of Transportation Systems - 2013 - Table 800.01, Size Number 3.

2.04 Rolled Erosion Control Products:

- A. Mulch Control Netting. A planar woven natural fiber or extruded geosynthetic mesh used as a temporary degradable rolled erosion product anchor loose fiber mulches
Max. Gradient = 5:1 (H:V) in slope application
C Factor = ≤ 0.10 @ 5:1 in slope application
Max Shear stress 0.25 lb/sf in channel application
Min. Tensile Strength ultra short (3 mo) and short (12 mo) term = 5 lbs/ft
Min Tensile Strength extended term ((24 mo) = 25 lbs/ft
- B. Open Weave textile. A temporary degradable rolled erosion control product composed of processed natural or polymer yarns woven into a matrix, used to provide erosion control and facilitate vegetation establishment.

Max. Gradient = 3:1 (H:V) in slope application
C Factor = ≤ 0.15 @ 3:1 in slope application
Max Shear stress = 1.5 lb/sf in channel application
Min. Tensile Strength ultra short (3 mo) and short (12 mo) term = 50 lbs/ft
Min Tensile Strength extended term ((24 mo) = 100lbs/ft

- C. Erosion Control Blanket. A temporary degradable rolled erosion control product composed of processed natural or polymer fibers mechanically, structurally or chemically bound together to form a continuous matrix to provide erosion control and facilitate vegetation establishment.

Netless Rolled Erosion Control Blankets:

Max. Gradient = 4:1 (H:V) in slope application
C Factor = ≤ 0.10 @ 4:1 in slope application
Max Shear stress = 0.5 lb/sf in channel application
Min. Tensile Strength ultra short (3 mo) and short (12 mo) term = 5 lbs/ft

Single-net Erosion Control Blankets:

Max. Gradient = 3:1 (H:V) in slope application
C Factor = ≤ 0.15 @ 3:1 in slope application
Max Shear stress = 1.5 lb/sf in channel application
Min. Tensile Strength ultra short (3 mo) and short (12 mo) term = 50 lbs/ft
Min Tensile Strength extended term ((24 mo) = 100lbs/ft

Double-net Erosion Control Blankets:

Max. Gradient = 2:1 (H:V) in slope application
C Factor = ≤ 0.2 @ 2:1 in slope application
Max Shear stress = 1.75 lb/sf in channel application
Min. Tensile Strength ultra short (3 mo) and short (12 mo) term = 75 lbs/ft

- D. Turf Reinforcement Mat. A rolled erosion control product composed of non-degradable synthetic fibers, filaments, nets, wire mesh, and/or other elements, processed into a permanent, three dimensional matrix of sufficient thickness. TRMs, which may be supplemented with degradable components, are designed to impart immediate erosion protection, enhance vegetation establishment and provide long term functionality by permanently reinforcing vegetation during and after maturation. These products are typically used in hydraulic applications such as high flow ditches, channels, steep slopes, stream banks, and shorelines, where erosive forces may exceed the limits of natural, unreinforced vegetation.

Slope Application max gradient = 0.5:1 (H:V)

Channel Application Max Shear Stress: 5A, B,C as defined in FHWA guidelines

5A = 6.0 lb/sf, 5B = 8.0 lb/sf, 5C = 10.0 lbs/sf

Min. Tensile Strength: 5A, B,C as defined in FHWA guidelines
5A = 125.0 lb/ft, 5B = 150.0 lb/ft, 5C = 175.0 lbs/ft
5A, B,C as defined in FHWA guidelines

PART 3 – EXECUTION

3.01 SEDIMENTATION CONTROL

- A. Silt dams, traps, barriers, and appurtenances shall be installed and shall be maintained in-place for duration of construction.
- B. Hay bales shall be staked with two (2) 1 x 4 wood stakes per bale driven eighteen (18) inches into the ground and finishing flush with the top of the bale.
 - 1. Install two (2) stakes per bale with the long dimension of the stakes parallel to the long dimension of the bale.
 - 2. Where bales are installed in multiple layers the bales shall be installed with vertical joints staggered and two (2) 1 x 4 wood stakes per bale driven through all layers, full from top of bale to eighteen inches into the ground.
- C. Hay bales which have deteriorated shall be replaced with new materials.
- D. Erosion and sedimentation controls shall be maintained in a condition which will retain unfiltered water.
- E. The Contractor shall construct the sedimentation ponds and control devices prior to clearing and grubbing the site to insure complete silt control. When the silt or the debris level is greater than 1 foot above the bottom of the pond, the Contractor shall remove the silt or debris to restore the proper elevation for the bottom of the pond.
- F. The Contractor shall have all erosion and sedimentation control devices in service and operating properly prior to completion and final acceptance of the contract.
- G. Two widths of silt fence are available, Type A or C (36" height) and Type B (22" height). In order to determine which to use, the project duration, slope gradient, and slope length must be known (See Table 6-13.1 below). Approved silt fence fabrics are listed in the Georgia Department of Transportation list #36. The manufacturer shall have either an approved color mark yarn in the fabric or label the fabricated silt fence with both the manufacturer and fabric name every 100 feet.

TABLE 6-13.1

Land Slope	Maximum Slope Length Behind Fence
<u>Percent</u>	<u>feet</u>
<2	100
2 to 5	75
5 to 10	50
10 to 20	25
>20	15

All silt fence must meet the minimum standards set forth in Section 171- temporary Silt Fence, of the Department of Transportation, State of Georgia, Standard specification, current edition. See Table 6-13.5 for current Georgia DOT silt fence specifications.

3.02 EROSION CONTROL BALNKET INSTALLATION

- A. Prepare a stable and firm soil surface free of rocks and debris. Apply soil amendments as necessary to prepare seedbed. Place fertilizer, water, seed in accordance with manufacture and specification recommendations. Unroll parallel to the primary direction of flow. Ensure that the product maintains intimate contact with the soil over the entire installation. Do not stretch or allow material to bridge over the surface. Staple/stake blanket to soil such that each staple/stake is flush with the underlying soil. Install anchor trenches, seams and terminal ends as specified.
- B. The Upslope Trench, Seams and Terminal Ends may be secure by anchor trench, checks, slots or staples as outlined in Erosion Control technology Council (ECTC) standards for upslope security.
- C. Staple installation shall be at a rate of 1.7 staples per square yard minimum. Sandy or silty soils may require more. Wet installations may require a more density securing.
- D. If seaming method is used seams shall overlap at least 4" and staples must be placed at sufficient spacing to avoid separation.
- E. Staples must be placed at 4"x 4" spacing on check slots and check seams.
- F. Consecutive rolls shall have overlaps of at least 6" and secured with staples every 1 foot.

3.03 RESPONSIBILITY

- A. The Contractor shall be solely responsible for insuring that no silt or debris leaves the immediate construction site. Any silt or debris that does leave the immediate site shall be cleaned up and the area disturbed shall be returned to its natural state as directed by the Engineer at the Contractor's expense.
- B. The Contractor has the option to submit additional control measures in the form of shop drawings.

END OF SECTION

Unofficial

**SECTION 02541
MISCELLANEOUS EROSION CONTROL ITEMS**

PART 1 - GENERAL

This work includes of furnishing, installing, and maintaining temporary erosion controls and temporary sedimentation controls:

- Silt control gates
- Temporary erosion control slope drains shown on the Plans or as directed
- Temporary sediment basins
- Sediment barriers and check dams
- Rock filter dams
- Stone filter berms
- Stone filter rings
- Temporary sediment traps
- Other temporary erosion control structures shown on the Plans or directed by the Engineer.
- This work also includes applying mulch (e.g., straw, hay, erosion control compost), and temporary grass.

PART 2 - MATERIALS

2.01 Hay bales shall be clean, seed free cereal hay type, securely bound.

2.02 Netting shall be 1/2-inch, galvanized steel chicken wire mesh.

2.03 Filter stone shall be crushed stone conforming to the Department of Transportation State of Georgia Standard Specifications – Construction of Transportation Systems 2013 Table 800.01, Size Number 3.

2.04 Rolled Erosion Control Products:

- A. Mulch Control Netting. A planar woven natural fiber or extruded geosynthetic mesh used as a temporary degradable rolled erosion product anchor loose fiber mulches.

Max. Gradient = 5:1 (H:V) in slope application

C Factor = <0.10 @ 5:1 in slope application

Max Shear stress 0.25 lb/sf in channel application

Min. Tensile Strength ultra short (3 mo) and short (12 mo) term = 5 lbs/ft

Min Tensile Strength extended term ((24 mo) = 25 lbs/ft

- B. Open Weave textile. A temporary degradable rolled erosion control product composed of processed natural or polymer yarns woven into a matrix, used to provide erosion control and facilitate vegetation establishment.

Max. Gradient = 3:1 (H:V) in slope application
C Factor = <0.15 @ 3:1 in slope application
Max Shear stress = 1.5 lb/sf in channel application
Min. Tensile Strength ultra-short (3 mo) and short (12 mo) term = 50 lbs/ft
Min Tensile Strength extended term ((24 mo) = 100lbs/ft

- C. Erosion Control Blanket. A temporary degradable rolled erosion control product composed of processed natural or polymer fibers mechanically, structurally, or chemically bound together to form a continuous matrix to provide erosion control and facilitate vegetation establishment.

Netless Rolled Erosion Control Blankets:

Max. Gradient = 4:1 (H:V) in slope application
C Factor = <0.10 @ 4:1 in slope application
Max Shear stress = 0.5 lb/sf in channel application
Min. Tensile Strength ultra-short (3 mo) and short (12 mo) term = 5 lbs/ft

Single-net Erosion Control Blankets:

Max. Gradient = 3:1 (H:V) in slope application
C Factor = <0.15 @ 3:1 in slope application
Max Shear stress = 1.5 lb/sf in channel application
Min. Tensile Strength ultra-short (3 mo) and short (12 mo) term = 50 lbs/ft
Min Tensile Strength extended term ((24 mo) = 100lbs/ft

Double-net Erosion Control Blankets:

Max. Gradient = 2:1 (H:V) in slope application
C Factor = <0.2 @ 2:1 in slope application
Max Shear stress = 1.75 lb/sf in channel application
Min. Tensile Strength ultra-short (3 mo) and short (12 mo) term = 75 lbs/ft

- D. Turf Reinforcement Mat. A rolled erosion control product composed of non-degradable synthetic fibers, filaments, nets, wire mesh, and/or other elements, processed into a permanent, three dimensional matrix of sufficient thickness. TRMs, which may be supplemented with degradable components, are designed to impart immediate erosion protection, enhance vegetation establishment, and provide long term functionality by permanently reinforcing vegetation during and after maturation. These products are typically used in hydraulic applications such as high flow ditches, channels, steep slopes, stream banks, and shorelines, where erosive forces may exceed the limits of natural, unreinforced vegetation.

Slope Application max gradient = 0.5:1 (H:V)
Channel Application Max Shear Stress: 5A, B, C as defined in FHWA guidelines
5A = 6.0 lb/sf, 5B = 8.0 lb/sf, 5C = 10.0 lbs/sf
Min. Tensile Strength: 5A, B, C as defined in FHWA guidelines
5A = 125.0 lb/ft, 5B = 150.0 lb/ft, 5C = 175.0 lbs/ft
5A, B, C as defined in FHWA guidelines

PART 3 - EXECUTION

3.01 Construction

Erosion and sedimentation controls shall be maintained in a condition which will retain unfiltered water.

The Contractor shall construct the sedimentation ponds and control devices prior to clearing and grubbing the site to insure complete silt control. When the silt or the debris level is greater than 1 foot above the bottom of the pond, the Contractor shall remove the silt or debris to restore the proper elevation for the bottom of the pond.

The Contractor shall have all erosion and sedimentation control devices in service and operating properly prior to completion and final acceptance of the contract.

Silt dams, traps, barriers, and appurtenances shall be installed and shall be maintained in place for duration of construction.

A. Silt Control Gates

If silt control gates are required or are directed by the Engineer, follow these guidelines to construct them:

1. Clear and grade only that portion of the roadway within the affected drainage area where the drainage structure will be constructed.
2. Construct or install the drainage structure and backfill as required for stability.
3. Install the silt control gate at the inlet of the structure. Use the type indicated on the plans.
4. Vary the height of the gate as required or as shown on the plans.
5. Finish grading the roadway in the affected drainage area. Grass and mulch slopes and ditches that will not be paved. Construct the ditch paving required in the affected area.
6. Keep the gate in place until the work in the affected drainage area is complete and the erodible area is stabilized.
7. Remove the Type 1 silt gate assembly by sawing off the wood posts flush with the concrete apron. Leave the concrete apron between the gate and the structure inlet in place. The gate shall remain the property of the Contractor.

B. Temporary Slope Drains

If temporary slope drains are required, conduct the roadway grading operation according to Section 161 of GDOT STD Specifications and follow these guidelines:

1. Place temporary pipe slope drains with inlets and velocity dissipaters (straw bales, silt fence, or aprons) according to the plans.

2. Securely anchor the inlet into the slope to provide a watertight connection to the earth berm. Ensure that all connections in the pipe are leak proof.
3. Place temporary slope drains at a spacing of 350 ft. (105 m) maximum on a 0% to 2% grade and at a spacing of 200 ft. (60 m) maximum on steeper grades, or more frequently as directed by the Engineer. Keep the slope drains in place until the permanent grass has grown enough to control erosion.
4. Remove the slope drains and grass the disturbed area with permanent grass. However, the temporary slope drains may remain in place to help establish permanent grass if approved by the Engineer.

C. Temporary Sediment Basins

Construct temporary sediment basins according to the Plans at the required locations, or as modified by the Engineer.

1. Construct the unit complete as shown, including:
 - Grading
 - Drainage
 - Riprap
 - Spillways
 - Anti-seep collar
 - Temporary mulching and grassing on internal and external slopes
 - Accessories to complete the basin
2. When the sediment basin is no longer needed, remove and dispose of the remaining sediment.
3. Remove the sediment basin. Grade to drain and restore the area to blend with the adjacent landscape.
4. Mulch and permanently grass the disturbed areas according to Section 700 of GDOT STD Specifications.

D. Sediment Barriers

Construct sediment barriers according to the Plan details. The following items may be used for sediment barriers.

1. Type A Silt Fence.
2. Type C Silt Fence.

Two widths of silt fence are available, Type A or C (36" height) and Type B (22" height). In order to determine which to use, the project duration, slope gradient, and slope length must be known (See Table 6-13.1 below). Approved silt fence fabrics are listed in the Georgia Department of Transportation list #36. The manufacturer shall have either an approved color mark yarn in the fabric or label the fabricated silt fence with both the manufacturer and fabric name every 100 feet.

TABLE 6-13.1

Land Slope	Maximum Slope Length Behind Fence
Percent	feet
<2	100
2 to 5	75
5 to 10	50
10 to 20	25
>20	15

All silt fence must meet the minimum standards set forth in Section 171-temporary Silt Fence, of the Department of Transportation, State of Georgia, Standard specification, current edition. See Table 6-13.5 for current Georgia DOT silt fence specifications.

3. Rectangular, mechanically produced and standard-sized baled wheat straw.
4. Triangular Silt Barrier.
5. Synthetic Fiber: Use synthetic fiber bales of circular cross section at least 18 in. (450 mm) in diameter. Use synthetic bales of 3 ft. or 6 ft. (0.9 m or 1.8 m) in length that are capable of being linked together to form a continuous roll of the desired total length. Use bales that are enclosed in a geotextile fabric and that contain a pre-made stake hole for anchoring.
6. Coir: Use coir fiber bales of circular cross section at least 16" (400mm) in diameter. Use coir bales of 10 ft., 15 ft., or 20 ft. (3 m, 4.5 m, or 6 m) in length. Use coir baled with coir twine netting with 2 in. X 2 in. (50 mm X 50 mm) openings. Use coir bales with a dry density of at least 7 lb/ft." (112 kg/m"). Anchor in place with 2 in. X 4 in. (50 mm X 100 mm) wooden wedges with a 6 in. (150 mm) nail at the top. Place wedges no more than 36 in. (900 mm) apart.
7. Excelsior: Use curled aspen excelsior fiber with barbed edges in circular bales of at least 18 in. (450 mm) in diameter and nominally 10 ft. (3 m) in length. Use excelsior baled with polyester netting with 1 in. X 1 in. (25 mm by 25 mm) triangular openings. Use excelsior bales with a dry density of at least 1.4 lb/ft." (22 kg/m"). Anchor in place with 1 in. (25 mm) diameter wooden stakes driven through the netting at intervals of no more than 2 ft. (600 mm).
8. Compost Filter Sock: Use general use compost (see Subsection 893.2.02.A.5.b) in circular bales at least 18 in. (450 mm) diameter. Use compost baled with photo-degradable plastic mesh 5 mils thick with a

maximum 0.38 in X 0.38 in (10 mm X 10 mm) openings. Anchor in place with 1 in. (25 mm) diameter wooden stakes driven through the netting at intervals of no more than 2 ft. (600 mm) in concentrated flow applications and no more than 5 ft. (1500 mm) in sheet flow applications. The sock shall be dispersed on site when no longer required, as determined by the Engineer. Do not use Compost Filter Socks in areas where the use of fertilizer is restricted.

9. Compost Filter Berm: Use erosion control compost (see Subsection 893.2.02) to construct a non- compacted 1.5 ft. to 2 ft. (450 mm to 600 mm) high trapezoidal berm which is approximately 2 ft. to 3 ft. (600 mm to 1 m) wide at the top and minimum 4 ft. (1.2 m) wide at the base. Do not use Compost Filter Berms in areas where the use of fertilizer is restricted.

The construction of the compost filter berm includes the following:

- a. Keeping the berm in a functional condition.
- b. Installing additional berm material when necessary.
- c. Removing the berm when no longer required, as determined by the Engineer. At the Engineer's discretion, berm material may be left to decompose naturally, or distributed over the adjacent area.

E. Other Temporary Structures

When special conditions occur during the design stage, the plans may show other temporary structures for erosion control with required materials and construction methods.

F. Temporary Grass

Use a quick-growing species of temporary grass such as rye grass, millet, or a cereal grass suitable to the area and season.

Use temporary grass in the following situations:

- When required by the Specifications or directed by the Engineer to control erosion where permanent grassing cannot be planted.
- To protect an area for longer than mulch is expected to last (60 calendar days), plant temporary grass as follows:
 1. Use seeds that conform to Subsection 890.2.01, Seed of GDOT STD Specifications. Perform seeding according to Section 700; except use the minimum ground preparation necessary to provide a seed bed if further grading is required.
 2. Prepare areas that require no further grading according to Subsection 700.3.05.A of GDOT STD Specifications, Ground Preparation. Omit the lime unless the area will be planted with permanent grass without further grading. In this case, apply the lime according to Section 700.

3. Apply mixed grade fertilizer at 400 lbs./acre (450 kg/ha). Omit the nitrogen. Mulch (with straw or hay) temporary grass according to Section 700. (Erosion control compost Mulch will not be allowed with grassing.)
4. Before planting permanent grass, thoroughly plow and prepare areas where temporary grass has been planted according to Subsection 700.3.05.A of GDOT STD Specifications, Ground Preparation.
5. Apply Polyacrylamide (PAM) to all areas that receive temporary grassing.
6. Apply PAM (powder) before grassing or PAM (emulsion) to the hydroseeding operation.
7. Apply PAM according to manufacturer specifications.
8. Use only anionic PAM.

G. Mulch

When staged construction or other conditions prevent completing a roadway section continuously, apply mulch (straw or hay or erosion control compost) to control erosion. Mulch may be used without temporary grassing for 60 calendar days or less. Areas stabilized with only mulch (straw/hay) shall be planted with temporary grass after 60 calendar days.

Apply mulch as follows:

1. Mulch (Hay or Straw) - Without Grass Seed
 - a. Uniformly spread the mulch over the designated areas from 2 in. to 4 in. (50 mm to 100 mm) thick.
 - b. After spreading the mulch, walk in the mulch by using a tracked vehicle (preferred method), empty sheep foot roller, light disking, or other means that preserves the finished cross section of the prepared areas. The Engineer will approve of the method.
 - c. Place temporary mulch on slopes as steep as 2:1 by using a tracked vehicle to imbed the mulch into the slope.
 - d. When grassing operations begin, leave the mulch in place and plow the mulch into the soil during seed bed preparation. The mulch will become beneficial plant food for the newly planted grass.
2. Erosion control compost - Without Grass Seed
 - a. Uniformly spread the mulch (erosion control compost) over the designated areas 2 in. (50 mm) thick.
 - b. When rolling is necessary, or directed by the Engineer, use a light corrugated drum roller.
 - c. When grassing operations begin, leave the mulch in place and plow the mulch into the soil during seed bed preparation. The

mulch will become beneficial plant food for the newly planted grass.

- d. Plant temporary grass on area stabilized with mulch (erosion control compost) after 60 calendar days.
- e. Do not use Erosion Control Compost in areas where the use of fertilizer is restricted.

H. Miscellaneous Erosion Control Items Not Shown on the Plans

When conditions develop during construction that were unforeseen in the design stage, the Engineer may direct the Contractor to construct temporary devices such as but not limited to:

- Bulkheads
- Sump holes
- Half round pipe for use as ditch liners
- U-V resistant plastic sheets to cover critical cut slopes

The Engineer and the Contractor will determine the placement to ensure erosion control in the affected area.

I. Diversion Channels

When constructing a culvert or other drainage structure in a live stream that requires diverting a stream, construct a diversion channel.

J. Check Dams

Check dams are constructed of the following materials;

- Stone plain riprap according to Section 603 of GDOT STD Specifications (Place woven plastic filter fabric on ditch section before placing riprap.)
- Sand bags as in Section 603 of GDOT STD Specifications without Portland cement
- Baled wheat straw
- Compost filter socks
- Fabric (Type C silt fence)

Check dams shall be constructed according to plan details and shall remain in place until the permanent ditch protection is in place or being installed and the removal is approved by the Engineer.

K. Construction Exits

Locate construction exits at any point where vehicles will be leaving the project onto a public roadway. Install construction exits and tire wash area at the locations shown in the plans and in accordance with plan details.

Construction exit tire cleaning station shall be installed when conditions dictate additional tire cleaning measures are necessary to assist in protecting public roadways. Tire cleaning station shall consist of two pressure washers, water source and necessary labor and materials to clean tires of exiting vehicles. When conditions warrant the use of the tire cleaning station or as directed by the Engineer, the Department will pay \$750 dollars per day for the use. The Contractor may submit other construction exit tire wash assembly and sediment storage methods for review and approval by the Engineer.

L. Retrofits

Add the retrofit device to the permanent outlet structure as shown on the plan details.

When all land disturbing activities that would contribute sediment-laden runoff to the basin are complete, clean the basin of sediment and stabilize the basin area with vegetation.

When the basin is stabilized, remove the retrofit device from the permanent outlet structure of the detention pond.

M. Inlet Sediment Traps

Inlet sediment traps consist of a temporary device placed around a storm drain inlet to trap sediment. An excavated area adjacent to the sediment trap will provide additional sediment storage.

Inlet sediment traps may be constructed of Type C silt fence, plastic frame and filter, hay bales, baffle box, or other filtering materials approved by the Engineer. Construct inlet sediment traps according to the appropriate specification for the material selected for the trap. Place inlet sediment traps as shown on the plans or as directed by the Engineer.

N. Rock Filter Dams

Construct rock filter dams of the material selected as shown in the approved erosion and sediment control plan. Construct and place this item in accordance with the approved erosion control construction detail(s) and Standard Specification Section 603 of GDOT STD Specifications.

Rock filter dams shall remain in place until the permanent ditch protection is in place or is being installed and their removal is approved by the Engineer.

O. Stone Filter Berms

Construct stone filter berms of the material selected as shown in the approved erosion and sediment control plan. Construct and place this item in accordance

with the approved erosion control construction detail(s) and Standard Specification Section 603 of GDOT STD Specifications.

Stone filter berms shall remain in place until the permanent slope protection is in place or is being installed and their removal is approved by the Engineer.

P. Stone Filter Rings

Construct stone filter rings of the material selected as shown in the approved erosion and sediment control plan. Construct and place this item in accordance with the approved erosion control construction detail(s) and Standard Specification Section 603 of GDOT STD Specifications.

A stone filter ring shall remain in place until final stabilization of the area which drains toward it is achieved and its removal is approved by the Engineer.

Q. Temporary Sediment Traps

Construct temporary sediment traps of the material selected as shown in the approved erosion and sediment control plan. Construct and place this item in accordance with the approved erosion control construction detail(s) and Standard Specification Section 603 of GDOT STD Specifications.

A temporary sediment trap shall remain in place until final stabilization of the area which drains toward it is achieved and its removal is approved by the Engineer.

R. Erosion control blanket installation

1. Prepare a stable and firm soil surface free of rocks and debris. Apply soil amendments as necessary to prepare seedbed. Place fertilizer, water, seed in accordance with manufacture and specification recommendations. Unroll parallel to the primary direction of flow. Ensure that the product maintains intimate contact with the soil over the entire installation. Do not stretch or allow material to bridge over the surface. Staple/stake blanket to soil such that each staple/stake is flush with the underlying soil. Install anchor trenches, seams and terminal ends as specified.
2. The Upslope Trench, Seams and Terminal Ends may be secure by anchor trench, checks, slots, or staples as outlined in Erosion Control technology Council (ECTC) standards for upslope security.
3. Staple installation shall be at a rate of 1.7 staples per square yard minimum. Sandy or silty soils may require more. Wet installations may require a more density securing.
4. If seaming method is used seams shall overlap at least 4" and staples must be placed at sufficient spacing to avoid separation.
5. Staples must be placed at 4"x 4" spacing on check slots and check seams.
6. Consecutive rolls shall have overlaps of at least 6" and secured with staples every 1 foot.

S. Hay bales

Hay bales shall be staked with two (2) 1 x 4 wood stakes per bale driven eighteen (18) inches into the ground and finishing flush with the top of the bale.

1. Install two (2) stakes per bale with the long dimension of the stakes parallel to the long dimension of the bale.
2. Where bales are installed in multiple layers the bales shall be installed with vertical joints staggered and two (2) 1 x 4 wood stakes per bale driven through all layers, full from top of bale to eighteen inches into the ground.
3. Hay bales which have deteriorated shall be replaced with new materials.

3.02 RESPONSIBILITY

- A. The Contractor shall be solely responsible for ensuring that no silt or debris leaves the immediate construction site. Any silt or debris that does leave the immediate site shall be cleaned up and the area disturbed shall be returned to its natural state as directed by the Engineer at the Contractor's expense.

END OF SECTION

SECTION 02555
WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 GENERAL

Water distribution systems shall be designed to sustain EPD's standards for safe drinking water quality. Special consideration should be given to distribution main sizing, providing for design of multidirectional flow, adequate valving for distribution system control, and provisions for adequate flushing. Distribution systems should be designed to maximize turnover and to minimize residence times while delivering acceptable pressures and flows.

1.02 REFERENCE STANDARDS

A. American Water Works Association (AWWA):

C104	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C151	Ductile-Iron Pipe, Centrifugally Cast
C300	Reinforced Concrete Pressure Pipe, Steel-Cylinder Type
C500	Gate Valves 3" - 48" for Water and Other Liquids
C502	Dry Barrel Fire Hydrants
C600	Installation of Cast Iron Water Mains
C651	Disinfecting Water Mains
C800	Threads for Underground Service Line Fittings
C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. - 60 In.

B. American National Standards Institute (ANSI):

A 21.10	Gray Iron and Ductile Iron Fittings, 2" - 48" for Water and Other liquids
A 21.11	Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe Fittings
A 21.4	Cement Mortar Lining for Cast Iron and Ductile Iron Pipe and Fittings for Water
A 21.51	Ductile Iron Pipe, Centrifugally Cast in Metal or Sand Lined Molds, for Water or Other Liquids
B 18.2	Square and Hex Head Bolts and Screws

C. American Society of Testing and Materials (ASTM):

A 47	Malleable Iron Castings
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- A 48 Gray Iron Casting
- A 88 Seamless Copper Water Tube
- A 240 Chromium and Chromium Nickel Stainless Steel Plate Sheet and Strip for Fusion Welded Uni fired Pressure Vessels
- A 307 Low Carbon Steel Externally and Internally Threaded Standard Fasteners
- D 1784 Rigid Poly (Vinyl chloride) Compounds, and Chlorinated Poly (Vinyl Chloride) Compounds
- D 2239 Polyethylene (PE) Plastic Pipe (SDR PR)
- D 2241 Poly Vinyl Chloride (PVC) Plastic Pipe (SDR PR and Class T)
- D 3139 Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals

D. Rule for Safe Drinking Water, Georgia State EPD: Chapter 391-3-5.10

1.03 DESCRIPTION

- A. All valves of the same type shall be from a single manufacturer. Parts for valves of the same type and size shall be interchangeable. Spare parts shall be furnished where required in the payment items. Special tools required for repacking or disassembling valves shall be provided.
- B. All valves shall open left (counterclockwise).

1.04 SUBMITTALS

- A. Six copies of the manufacturer's drawings and catalog cuts of the following items shall be submitted for approval of the Design Engineer and the Inspector:
 - 1. Pipe
 - 2. Fittings
 - 3. Joints and Couplings
 - 4. Hydrants
 - 5. Valves

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Materials delivered to the site shall be inspected for damage, unloaded, and stored with the minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and rubber gaskets under cover and protect from exposure to direct sunlight. Store materials above ground. Interior of pipe and fittings shall be kept free of dirt and debris.

- B. Pipe, fittings, valves, hydrants, and other accessories shall be handled to ensure delivery to the point of installation in sound undamaged condition. If coatings or linings of pipe or fittings are damaged, such pipe or fittings shall be removed from the site and new materials furnished. Pipe shall not be dragged. Rubber gaskets that are not installed immediately shall not be left in the sunlight but shall be stored under cover and protected from exposure to direct sunlight.

PART 2 – PRODUCTS

2.01 POLYVINYL CHLORIDE PIPE (PVC)

- A. IPS Size PVC Pipe: Class 200 SDR 21 - Polyvinyl chloride water main pipe shall conform to Designation ASTM D2241 and shall consist of Type I, Grade 1 PVC compound conforming to ASTM D1784. All pipe shall be Class 200, SDR 21. The standard laying length shall be 20 ft. ±1 inch.
- B. DIP Size PVC Pipe: AWWA C-900
 - 1. C-900 polyvinyl chloride water main pipe 4" TO 12" shall conform to Designation ASTM D2241 and shall consist of Type I, Grade 1 PVC compound conforming to ASTM D1784. All pipe larger than 4" to 12" shall meet the requirements of AWWA C900, "Poly Vinyl Chloride (PVC) pressure pipe." All pipe shall be class 200 pipe and shall meet the requirements of DR14. The standard laying length shall be 20 ft. ±1 inch. The FM approved pressure class will be used to determine pressure class.
 - 2. C-905 polyvinyl chloride water main pipe 14" to 30" shall be manufactured from compounds conforming to PVC cell classification of 12454B as defined in ASTM D-1784. The integral bell joint system meets the requirements of ASTM D-3139 and utilizes an elastomeric gasket materials conforming to ASTM F-477. All pipe shall be class 200 pipe and shall meet the requirements of DR18. The standard laying length shall be 20 ft. ±1 inch.
- C. When DIP size PVC pipe is used two 2" PVC pipe shall be SDR 21, minimum pressure class of 200psi.
- D. Pipe shall have integral bell and spigot joints. Provisions shall be made for contraction and expansion at each joint with an elastomeric ring. Threaded or solvent welded type joints shall not be used. Bell end pipe and couplings with elastomeric gaskets shall meet the requirements of ASTM 3139.

- E. All fittings such as tees, ells, etc. using welded joints shall be factory welded and shall meet the same specifications as the welded bell section. Lubricants shall be non-toxic, shall not promote biological growth. Solvent cemented joints are not allowed for buried pipes.
- F. The Contractor shall install a continuous run of 14 gauge copper tracer wire with underground coating above the top of the PVC pipe 12 inches above the pipe but no deeper than 48 inches below finished grade. The tracer wire shall be suitable for detection with metal pipe location equipment.
- G. All water pipe shall be blue in color and labeled "water" every three feet as a minimum.
- H. Pipe shall carry National Sanitation Foundation (NSF) seal and be factory marked with manufacturer's identification, pipe size, material and pressure rating. Detection tape shall be placed along all PVC water mains.

2.02 DUCTILE IRON PIPE

- A. Ductile iron pipe shall conform to the requirements of ANSI Standard A21.51 and AWWA C151. All pipe shall class 350. Class designations for the various classes of pipe shall be painted on the outside of each joint of pipe. Weights shall be conspicuously painted in white on each joint of pipe after the bituminous coating has hardened.
- B. All joints shall have the same pressure rating as the pipe with which it is used. Joints shall be rubber gasketed push on or mechanical joint. Joints shall meet the requirements of ANSI A21.11 and AWWA C111.
- C. Pipes shall be cement lined in accordance with the latest edition of AWWA Standard C104.

2.03 GALVANIZED STEEL PIPE

- A. This pipe and fittings shall conform to the requirements of ASTM A120. The pipe shall be "standard weight", unless otherwise specified.

2.04 PLASTIC TUBING

- A. Plastic pipe shall conform to all the requirements of the "Specifications for Polyethylene (PE) Plastic Pipe (ADR PR)", as they apply to PE 3306 of ASTM D2239.

- B. The hydrostatic design stress shall be 630 psi for water at 23° centigrade (73.4° F) and 500 psi for water at 37.8° C (100° F).
- C. The polyethylene extrusion compound from which the pipe is extruded shall meet the requirements of Type III, Grade 3, Class C material as described in "Specification for Polyethylene Molding and Extrusion Materials", ASTM D1248, except that melt index shall be determined under a higher temperature than any of the conditions as listed in Section 6(b) of "Method of Test for Measuring Flow Rates of Thermoplastics by Extrusion Plastometer", ASTM D1238. The test condition shall be the same as for condition J, except that the temperature shall be 310° C (590° F), with a load of 12.5 kilograms. Under these conditions the resin shall extrude at a maximum rate of 0.25 grams per ten (10) minutes. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform in color, capacity, density, and other physical properties.
- D. The size, the type of plastic pipe material, dimension ratio, commercial standards with which the pipe complies, the manufacturer's name and the National Sanitation Foundation (NSF) seal of approval, shall be conspicuously marked on the outside of the pipe at intervals of not more than five (5) feet.

2.05 FITTINGS

- A. Fittings shall be ductile iron and shall conform to the latest edition of AWWA Standard C110 or C153. The fittings shall be of the lightest class conforming to the pressure rating of the pipelines in which they are installed. In no case shall the fittings be lighter than class 200.
- B. Fittings for galvanized steel pipe shall be malleable iron conforming to ANSI B16.3 except the nipples and couplings shall be the same material as the pipe. All fittings shall be hot dip galvanized in accordance with ASTM A120.
- C. Pipe having mechanical joints or slip-on joints with rubber gaskets shall be used. Lead-tip gaskets shall not be used.
- D. The mechanical joint shall meet the requirements of AWWA C111 and shall have the same pressure rating as the fitting of which it is a part.
- E. Fittings shall be cement lined in accordance with the latest edition of AWWA Standard C104.

2.06 HYDRANTS

- A. All fire hydrants shall conform to AWWA C502.
- B. All fire hydrants shall have a 6" mechanical joint inlet connection and be equipped with a 5 1/4 inch valve, two 2 1/2 inch hose nozzles, and one 4 1/2 inch pumper connection, all with ANSI (National) standard threads. Operating nuts shall be 1 1/2 inch, pentagon type.
- C. All fire hydrants shall be equipped with "O" ring-type stem seals.
- D. All fire hydrants shall be designed for 150 psi working pressure and 300 psi test pressure.
- E. All fire hydrants shall be equipped with a 6" gate valve, complying with other sections of the specifications, installed on the fire hydrant lead between the hydrant and the main.
- F. The Contractor shall paint the hydrant with XO 14 Tractor Red (Federal Safety Color) paint.
- G. All fire hydrants shall be designed such that clockwise rotation of the stem closes the valve and counterclockwise rotation opens the valve. Hydrant covers shall have the word "Open" and an arrow showing the proper rotation of the operating nut cast in or permanently attached.
- H. An independent drain shall be provided, completely draining the hydrant after use. The drain shall be activated to the open position by the closing of the hydrant valve. The drain rod shall be easily cleaned. The drain shall have a protective shield integral with the hydrant base to minimize clogging and prevent undermining.
- I. All working parts of the hydrant shall be easily removed for inspection or servicing without digging or the use of hoists or derricks or special tools. The hydrant cover and standpipe shall be removable without requiring the water to be shut off.
- J. Each fire hydrant shall be equipped with a ground line mounted breakaway flange and cast iron safety stem coupling specially designed so that upon sustaining severe impact the hydrant will shear off at the ground line without loss of water in the main.
- K. All fire hydrants shall be Mueller standard or equal as approved by the Engineer.

2.07 METERS

- A. All meters shall be approved first-line products of recognized manufacturers and shall be compatible with the meter reading system currently being used by the water system owner and operator.
- B. Meters, meter materials, and meter test shall conform to applicable AWWA Specifications and shall meet or exceed current AWWA Specifications.
- C. Each meter shall have manufacturer's serial number on the lid.
- D. All body parts as cases, boxes, and lids shall be of bronze composition.
- E. Meters shall be split case, positive displacement type.
- F. The register shall read in U.S. Gallons and shall be hermetically sealed and driven by permanent magnets.

2.08 METER BOXES

- A. The meter box shall be the approved standard product used by the water system owner and operator.
- B. They shall be rectangular and of adequate dimension to accommodate the specified meters.
- C. Boxes shall have cast iron or polyethylene covers labeled "WATER METER".
- D. Boxes for 5/8" by 3/4" meters shall have inside width not less than 10 inches, inside length not less than 15 inches and overall height not less than 12 inches.
- E. Boxes shall be designed and built to withstand traffic loads typical of yard installations.

2.09 VALVES

- A. All valves 2" in diameter and smaller shall be constructed of brass or bronze except that the hand wheel which shall be of malleable iron construction with screwed ends. All valves 2 1/2" in diameter and larger shall have flanged ends for interior service and mechanical joints for buried service unless otherwise approved. They shall be iron body, bronze mounted, except that in the smaller sizes the valves may be all bronze.

B. Gate Valves:

1. Gate valves smaller than three inches shall meet the requirements of Fed. Spec. WW V 54, Class A, 125 pounds.
2. Gate valves three inches and larger shall have non-rising stems and shall meet the requirements of AWWA Standard C 500. Valves for lighter pressures than the AWWA Standard shall meet the requirements of the above specifications except that the requirements for metal thickness and strengths and structural designs shall be adjusted as required to meet hydrostatic test pressures not less than 150 psi.
3. All gate valves shall have standard stuffing box seals. Bonnet bolts, studs and nuts shall be cadmium plated. Seating devices shall be bronze to iron or bronze to bronze. The glands shall be bronze, or bronze brushed. Gland bolts and nuts shall be bronze.
4. All gate valves shall be of the double disc or wedge type. The wedge or disc shall be totally encapsulated in rubber. The sealing rubber shall be permanently bonded to the wedge or disc to meet ASTM tests for rubber metal bond ASTM D249.
5. Valves to have two inches square operating nut, with the exception that gate valves in altitude valves pits shall have hand wheels.
6. Valves buried in ground or located in vaults or structures shall have suitable extensions for socket operation with top of operating nut located two feet below finished grade maximum.
7. Any valve installed in a vault readily accessible for entry shall be equipped with handle wheels in lieu of operating nuts. No hand wheels are allowed in buried valves.

C. Check Valves:

1. Check valves 2" through 24" shall be iron body, bronze mounted swing check valves meeting the requirements of AWWA Standard C508 76.
2. The check valve shall be metal to metal or composite to metal seat construction with flange ends or screw and coupled ends.

D. Altitude Valves:

1. All altitude valves furnished for use in the systems shall be equipped for showing at all times the position of the valve. Said altitude valves shall be of the size specified on the drawings and suitable for the use intended.
2. The Contractor shall supply the services of a qualified manufacturer's representative to check and calibrate each altitude valve installation for proper working pressure and sequence.

E. Air Release Valves

1. Air release valve shall have all bronze body and bonnet. They shall be the direct acting type.
2. Valves shall be hydrostatically tested to at least 150 psi.
3. The valve shall have stainless steel floats and an internal coating with rust inhibitors.

2.10 BACKFLOW PREVENTERS

- A. The backflow preventers used shall be those specifically designed for use in connections when the danger from backflow presents a health hazard.
- B. All domestic backflow preventers shall be of the reduced pressure type or double check type as shown on plans. All fire protection system backflow preventers shall be of the double check detector type.
- C. Backflow preventers 3/4" to 2" shall be Ames LF 2000 B, LF 4000 B, or equal meeting or exceeding the following specifications:

Mainline Case – Bronze or Copper Alloy
Working Parts Bronze & Stainless Steel
Springs Stainless Steel
Diaphragms Buna N and Mylar
Valve disc Silicone Rubber
Check Valve Enclosure Glass Reinforced Plastic
Maximum Rated Working Pressure 175 psi
Temp. Range 33° 180°F

- D. Backflow Preventers 2½" to 10" shall be Ames M200, M400, or LFM300 Lead Free or equal meeting or exceeding the following specifications:

Body 8" 10" Stainless Steel
Body 2½" 6" Stainless Steel
Working Parts Stainless Steel
Springs 2½" 6" Stainless Steel
Springs 8" 10" Stainless Steel
Valve Disc Silicone Rubber
Maximum Rated Working Pressure 175 psi
Temp. Range 33° 140°F

- E. Backflow preventers larger than 10" shall be designed for conditions that do present a health hazard. It shall be the reduced pressure type and depending on the application, may require detection of leaks or unauthorized use. Detectors above 10" shall be submitted for approval. The submittal shall include complete shop drawings. The submittal will be reviewed based on the product's ability to meet the needs of the project and the Owner.

PART 3 – EXECUTION

- A. All valves shall be carefully mounted in their respective positions free from distortion and strain. All valves shall be properly packed and left in satisfactory operating condition at the completion of the project.
- B. Valve box, cover, and the concrete pad shall be installed with each valve as shown in miscellaneous details.

3.01 PIPE INSTALLATION

- A. PVC pipe shall be installed in accordance with the Uni Bell Plastic Pipe Association guide for installation of polyvinyl chloride plastic pressure pipe for municipal water main distribution system and the printed recommendations of the manufacturer.
- B. Ductile iron pipe shall be installed in accordance with AWWA C600. Concrete pipe shall meet the latest edition of AWWA Standard C300.
- C. Pipeline alignment and gradient shall be straight or shall follow true curves as near as practicable. Curvature in pipelines, where required, shall be well within the allowable laying radius, horizontal and vertical.

- D. Excavation, cleaning, laying, jointing and backfilling shall follow as closely as is possible so as to progress the work. In no case shall pipe be left in the trench overnight without completing the jointing. The completed pipeline shall not be left exposed in the trench unnecessarily, and the Contractor shall backfill and compact the trench as soon as is possible after laying and jointing is completed. Each day at the close of work, and at all times when laying is not in progress, the exposed end of the pipeline in the trench shall be closed with a head or barrier of wood or metal. If at any time it becomes necessary to cover the end of any uncompleted pipe line with backfill, the end of that pipe shall be closed with a mechanical joint plug.
- E. The Contractor shall keep exposed ends of pipe properly plugged during laying to prevent dirt and other materials from entering the line, and shall also, before the system is accepted, thoroughly clean all lines.
- F. Thrust Blocks (Reaction Blocking) shall be provided as specified AWWA C600. All exposed pipes, valves, hydrants, etc., shall be securely strapped and all ends and bends braced.
- G. Other means of pipe restraining in addition to thrust blocking shall include "mega lug" utilization and all threads bolted through fittings in accordance with AWWA C600. Thrust blocking may not be eliminated with the use of joint restraint.
- H. Mechanical joints shall be made only by experienced mechanics. Sockets and spigots shall be washed with soapy water before slipping gland and gasket over spigot. The spigot shall be inserted in the socket full depth. The gasket shall be brushed with soapy water, and pushed into position making sure the gasket is evenly seated in the socket. The gland shall then be properly positioned for compressing the gasket. All bolts and nuts shall be tightened with a torque wrench to a uniform, permanent tightness. Bolts shall be tightened alternately 180 degrees apart. Sockets, spigots, glands, and bolts shall be kept clean and wet with soapy water until each joint is completed.
- I. All water distribution mains shall have a minimum 36" of cover.

3.02 INSTALLATION OF MAINS

- A. Water lines must not be installed in contaminated areas such as sanitary landfill or dump areas.
- B. No water main or pipe shall pass through or come into contact with any part of a sewer or sewer manhole.

- C. A continuous and uniform bedding shall be provided in the trench for all buried pipe.
- D. Backfill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect pipe.
- E. Thrust restraint shall be provided at all points where hydraulic thrust may develop. This will include providing reaction blocking, tie rods or joints designed to prevent movement to all bends, tees, valves, plugs, hydrants and other points where thrust may develop. Additional restraints may be necessary on fusible pipe at the connection to appurtenances or transitions to different pipe materials to prevent separation of joints. The restraint may be provided in the form of an anchor ring encased in concrete or other methods as approved by the Division.
- F. Whenever a state route or heavily traveled off-system road or a railroad is crossed, the agency that has jurisdiction over the road or the railroad must be notified, prior to the installation of the mains. At the crossing, a steel casing with sufficient diameter must be jacked and bored to accommodate the carrier pipe. Any free boring at low traffic city streets and county roads must conform to the applicable local and/or state requirements.
- G. Installation of water lines and appurtenances along highways, streets and roadways must comply with the applicable regulations of, and permits issued by, the Georgia Department of Transportation, local County and Municipality with reference to construction operations, safety, traffic control, road maintenance and repair.
- H. When non-metallic pipe is installed, detection tape shall be installed.
- I. Any pipe, pipe fittings, plumbing fittings or fixtures, solder, or flux used in the installation or repair of a public water system must meet the new definition of lead free meaning: (a) not containing more than 0.2 percent lead when used with respect to solder; and (b) not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.
- J. If soils are found to be aggressive, the water main shall be protected by encasement in polyethylene, the provision of cathodic protection (in very severe instances), or the use of corrosion resistant water main materials.
- K. Stones found in the trench shall be removed for a depth of at least six (6) inches below the bottom of the pipe.

- L. All distribution mains shall be provided with sufficient earth and other suitable cover to prevent freezing. This shall be not less than 24 inches measured above the top of pipe.

3.03 FIRE HYDRANT INSTALLATION

- A. Fire Hydrants shall meet the current AWWA Standard C502.
- B. All fire hydrants shall have 36" minimum pipe cover provided for the branch supply line.
- C. Each fire hydrant shall be set on a stable foundation at least 18 inches square and 6 inches thick and shall be blocked against the end of the trench with concrete and anchored.
- D. Hydrant drainage shall be provided by installing around the hydrant at least 7 cubic feet of gravel or crushed stone below the top of the hydrant supply pipe.
- E. The barrel of the fire hydrant shall be set plumb (perpendicular to the ground) with the lowest discharge outlet at least fifteen (15) inches high but no higher than 24 inches above finished grade. No fire hydrant shall be installed within 10 feet of any private driveway. Hydrants shall be located no closer than 5 feet of a curbing and no further than 12 feet of the curbing.
- F. Immediately before installation of a hydrant, the following operations shall be performed:
 - 1. The hydrant shall be thoroughly inspected.
 - 2. The hydrant interior shall be thoroughly cleaned.
 - 3. The hydrant shall be opened and closed to determine that all parts are in proper working order, with valves seating properly and the drain valve operating freely.

3.04 HYDROSTATIC TEST

- A. Upon completion of backfilling operations and not less than seven (7) days after the last concrete blocking anchor has been poured, the pipe system shall be subject to hydrostatic test.
- B. Pressure and leakage tests shall be performed in accordance with the latest edition of AWWA Standard C600.

1. For PVC: Allowable leakage shall be no greater than as calculated in $L = ND(P)^{1/2} / 7,400$ where L is allowable leakage in gallons/hour, N is the number of joints in the length of pipe tested, D is the nominal diameter of the pipe in inches and P is average test pressure during the leakage test in pounds per square inch (psi-gauge).
 2. For DIP: Allowable leakage shall be no greater than as calculated in $L = SD(P)^{1/2} / 133,200$ where L is allowable leakage in gallons/hour, S is the length of pipe tested in feet, D is the nominal diameter of the pipe in inches and P is average test pressure during the leakage test in pounds per square inch (psi gauge).
- C. The system shall be filled with water and all air expelled.
 - D. The Contractor shall pressurize the system to 1.5 times the working pressure or 150psi, whichever is greater, at the highest point in the system.
 - E. The test pressure shall be maintained for two hours.
 - F. If the pressure cannot be maintained, the cause shall be determined, corrected and test repeated until successful.

3.05 LEAKAGE TEST

- A. Following the pressure test, the system shall be subject to a leakage test.
- B. Leakage shall be defined as the quantity of water that must be supplied into the pipe to maintain the design working pressure after all air in the pipeline has been expelled and the pipe has been filled with water.
- C. Leakage shall not exceed the quantity determined by the formula given below:

$$L = ND(\text{Square Root of } P) / 7400$$

WHERE	L	=	allowable leakage in gallon/hr.
	N	=	number of joints in pipeline
	D	=	nominal diameter of the pipe inches
	P	=	average test pressure during leakage test in psig

- D. If leakage exceeds the allowable rate, leaks shall be found and repaired and the test repeated until successful.

3.06 CORROSION CONTROL

A. General:

1. All treated water shall be evaluated to ensure that water quality parameters and characteristics are optimized to obtain the desired water stability throughout the distribution systems of a water supply.
2. The primary approaches to internal corrosion control in drinking water systems are to modify the water chemistry to make it less corrosive and to encourage formation of passivating films on the contacting surface. This is typically accomplished through pH and/or alkalinity adjustment or through the addition of a corrosion inhibitor. Most corrosion control treatment will be beneficial for reducing corrosion of lead, copper, iron, steel, and galvanized pipe.
3. Where adjustments to water quality parameters such as chlorine residual, pH, alkalinity or carbonate buffer strength prove insufficient to control corrosion rates, the use of corrosion inhibitors should be considered. Orthophosphate is particularly effective for this purpose in most situations.
4. To control corrosion, certain basic approaches can be utilized:
 - a. Using pipe materials and designing the system so it is not corroded by a given water;
 - b. Modifying the water quality so it is not corrosive to the pipe material; and
 - c. Placing a protective barrier or lining between the water and the pipe.

B. Corrosion Control Study:

1. Monitoring/testing equipment shall be provided for determining the effectiveness of stabilization treatment and the chemical residuals at the entry point and in the distribution system, including an acceptable pH probe that utilizes three standards for calibration.
2. A sample site location plan for water quality parameter monitoring. Entry point and distribution system samples shall be collected for water quality data and other system information pertinent to achieving optimum corrosion control. The frequency of sampling and number of sites shall be determined by the Division. The water quality parameters include:

pH	Conductivity
Temperature	Hardness
Alkalinity	Iron
Calcium Manganese	Sulfate Aluminum
Ammonia	Dissolved Oxygen
Total Phosphorus	Natural Organic Matter
Chloride	Total and Free Chlorine Corrosion Control Inhibitors
	Total & Free Chlorine (Orthophosphate, Silica)

3. A summary of all water quality parameter monitoring results. These results should be evaluated considering the location of sample sites within the distribution system and used as the basis for considering corrosion control treatment options.
 4. A desktop evaluation utilizing corrosion control computer modeling or regulatory guidance. The evaluation shall recommend optimal corrosion control treatment and water quality parameter performance requirements for the selected treatment.
 5. Identification of possible limitations and secondary impacts for treatment options.
- C. Adjustments to water quality
1. pH adjustment by the addition of lime, caustic soda or soda ash in order to stabilize the water with regard to calcium carbonate. Advantages of aeration for iron, H₂S or CO₂ removal should be balanced against the fact that dissolved oxygen is a corrosive agent.
 2. pH/Alkalinity adjustment includes adding a base or similar chemical to the water to increase pH to a level where the practical lead or copper solubility lowers, acids are neutralized, and less soluble metal compounds are formed on the pipes. Treatment shall be designed to operate within the optimum pH range and alkalinity concentration.
 - a. Caustic Soda- Caustic soda (sodium or potassium hydroxide) will increase the pH with minimal effect on alkalinity and dissolved inorganic carbon (DIC). A stable pH is very difficult to provide when using caustic soda on water having low alkalinity. Caustic soda can cause severe burns and damage the eyes.

- b. Soda Ash- Soda ash (sodium or potassium carbonate) will increase the alkalinity, DIC, and moderately increase the pH. Soda ash is relatively safe to handle compared to caustic soda.

3. Aeration

- a. Aeration can increase the pH and reduce excess DIC by removing carbon dioxide. Aeration is most effective when there is an adequate carbon dioxide concentration in the water.
- b. The carbon dioxide content of aggressive water may be reduced by aeration.

3.07 DISINFECTION

- A. Water mains and accessories shall be disinfected in accordance with "Rules for Safe Drinking Water" as published by the Georgia Environmental Protection Division.
- B. The mains shall be flushed into the storm drainage system before disinfecting by maintaining a velocity of at least 2.5 feet per second for a period of ten minutes.
- C. The continuous feed method may be used for any size main or system where satisfactory quantity and quality water is available. The tablet method shall not be acceptable.
- D. Following disinfection of the water system, the system shall be flushed until chlorine concentration is less than 1 milligram per liter. Flushing shall not allow chlorinated water to be discharged into the storm sewer system without first allowing the chlorine in the system to dissipate. The contractor shall use a Pollard Water LPD-250 or equal equipment along with LPD-Chlor tablets (Sodium Sulfate or Ascorbic Acid) to de-chlorinate the water using 1 tablet per 2000 gallons of water minimum prior to flushing, then after adequate testing, discharge the de-chlorinated water to the storm sewer system or onto the land surface. During the de-chlorination flushing the flow through the LPD 250 will be maintained at between 200 and 1200 GPM. No flows for de-chlorination or flushing will not be allowed outside this flow specification. The contractor may apply to the owner of the sanitary sewer system to obtain permission to discharge the chlorinated water into the sanitary sewer system for a fee. The contractor shall be charged at the going rate per gallon for treating the water discharged to the sanitary sewer system.
- E. When new water mains are placed in or returned to service, they shall be disinfected in accordance with the latest addition of AWWA Standard C651.

1. 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, an alternative to flushing, such as broom-sweeping of the main, is acceptable prior to chlorinating the main.
 2. 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.
 3. The quality of the water used during the disinfection procedures shall meet the required drinking water standards.
 4. The chlorine solution used for the “continuous feed” method of 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.
 5. 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.
 6. 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. Re-flush and re-disinfect the lines, as necessary, until satisfactory bacteriological results are obtained.
- F. When cutting into existing mains, for abandonment or reuse, the pipes must be disinfected. a. All water mains that are depressurized and/or wholly or partially dewatered shall be disinfected in accordance with the current AWWA C651 Standards, including swabbing with hypochlorite solution, flushing, and/or slug chlorination as appropriate. Leaks or breaks that are repaired with clamping devices while the mains remain full of water under pressure may require no disinfection.

1. Chlorine required to produce 25 mg/L concentration in 100 feet of pipe by diameter:

Pipe Diameter (inches)	100% Chlorine		1% Chlorine Solution	
	(lbs.)	(g)	(gal)	(L)
4	0.013	5.9	0.16	0.6
6	0.030	13.6	0.36	1.4
8	0.054	24.5	0.65	2.5
10	0.085	38.6	1.02	3.9
12	0.120	54.4	1.44	5.4
16	0.217	98.4	2.60	9.8

Note: 1% chlorine solution may be prepared with sodium hypochlorite (contains 5% to 15% available chlorine) or calcium hypochlorite (contains approximately 65% available chlorine by weight). To prepare 1% chlorine solution using calcium hypochlorite, add one (1) pound (454 grams) of calcium hypochlorite in approximately 8 gallons of water.

2. Amounts and types of chemicals advised to be used for neutralizing various residual chlorine concentration in 100,000 gallons of water:

Residual Chlorine Concentration Mg/L	Chemicals							
	Sulfur Dioxide (SO ₂)		Sodium Bisulfate (NaHSO ₃)		Sodium Sulfite (Na ₂ SO ₃)		Sodium Thiosulfate (Na ₂ S ₂ O ₃ ·5H ₂ O)	
	Lb.	Kg	Lb.	Kg	Lb.	Kg	Lb.	Kg
1	0.8	0.36	1.2	0.54	1.4	0.64	1.2	0.54
2	1.7	0.77	2.5	1.13	2.9	1.32	2.4	1.09
10	8.3	3.76	12.5	5.67	14.6	6.62	12.0	5.44
50	41.7	18.91	62.6	28.39	73.0	33.11	60.0	27.22

- G. Surface water crossings, both over and under water, may present special concerns and should be discussed with the Division before the final plans are prepared.

1. At above water crossings, the pipe shall be adequately supported and anchored, protected from vandalism, damage and freezing, and accessible for repairs or replacement. At underwater crossings, a minimum of 3 feet of cover shall be provided over the pipe.

2. The installation of ductile iron pipe with restrained push-on joints and encased in concrete, may be considered with the prior approval of the Division. Otherwise, when crossing water courses which are greater than 15 feet in width, only pipes of special construction, having flexible, watertight joints shall be installed.
 3. Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; valves shall be easily accessible and not subject to flooding. Sampling taps shall be installed at each end of the crossing, and permanent taps shall be made for testing and determining leaks.
- H. There shall be no physical connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water and other contaminating materials may be discharged or drawn into the system.
1. The approval of the Division shall be obtained for interconnections between potable water supplies.
 2. Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to the potable water supply
- I. Water services and plumbing should conform to relevant local and/or state plumbing codes, or to the Standard Plumbing Code, as applicable within the jurisdiction in which the system is located. The product that is used for the service line must be listed as being certified for conformance with the NSF Standard 61.
1. All new and existing services connected to community and non-transient noncommunity water systems shall be individually metered.
 2. Individual booster pump(s) shall not be allowed for any individual residential service from the public water supply mains. Where permitted for other types of services, booster pumps shall be designed in accordance with AWWA standards.
- J. Water loading stations present special problems since the fill line may be used for filling both potable water vessels and other tanks or contaminated vessels. To prevent contamination of both the public supply and potable water vessels being filled, the following principles shall be met in the design of water loading stations:
1. There shall be no backflow to the public water supply;
 2. The piping arrangement shall prevent contaminant being transferred from a hauling vessel to others subsequently using the station; and

3. Hoses shall not be contaminated by contact with the ground.

K. Bacteriologic Tests:

1. Bacteriological testing shall be performed after the repairs are complete. However, depending upon the circumstances, the water main may be returned to service prior to completion of testing to minimize the time the customers are out of service.
2. Tests shall be performed to detect the presence of coliform organisms on samples taken from the end farthest from the point at which chlorine was introduced into the system and at 1000 ft. intervals.
3. The bacteriological sample shall meet the requirements established by EPD for suitable disinfection for human consumption.
4. If unsatisfactory samples are produced, disinfection shall be repeated until samples are satisfactory.

END OF SECTION

Unofficial

**SECTION 02616
PAVEMENT REMOVAL AND REPLACEMENT**

PART 1 GENERAL

1.01 DEFINITION

- A. When used in this section, the term "Standard Specifications" shall mean the DEPARTMENT OF TRANSPORTATION, STATE OF GEORGIA STANDARD SPECIFICATIONS FOR CONSTRUCTION OF ROADS AND BRIDGES, 2001 Edition or later edition, unless amended herein.

1.02 DESCRIPTION

- A. Related Work Specified Elsewhere:
1. Trench Excavation, Backfill and Compaction Section 02221.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Base: Granular material to meet the following gradation:

<u>SIEVE SIZE</u>	<u>PERCENT PASSING BY WEIGHT</u>
1 1/2"	100
3/4"	60 100
10	30 55
60	8 35
200	5 20

- B. Concrete: 3000 psi compressive strength
- C. Prime Coat: RC-70 Georgia DOT Specifications
- D. Asphalt Surface Course: The surface course shall be either Superpave 9.5 mm or 12.5 mm Asphaltic Concrete and shall conform with Section 402, Hot Mix Asphaltic Concrete Construction, of the Standard Specifications.

PART 3 EXECUTION

3.01 CONCRETE PAVEMENT REPLACEMENT (DRIVEWAYS)

- A. Existing pavement shall be removed to a minimum of 12 inches on either side of the trench.
- B. Following trench backfilling and compaction, the depth of concrete pavement replaced shall match the existing pavement or shall be a minimum of 6 inches thick, whichever is greater.
- C. Joints and finish of the concrete slab shall match existing pavement.
- D. Pavement replacement for each driveway shall be accomplished with one pour. Deviation must be approved by the Engineer.
- E. All joints shall have waterproof sealer to avoid water intrusion and deterioration of the patch.

3.02 CONCRETE PAVEMENT REPLACEMENT (ROADWAY)

- A. Existing pavement shall be removed to a minimum of 12 inches on either side of the trench.
- B. A minimum 8-inch concrete slab containing black dye in the top 2 inches (minimum) shall be placed extending 12 inches on either side of the trench and on undisturbed soil.
- C. Depth of concrete pavement replaced shall match the existing pavement or shall be a minimum of 8 inches thick, whichever is greater.
- D. Joints and finish of the slab shall match existing pavement. Joints shall have expansion material between old and new paving.
- E. All slabs shall be installed in one pour unless directed otherwise by the Engineer. If construction joints are required, measures must be taken to avoid deterioration of the patch later by water intrusion.

3.03 ASPHALT PAVEMENT REPLACEMENT

- A. Existing pavement shall be removed to a minimum of 12 inches on either side of the trench.

- B. Granular base material shall be placed to a minimum depth of 8 inches and compacted to 95% maximum dry density following trench backfilling and compaction.
- C. If so directed by the Engineer, the base shall be a 6 inch concrete slab extending 12" on either side of the trench and on undisturbed soils, then a 2 inch asphalt surface course shall be placed after a prime coat is applied to the concrete slab at the rate of 0.25 gallons per square foot to bring the paving to grade.

3.04 MAINTENANCE OF SURFACE

- A. Pavement damage due to settlement of backfill: Repair for period of bond.
- B. Depressions more than 6 inches deep in aggregate surfaced areas: Fill to grade for period of bond.

3.05 TESTING

- A. Certified laboratory reports shall be required to ensure the subgrade has been compacted to 95% and the base compacted to 100% standard proctor.

END OF SECTION

**SECTION 02920
GRASSING**

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Ground preparation, seeding, planting grass, hydroseeding, fertilizing, and mulching of graded areas, over pipelines, in rights-of-way, roadway shoulders, ditches slopes and any other disturbed area.
- B. Seed Protection.
- C. Maintaining seeded areas until final acceptance.

1.02 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed in original containers showing analysis of seed mixture, percentage of pure seed, year of production, net weight, date of packaging and location of packaging. Damaged packages are not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer. Damaged bags are not acceptable.
- C. Deliver sod on pallets.
- D. All materials shall be acceptable to Engineer prior to use.

1.03 PLANTING DATES

- A. This specification provides for the establishment of a permanent grass cover between the dates of March 1 and September 30. If finished earth grades are not completed in time to permit planting and establishment of the permanent grass during the favorable season between the dates specified above unless otherwise accepted, the Contractor will be required to plant a temporary cover to protect the newly graded areas from erosion and to keep windblown dust to a minimum. The temporary cover shall be planted between October 1 and February 28 unless otherwise permitted.

1.04 HYDROSEEDING

- A. The Contractor may hydroseed in lieu of seeding grass. At least 10 days prior to beginning hydroseeding, the Contractor shall submit to the Engineer a statement of hydroseeding, which shall contain, but not limited to, the following items: seed mixture combination, type of fertilizers and soil amenders, type of mulch fibers, type of binder, application rates, type of spraying equipment and agitator.

PART 2 - PRODUCTS

2.01 SEED

- A. All grass seed shall be certified by the Georgia Department of Agriculture.
- B. All grass seed shall be in undamaged containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.
- C. Selected grasses shall be appropriate for the season and site as specified by the Manual.
- D. Selected seed shall be equal type and grade to the previously existing grass.
- E. The Engineer reserves the right to test, reject, or accept all seed before seeding.

2.02 FERTILIZER

- A. 10-10-10 or 6-20-20, commercial fertilizer of approved type, conforming to state fertilizer laws.

2.03 SEEDING SCHEDULE

- A. Schedule: See plans.
- B. In areas where existing grass is to be matched, contractor shall sow seed at the rate and dates recommended by seed distributor.

2.04 LIME

- A. Agricultural grade, ground limestone.

2.05 SOD

- A. Sod shall be densely rooted, good quality grass, free from noxious weeds. The sod shall be obtained from areas where the soil is reasonably fertile. The sod shall be raked free of all debris and the grass mowed to two inches before cutting. The sod shall contain practically all of the dense root system and not be less than one (1) inch thick. Sod shall be cut in uniform strips not less than twelve (12) inches in width and not less than twenty-four (24) inches in length.

2.06 HYDROSEED

- A. Equipment shall have a built in agitation system and operating capacity sufficient to agitate, suspend and homogeneously mix a slurry containing not less than 44 lbs. of organic mulching amendment plus fertilizer, chemical additives and solids for each 100 gallons of water.
- B. Cellulose Fiber Mulch: Apply at a minimum rate of 1500 lbs./acre.
- C. Fertilizers: See Paragraph 2.2

- D. Organic tackifier: Apply at a rate of 70 lbs./acre.
- E. Hydroseed seed mix shall be applied at the lbs./1000 sq.ft. designated in the planting schedule.

2.07 ACCESSORIES

- A. Straw Mulch: Oat or wheat straw reasonably free from weeds, foreign matter detrimental to plant life, and in dry condition.
- B. Excelsior Mulch: Excelsior mulch shall consist of wood fibers cut from sound, green timber. The average length of the fibers shall be 4 to 6 inches. The cut shall be made in such a manner as to provide maximum strength of fiber, but at a slight angle to the natural grain of the wood so as to cause splintering of the fibers when weathering in order to provide adherence to each other and to the soil.
- C. Wood cellulose fiber shall be made from wood chip particles manufactured particularly for discharging uniformly on the ground surface when dispersed by a hydraulic water sprayer. It shall remain in uniform suspension in water under agitation and blend with grass seed and fertilizer to form a homogenous slurry. The mulch fibers shall intertwine physically to form a strong moisture holding mat on the ground surface and allow rainfall to percolate into the underlying soil. The mulch shall be heat processed so as to contain no germination or growth-inhibiting factors. It shall be dyed (non-toxic) an appropriate color to facilitate metering of material.

2.08 PRODUCT REVIEW

- A. The Contractor shall provide the Engineer with a complete description of all products before ordering. The Engineer will review all products before they are ordered.

PART 3 - EXECUTION

3.01 GENERAL

- A. All areas that are disturbed by the work, including trenches and ungraded clear areas, except areas to be paved, shall be provided with a full stand of permanent grass.
- B. Concentrated flow areas, all slopes steeper than 2.5:1 and with a height of ten feet or greater, and cuts and fills within stream buffers, shall be stabilized with sod and/or the appropriate erosion control matting or blanket. Appropriate matting or blankets shall be specified by the Engineer on the Drawings.

3.02 PREPARATION

- A. The areas to be seeded shall be made smooth and uniform and shall conform to the finished grade indicated on the plans.

- B. Remove foreign materials, plants, roots, stones, and debris from surfaces to be seeded.
- C. Grassing areas, if not loose, shall be loosened to a minimum depth of 3 inches before fertilizer, seed, or sod is applied.

3.03 STAND OF GRASS

- A. Before acceptance of the seeding performed for the establishment of permanent vegetation, the Contractor will be required to produce a satisfactory stand of perennial grass whose root system shall be developed sufficiently to survive dry periods and the winter weather and be capable of re-establishment in the spring.
- B. Before acceptance of the seeding performed for the establishment of temporary vegetation, the Contractor will be required to produce a stand of grass sufficient to control erosion for a given area and length of time before the next phase of construction or the establishment of permanent vegetation is to commence.

3.04 SEEDING DATES

- A. Seeding shall be performed during the periods and at the rates specified in the seeding schedules. Seeding work may, at the discretion of the Contractor, be performed throughout the year using the schedule prescribed for the given period. Seeding work shall not be conducted when the ground is frozen or excessively wet. The Contractor will be required to produce a satisfactory stand of grass regardless of the period of the year the work is performed.

3.05 APPLYING LIME AND FERTILIZER

- A. Following advance preparation and placing selected material for shoulders and slopes, lime, if called for based on soil tests and fertilizer, shall be spread uniformly over the designated areas, and shall be thoroughly mixed with the soil to a depth of approximately 2 inches. Fertilizer shall be applied at the rate of 1,000 pounds per acre for the initial application unless otherwise directed by the Engineer. Lime shall be applied at the rate determined by the soil test. Unless otherwise provided, lime will not be applied for temporary seeding. In all cases where practicable, acceptable mechanical spreaders shall be used for spreading fertilizer. On steep slopes subject to slides and inaccessible to power equipment, the slopes shall be adequately scarified. Fertilizer may be applied on steep slopes by hydraulic thuds as a mixture of fertilizer and seed. When fertilizer is applied with combination seed and fertilizer drills, no further incorporation will be necessary. The fertilizer and seed shall be applied together when Wood Cellulose Fiber mulch is used. Any stones larger than 2/z inches in any dimension, larger clod, roots, or other debris brought to the surface shall be removed. In lieu of soil test Contractor must apply 1 ton of lime per acre.

3.06 SEEDING

- A. Seed shall be sown within 24 hours following the application of fertilizer and lime and preparation of the seedbed as specified in Section 3.2. Seed shall be uniformly sown at the rate specified by the use of acceptable mechanical seed drills. Rotary

hand seeders, power sprayers or other satisfactory equipment may be used on steep slopes or on other areas that are inaccessible to seed drills.

- B. The seed shall be covered and lightly compacted by means of cultipacker or light roller if the drill does not perform this operation. On slopes inaccessible to compaction equipment, the seed shall be covered by dragging spiked chains, by light harrowing, or by other satisfactory methods.
- C. Apply water with fine spray immediately after each area has been sown.
- D. Do not sow seed when ground is too dry, during windy periods or immediately following a rain.
- E. If permitted by the special provisions, wood cellulose fiber mulch or excelsior fiber mulch may be used.

3.07 SEED PROTECTION (STRAW MULCH)

- A. All seeded areas seeded with permanent grasses shall be uniformly mulched in a continuous blanket immediately following seeding and compacting operations, using at least 2 tons of straw per acre.

3.08 SEED PROTECTION (OPTIONAL EXCELSIOR MULCH)

- A. Seed shall be sown as specified in Section 3.6. Within 24 hours after the covering of seed, excelsior mulch shall be uniformly applied at the rate of 2 tons per acre. The mulch may be applied hydraulically or by other acceptable methods. Should the mulch be placed in a dry condition, it shall be thoroughly wetted immediately after placing. The Engineer may require light rolling of the mulch to form a tight mat.

3.09 SEED PROTECTION (WOOD CELLULOSE FIBER MULCH)

- A. After the lime has been applied and ground prepared as specified in Section 3.2, wood cellulose fiber mulch shall be applied at the rate of 1,500 pounds per acre in a mixture of seed and fertilizer. Hydraulic equipment shall be used for the application of fertilizer, seed, and slurry of the prepared wood pulp. This equipment shall have a built-in agitation system with an operating capacity sufficient to agitate, suspend, and homogeneously mix a slurry of the specified amount of fiber, fertilizer, seed and water. The slurry distribution lines shall be equipped with a set of hydraulic spray nozzles, which will provide an even distribution of the slurry on the various areas to be seeded. The slurry tank shall have a minimum capacity of 1,000 gallons.
- B. The seed, fertilizer, wood pulp mulch, and water shall all be combined into the slurry tank for distribution of all ingredients in one operation by the hydraulic seeding method specified herein. The materials shall be combined in a manner recommended by the manufacturer. The slurry mixture shall be so regulated that the amounts and rates of application shall result in a uniform application of all materials at rates not less than the amount specified. Using the color of the wood pulp as a guide, the equipment operator shall spray the prepared seedbed with a

uniform visible coat. The slurry shall be applied in a sweeping motion, in an arched stream so as to fall like rain, allowing the wood fibers to build upon each other until an even coat is achieved.

3.10 SODDING

- A. Sod shall be placed between March 1 and December 1 to all yards that have been disturbed.
- B. Sod shall be placed within 48 hours of cutting.
- C. Sod shall be moist when laid and placed on moist ground. The sod shall be carefully placed by hand, beginning at the toe of slopes and working upwards. The length of the strips shall be at right angles to the flow of surface water. All joints shall be tightly butted and end joints shall be staggered at least 12 inches. The sod shall be immediately pressed firmly into the ground by tamping or rolling. Fill all joints between strips with fine screened soil. Sod on slopes shall be pegged with sod pegs to prevent movement. The sod shall be watered, mowed, weeded, repaired or otherwise maintained, to ensure the establishment of a uniform healthy stand of grass until acceptance.

3.11 HYDROSEEDING

- A. Installation procedures:
 - 1. Inspection of conditions: Examine related work including irrigation and grading of surface before proceeding with any work and notify the Engineer in writing on conditions which may prevent the proper execution of this work. Failure to report unsuitable conditions will require the contractor to rectify unacceptable work at no additional cost to the Owner.
 - 2. Water all plant areas thoroughly to saturate upper layers of soil prior to the hydroseeding operation.
 - 3. Allow the planting area soil surface to dry out for one day only prior to the hydroseeding application. Exercise care not to allow the soil surface to be overly saturated with water prior to the hydroseeding installation. At the same time the soil surface should not become too dry during this period. There should be some residual moisture within the first 1/4 inch of the soil surface.
 - 4. Prior to starting the hydroseeding operation notify the Engineer forty-eight (48) hours in advance to be present at start of start of hydroseeding.
- B. Hydroseeding Application:
 - 1. Apply the hydroseeding in the form of a slurry consisting of organic soil amendments, commercial fertilizer, and any other chemicals that are called out. When hydraulically sprayed onto the soil, the mulch shall form a blotter-like material. Direct the spray operation so that this procedure will drill and mix the slurry components into the soil, the slurry spray will also penetrate

the soil surface, thus ensuring maximum impregnation and coverage. The impregnation and mixing of the components will help in retaining moisture while stabilizing soil surface from superficial erosion.

2. Do not leave the hydroseeding slurry components in the hydroseeding machine for more than two (2) hours because of possible seed destruction. If slurry components are left for more than two hours in the machine, add 50% more of the originally specified seed mix to any slurry mixture which has not been applied within the two hours after mixing. Add 75% more of the original seed mix to any slurry mixture which has not been applied eight (8) hours after mixing. All mixtures more than eight (8) hours old, must be disposed, off-site, at the Contractor's expense.
3. Spray the area with a uniform visible coat, using the dark color of the cellulose fiber as a visual guide. The slurry shall be applied in a downward drilling motion via a fan stream nozzle. Ensure that all of the slurry components enter and mix with the soil. Ensure the uniformity of the hydroseed application. The hydraulic Contractor shall be approved by the Engineer.
4. Exercise special care to prevent any of the slurry from being sprayed onto any hardscape areas including concrete walks, fences, walls, buildings, etc. Remove all slurry sprayed onto these surfaces at the Contractor's expense.
5. Contractor shall save all seed and fertilizer taps and fiber mulch bags for the Engineer to verify compliance with the drawings and specifications.
6. The Engineer shall be present during the hydroseeding operation and has final determination if conditions are acceptable for hydroseed application.

3.12 MAINTENANCE

- A. Maintain seeded surfaces until final acceptance.
- B. Maintenance shall consist of providing protection against traffic, watering to ensure uniform seed germination and to keep surface of soil damp, and repairing any areas damaged as a result of construction operations or erosion.
- C. If a poor stand of grass is present, re-seed as required to achieve final stabilization. Replace sod as needed.
- D. After grass has been established, mow as often as needed to maintain height between 4 and 6 inches until final acceptance.

3.13 ACCEPTANCE

- A. Before acceptance of the seeding performed for the establishment of permanent vegetation, the Contractor will be required to produce a satisfactory stand of perennial grass that covers at least 100% of the total area and is uniformly covered with a density of at least 70% so that it is fully stabilized against erosion and whose

root system shall be developed sufficiently to survive dry periods and the winter weather and be capable of re-establishment in the spring.

END OF SECTION

Unofficial

**SECTION 03300
GENERAL CONCRETE**

PART 1 GENERAL

1.01 QUALITY STANDARDS

- A. Any procedure and material operation specified by reference to the following publications shall comply with the requirements of the current specification or standard:
1. American Society for Testing Materials (ASTM):
 - A185 Welded Steel Wire Fabric for Concrete Reinforcement.
 - A615 Deformed Billet Steel Bars for Concrete Reinforcement.
 - C31 Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field.
 - C33 Specification for Concrete Aggregate.
 - C39 Compressive Strength of Molded Concrete Cylinders.
 - C94 Specification for Ready Mixed Concrete.
 - C143 Slump of Portland Cement Concrete.
 - C150 Portland Cement.
 - C172 Sampling Fresh Concrete.
 - C192 Making and Curing Concrete Test Specimens in the Laboratory.
 - D1751 Preformed Expansion Joint Fillers for Concrete Paving.
 2. American Concrete Institute:
 - ACI 301 Specification for Structural Concrete for Buildings.
 - ACI 305 Recommended Practice for Hot Weather Concreting.
 - ACI 318 Building Code Requirements for Reinforced Concrete.

1.02 QUALITY CONTROL

- A. The Contractor shall submit to the Engineer, for review a design mix for each class of concrete listed under CLASSES OF CONCRETE, prior to placing any concrete.

- B. Verification tests of design mixes and aggregates are required by the Engineer. Verification test specimens shall be made in accordance with ASTM C39 by an Independent Test Laboratory. Compressive strength shown by verification tests shall be at least fifteen percent in excess of the strengths listed under CLASSES OF CON-CRETE. The Independent Testing Laboratory shall report the test results to the Engineer, in writing and shall note any failure to meet the specification.
- C. Verification tests of design mixes made not more than one year prior to the date of submittal will be acceptable provided they were made from materials identical to those to be used in the project.
- D. Mill Test: Conducted in accordance with ASTM A615 recommendations on each 15 tons, or less reinforcing shipped to the job. Two (2) copies of test to be sent to the Engineer.
- E. Inspection and Testing of Concrete:
1. The cost of slump tests and sampling, molding, storing, materials, transporting concrete test specimens shall be paid by the Contractor. The laboratory or inspection agency shall be selected by the Owner. Costs of all laboratory testing services required because of failure to meet the requirements of these specifications shall be paid by the Contractor.
 2. One set of four (4) acceptance cylinders shall be prepared for each day's placing of each strength of concrete and if more than 50 cubic yards of concrete is placed in any day, there shall be an additional set of cylinders prepared for each 50 cubic yards placed or for any fraction thereof. One cylinder shall be broken at seven days and two at twenty-eight days, with one cylinder held in reserve.
 3. Responsibilities in Inspection:
 - a. Laboratory's Duties
 1. The reception and marking of specimens in the laboratory, laboratory curing, preparation for breaking and testing of cylinders shall be the responsibility of the laboratory and shall be performed by qualified laboratory personnel, observing all requirements of applicable ASTM Standards. Compression test specimens shall be tested in accordance with ASTM C39.
 2. Prior to the commencement of concrete work, the laboratory shall provide initial instruction in the performance of sampling and testing duties for an employee designated by the Contractor and shall provide him with copies of all ASTM Standards pertinent to his duties.

b. Contractor's Duties:

1. The Contractor shall deliver to the laboratory all materials to be used in required testing. He shall supply wheelbarrows, shovels, mixing boards, shaded work space and similar equipment required for molding test cylinders. He shall provide stable, insulated storage boxes, equipped with thermostatically controlled heat, for storage of cylinders in the first 24 hours after molding.
2. He shall designate an employee, who alone shall perform all operations of sampling concrete, molding test specimens, protecting test specimens for the first 24 hours after molding, and packing and shipping of test specimens. The employee shall make a record of a slump test in connection with each truckload of concrete. The designated employee shall receive initial instruction in the performance of his sampling and testing duties from a representative of the testing laboratory and shall have available copies of all ASTM Standards pertinent to his duties. Sampling shall conform to ASTM C172. Slump tests shall conform to ASTM C143. Compression test specimens shall be made and cured in accordance with ASTM C31.
3. Each set of test cylinders shipped to the laboratory shall be accompanied by a report giving information as to location in the structure of concrete sampled, time and date of sampling, air temperature, slump, class designated nominal strength, air content if applicable, temperature of concrete, truck number, and time batched. Each report shall be signed by the employee making the test and by the Contractor or his representative, certifying that the test specimens have been made by the one designated, fully instructed employee and have been made in accordance with applicable standard specifications.
4. Should any concrete fail to meet the specified strength, have a slump in excess of that required by the design mix for each class of concrete listed under CLASSES OF CONCRETE, or result in voids, honeycombs or otherwise fail to meet the requirements, the Engineer may order the concrete removed, further tests made, or other remedial measures taken, all at the Contractor's expense.

1.03 SHOP DRAWINGS

- A. After making his check the Contractor shall submit to the Engineer one (1) blue line copy of each of placing plans, bending details and bar lists covering all reinforcing steel.

- B. Full information for checking and for proper installation without reference to other drawings shall be included. At splices the amount of lap shall be shown. Location and arrangement of accessories shall be clearly shown. Elevations shall be drawn for all reinforced masonry and reinforced concrete walls to a scale no smaller than 1/4 inch = 1 foot.
- C. Work shall not proceed before the Contractor has received shop drawings approved by the Engineer. The Contractor shall be responsible for the conformation of all typical and special reinforcing steel details.
- D. Engineer's review is for conformance to the design concept and contract documents. Markings or comments shall not be construed as relieving the Contractor from compliance with the project plans and specifications, nor departures therefrom. The Contractor remains responsible for details and accuracy, for selecting fabrication processes, for techniques of assembly, and for performing his work in a safe manner.
- E. Proposed construction joint shall be clearly indicated on shop drawings and subject to approval of the Engineer.

1.04 INSPECTION

- A. The Contractor shall give the Engineer 24 hours advance notice before starting to place concrete in any portion of the structure to permit observation. An authorization of the Engineer shall be secured before concrete is placed. Any concrete placed in violation to this provision shall be replaced by new concrete if required by the Engineer.
- B. Prior to notification of the Engineer, the Superintendent shall personally inspect the work and verify that it is ready for observation.
- C. At the time of observation, all reinforcing in the area where concrete is to be poured shall be in place, tied and ready for the placement of concrete. All anchors, sleeves, inserts, etc., shall be securely held in position.

1.05 STORAGE

- A. Reinforcing steel delivered to the job and not immediately placed in forms shall be placed in racks or other supports at least eighteen (18) inches above ground.

PART 2 MATERIALS

2.01 CEMENT

- A. Portland cement shall conform to ASTM C150, Type I.

2.02 AGGREGATES

- A. Aggregates for standard weight concrete shall conform to ASTM C33, maximum size: 3/4 inch.

2.03 WATER

- A. Mixing water shall be potable.

2.04 REINFORCING STEEL

- A. Reinforcing bars shall be American manufactured conforming to the requirements of ASTM A615 "Deformed Billet Steel Bars for Concrete Reinforcement", Grade 60.
- B. Welded wire fabric or cold drawn wire for concrete reinforcement shall be of American manufacture and shall conform to the requirements of the ASTM A185 "Welded Steel Fabric for Concrete Reinforcement".
- C. Accessories shall conform to the requirements of C.R.S.I. Manual.

2.05 READY MIXED STRUCTURAL CONCRETE:

- A. Ready mix concrete shall be mixed and delivered in accordance with these specifications and requirements set forth in ASTM C94. In addition, these following conditions must be met:
 - 1. Concrete shall be normal weight with an ultimate compressive strength at 28 days, and slump as follows:
 - 2. Air entrained concrete shall be used for all structural concrete with the air content not less than 3 percent and no more than 5 percent.
- B. Classes of Concrete:
 - Class A $f'c = 3000$ psi, Slump 4 inches +/- 1 inch
 - Class AA $f'c = 4000$ psi, Slump 3 inches +/- 1 inch
 - Class B $f'c = 5000$ psi, Slump 5 inches +/- 1 inch

2.06 EXPANSION JOINT MATERIAL

- A. Expansion joint material at slabs on grade shall be premolded asphalt saturated cellulose fiber or mineral strips conforming to ASTM D1751.

2.07 WALL TIES

- A. Ties shall be made with break back ends or other means of removing the tie end to a depth of at least 1 inch from the concrete surface after the forms are removed.

2.08 LIQUID FORM SEALER

- A. Form sealer shall be a standard product compatible with the finish required for exposed concrete and shall contain no paraffin oil or mineral oil.

PART 3 – EXECUTION

3.01 FORMWORK

- A. Forms shall conform to the shapes, lines and dimensions of the members as indicated, and shall be substantial and sufficiently tight to prevent leakage of mortar. They shall be braced or tied together so as to maintain position and shape.
- B. Formwork shall be observed by the Engineer before pouring concrete. Before placing the reinforcement, surfaces of wood forms in contact with the concrete, unless lined, shall receive a thorough coating of form sealer. The Engineer shall have the right to reject any forms that do not appear to him to be sufficient as to alignment and of producing the required finished surface. Should misalignment of forms or screed, excessive deflection of forms or displacement of reinforcing occur during concrete placing, corrective measures shall be immediately made to the extent, if necessary, that placing operations shall be stopped and concrete removed from within forms. The surfaces to required dimensions and cross section. Exposed lines and surfaces shall not vary from dimensions shown on plans by more than 1/4 inch in twenty feet.
- C. Forms may be constructed of wood or metal. Earth forms for footings may be permitted if local conditions are favorable and approved by the Engineer. Form work for exposed concrete shall be form grade plywood.
- D. Studs, waler, and ties shall be so spaced that the load of wet concrete will not stress ties beyond the printed working load recommended by the manufacturer not cause spans of form material to deflect from a true surface.
- E. The Contractor shall maintain a continuous check upon formwork during the placing of concrete. An instrument check shall be periodically made, or "Tattle Tail" rods or other devices shall be used to detect any settlement in forms.
- F. Conduits in Concrete: Conduits shall not displace reinforcing steel from its intended position, nor impair the strength of the structure.
- G. The Contractor shall assume all responsibility for removal of formwork. Elevated concrete slabs shall attain 70% of the specified ultimate strength before removing the forms. After removing forms, slabs shall be reshored at mid span and at all points under shores supporting forms for the work above. No floor shall be loaded in excess of the live load for which designed unless adequate shores are place beneath members supporting the concrete of load.

3.02 PLACING REINFORCING STEEL

- A. Reinforcement shall be shop fabricated, accurately positioned, and secured with not less than 16-gauge annealed wire or suitable clips.
- B. No bars, partially embedded in concrete shall be field bent, unless noted otherwise.

- C. Reinforcing bars shall be accurately placed and secured in position by approved chairs, spacers, or ties to maintain the position of the reinforcing steel prior to and during placing of concrete.
- D. Reinforcing steel support chairs and bolsters for use in concrete to be exposed shall have galvanized steel leg.
- E. No splices shall be made, except as shown on approved Shop Drawings or approved in writing by the Engineer.
- F. The placement of reinforcement shall be observed by the Engineer before pouring of concrete. Should there be any delay in the work, reinforcement previously placed shall be reinspected and cleaned, if necessary, before concrete placement is resumed.
- G. Metal reinforcement shall be protected by concrete cover. Where not otherwise shown, the thickness of concrete over the reinforcement shall be as follows:

Footings	3" clear sides and bottom
Slabs	3/4" clear, top, and bottom
Beams	2" clear, all around
Walls	2" clear, both faces
Columns & Piers	2" clear
- H. All splicing or reinforcement not shown shall be approved by the Engineer. Splices shall not be made at a point of maximum stress and shall provide sufficient lap to transfer the stress between bars by bond. Hook and bending details, column tie arrangements, etc., shall be as shown by the S.R.A.I. Manual or the ACI Detail Engineering Manual.
- I. Wire mesh reinforcing shall be placed one inch from top of concrete slabs on ground. Lap all joints 12 inches and extend mesh to within 1 inch of sides and ends of slabs.

3.03 CONCRETE MIXING AND PLACING

- A. Ready mix concrete shall conform to ASTM C94. Not more than one hour shall elapse between the time mixing water is added to the batch and the concrete is poured. No water shall be added on the job.
- B. No concrete shall be placed until all embedded items and reinforcing have been placed in the forms and observed by the Engineer. At least 24-hour notice shall be given the Engineer of an impending pour, so that he may observe the work, prior to placing.
- C. Concrete shall be conveyed from the mixer to the place of final deposit by methods that will prevent segregation or loss of materials.
- D. Concrete shall be deposited in its final position to avoid segregations and separation do to rehandling or flowing. The placing shall be carried on at such a

rate that concrete is at all times plastic and flows readily into the spaces between bars. When placing is once started, it shall be carried on as a continuous operation, until placement of that section is completed.

- E. Concrete shall be worked into and around bars and embedded items with spades, rods, trowels, and vibratos, so as to produce a solid homogeneous mass, free of voids, pockets or honeycombs.
- F. Construction joints shall be installed and located as indicated. Where a joint occurs, the surface of the concrete shall be thoroughly cleaned and all laitance removed and shall be left rough or mechanically roughened, thoroughly wetted and slushed with a coat of neat cement grout immediately before placement of new concrete.
- G. All embedded items, including anchor bolts and dowels, shall be in place, preset and held in position, before any concrete is placed.
- H. No concreting shall be performed when ambient temperatures are below 40°F or if the temperature is predicted by the local U.S. Weather Bureau will fall below 40°F within 24 hours after the time of installation.
- I. No concrete shall be installed against frozen ground. All foundation cavities and slab areas that have frozen, shall be thoroughly clean of all loose earth prior to pouring concrete.
- J. All newly poured concrete shall be protected from freezing or near freezing weather during the cure period.
- K. Hot weather precautions shall be taken whenever the maximum air temperature exceeds 80°F during the day. Hot weather concreting shall be performed in accordance with ACI 305.

3.04 EXPANSION/CONTROL JOINT INSTALLATION

- A. Expansion joints shall be placed a maximum of 20 ft. intervals and at all intersections with steps, curbs other walks or abutting structures. Joints shall extend from the surface to the subgrade at right angles to the sidewalk.
- B. Expansion joint filler shall be 1/2 inch thick and as wide as the full width and depth of the sidewalk. All expansion joints shall be filled with semi-rigid epoxy, specifically manufactured for the sealing of control joints in concrete slab construction, to create a watertight slab.
- C. Control joints (tooled or saw-cut) shall be placed at no less than 12 and no more than 15 ft. intervals, in a square grid, throughout the full length and width of the concrete slab. All control joints shall be filled with semi-rigid epoxy, specifically manufactured for the sealing of control joints in concrete slab construction, to create a water tight slab.

3.05 ANCHORAGE

- A. Slots, inserts, and connections elements for anchoring items to concrete shall be built into forms before placing concrete.

3.06 SLABS ON GRADE

- A. Concrete shall be compacted, screeded to grade, and prepared for the specified finish. Slabs shall be placed in panels in alternate checkerboard pattern or in alternate lanes divided into panels. Each panel shall be approximately square terminated by slab joints.
- B. Contraction joints shall be true to line 1/8 inch wide, and of depth equal to approximately 1/4 of the slab thickness. Joints shall be sawed or formed.

3.07 CURING

- A. Provisions shall be made for maintaining concrete in a moist condition for at least 10 days after the placement of the concrete, or by one of the following methods:
 - 1. Spraying with water or ponding.
 - 2. Using moisture retaining covers.
 - 3. Concrete curing compound, W.R. Meadows CS 309 or Guardian Chemical Co., Master Builders or Triple Cure by Cobra Chemicals.
- B. The spraying water shall be applied on unformed surfaces within one hour after the forms are stripped and the spraying shall be continuous. The moisture retaining cover shall be applied on unformed surfaces immediately after the concrete is finished. If there is any delay, the concrete shall be kept moist until the application is made. If the surfaces are formed, the forms shall be removed, and the concrete sprayed lightly with water before the cover is applied.
- C. When concrete surfaces are to receive applied finishes of materials, all curing compounds shall be checked for compatibility with other material to be applied to the concrete surfaces before application.

3.08 CONCRETE FINISHES

- A. All poured joints, voids, honeycombs, and other imperfections shall be patched within the same working day that forms are removed.
- B. Troweled Finish:
 - 1. Troweled finish shall be applied to the surface of all floors unless ceramic tile, quarry tile or pavers are called for on finish schedule.
 - 2. Floor slabs shall be screened to an even surface by the use of straight edge and screeding strips accurately set to the proper grade. The

concrete shall be floated with a wood float in a manner which will compact it and produce a surface free from depressions or inequalities of any kind. Floors shall be level with a tolerance of 1/8 inch in 10 feet except where drains are indicated. After the concrete has hardened sufficiently to prevent fine materials from working to the top and has been allowed to stand until all water sheen has disappeared, it shall be steel troweled. Final troweling shall be done after the concrete is hard enough that no mortar accumulates on the trowel and a ringing sound is produced as the trowel is drawn over the surface. The drying of the surface moisture before troweling shall proceed naturally and shall not be hastened by the dusting on of dry sand or cement.

- C. Nonslip Finish: All exterior platforms and step treads shall be made non slippery by application at not less than 1/4 lb. per sq. ft. of aluminum oxide or emery aggregate graded from particles retained on a #50 mesh screen to particles passing an 1/8 inch screen placed during the finishing process. Abrasive aggregate shall be sprinkled by hand as soon as the freshly placed cement will support the weight of workmen and floated into the surface.
- D. Unfinished Slabs: Depressed slab areas to receive ceramic quarry tile or pavers shall be finished to remove all laitance and to leave a slightly roughened, surface to ensure bond. The surface of the slab shall not vary in any direction more than 1/8 inch when tested with a ten-foot straight edge. The straight edge shall be lapped one half its length as the test is being made.

3.09 CONCRETE FLOOR HARDENER

- A. All concrete floor slabs shall be cured with concrete floor hardener, "Clear Bond", as manufactured by Guardian Chemical, "Triple Cure" by Cobra Chemicals, or "Sealtight CS-309" by W.R. Meadows. The floor hardener shall be applied in strict accordance with the manufacturer's recommendations.
- B. Walks shall be tooled, full 1 inch deep into separate slabs as indicated. Surface edges of each slab shall be rounded to approximately 1/4 inch radius.
- C. Final finish shall be a medium or light broom finish and all tool marks completely removed.

END OF SECTION