515 N. Main Street | Hinesville, GA 31313
PO Box 649 | Hinesville, GA 31310
912.368.5212
www.mesack.com
ME Sack Engineering
@mesackengineering
mesack

BID DOCUMENTS

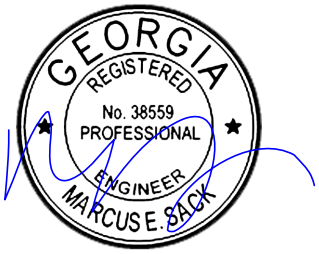
LAND APPLICATION SYSTEM (LAS) EXPANSION

AND

SEWER SYSTEM IMPROVEMENTS

FOR

CITY OF PEMBROKE



October 12, 2023

MES No. 2020-48

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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 November 13, 2023 until 10:00 a.m. local time for the LAS Expansion and Sewer System Improvements.

The work to be performed consists of furnishing all labor and materials to complete the LAS Expansion and Sewer System Improvements. More specifically, the LAS expansion will consist of approximately 11,900 LF spray field piping, sprinkler heads/supports, and a lift station pump upgrade. The pump station improvements will include pumps and a control panel, a complete screening system, and a generator. The force main extension will consist of approximately 10,300 LF force main piping, air release valves, pavement removal and replacement, and structure relocation.

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No bids may be withdrawn for a period of sixty (60) days after the closing time schedule for receipt of bids.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

A mandatory pre-bid meeting will be held at Pembroke City Hall, 353 N. Main Street, Pembroke, Georgia at 10:00 am on October 30, 2023.

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. A mandatory pre-bid meeting will be held at Pembroke City Hall, 353 N. Main Street, Pembroke, Georgia at 10:00 a.m. on October 30, 2023.

2. 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 November 13, 2023, for all labor and materials required to fully complete the work identified in the plans and specifications for the LAS Expansion and Sewer System Improvements.

3. At the time and place noted above, the proposals will be publicly opened and read aloud.

4. 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.

5. 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.

6. Proposal shall be in opaque, sealed envelope and marked "LAS Expansion & Sewer System Improvements" 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.

7. 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. LAS Expansion					
1	11,900	LF	Spray Fields Piping	$	$
2	88	EA	Half Circle Sprinkler Head	$	$
3	162	EA	Full Circle Sprinkler Head	$	$
4	250	EA	Sprinkler Head Support	$	$
5	1,250	LF	Silt Fence Type NS	$	$
6	1,300	LF	Silt Fence Type S	$	$
7	1	LS	Grassing	-	$
8	1	LS	Pump Station Pump Modification	-	$
9	1	LS	Pump Inspection and Maintenance Contingency	-	$ 25,000.00
10	1	LS	Traffic Control	-	$
11	1	LS	Mobilization (5% Max)	-	$
				SUBTOTAL	**$**
B. Pump Station Improvements and Force Main Addition					
12	1	LS	Pump Station Complete	-	$
13	1	LS	Screen Complete	-	$
14	1	LS	Electrical Complete	-	$
15	1	LS	Standby Power Generator	-	$
16	1	LS	Propane Tank and Accessories	-	$
17	10,300	LF	8” PVC Force Main	$	$
18	1	EA	Force Main Connection to Existing Manhole	$	$
19	6	EA	Air Release Valve	$	$
20	16	EA	Plug Valve	$	$
21	1	LS	Structure Relocation	-	$
22	165	SY	Pavement Removal & Replacement	$	$
23	45	SY	Concrete Driveway Removal & Replacement	$	$

B. BID FORM continued

Bid Item	Quantity	Units	Description	Unit Price	Cost
B. Pump Station Improvements and Force Main Addition (continued)					
24	211	LF	16" Steel Cased Jack and Bore with 8" Carrier Pipe	$	$
25	280	LF	Open-Cut with 8” PVC Pipe	$	$
26	1,725	LF	Type A Silt Fence	$	$
27	1	LS	Temporary Grassing	-	$
28	1	LS	Permanent Grassing	-	$
29	1	EA	Haybale Check Dam	$	$
30	1	LS	Traffic Control	-	$
31	1	LS	Mobilization (5% Max)	-	$
				SUBTOTAL	$
				TOTAL BID	$

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 three hundred sixty (360) 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 Pubic

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.

H. SITE VISIT CERTIFICATION

This document is to be executed by the Bidder and submitted with the bid for the construction of the **LAS Expansion & Sewer System Improvements (Project #2020-48)** 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 **LAS Expansion & Sewer System Improvements (Project #2020-48)** 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

LAS Expansion & Sewer System Improvements
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

LAS Expansion & Sewer System Improvements
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 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:

LAS EXPANSION AND SEWER SYSTEM IMPROVEMENTS
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 three hundred sixty (360) 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.

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)

By

(Secretary)

Mayor
(Witness) (Title)

(Contractor)

By

(Secretary)

(Witness) (Title)

(Address and Zip Code)

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.

SECTION V: OTHER CONDITIONS OF CONTRACT BY ATTACHMENT

A. SUPPLEMENTAL CONDITIONS

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

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

AMERICAN COUNCIL OF ENGINEERING COMPANIES

_____

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

_____

AMERICAN SOCIETY OF CIVIL ENGINEERS

_____

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by

CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

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, expediters, 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

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 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 any claim based on 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 which 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 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 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 where 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. Contractor shall provide necessary temporary piping, faucets, valves, wiring, switches, outlets, etc., to carry services to the work. The Contractor shall make all temporary utilities connection for his own use and remove temporary services on completion of 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 cost 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. Engineer will furnish prints to 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 applies 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 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 normal 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 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 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 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 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 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 benefit of the difference in 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-SITE 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 has 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 for 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 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.

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.

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 under taken. 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.

D. Submission of Shop drawings shall be accompanied by a transmittal letter in duplicate, containing project name, Owner's project number, Contractor's name, and number of drawings, title, and other pertinent data.

E. The Contractor shall promptly submit to the Engineer, five copies for Architectural items and six copies for 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. dba M.E. Sack Engineering. Transmission of the file to, or use by, any third party is prohibited.

END

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 SPRAY FIELD PIPING

A. Measurement: Measurement shall be made along the centerline of the pipe trench through fittings and specials with no deduction for such fittings and specials.

B. Payment: Payment will be made for each linear foot of polyethylene tubing installed at the unit price stated in the bid. The unit price bid shall include all labor, materials, and equipment necessary to complete the installation including, but not limited to, trenching, excavation, shoring and sheeting, dewatering, bedding, pipe, backfill, compaction, testing, and complete surface restoration.

2.02 LAND APPLICATION SYSTEM SPRAY FIELD SPRINKLERS AND SPRINKLER HEAD SUPPORTS

A. Measurement: Measurement shall be made on the basis of each sprinkler installed and each sprinkler head support. Each sprinkler shall be categorized as a half-circle or full-circle spray head in the design drawings.

B. Payment: Payment will be made for each spray head unit installed and for each support installed for the sprinkler heads at the unit prices stated in the bid. The unit price bid shall include labor, materials, and equipment necessary, including, but not limited to, locating existing connection points, installation of sprinkler heads, length of polyethylene tubing installed, each unit of distribution lateral tees installed, and testing at 45 psi.

2.03 SILT FENCE

A. Measurement: Measurement shall be made on the basis of each linear foot of silt fence installed in accordance with the Plans, Specifications and "The Manual for Erosion and Sediment Control in Georgia."

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 to prevent erosion from the site. Work shall include, but not be limited to, excavation, trenching, post and fabric installation, backfill, daily inspection, maintenance, re-installation of failed sections, sediment removal once its one-half original height of fence. Once final stabilization has occurred, removal and disposal of fence and surface restoration of remaining disturbed area. All silt fence locations shall be approved by the Engineer prior to installation. No payment will be made for silt fence installed without approval of Engineer or silt fence not properly maintained.

2.04 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 on 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.

2.05 LAS PUMP STATION PUMP MODIFICATION

A. Measurement: Measurement shall be made on the basis of the percent complete of the task in accordance with approved plans and specifications.

B. Payment: Payment will be made on the basis of the percent complete of the lump sum price stated in the bid. The price bid shall include all labor, materials, and equipment necessary to complete the task. The task shall include, but is not limited to, receiving and installing the new bowls and impellers for the pumps at the pumping station, piping, fitting, bolts, and accessories, removal of the existing the pumps, testing, operational setup, general cleanup, and surface restoration.

2.06 LAS PUMP INSPECTION AND MAINTENANCE CONTINGENCY

A. Measurement: Measurement shall be made on the basis of the percent complete of the visual inspection of the pump as required in accordance with approved plans and specifications.

B. Payment: Payment will be made on the basis of the percent complete of the lump sum price stated in the bid. The price bid shall include all labor, materials, and equipment necessary to complete the task. The task shall include, but is not limited to, visual inspection of existing conditions of mechanical seals, bearings, coupling, shaft alignment, lubrication, bolts, wiring, electrical components, and piping. This item is to cover unforeseen items that may be found during the removal and reinstallation process to ensure proper operation of the pumping station.

2.07 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.

2.08 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.

2.09 PUMP STATION COMPLETE

A. Measurement: Measurement shall be made on the basis of the percentage completed item in accordance with the plans, specifications and bid documents.

B. Payment: Payment will be made on the basis of the percent completion of the lump sum price stated in the bid. The price bid shall include all labor, materials, and equipment necessary to complete this item of work. The work shall include, but is not limited to, removal of piping, fittings and other existing infrastructure that will impede the installation of the proposed system, cleaning and removal of solids from the wet well, by-pass pumping, receiving and installing the pump station equipment (pumps, pump bases, pipe, pipe supports, control panel, level control, covers, miscellaneous hardware, connection hardware, electrical, telemetering), testing, operational setup, general cleanup, and surface restoration.

2.10 SCREEN COMPLETE

A. Measurement: Measurement shall be made on the completed item of work in accordance with the plans, specifications and bid documents.

B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials, and equipment necessary to complete this item. Work shall include, but is not limited to, locating the manhole and wet well, excavation, connection to the existing manhole and wet well including any fittings required, manhole and wet well cored with boot (required), existing wet well modifications with necessary excavation, shoring and sheeting, dewatering, gravel bedding, castings, foundation, backfill, compaction, complete surface finish, and clean up, for the correct installation of the screen system, installing screen, bypass valve, water service, grouting, control panel, covers, miscellaneous hardware, connection hardware, electrical, testing, cleanup and surface restoration.

2.11 ELECTRICAL COMPLETE

A. Measurement: Measurement shall be made on the completed item of work in accordance with the plans, specifications and bid documents.

B. Payment: Payment will be made at the lump sum stated in the bid. The price bid shall include furnishing all labor, materials and equipment necessary to complete the task. The task shall include, but is not limited to, trenching, excavation, backfill compaction, conduit, fittings, joints, connections, pull boxes, wiring and electrical hardware, testing and start up, cleanup and surface restoration.

2.12 STANDBY POWER GENERATOR

A. Measurement: Measurement shall be made on the completed item in accordance with the plans, specifications and bid documents.

B. Payment: Payment will be made at the lump sum price stated in the bid. The lump sum price shall include furnishing and installing the new standby power generator including all labor, materials, and equipment to complete the installation. Price shall include, but is not limited to, forming, concrete, loading and unloading, controls, start-up and training, clean-up and restoration.

2.13 PROPANE TANK AND ACCESSORIES

A. Measurement: Measurement shall be made on the completed item in accordance with the plans, specifications and bid documents.

B. Payment: Payment will be made at the lump sum price stated in the bid. The lump price shall include furnishing all labor, materials, and equipment to complete the installation. Price shall include, but is not limited to, the installation of a propane tank and required accessories including connectors, fittings, valves, hoses, and pressure indicators.

2.14 FORCE MAIN

A. Measurement: Measurement shall be made along the centerline of the pipe trench through fittings and specials with no deduction for such fittings and specials in accordance with the plans, specifications and bid documents.

B. Payment: Payment will be made for each linear foot of PVC or DIP force main installed at the unit price stated in the bid. The unit price bid shall include all labor, materials, and equipment necessary to complete the installation, including, but not limited to, trenching, excavation, shoring and sheeting, dewatering, bedding, PVC or DIP pipe, connection to existing force main, backfill, compaction, testing at 150 psi and complete surface restoration.

2.15 FORCE MAIN CONNECTION TO EXISTING MANHOLE

A. Measurement: Measurement shall be made on the basis of the complete connection in accordance with the plans, specifications and bid documents.

B. Payment: Payment will be made at the lump sum stated in the bid. Work shall include furnishing all labor, materials and equipment necessary to complete the task. The price shall include but is not limited to, locating the receiving manhole,

excavation, connection to the receiving manhole including any fittings required, blocking, excavation, trenching, backfill, compaction, shoring, sheeting, fittings, grouting, dewatering, bedding and preparation of the surface for stabilization.

2.16 AIR RELEASE VALVES

A. Measurement: Measurement will be made on the basis of each unit installed in accordance with the plans, specifications and bid documents.

B. Payment: Payment will be made at the unit price bid for each complete valve installation. Work shall include trenching, excavation, necessary shoring and sheeting, dewatering, furnishing and installing valves, backfill, compaction, complete surface restoration, cleanup, and testing.

2.17 PLUG VALVES

A. Measurement: Measurement will be made on the basis of each unit installed in accordance with the plans, specifications and bid documents.

B. Payment: Payment will be made at the unit price bid for each complete valve installation. Work shall include trenching, excavation, necessary shoring and sheeting, dewatering, furnishing and installing valves, backfill, compaction, complete surface restoration, cleanup, and testing.

2.18 STRUCTURE RELOCATION

A. Measurement: Measurement shall be made on the basis of the lump sum of the items to be removed or relocated in accordance with the plans, specifications and bid documents.

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.

2.19 CONCRETE DRIVEWAY AND PAVEMENT REMOVAL & REPLACEMENT

A. Measurement: Measurement shall be made on the basis of each square yard of concrete driveway and pavement 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.

2.20 ENCASED FORCE MAIN

A. Measurement: Measurement will be made based on the number of linear feet of steel cased bore installed to the lines and grade shown on the plans.

B. Payment: Payment will be made for each linear foot of PVC force main with casing pipe installed at the unit price stated in the bid. The unit price bid shall include all labor, materials, and equipment necessary to complete the installation, including, but not limited to, excavation of the bore pit, trenching, shoring and sheeting, dewatering, bedding, PVC pipe, backfill, compaction, testing at 150 psi and complete surface restoration.

2.21 CHECK DAM

A. Measurement: Measurement shall be made on the basis of each hay bale check dam placed at the locations shown on the plans and in accordance with “The Manual for Erosion and Sediment Control in Georgia”.

B. Payment: Payment will be made at the unit price bid. The unit price bid shall include all material, labor and equipment necessary to accomplish the task. Work shall include, but not be limited to, excavation, grading, furnishing and placing stone, gravel filler, hay, and geotextile filter blanket as shown on the plans. All check dam locations shall be approved by the Engineer prior to installation. No payment will be made for check dam installed without approval of Engineer.

END OF SECTION

SECTION 02100
CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Clearing shall consist of the felling, trimming, cutting and disposal of trees and other vegetation designated for removal, including down timber, snags, brush and rubbish occurring within the area to be cleared. Grubbing shall consist of the removal and disposal of stumps, roots larger than 1.5 inches in diameter and matted roots.

PART 2 - EXECUTION

2.01 Trees, down timber, stumps, roots, brush and other vegetation in areas to be cleared shall be removed completely, except such trees and vegetation as may be indicated or directed to be left standing. Trees to be left standing within the cleared areas shall be trimmed of dead branches 1.5 inches or more in diameter.

2.02 Limbs and branches to be trimmed shall be neatly cut close to the bore of the tree or main branches. Cuts more than 1.5 inches in diameter shall be painted with commercial tree-wound paint.

2.03 All organic materials, masonry, concrete or metallic debris in the clearing and grubbing areas shall be excavated and removed to a depth of not less than 12 inches below grade where original grade is to remain level and two feet below finish grade, bottom of pavement base and bottom of footings.

2.04 Depressions made by grubbing shall be backfilled and compacted with fill material to meet the requirement for trenching and structural backfilling.

2.05 Machine grubbing shall not be done under trees left standing in the area covered by the branches, nor in any manner which might damage the trees or any new work.

2.06 Trees and vegetation to be left standing shall be protected from damage during clearing, grubbing and construction operations, by the erection of barriers.

2.07 Damages caused by the execution of clearing and grubbing shall be paid for by the Contractor.

2.08 Objects above or below grade interfering with construction to be removed as directed by the Engineer.

2.09 DISPOSAL OF MATERIALS

A. Cleared and grubbed materials to be disposed of to an approved off-site disposal area.

B. On site burning will not be allowed, without written permission of local authorities.

END OF SECTION

SECTION 02210
SITE GRADING

PART 1 – GENERAL

1.01 QUALITY ASSURANCE

A. Reference Standards:

1. Standards of American Society for Testing and Materials:

   ASTM-D-698 Moisture-Density Relations of Soils Using 5.5 lb. (2.5 KG) Hammer and 12 inch (304.8 mm) Drop

2. Methods of Sampling and Testing of American Association of State Highway and Transportation Officials (AASHTO), latest edition.

1.02 TESTING

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

1.03 EXCESS EXCAVATED MATERIALS

A. Excess excavated materials shall be wasted off site by the Contractor at no expense to Owner, or as directed by the Engineer.

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 soil analysis for borrow material.

1.05 EXCAVATED MATERIAL

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

1.06 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 depths.

B. Compensation for the removal and/or replacement of unsuitable materials shall be in accordance with the General Conditions, Article 10.01.

C. Excavation of unsuitable bearing materials shall not proceed until the conditions have been observed by the Engineer and written approval has been given by the Owner.

PART 2 – EXECUTION

2.01 TOP SOIL

A. Areas to be stripped shall first be scraped clean of all brush, weeds, grass, roots and other material.

B. Remove topsoil from areas to be graded and stockpile in locations where it will not interfere with structures, roads or utility operations.

C. Topsoil shall be free from subsoil, debris and stones larger than 2 inches in diameter. The stored topsoil shall be left in piles to be used for finished grading. Contractor shall install a minimum of 4” thick topsoil across pervious areas of the site prior to planting. If topsoil from site is unsuitable or insufficient to achieve 4” thickness, additional material is to be provided by the Contractor at no additional cost to owner and from a source approved by Engineer.

D. Stockpiles shall be protected from contamination by undesirable foreign matter and shall be graded to shed water.

2.02 EXCAVATION

A. Excavations shall be accomplished to bring surface to the levels, lines and grades as indicated.

B. Excavated material to be used for fill or backfill material shall be stockpiled on the site as directed by the Engineer. Stockpiles shall be graded to shed water.

2.03 FILLING

A. All fill material required to bring areas to the levels, lines and grades indicated shall be selected and approved materials from approved borrow areas.

B. Sub-grades on which fill material is to be placed shall be scarified to a depth of not less than 4 inches by plowing or discing. A layer of suitable fill material,

approximately 3 inches in depth, shall be spread over the scarified surface and compacted.

C. Fill material shall be spread and compacted in successive uniform layers not exceeding 8 inches in depth (loose measure) until the total thickness of fill is completed.

2.04 COMPACTION

A. Compaction required for material fill shall be 95% of Standard Proctor, maximum dry density as determined by the procedures of ASTM D-698. Fill areas shall be crowned and sloped to drainage ditches or as required to prevent ponding of surface water.
B. Compaction by flooding of any material is not acceptable. In the event that any flooding takes place, the material and all adjacent softened material shall be removed and replaced with compacted fill at no cost to the Owner.

2.05 FINISH GRADE

A. Distribute topsoil evenly to levels, lines and grades shown.

B. Finish grade to be trimmed and raked true to line and grade to avoid surface ponding.

C. Remove stone two inches or greater in diameter and debris from soil.

D. Finish grade tolerance to +/- 0.05 foot for roadways and +/- 0.10 foot for other areas.

END

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

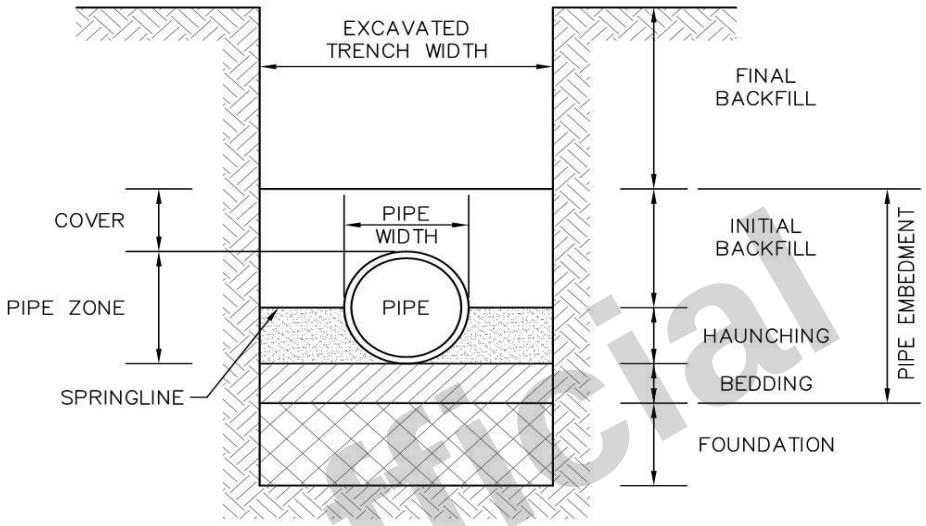
A. Should unsuitable bearing materials be encountered at levels indicated and found to have insufficient bearing values the Engineer may order the excavation carried to lower depth.

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
N.T.S.

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

SECTION 02415
SITE DEMOLITION

PART 1 GENERAL

1.01 DESCRIPTION

This section specifies demolition and removal of buildings, portions of buildings, utilities, other structures, and debris from trash dumps shown.

1.02 RELATED WORK

A. Demolition and removal of roads, walks, curbs, and on grade slabs outside buildings to be demolished.

B. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.

C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.

D. Reserved items that are to remain the property of the Owner.

E. Asbestos Removal: See Hazardous Material Sections of General Conditions.

F. Lead Paint: See Hazardous Material Sections of General Conditions.

G. Environmental Protection: See Erosion and Sedimentation Control Specification.

H. Construction Waste Management: See General Requirements Specification.

1.03 PROTECTION

A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.

B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations.

C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.

D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.

E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to, ice, flooding, or pollution. Vacuum and dust the work area daily.

F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:

1. No wall or part of wall shall be permitted to fall outwardly from structures.

2. Maintain at least one stairway in each structure in usable condition to highest remaining floor. Keep stairway free of obstructions and debris until that level of structure has been removed.

3. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.

4. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.

G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Owner; any damaged items shall be repaired or replaced as approved by the Resident Engineer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have Resident Engineer's approval.

H. The work shall comply with the requirements of the Erosion and Sediment Control Specification and other sections of this specification.

I. The work shall comply with the requirements of GENERAL REQUIREMENTS.

1.04 UTILITY SERVICES

A. Demolish and remove outside utility service lines shown to be removed.

B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.

PART 2 - EXECUTION

2.01 DEMOLITION

A. Completely demolish and remove buildings and structures, including all appurtenances related or connected thereto, as noted below:

1. In accordance with Building Demolition Specification.

2. As required for installation of new utility service lines.

3. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.

B. Debris, including brick, concrete, stone, metals, and similar materials shall become property of Contractor and shall be disposed of by him daily, off the project site to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Resident Engineer. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state, or local permits, rules and/or regulations.

C. Remove and legally dispose of all materials, other than earth to remain as part of project work, from any trash dumps shown. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state, or local permits, rules and/or regulations to a permitted site. All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500mm (5feet) below surrounding grade, shall be included as part of the lump sum compensation for the work of this section.

Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.

D. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Resident Engineer. When Utility lines are encountered that are not indicated on the drawings, the Resident Engineer shall be notified prior to further work in that area.

2.02 CLEAN UP

On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to Resident Engineer. Clean up shall include off the offsite disposal of all items and materials not required to remain property of the Owner as well as all debris and rubbish resulting from demolition operations.

END OF SECTION

SECTION 02540
CONTROL OF SOIL EROSION AND SEDIMENTATION

PART 1 - GENERAL

1.01 SCOPE

This Work includes using best management practices (BMPs) shown on the Plans, ordered by the Engineer, or as required during the life of the Contract to control soil erosion and sedimentation through the use of any of the devices or methods referred to in this Section.

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.

C. Certified Personnel — certified personnel are defined as persons who have successfully completed the Level IA, or higher, certification course approved by the Georgia Soil and Water Conservation Commission. For Department projects the certified person must also have successfully completed the Department's Worksite Erosion Control Supervisor (WECS) certification course.

D. Design Professional — as used within this specification, means that which is defined in the current National Pollutant Discharge Elimination System (NPDES) Permits No. GAR100003 Part I.B.

1.03 SUBMITTALS

A. Status of Erosion Control Devices

The Worksite Erosion Control Supervisor (WECS) or certified personnel will inspect the installation and maintenance of the Erosion Control Devices and the ESPCP.

1. Submit all reports to the Engineer within 24 hours of the inspection.

2. The Engineer will review the reports and inspect the Project for compliance and concurrence with the submitted reports.

3. The Engineer will notify the WECS or certified personnel of any additional items that should be added to the reports.

4. Items listed in the report requiring maintenance or correction shall be completed within seventy-two (72) hours.

5. BMP(s) that has failed or is deficient beyond routine maintenance and has resulted in sediment deposition into waters of the State shall have

immediate reasonable steps taken to address the condition, including but not limited to cleaning up any contaminated surfaces so the sediment material will not discharge in subsequent storm events. When the repair does not require a new or replacement BMP or significant repair, the BMP failure or deficiency must be corrected by the close of the next business day from the time of discovery. If the correction requires a new or replacement BMP or significant repair, the correction must be completed and operational within seven (7) days from the time of discovery. If seven (7) days is infeasible, the Contractor must document the reasons why the timeframe is infeasible and coordinate with the Engineer to schedule the correction as soon as feasible after the seven (7) day timeframe. The Department must be in agreement with the infeasibility assessment.

B. Erosion and Sediment Pollution Control Plan

1. Project Plans

An Erosion, Sedimentation and Pollution Control Plan (ESPCP) for the construction of the project will be provided by the Department. The ESPCP will be prepared for the various stages of construction necessary to complete the project. If the Contractor elects to alter the stage construction from that shown in the plans, it will be the responsibility of the Contractor to have the plans revised and prepared in accordance with the current GAR100003 NPDES permit by a Design Professional to reflect all changes in Staging. This will also include any revisions to erosion and sedimentation control item quantities. If the changes affect the Comprehensive Monitoring Program (CMP), the Contractor will be responsible for any revisions to the CMP as well. Submit revised plans and quantities to the Engineer for review prior to land disturbing activities.

2. Haul Roads, Borrow Pits, Excess Material Pits, etc.

The Contractor is responsible for amending the approved erosion, sedimentation and control plans if they add a haul road that is outside of the project roadway but within the right of way or construct any borrow pits, or excess material pits inside the Right of Way. Prepare these plans for all stages of construction and include the appropriate items and quantities. Submit these plans to the Engineer for review prior to land disturbing activities. These plans are to be prepared by a Design Professional.

If construction of haul roads, or borrow pits, or excess material pits, etc., (inside the Right of Way) encroach within the 25-foot (7.6 m) buffer along the banks of all state waters or within the 50 ft. (15 m) buffer along the banks of any state waters classified as a “trout stream”, a state water buffer variance must be obtained by the Contractor prior to beginning any land disturbing activity in the stream buffer.

3. Erosion Control for Borrow and Excess Material Pits Outside the Right-of-Way

Erosion control for borrow pits and excess material pits outside the right of way is the responsibility of the Contractor. If borrow or excess material pits require coverage under the National Pollutant Discharge Elimination System permit (NPDES) or other permits or variances are required, submit a copy of all documentation required by the permitting agency to the Engineer. All costs associated with complying with local, state, and federal laws and regulations are the responsibility of the Contractor.

4. Culverts and Pipes

The ESPCP does not contain approved methods to construct a stream diversion or stream diversion channel. The Contractor shall prepare a diversion plan utilizing a Design Professional as defined in the current NPDES permit. See Subsection 161.3.05 F for additional information.

5. Temporary Asphalt or Concrete Batch Plants

In addition to the requirements of any applicable specifications, if the Department authorizes the temporary installation and use of any asphalt, concrete or similar batch plants within its right of way, the contractor shall submit an NOI to the Georgia Environmental Protection Division for coverage under the following NPDES permits; The Infrastructure permit for the construction of the plant, and the Industrial permit for the operation of, such a plant. The contractor shall submit the NOIs as both the Owner and the Operator.

PART 2 - CONSTRUCTION REQUIREMENTS

2.01 PERSONNEL

A. Duties of the Worksite Erosion Control Supervisor

Before beginning Work, designate a Worksite Erosion Control Supervisor (WECS) to initiate, install, maintain, inspect, and report the condition of all erosion control devices as described in the Contract and ESPCP documents. The designee shall submit their qualifications on the Department provided resume form for consideration and approval. The contractor may utilize additional persons having WECS qualifications to facilitate compliance however, only one WECS shall be designated at a time.

The WECS and alternates shall:

- Be an employee of the Prime Contractor.
- Have at least one year of experience in erosion and sediment control, including the installation, inspection, maintenance and reporting of BMPs.
- Successfully completed the Georgia Soil and Water Conservation Commission Certification Course Level IA and the Department's WECS Certification Course.

- Provide phone numbers where the WECS can be located 24 hours a day.

The WECS' duties include the following:

- Be available 24 hours a day and have access to the equipment, personnel, and materials needed to maintain erosion control, and to the extent practicable, flooding control. An approved representative can be substituted for the WECS in regard to 24-hour availability. This representative shall be at least GSWCC Level IA, or higher, but is not required to be certified as a WECS.

- Inform the Engineer in writing whenever the alternate WECS will assume project responsibilities for more than 3 (three) days.

- Ensure that erosion control deficiencies are corrected within seventy-two (72) hours.

- Ensure that erosion control deficiencies that resulted in sediment deposition into waters of the State are corrected.

- Deficiencies that interfere with traffic flow, safety, or downstream turbidity are to be corrected immediately.

- Be on the site within three (3) hours after receiving notification of an emergency prepared to positively respond to the conditions encountered. The Department may handle emergencies without notifying the Contractor.

- Maintain and submit for project record, "As-built" Erosion, Sedimentation and Control Plans that supplement and graphically depict EC-1 reported additions and deletions of BMPs. The As-Built plans are to be accessed and retained at a department facility at all times.

- Ensure that both the WECS and the alternate meet the criteria of this Subsection.

- The WECS shall maintain a current certification card for the duration of the Project. Recertification of the WECS may begin within three hundred sixty-five (365) days of the expiration date of the current certification and upon receiving a passing examination grade; the current expiration date shall be extended three (3) years. Certification shall be allowed to occur without a lapse of the credential for a period not to exceed ninety (90) days after the current expiration date. If the allowed ninety (90) days has lapsed, the individual is no longer certified to serve in a WECS capacity on the Project until the individual attends and passes the course examination.

2.02 CONSTRUCTION

A. Control Dust Pollution

The contractor shall keep dust pollution to a minimum during any of the activities performed on the project. It may be necessary to apply water or other BMPs to roadways or other areas reduce pollution.

B. Perform Permanent or Temporary Grassing

Perform permanent grassing, temporary grassing, or mulching on cut and fill slopes weekly (unless a shorter period is required) during grading operations. When conditions warrant, the Engineer may require more frequent intervals.

Under no circumstances shall the grading (height of cut) exceed the height operating range of the grassing equipment. It is extremely important to obtain a cover, whether it is mulch, temporary grass or permanent grass. Adequate mulch is a must.

When grading operations or other soil disturbing activities have stopped, perform grassing or erosion control as shown in the Plans, as shown in an approved Plan submitted by the Contractor, or as directed by the Engineer.

C. Implement Permanent or Temporary Erosion Control

1. Silt fence shown along the perimeter, e.g., right of way, and sediment containment devices, e.g., sediment basins, shall be installed prior to major clearing and grubbing operations. Minor clearing and grubbing are allowed for the sole purpose of installing perimeter controls and other initial phase BMPs.

2. Incorporate permanent erosion control features into the Project at the earliest practicable time, e.g., velocity dissipation, permanent ditch protection.

3. Use temporary erosion control measures to address minor conditions that develop during construction, e.g., between construction stages.

4. Use temporary erosion control measures when installation of permanent erosion control features cannot be accomplished.

   The Engineer has the authority to:

   - Limit the surface area of erodible earth material exposed by clearing and grubbing.

   - Limit the surface area of erodible earth material exposed by excavation and borrow and fill operations.

   - Limit the area of excavation, and embankment operations in progress to correspond with the Contractor's ability to keep the finish grading, mulching, seeding, and other permanent erosion control measures current.

- Direct the Contractor to provide immediate permanent or temporary erosion control to prevent contamination of adjacent streams or water courses, lakes, ponds, or other areas of water impoundment.

D. Erodible Area

NOTE: Never allow the surface area of erodible earth material exposed at one time to exceed 17 acres (7 ha) except as approved by the State Construction Engineer.

The maximum of 17 acres (7 ha) of exposed erodible earth applies to the entire Project and to all of its combined operations as a whole, not to the exposed erodible earth of each individual operation.

Upon receipt of a written request from the contractor the State Construction Engineer, or his designee, will review; the request, any justifications and the Project conditions for waiver of the 17 acres (7 ha) limitation. If the 17-acre limitation is increased by the State Construction Engineer, the WECS shall not be assigned to another project in that capacity and should remain on site each work day that the exposed acreage exceeds 17 acres.

After installing temporary erosion control devices, e.g., grassing, mulching, stabilizing an area, and having it approved by the Engineer, that area will be released from the 17 acres (7 ha) limit.

E. Perform Grading Operations

Perform the following grading operations:

1. Whenever practicable, complete each roadway cut and embankment continuously.

2. Maintain the top of the earthwork in roadway sections throughout the construction stages to allow water to run off to the outer edges, including techniques to minimize concentrated flow.

3. Provide temporary slope drain facilities with inlets and velocity dissipaters (straw bales, silt fence, aprons, etc.) to carry the runoff water to the bottom of the slopes. Place drains at intervals to handle the accumulated water.

4. Continue temporary erosion control measures until permanent drainage facilities have been constructed, pavement placed, and the grass on planted slopes stabilized to deter erosion.

F. Perform Construction in Rivers and Streams

Perform construction in river and stream beds as follows:

1. Unless otherwise agreed to in writing by the Engineer, restrict construction operations in rivers, streams, and impoundments to areas

where channel changes or access for construction are shown on the Plans to construct temporary or permanent structures.

2. If channel changes or diversions are not shown on the Plans, the Contractor shall develop diversion plans prepared in accordance with the current GAR100003 NPDES Common Development Construction permit utilizing a design professional as defined within the permit. The Engineer will review prepared diversion plans for content only and accepts no responsibility for design errors or omissions. Amendments will be made part of the project plans by attachment. Include any associated costs in the price bid for the overall contract. Any contract time associated with the submittal or its review and subsequent response will not be considered for an extension of Contract time. All time associated with this subsection shall be considered incidental.

3. If additional access for construction or removal of work bridges, temporary roads/access or work platforms is necessary, and will require additional encroachment upon river or stream banks and bottoms, the contractor shall prepare a plan in accordance with the current GAR100003 NPDES Common Development Construction permit utilizing a design professional as defined within the permit. Plans should be submitted at least 12 weeks prior to the date the associated work is expected to begin. If necessary, the plan will be provided to the appropriate regulating authority, e.g., United States Army Corps of Engineers by the Department for consideration and approval. No work that impacts areas beyond what has been shown in the approved plans will be allowed to begin until written approval of the submitted plan has been provided by the Department. Approved plan amendments will be made part of the project plans by attachment. Include any associated costs in the price bid for the overall contract. Any contract time associated with the submittal or its review and subsequent response will not be considered for an extension of Contract time. All time associated with this subsection shall be considered incidental.

3. Clear rivers, streams, and impoundments of the following as soon as conditions permit:

   - Falsework
   - Piling that is to be removed
   - Debris
   - Other obstructions placed or caused by construction operations

5. Do not ford live streams with construction equipment.

6. Use temporary bridges or other structures that are adequate for a 25-year storm for stream crossings. Include costs in the price bid for the overall contract.

7. Do not operate mechanized equipment in live streams except to construct channel changes or temporary or permanent structures, and to

remove temporary structures, unless otherwise approved in writing by the Engineer.

G. State Water Buffers and Environmental Restrictions

1. The WECS shall review the plans and contract documents for environmental restrictions, Environmentally Sensitive Areas (ESA), e.g., buffers, etc. prior to performing land disturbing activities.

2. The WECS shall ensure all parties performing land disturbing activities within the project limits are aware of all environmental restrictions.

3. Buffer delineation shall be performed prior to clearing, or any other land disturbing activities. Site conditions may require temporary delineation measures to be implemented prior to the installation of orange barrier/safety fencing. The means of temporary delineation shall have the Engineer's prior approval.

4. The WECS shall allow the Engineer to review the buffer delineation prior to performing any land disturbing activities, including but not limited to clearing, grubbing and thinning of vegetation. Any removal and relocation of buffer delineation based upon the Engineer's review will not be measured for separate payment.

5. The WECS shall advise the Engineer of any surface water(s) encountered that are not shown in the plans. The WECS shall prevent land disturbing activities from occurring within surface water buffers until the Engineer provides approval to proceed.

H. Maintenance Projects

Projects that consist of asphalt resurfacing, shoulder reconstruction and/or shoulder widening; schedule and perform the construction of the project to comply with the following:

1. After temporary and permanent erosion control devices are installed and the area permanently stabilized (temporary or permanent) and approved by the Engineer, the area may be released from the 1-acre (0.4 ha) limit.

2. The maximum of 1 acre (0.4 ha) of erodible earth applies to the entire project and to all combined operations, including borrow and excess material operations that are within the right of way, not 1 acre (0.4 ha) of exposed erodible earth for each operation.

3. Do not allow the disturbed exposed erodible area to exceed 1 acre (0.4 ha). This 1-acre (0.4 ha) limit includes all disturbed areas relating to the construction of the project including but not limited to slope and shoulder construction.

4. At the end of each working day, permanently stabilize all of the area disturbed by slope and shoulder reconstruction to prevent any contamination of adjacent streams or other watercourses, lakes, ponds or other areas of water impoundment. For purposes of this Specification,

the end of the working day is defined as when the construction operations cease. For example, 6:00 a.m. is the end of the working day on a project that allows work only between 9:00 p.m. and 6:00 a.m.)

5. Stabilize the cut and fill slopes and shoulder with permanent or temporary grassing and a Wood Fiber Blanket. Mulching is not allowed. Borrow pits, soil disposal sites and haul roads will not require daily applications of wood fiber blanket. The application rate for the Wood Fiber Blanket on shoulder reconstruction is the rate specified for Shoulders. Preparation consists of scarifying the existing shoulders 4 to 6 in. (100 to 150 mm) deep and leaving the area in a smooth uniform condition free from stones, lumps, roots or other material.

6. If a sudden rain event occurs that would not allow the Contractor to apply the Type II Wood Fiber Blanket, install Wood Fiber Blanket Type I if directed by the Engineer. Wood Fiber Blanket Type I application is for emergency use only.

7. Install temporary grass or permanent grass according to seasonal limitations and Specifications. When temporary grass is used, use the over seeding method when planting permanent grass.

8. Remove and dispose of all material excavated for the trench widening operation at an approved soil disposal site by the end of each working day. When shoulder reconstruction is required, this material may be used to reconstruct the graded shoulder after all asphaltic concrete pavement has been placed.

9. Provide immediate permanent and/or temporary erosion control measures for borrow pits, soil disposal sites and haul roads to prevent any contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment.

10. Place asphalt in the trench the same day as the excavation occurs. Place asphalt or concrete in driveways and side roads being re-graded the same day as the excavation occurs. Stabilize any disturbed or exposed soil that is not covered with asphalt with a Wood Fiber Blanket (and grass seed). Payment will be made for the Wood Fiber Blanket and grass seed only if the shoulder has been constructed to final dimensions and grade and no further grading will be required.

11. Do not allow the grading (height of cut or fill) to exceed the operating range of the grassing equipment.

12. When grading operations or other soil disturbing activities are suspended, regardless of the reason, promptly perform all necessary permanent stabilization and/or erosion control work.

13. Use temporary erosion control measures to:

    - Correct conditions that develop during construction but were unforeseen during the design stage.

- Use as needed before installing permanent erosion control features.

- Temporarily control erosion that develops during normal construction practices but are not associated with permanent control features on the Project.

14. When conditions warrant, such as unfavorable weather (rain event), the Engineer may require more frequent intervals for this work.

I. Other Projects

On non-NOI construction projects that have minimal amounts of grading with the installation of BMP's, the Contractors qualified personnel shall be required to submit a weekly EC-1 inspection form. This weekly EC-1 inspection shall begin when BMPs are installed and continue until the acceptance of permanent stabilization.

2.03 QUALITY ACCEPTANCE

Before Final Acceptance of the Work, clean drainage structures within the project limits, both existing and newly constructed, and ensure that they are functioning properly. Costs to accomplish this work are incidental and shall be included in the overall bid for the Contract.

2.04 CONTACTOR WARRANTY AND MAINTENANCE

Maintain the erosion control features installed to:

- Contain erosion within the limits of the right-of-way

- Control storm water discharges from disturbed areas

Effectively install and maintain the erosion control features. Ensure these features contain the erosion and sediment within the limits of the rights of way and control the discharges of storm-water from disturbed areas to meet all local, state, and federal requirements on water quality.

END OF SECTION

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. Silk 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.

0. 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 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:

SIEVE SIZE	PERCENT PASSING BY WEIGHT
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 02650
SANITARY SEWERS

PART 1 - GENERAL

1.01 APPLICABLE STANDARDS

A. American National Standards Institute (ANSI):

A21.4	Cement Mortar Lining for Cast Iron and Ductile Iron Pipe and Fittings for Water
A21.6	Cast Iron Pipe Centrifugally Cast in Metal Molds, for Water or Other Liquids
A21.11	Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings
A21.51	Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water or Other Liquids

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

A48	Gray Iron Castings
C12	Installing Vitrified Clay Sewer Pipe
C425	Compression Joints for Vitrified Clay Bell and Spigot Pipe
C478	Precast Reinforced Concrete Manhole Sections
C594	Compression Couplings for Vitrified Clay Plain End Pipe
C700	Extra Strength and Standard Strength Clay and Perforated Clay Pipe
D1784	Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds
D2241	Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR PR and Class T)
D2321	Underground Installation of Flexible Thermoplastic Sewer Pipe
D2774	Underground Installation of Thermo plastic Pressure Piping
D3034	Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
D3139	Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals
D3212	Sewer Pipe Joints using Elastomeric Seals

C. American Water Works Association (AWWA):

C 600	Installation of Cast Iron Mains

1.02 SUBMITTALS

A. Materials used in the sanitary sewer system shall be submitted for approval to the Design Engineer. The Design Engineer shall review the drawings, provide a list of materials and certify compliance to the Owner.

B. Six copies of shop drawings or manufacturer's standard drawings or catalog cuts shall be submitted for the following:

1. Precast concrete manholes
2. Manholes and Frames
3. Gaskets One of each type
4. Pipe One of each type
5. Valves One of each type

1.03 PRODUCT DELIVERY, STORAGE, AND 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 arriv¬al. 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 chippage or breakage.

PART 2 – PRODUCTS

2.01 POLYVINYL CHLORIDE PIPE AND FITTINGS

A. Polyvinyl chloride pipe and fittings for gravity sewers shall be SDR 35 for less than 12’ bury and SDR – 26 for 12’ bury and over, meeting ASTM D3034 for type PSM Polyvinyl Chloride (PVC) sewer pipe. The joints shall be Push On "O" ring gasket type with integral bell and spigot meeting ASTM 3212. Threaded or solvent welded type joints shall not be used.

B. Polyvinyl chloride pressure pipe shall meet one of the following specifications:

1. 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.

2. DIP Size PVC Pipe: AWWA C-900-07

a. 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.

b. 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 seal 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, 200 PSI pressure class, iron pipe

C. Marking: Pipe shall be clearly marked with:

1. Manufacturer's Identification
2. Nominal Pipe Size
3. Material, Type and Grade
4. SDR or Pressure Rating
5. All gravity sewer pipe shall be green. Force main pipe shall be white or brown.
6. All pipe regardless of color shall be clearly marked "SEWAGE FORCE MAIN" or "GRAVITY SEWER" as appropriate, marked every three feet.

2.02 DUCTILE IRON PIPE AND FITTING

A. Type: Coated Ductile

B. Joints:

1. Push on type in accordance with ANSI A21.11.

2. Mechanical joint in accordance with ANSI A21.11 and fittings may be in accordance with A21.53..

C. Ductile iron pipe shall conform to ANSI A21.51.

D. Pipe shall have a Protecto 401 lining or equal. The lining should have a high resistance to fatty oils, detergents and sewage generated hydrogen sulfide.

E. Pipe shall be coated outside with one mil. thick bituminous coating conforming to ANSI A21.4 and AWWA C110, C115OR C151.

2.03 REINFORCED CONCRETE PIPE AND MANHOLES (WET WELLS OR VALVE PITS)

A. Precast concrete sections to be manufactured in accordance with provisions of ASTM C478. As a minimum, the interior of all sections shall be coated with two coats of bituminous coating. The first coat shall be spray applied and the second coat should be roller applied. In addition, in extremely corrosive environments, to include force main receiving manholes, wetwells, and the first two manhole from the force main connection shall be lined with sealed HDPE sheet liner. The HDPE liner shall have a watertight seal at all joints and penetrations. The liner shall be Agru Sure Grip Liner or equivalent.

B. Precast concrete riser sections to be 48 inches in diameter with minimum wall thickness of 4 inches.

C. Precast concrete base units to have minimum wall thickness of 5 inches.

D. Jointing material shall be rubber gasket type conforming to ASTM C443 or vulcanized butyl rubber base flexible joint sealer in rope form conforming to Federal Specification SS S 00210, Kent Seal No. 2 or approved equal. The inside and outside of the joint shall be finished with mortar. Mortar shall be one part Port-land cement and two parts sand.

E. Manhole base sections shall provide for a flexible watertight union between pipe and manhole base. Manhole sleeves shall be of high quality synthetic rubber with tensile strength of 1,500 psi, resistant to raw sewage, ozone, acids, and weathering, flexible at temperatures below 0°F and resistant to heat as high as 250°F. A substantial, serrated flange of the sleeve material shall be integrally cast into the wall of the manhole base forming a tight waterseal. The sleeve shall protrude through the wall of the base. A watertight union shall be secured with the end of the pipe with stainless steel strap clamps. Manhole sleeves shall be Interpace Corp. Lock Joint Manhole Sleeves or approved equal.

F. Pick up holes shall not penetrate the interior walls or the riser.

2.04 MANHOLE FRAMES AND COVERS

A. Frames and covers to have machined bearing surfaces.

B. Covers to have checkered top design and marked "Sanitary Sewer" and include the name of the utility owner.

C. Combined weight of frame and cover shall be approxi¬mately 450 pounds.

D. Frame shall have a depth of approximately 9 inches and an access opening of not less than 20 inches.

E. Covers shall have two pick holes located at edges.

F. Materials shall conform to ASTM A48 for Class 30 gray iron castings.

2.05 MANHOLE STEPS

A. Manhole steps shall be constructed of a number 3 rein¬forcing bar encapsulated in polypropylene plastic with a non skid tread.

B. Finished dimensions of the steps shall be identical to that of malleable iron manhole steps.

C. Steps to have a minimum tread width of 12 inches.

2.06 NUTS AND BOLTS

A. Stainless Steel Flanged: Square head MB/SF, hexagon nuts; ASTM 307B; ANSI B18.2, zinc plated.

2.07 GASKETS

A. Flanged pipe gaskets shall conform to requirements of ASA A21.10 and shall be suitable for the indicated services.

2.08 VALVES

A. All valves two inches in diameter and smaller shall be constructed of brass or bronze except the hand wheel, which shall be of malleable iron construction. Valves two inches in diameter and smaller shall have screwed ends unless approved otherwise. All valves 2½ inches in diameter and larger shall have flanged ends unless otherwise approved. They shall be iron body, bronze mounted, except that in the smaller sizes the valves may be all bronze at the contractors option and expense.

B. The contractor shall prepare and submit for approval complete detailed drawings of all valves in accordance with the requirements of the appropriate section of these specifications. All valves of the same type shall be from a single manufacturer. Parts of valves of the same type and size shall be interchangeable. Spare parts shall be furnished

as specified under the proposal items. Special tools required for repacking or disassembling valves shall be provided.

C. All valves shall be carefully mounted in their respective positions free from all distortion and strain. All valves shall be properly packed and left in satis¬factory operating condition at the completion of the project. All valves shall open left.

D. Gate Valves

1. Gate valves should not be used in raw sewage applications. Gate valves should only be used where primary and partial secondary treatment has already occurred.

2. Unless otherwise specified or directed, 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 thicknesses and strengths and structural designs shall be adjusted as required to meet hydrostatic test pressures not less than 125 psi.

3. Unless otherwise specified or directed, gate valves smaller than three inches shall meet the requirements of Federal Specification WW V 54, Class A, 125 pounds.

4. 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 as specified or required. The glands shall be bronze or bronze bushed. Gland bolts and nuts shall be bronze.

5. All gate valves 2½ inches in diameter and larger shall be of the double disk type. All gate valves two inches in diameter and smaller may be of the double disk or the solid wedge type.

E. Plug Valves

1. All plug valves shall be the two way type.

2. Nonlubricated, eccentric with resilient faced plugs.

3. Port area of 4 to 20 inch valves shall be at least 70 percent of full pipe area.

4. Valves to be designed for 125 psi working pressure.

5. Bodies to be semisteel with raised seats.

6. Seats to have either a welded in overlay of approxi¬mately 90 percent pure nickel on surfaces contacting the plug face or shall be bronze conforming to ASTM B 62 and attached to the body by stainless steel set screws.

7. Upper and lower plug stem bushings to be stainless steel and shall be permanently lubricated.

8. Exposed nuts, bolts and washers to be zinc plated.

9. Flanges to be faced and drilled to ASA 125 pound standard.

F. Check Valves

1. Type: Ball Check

   a. Static head must exceed 10 feet to use ball check valves.
   b. No ball check valve will be mounted vertically to compensate for low static head.
   c. Ball check ends must be flanged.
   d. The body shall be cast iron, ASTM A159 72, Class 35.
   e. The ball shall be hollow steel with vulcanized nitrile rubber covering.
   f. Pressure rating shall be 150 psi.
   g. Valve to be Flygt HDL or equal.

2. Lever Actuate Spring Check Valve

   a. Where static head is less than 10 feet lever action swing check valves shall be used.
   b. Lever action swing checks may be spring and lever type or weight on lever type as approved by the design engineer and the Owner.
   c. Valves shall be installed in the horizontal position.
   d. The valve body, disc, cover and lever shall be cast iron, ASTM A159 72, Class 35.
   e. The disc arm shall be cast steel
   f. The seat ring shall be bronze or stainless steel.
   g. All studs, bolts or nuts shall be commercial grade steel.
   h. The gate shall be rubber faced.
   i. The hinge shaft shall be stainless steel.
   j. The chamber shall be bronze.
   k. The valve shall be Clow F5340 (outside spring and lever) or Clow F5345 (outside weight and lever) or an approved equal.

G. Automatic Sewage Air Release Valve

1. The automatic sewage air release valve shall be designed to allow entrapped air to escape from the sewage force main line. After the air escapes out of the air release valve, the valve shall shut off until more air accumulates in it and the opening cycle will repeat automatically.

2. The sewage release valve must have a compound internal linkage of precision molded delfin or stainless steel. All other internals must be stainless steel to positively prevent galvanic action. The float rod shall be 20" long to provide an air gap between the linkage and waste level inside the valve to retard the waste solids from clogging the linkage. The stainless steel float must withstand a minimum 1000 psi pressure. Each valve shall be complete with hose and blow off valves to permit back flush¬ing without dismantling valve.

Body and cover cast iron	ASTM A48 Class 30
Internal Delfin linkage	ASTMD2133 (or Stainless Steel)
Stainless Float	ASTM A240
Buna N	ASTM SB800

3. Typical installation will utilize standard body valve. Valve height 28" with back flushing attachments 33 1/2". If depth of trench is not deep enough, furnish short valve. Valve height 17 1/2" with back flushing attachments 23 1/2".

4. Automatic sewage air release valve to be as manufactured by Crispin, Val matic, or APCO equal to APCO Series 400 with accessories.

2.09 ACCESSORIES, PLUG, AND GATE VALVES

A. Valves to have two inch square operating nut unless otherwise indicated.

B. Valves buried in ground or located in vaults or structures to have suitable extensions for socket operation with top of operating nut located two feet below finished grades maximum.

PART 3 EXECUTION

3.01 INSTALLATION

A. Plastic piping installation shall be in accordance with ASTM D2321 Recommended Practice for non pressure pipe and ASTM D2774 Recommended Practice for pressure pipe.

B. Ductile iron pressure piping shall be installed in accordance with AWWA Standard C600.

C. Material selection for piping material shall be as indicated. If piping materials are not indicated the Contractor has the option of selecting materials in accordance with this section.

D. Service sewer lines shall be constructed of same material as the mains.

E. Sewer lines shall not be laid closer than 10 feet horizontally to a water main. Pressure sewer lines shall pass beneath water lines, with the top of the sewer being at least 18 inches below the bottom of the water line. Where sanitary sewer lines pass beneath water lines, no joints in the sewer line shall be closer than 10 feet, horizontal the water line. When the vertical or horizontal separation cannot be accomplished, then concrete encasement shall extend a minimum of 10 feet on both sides of crossing.

F. Pipe laying to proceed up grade with pipe bells or groove on the upper end. Pipe to be laid with joints close and even, butting all around. Sagging joints will not be tolerated.

G. Pipe shall be straight and of uniform grade between manholes, laid to line and grade.

H. All sewer shall be designed and constructed to give velocities of not less than 2.0 FPS. Since the Owner has adopted a low flow plumbing device ordinance, the following slopes will be used.

Minimum Slope in Feet

Sewer Size	Per 100 Feet
8"	0.44
10"	0.30
12"	0.24
15"	0.15
18"	0.12
21"	0.10
24"	0.08
30"	0.058
36"	0.046

I. An allowable deviation from the design grades will be allowed up to 5% of the grade shown on the plan. If the grade is steeper than allowed 5% deviation the engineer must verify that the project was installed to all minimum requirements and determine the impact of the additional grade. If the grade is flatter than the 5% deviation, then it exceeds the allowable tolerance and the installation of that line is not acceptable and must be replaced. All sewer mains installed will be field checked for grades during preparation of “Record drawings”.

J. Bell holes shall be dug so the pipe barrel will carry the load of the pipe. Pipe shall be bedded in undisturbed earth or, where rock occurs, on a thoroughly compacted layer of #57 stone or sand fill of a minimum thickness of 6 inches under the barrel or bell of the pipe.

K. Where sewers or force mains are to be connected to existing manholes or other structures, and where no stub or opening has been provided for the connection, the Contractor shall make an opening of minimum diameter through the side wall of the structure utilizing a professional coring machine and installing a boot for inserting the sewer pipe. The boot and stainless steel strap shall be sized and installed to create a water tight seal.

L. Lateral connection made to the sewer prior to back filling shall be laid on a slope not exceeding 2 feet vertical to 1 foot horizontal, and not less than 1/8 inch per foot, so that the lateral shall have a solid bearing on undisturbed earth as stipulated for pipe sewers. The lateral shall make such a horizontal angle with the sewer line that a proper connection with the wye or tee branch or slant is obtained without trimming the pipe and with no danger of jointing material being forced into the sewer. All laterals shall be closed by means of suitable stoppers or end caps.

M. Wye or tee branches shall be field located for service to all subdivided lots or inhabitable structures unless otherwise directed by the Architect/Engineer. Wye branches shall be installed so that the lower lip of the branch is not more than 2 inches below the outside top of the pipe. Tees shall be installed with the branch 45° to vertical. After installation, wye or tee branches shall not be covered with backfill until determination and record has been made of the locations of each with reference to the nearest manhole downstream and the direction in which the wye faces.

N. All laterals shall be properly marked on ground surface at the point where laterals terminate with treated timber markers. Timber markers shall consist of a 2 inch by 4 inch timber extending from the end of the lateral vertically to within 2 inches of the ground surface. All such markers shall be securely anchored and maintained in a proper vertical position until backfilling has been completed. The top end of such markers shall be marked or left exposed until an "as built" survey has been made.

O. The top rim of manhole frames and covers shall be set to conform to grades and transverse slopes. Generally along outfall lines, the manhole frames and covers shall extend approximately 6 inches above finished grade or to a designated elevation for flood protection. Generally where lines are located along streets, the manhole frames and covers shall be set flush with the surface.

P. The Contractor shall install a continuous run of plasticized metallic tape above the top of the sewer main at 12 inches to 18 inches below finished grade. Tape shall be suitable for

detection with metal pipe location equipment labeled "sewer buried below," and brightly colored to contrast with the soil.

Q. A 14 gauge copper tracer wire with underground coating shall be installed along the route of pressure sewers. The wire shall be located 12 inches above the pipe but no deeper than 48 inches.

R. All PVC pressure pipe shall have a minimum of 36" cover. Areas where the cover is not maintained may require the use of extra strength (D.I.) pipe as directed by the engineer.

S. All sewer mains will be installed at a constant grade and line as shown on the plans. If after video inspection “sags” are found in the line, then the depth of the sag will be determined by the utility owner. If the sag is determined to be deeper than the following chart then the line will be removed and replaced to meet the minimum requirements of these specifications.

Pipe Size	Max. Sag Depth
8”	0.50”
10”	0.50”
12”	0.75”
15”	0.75”
18”	0.75”

3.02 PRESSURE TESTS

A. FORCE MAINS: The Contractor shall test by hydrostatic pressure to 150 pounds per square inch. Each section tested shall be slowly filled with water, care being taken to expel all air from the pipes. The required pressure shall be applied for not less than two hours. No pipe installation will be accepted until the leakage during the pressure test is less than the number of gallons listed below for each 1000 feet of pipe.

6" - 1.5 gallons	12" - 2.75 gallons
8" - 1.75 gallons	14" - 3.00 gallons
10" - 2.75 gallons	16" - 3.5 gallons

B. GRAVITY MAINS: On All sewer mains less than 8’ deep, the Contractor shall pressure test the gravity mains with air. Each section including manholes shall be pressurized to 3.5 psi. The allowable pressure drop of 0.5 psi on any portion of the system shall not be less than the times shown on the following chart.

PIPE SIZE	MINIMUM TIME
4"	3 MIN.
6"	4 MIN.
8"	6 MIN.

10"	7 MIN.
12"	8 MIN.

If the main will not maintain the specified pressure, the Contractor will isolate the weak joint and repair. The test will be repeated until successful. The service lines must be installed at least to the back of the curb prior to testing. These pressure drops represent a maximum infiltration/exfiltration rate of 25 gallons per inch of pipe diameter per mile per 24 hour period.

3.03 ALLOWABLE INFILTRATION/EXFILTRATION

A. If any visible flow is observed in the pipe during installation or final inspection a weir test will be conducted.

B. The leakage inward or outward (infiltration or exfiltration) of the entire system including the sewer mains, service sewers, manholes and wet wells shall not exceed 25 gallons per inch of pipe diameter per mile per day for any section of the system.

C. The weir shall be installed in each manhole. The manhole will then be filled with water to a depth of 3' from the top of the pipe, which should be at the bottom of the weir. The water level will stand for one (1) hour to stabilize then filled (if necessary) to the initial level. During the next hour the water level will be observed and the amount flowing through the weir or the amount of water required to maintain the level will be measured. This measured amount should not exceed the allowable.

D. 3.04 INSPECTION

A. Upon complete installation of the gravity sewer, the Contractor must enter a waiting period of not less than 10 days prior to inspection. In order to initiate the waiting period, the Contractor must notify the Design Engineer and the Owner’s inspector in writing of the status of the sewer.

B. After completion of the waiting period all sewer mains must pass a 5% deflection mandrel pulled by hand. If a 5% deflection mandrel will not pass through any section, that section will be replaced or rerounded at the expense of the Contractor. Mandrel to be supplied by the Owner’s inspector or by the Contractor, if requested by the Owner.

C. Once the mandrel and physical inspection is complete the contractor will schedule a time when the owner may internally inspect the sewer main utilizing a sewer camera and generating a video inspection of the system. If any defects are found in the system as a result of the internal inspection, then that section of the sewer main and any mains feeding into that system will not be accepted.

D. No sewer main will be accepted if there is any evidence of sagging or bowing in the line which will adversely affect the performance of the pipe. Nor will any sewer mains be accepted if they are laid on a grade substantially less that specified on the Construction Plans. No line will be accepted if laid on less grade than the minimum stated in this specification.

E. All manholes will be inspected for general appearance, cracks, leaks, proper installation of frame and cover, steps and inverts. Any manholes, which do not conform to the specifications, will not be accepted until the deficiency is corrected by the Contractor.

F. All 4" sewer services will be tested for continuity and minimum bends by passing a standard tennis ball. Each sewer service shall be temporarily capped during construction. During the inspection, a tennis ball will be dropped down the open end of the sewer service. If the ball does not appear in the lower manhole the contractor will excavate the service, correct the blockage and repeat the test until successful.

G. All manhole and wetwell liner systems shall be tested using the “Spark Test” to locate incomplete welds or penetrations in the liner not adequately sealed for gas containment.

3.05 CLEANING

A. Contractor to clean the completed system of any debris or obstructions prior to Final Inspection.

END OF SECTION

SECTION 02821
GRASSING

PART 1 – GENERAL

1.01 APPLICABLE STANDARDS

A. Conform to Section 700 and other applicable articles of the "Standard Specifications Construction of Transportation Systems", of the Department of Transportation, State of Georgia, dated April 18, 2013. Omit all references to measurement and payment.

1.02 SOIL SAMPLES

A. The Contractor shall take soil samples from several areas of the site to be grassed and have them analyzed by the Georgia Extension Service. The results of the analysis shall determine the best fertilizer mixture to use on the site.

PART 2 – MATERIALS

2.01 FERTILIZER

A. Commercial Fertilizer: Fertilizer for lawns shall be a complete fertilizer, the nitrogen content of which shall be derived from either organic or inorganic sources and meeting the following minimum requirements of plant food by weight, unless the soil analysis and report indicates a need for a different fertilizer mixture in which case the recommended mixture shall be furnished and applied. All State and Federal laws relative to fertilizer must be complied with.

10% Nitrogen 12% Phosphoric Acid 12% Potash

B. Ground Limestone: Lime shall be ground dolomitic limestone containing not less than 85% of total carbonates and shall be ground to such fineness that 50% will pass through a 20 mesh sieve. Coarser material will be acceptable, provided the specified rates of application are increased proportionately on the basis of quantities passing the 100 mesh sieve.

C. Sodium Nitrate shall be a commercial product in dry powder form and shall be delivered in the original, unopened containers each bearing the manufacturer's guaranteed statement of analysis. It shall contain not less than 16% Nitrogen.

2.02 LAWN MATERIALS

A. Kentucky 31 Fescue (Fescue elatior: var. arundinacea): Seed shall be 98% minimum purity and 85% germination.

B. Bermuda Grass (Cyanodon Dactylon): Seed shall be 98% minimum purity and 85% germination.

PART 3 – EXECUTION

3.01 PREPARATION

A. Prepare the seed bed by thoroughly cultivating, discing and hand raking as necessary to produce a smooth even grade free from hollows or other inequalities. Before any seeding is attempted the soil must be in a well pulverized, smooth, friable condition of uniformly fine texture.

3.02 FERTILIZING AND LIMING

A. Approximately two (2) days prior to the start of seeding operations, apply ground limestone at the rate of 20 pounds per 1000 sq. ft. of lawn area. Either in conjunction with the above operation or immediately afterwards apply the specified Commercial Fertilizer over all lawn areas at the rate of 30 pounds per 1000 sq. ft. of lawn area. Work limestone into the top 6 inches of ground and the fertilizer into the top 2 inches of ground.

B. When the grass has started to cover well (approximately 4 weeks after sowing seed) apply 1 1/2 pounds of Ammonium Nitrate to all lawn areas and immediately water using a fine spray. At the end of the maintenance period and prior to the final inspection apply 10 pounds of the specified Commercial Fertilizer per 1000 sq. ft. of lawn area and immediately water.

3.03 SEEDING

A. Before any seeding is attempted the soil must be in a well pulverized, smooth, friable condition of uniformly fine texture. Lawn areas shall be seeded evenly with a mechanical spreader at the rate of 2 lbs. of seed per 1000 sq. ft., 50% in one direction and the remainder sown at right angles to first sowing. The seeded areas shall be lightly raked, rolled with a suitable weight roller and watered with a fine spray.

B. Fescue planting season shall be as approved by Engineer.

C. Bermuda Grass seeding shall be planted only between May 1 to September 1.

D. When grassing is required between curbs and sidewalks, behind sidewalks in areas adjacent to private property, the Engineer may change the type of seeding to that required to match any type of grass which may be planted and growing on the adjacent lawn. No increase in the Contract Sum will be made for this substitution.

3.04 WATERING

A. Soak soil to a minimum depth of 6 inches immediately after seeding. Do not wash away soil or seed. Keep all surfaces continuously moist thereafter until 30 days after the lawn has been seeded. Use fine spray nozzles only.

3.05 RESPONSIBILITY

A. Maintenance of grass areas shall consist of watering, weeding, cutting, repair of any erosion and reseeding or resodding as necessary to establish a uniform stand of the specified grasses, and shall continue until final acceptance.

B. All grassed areas that do not show satisfactory growth within 15 days after sowing shall be re sown and re-fertilized as directed until a satisfactory blanket is established. Approximately 3 weeks after sowing the last seed, but not before the seed has taken hold and the grass is growing well, apply sulfate of ammonia or sodium nitrate at the rate of 300 pounds to the acre and water immediately. The lawns shall be considered established when they are reasonably free from weed, green in appearance and the specified grass is vigorous and growing well on each square foot of lawn area. Full coverage is required in 60 days.

C. All grassed areas shall be protected until accepted. All eroded and damaged areas, regardless of cause, shall be immediately repaired and reseeded. Protect lawn areas against traffic.

D. Grassed areas shall be covered evenly with a loose layer of clean wheat, rye, oats, Serecia Lespedeza or Coastal Bermuda Hay. Two tons of dry mulch shall be applied to each acre seeded. Hay shall be placed during calm weather with no wind.

E. As soon as the grass becomes established, a final inspection of the work will be made, provided a written request for such inspection is given to the Engineer. Satisfactory coverage is defined as coverage of the areas seeded

with grass that is alive and growing, leaving no bare spots larger than one (1) square foot with 98% coverage.

F. All temporary valves, cutoffs and piping shall be removed by the Contractor at final acceptance of the grassing.

END

SECTION 02850
RAILWAY AND HIGHWAY CROSSINGS

PART 1 GENERAL

1.01 APPLICABLE STANDARDS

A. American Water Work Association (AWWA):

C200 Steel Water pipe, 6in. and larger

C203 Coat Tar Protective Coatings and Linings for Steel Water Pipelines, Enamel and Tape Hot Applied

C206 Field welding of steel water pipe

B. American Railway Engineering Association (AREA):

1 4 13 Bituminous Coated Corrugated Metal Pipe and Arches

1 4 19 Jacking Culvert Pipe through fills

1 5 Pipelines

C. Department of Transportation, State of Georgia, Standard Specifications:

Section 615 Jacking or Boring Pipe

1.02 RAILROAD CROSSINGS

A. Utility crossings shall be made in strict accordance with the applicable sections of the American Railway Engineering Association Specifications and the specifications of the Owner of the railway being crossed. The Railway Engineer shall be notified prior to beginning construction. Construction shall not commence before such permits are acquired.

B. Railroad crossings shall be either carrier pipe encased in a larger bored or jacked casing pipe or as directed by the Engineer.

1.03 HIGHWAY CROSSINGS

A. Utility crossings shall be made in strict conformance with all applicable sections of the State Department of Transportation, State of Georgia, Specifications. The district highway Engineer shall be notified prior to beginning construction.

B. The Owner will acquire all the necessary permits prior to beginning construction. Construction shall not commence until all permits are acquired.

C. Highway crossings shall be by one of the following methods:

1. Boring
2. Jacking
3. Tunneling

PART 2 EXECUTION

2.01 METHODS OF INSTALLATION

A. Boring or Jacking shall be in accordance with AREA 1 4 19 and 1 5, DOT Specification 615 and as follows:

1. Bored or jacked installation, approved by the Architect/Engineer, shall have a bored hole diameter essentially the same as the outside diameter of the encasing pipe plus the protective coating thickness. If the bored hole diameter is greater than the outside diameter of the pipe, including the thickness of the coating by more than 1 inch, or if voids should develop during the operation and are determined to be detrimental to the work then the voids shall be pressure grouted with an approved mix.

2. The carrier pipe shall be as shown on the plans. If the carrier pipe is steel without casing then the pipe shall be designed to the maximum continuous length possible, thickness and size according to the application needed. The aforementioned steel shall comply with AWWA C 200 and shall be lined and coated in accord with AWWA C 203, subject to the approval of the Engineer. Adapters shall be provided between steel pipe and pipe of other materials.

3. All casing pipe shall be steel, fully bituminous coated in accordance with AREA 1 4 13. Metal thickness shall be as follows.

MINIMUM WALL THICKNESS FOR STEEL CASING PIPE

Nominal Thickness Inches	Nominal Diameter Inches

0.250	18 and under
0.281	20
0.312	22
0.344	24
0.375	26
0.406	28 and 30
0.438	32
0.469	34 and 36

4. Steel casing pipe shall conform to the AWWA C200. Steel casing pipe shall be of maximum length possible for the applications intended and shall be welded in conformance with AWWA Specification C206. Steel casing pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe including bells, lugs, etc., for carrier pipe less than 6 inches in diameter; and at least 4 inches greater for carrier pipe 6 inches and over in diameter.

5. Casing pipe shall be jacked or bored in place with allowances made for lines and gradients of the carrier pipes. After the casing pipe is installed the carrier pipe shall be installed within it to the exact line and gradient.

6. When the carrier pipe has been installed and securely anchored inside the casing pipe, the ends of the casing shall be plugged with a masonry plug.

7. Construction effort shall not cease when such cessation might tend to harm the total crossing effort. Protective measures shall be taken to protect the railroad and highway as well as the crossing pipe. Pipe work and tunnels shall be protected at the end of each working day against the weather and any other danger.

B. TUNNELING

1. The Contractor must supply the Architect/Engineer, in advance, the method of tunneling for approval prior to any tunnel construction.

2. Tunneling shall only be done after receiving written permission by the Architect/Engineer.

C. Directional Bores

1. Directional bores shall be performed using a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to guidable drill

head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the crossing. The hydraulic power system shall be self- contained with sufficient pressure and volume to power boring operations. Hydraulic system shall be free of leaks. The rig shall have a system to monitor and guide the boring head and shall be capable of monitoring pull back pressure during the pull-back operation. Sufficient spare parts shall be on hand for any break downs which can be reasonably anticipated.

2. Bore head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and boring fluid jets.

3. Drill pipe shall be constructed of high quality 4130 seamless tubing, grade D or better, with threaded box and pins. Tool joints should be hardened to 32-36 RC.

4. Directional bored pipe shall be fusible PVC of the same size and outside diameter as the pipe being installed and should bell to the PVC pipe being used for the rest of the project.

END OF SECTION

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 CONCRETE. 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 by 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 water tight 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 retain-ing 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. Non slip 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 insure 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

SECTION 15150
IMPACT SPRINKLER HEADS

PART 1 - GENERAL

1.01 SCOPE

A. The work in this section involves furnishing and installing impact sprinklers, connections, and supports required to complete the installation.

1.02 SUBMITTAL INFORMATION

A. Submit detailed specifications on the sprinkler head to include the body and arm materials, bearing information, nozzle dimension, and adjustability options.

B. The shop drawing submittal shall include a chart showing the nozzle size and number, radius of throw, flow in GPM, and precipitation rates.

PART 2 - PRODUCTS

2.01 FULL TURN SPRINKLERS

A. The full-turn sprinkler heads shall be capable of operating at a minimum of 45 psi with nozzle sizes ranging from 1/8” to 5/32” with optional trajectory angles of 25° or 15° standard.

B. Each sprinkler shall be capable of delivering 6.8 GPM with a throw radius of 52ft when operating at a system pressure of 45 psi.

C. The impact sprinklers shall be Nelson F33S series single nozzle 3/4" brass arm or equivalent.

D. The sprinkler body, arm, and bearing assembly shall be of brass and bronze construction. The body shall be designed in such a manner as to accept a plastic cylinder-type straightener vane to help to dissipate unwanted turbulence and help provide better stream integrity and greater distance of throw at higher operating pressure.

E. The bearing assembly shall be sealed for extended life and longer wear.

F. The arm spring and fulcrum pin shall be constructed of stainless steel to resist corrosion and extend life.

G. The drive arm shall be of horizontal motion and impact for a stronger drive.

H. The bearing connection shall be ¾” male I.P.T.

I. The sprinklers shall be painted with a black sprinkler head.

J. The impact sprinklers shall be connected to the PVC distribution lateral with 3/4" polyethylene tubing. See Specification Section 02555.

2.02 HALF TURN SPRINKLERS

A. The half-turn sprinkler heads shall be capable of operating at a minimum of 45 psi with nozzle sizes ranging from 1/8” to 5/32” with optional trajectory angles of 25° or 15° standard.

B. Each sprinkler shall be capable of delivering 3.00 GPM with a throw radius of 37ft when operating at a system pressure of 45 psi.

C. The impact sprinklers shall be Nelson P35 series single nozzle brass arm or equivalent.

D. The sprinkler body, arm, and bearing assembly shall be of brass and bronze construction. The body shall be designed in such a manner as to accept a plastic cylinder-type straightener vane to help to dissipate unwanted turbulence and help provide better stream integrity and greater distance of throw at higher operating pressure.

E. The bearing assembly shall be sealed for extended life and longer wear.

F. The arm spring and fulcrum pin shall be constructed of stainless steel to resist corrosion and extend life.

G. The drive arm shall be of horizontal motion and impact for a stronger drive.

H. The bearing connection shall be ¾” male I.P.T.

I. The sprinklers shall be painted with a black sprinkler head.

J. PVC risers must not be used. EPD recommends that flexible connections be used to connect risers to distribution lines. As such, the impact sprinklers shall be connected to the PVC distribution lateral with 3/4" polyethylene tubing. See Specification Section 02555.

2.03 ANGLE SUPPORT SYSTEM

A. Each sprinkler head shall be supported by a 3” x 3”x ¼” steel angle driven into the ground at least 36”. The angle shall be coated with a two (2) part epoxy coating suitable for use in a wastewater environment. The steel angle shall be painted red. See Specification Section 09900.

B. The angle shall extend 30” minimum above ground to mount all heads at the same elevation.

C. The impact sprinkler shall be attached to an angle using stainless steel U-bolts and straps ¼” in diameter.

D. The impact sprinkler shall have a 6” length of brass pipe between the impact sprinkler and the ¾” tubing for use in clamping the sprinkler to the support system.

E. PVC risers must not be used. EPD recommends that flexible connections be used to connect risers to distribution lines. As such, the impact sprinklers shall be connected to the PVC distribution lateral with 3/4" polyethylene tubing. See Specification Section 02555.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Sprinklers and drain valves should be checked for proper operation prior to installation.

B. The existing and proposed sprinkler head system shall remain as indicated below. The total expanded acreage shall include previously developed spray fields as well as the new area on which the sprinklers shall be installed.

1. Existing Irrigation System:

Spray Field #	No. of Full Turn Heads	No. of Half-Turn Heads
1	132	36
2	127	45
3	124	51
4	127	45
5	127	49
6	132	32

2. Proposed Irrigation System:

Spray Field #	No. of Full Turn Heads	No. of Half-Turn Heads	Max. Flow Capacity
1	159	49	1228 GPM
2	151	54	1236 GPM
3	159	64	1219 GPM
4	154	61	1230 GPM
5	150	65	1215 GPM
6	161	46	1233 GPM

3. Total Expanded Spray Field Acreage

Spray Field #	Existing Acreage	Proposed Acreage
1	8.20	10.34
2	8.20	10.52
3	8.20	10.40
4	8.21	10.39
5	8.29	10.21
6	8.20	10.89

3.02 OPERATION

A. The expanded field areas shall support a total system flow of 500,000 gallons per day.

B. The land application system shall support the proposed irrigation system. This shall include a minimum loading rate of 2.2 inches/week, an instantaneous application rate of 0.25 inches/hour, a minimum discharge rate of 1,215 GPM to each spray field, and an average irrigation period of 9.6 hours/day.

C. There shall be five fields in operation with one field on standby, ranging in size from 10.21 ac to 10.89 ac.

D. Secondary mist nozzles on impact sprinklers should not be used. These saturate the ground around the sprinkler riser and undermine the riser's support. They also make it impossible to inspect operating sprinklers without getting wet.

E. Pressure testing of irrigation force mains and laterals must be conducted during installation to avoid damage to spray fields from re-excavation and repair. Extensive flushing may be necessary to clear distribution system pipes of materials that may clog sprinkler nozzles.

END

SECTION 15200
PUMPS

PART 1 GENERAL

1.01 SCOPE

The work of this section involves furnishing and installing submersible sewage pumps complete with controls, access covers and accessories necessary for a complete installation. Controls shall be as specified in paragraph 2.03, below.

1.02 SUBMITTAL OF INFORMATION

A. Submit characteristic curves for pumps, showing total dynamic head, efficiency and brake horsepower plotted against capacity in gpm for all conditions of head and capacity.

B. Submit manufacturer's data showing dimensional information and materials of construction for pumps, discharge elbows, access covers, guide bars and brackets, cable holders, control panels, floats, and all other accessories. Control panel drawings shall include wiring diagrams.

C. Submit shop drawings showing equipment installation, layout and dimensions.

D. Submit six Operation and Maintenance Manuals which include specific instructions for receiving and handling, disassembly, wiring, installation repair and service troubleshooting pumps and controls, and a full parts list.

PART 2 PRODUCTS

2.01 PUMPS

PUMP STATION 1

A.	Quantity:	2
B.	Manufacturer:	Flygt
C.	Model:	NP-3202.185

D. Operating Conditions:

1.	Capacity (GPM):	1,000 GPM
2.	Total Dynamic Head(ft):	102
3.	Minimum motor hp:	45 HP
4.	Speed (max.):	1750
5.	Base Elbow Size:	6”
6.	Liquid:	SEWER
7.	Impeller: 460	

E. Materials of Construction:

1.	Casing:	Cast Iron
2.	Impeller:	Cast Iron
3.	Shaft:	Stainless steel, integral pump and motor supported by upper and lower ball bearings.
4.	All exposed fasteners: Stainless Steel	

F. Impeller

1. Semi open, non-clog
2. Keyed to shaft
3. Dynamically balanced while pumping

G. All pump openings shall be capable of passing solid spheres of at least 3 inches. Pump suction and discharge openings shall be at least 4 inches in diameter. An exception to the requirement for passing solid sphere of at least 3 inches in diameter may be made on a design where the pump is designed in accordance with the Environmental Protection Division (EPD) Design Standards and when the design includes equivalent protection for clogging or damage. Pumps shall have a maximum of 1800rpm.

H. Motors

1. Motor to be protected from water by double mechanical rotating shaft seal system running in an oil reservoir. The shaft sealing system shall be capable of operating submerged to depth of 50 feet or out of the pumps liquid environment without damage.

2. The motor shall be 230/460 volts, 3 phase, induction type operating in a watertight casing. The motor shall be continuous duty NEMA Design B. However, output torque and speed characteristics shall be adequate to start and operate the pump over the entire recommended range without exceeding its allowable current and/or temperature rating.

3. The motor shall be furnished with a minimum of 50 feet of 4 conductors, waterproof cable sized for the motors furnished. The cable shall be routed to the control panel without need for splicing.

4. All motors shall be rated for Class I, Division I, Group D hazardous locations.

5. Each motor shall be provided with thermal switches embedded in the motor stator. A moisture (leakage) sensor shall be provided to detect water in the stator chamber. Waterproof cables, minimum length 50 feet shall be provided for thermal switch and leakage sensor. These cables shall be routed to the control panel without need for splicing.

6. All electrical materials, equipment and installation must be in accordance with the National Electrical Code.

7. Motors shall be equipped with circuit breakers for unbalanced three phase loads.

2.02 ACCESSORIES

A. General:

The pump manufacturer shall furnish a lifting and sealing system and station hardware such that the pump unit will be automatically and firmly connected to the discharge piping when lowered into place on the discharge elbow, permanently installed in the wet well. The pump shall be easily removable for inspection or service requiring no nuts, bolts, or other fasteners to be disconnected. As a minimum, the system shall provide the following at each station:

1. Non sparking sliding guide bracket and machined discharge flange cast integrally with the pump volume.

2. Discharge elbow and pump mounting base.

3. Access frame and cover, complete with hinges and lockable hasp, upper guide bar holder and level sensor cable holder.

4. Guide bars of 316 stainless steel pipe. Size of guide bars per pump manufacturer.

5. Safety chain and hook to be stainless steel.

6. The pump station shall have water service through a 1" freeze proof anti siphon hydrant and backflow prevention device.

7. The contractor shall supply a separate NEMA 4X stainless steel enclosure for the remote transmitting unit as specified in the control section and shown on the electrical plan.

2.03 DUCTILE IRON PIPE AND FITTING

A. Type: Coated Ductile

B. Joints:

1. Push on type in accordance with ANSI A21.11.

2. Mechanical joint in accordance with ANSI A21.11 and fittings may be in accordance with A21.53.

C. Ductile iron pipe shall conform to ANSI A21.51 for use outside of the wetwell.

D. Pipe shall have a Protecto 401 lining or equal. The lining should have a high resistance to fatty oils, detergents and sewage generated hydrogen sulfide.

E. Pipe shall be coated outside with one mil. thick bituminous coating conforming to ANSI A21.4 and AWWA C110, C115OR C151.

2.04 CONTROL PANELS

A. Control Cabinet Standards

1. The control cabinet shall be completely made of stainless steel NEMA 4X (304 or 316 grades stainless minimum), no PVC or composite materials. The door gasket shall be rubber in composition to assure a waterproof seal.
2. The door shall open a minimum of 180 degrees. Fail-Safe input (Door Switch) shall be provided indication intrusion into the enclosure. Upon loss of this signal, an alarm shall be reported.

3. Only control transformers shall be allowed inside the control cabinet.

4. All external conduits and connections of the control cabinet shall be sealed with grommet type reusable seals (not Chico or other permanent sealing mediums, if explosion proofing is not required).

5. All control panels mounted outside are required to have a heat shield.

6. The control panel shall have a door that opens easily, is lockable to prevent unauthorized intrusion and completely blocks out UV rays from the sun that damage equipment displays and have a removable hinged inner door constructed on minimum .090" 5052 H-32 marine alloy aluminum. Print pocket shall be provided on the inside of exterior door.

7. The control panel shall include toggle latches, drip shield, and a single handled three-point latch system with padlocking provisions.

8. Control panels, electrical enclosures, junction boxes, and remote termination cabinets shall be sourced from any of these common and reliable manufacturers, Hoffman, Hubbell-Wiegmann, Eaton or Appleton.

9. All control panels (even if a permanently mounted emergency standby generator/transfer switch is installed) shall have a portable generator connection manufactured by Crouse-Hinds, with part number AR-1041 Arktite heavy duty plugs, receptacles and connectors (NEMA 4 watertight, 4 wire, 100-amp, style 1, 600Vac/250Vdc, 50-400Hz). Include these options: back angled box, spring return cover, and 4 wire mating plugs.

10. All hardware components and terminal connections shall have a protective coating to resist corrosion from hydrogen sulfides.

B. Mounting of field devices and equipment

1. All Unistrut material shall be made of grade 304 or 316 stainless steel.

2. All fasteners used in the construction of Lift station shall be 304 or 316 stainless steel (installed with anti-galling compound on fasteners 5/6 or 8mm and larger).

3. All field devices with a visible display shall be mounted in a NEMA 4X lockable enclosure (separate enclosures if the process or measuring medium requires it).

4. All field enclosures and junction boxes shall be sealed with grommet type reusable seals (not Chico or other permanent sealing mediums, if explosion proofing is not required).

C. Inner Dead Front Door:

A polished aluminum dead front shall be mounted on a continuous aircraft type hinge, contain cutouts for mounted equipment, and provide protection of personnel from live internal wiring. Cutouts for breaker handles shall be provided to allow operation of breakers without entering the compartment. All control switches, indicator pilot lights, elapsed time meters, duplex receptacle and other operational devices shall be mounted on the external surface of the dead front. The dead front shall be open a minimum of 150 degrees to allow access to equipment for maintenance. A 3/4" break shall be formed around the perimeter of the dead front to provide rigidity.

D. Back Plate:

The back plate shall be manufactured of 12 gauge sheet steel and be finished with a primer coat and two (2) coats of baked on white enamel. All hardware mounted to the subpanel shall be accomplished with machine thread tapped holes. Sheet metal screws are not acceptable. All devices shall be permanently identified.

E. Power Distribution:

The panel power distribution shall include all necessary components and be wired with stranded copper conductors rated at a minimum of 90 degrees C. All conductor terminations shall be as recommended by the device manufacturer.

F. Circuit Breakers:

All circuit breakers shall be heavy duty thermal magnetic or motor circuit protectors similar and equal to Square D type FAL. Each motor breaker shall be adequately sized to meet the pump motor operating characteristics and shall have a minimum interrupting capacity of 22,000 amps at the power service voltage. The control circuit and the duplex receptacle shall individually be controlled by heavy duty breakers.

Circuit breakers shall be indicating type, providing "ON-OFF-TRIP" positions of the operating handle. When the breaker is tripped automatically, the handle shall assume a middle position indicating "TRIP".

Thermal magnetic breakers shall be quick-make and quick-break on both manual and automatic operation and have Inverse time characteristics secured through the use of bimetallic tripping elements supplemented by a magnetic trip.

Breakers shall be designed so that an overload on one pole automatically trips and opens all legs. Field installed handle ties shall not be acceptable.

Provide two 20 ampere, one pole circuit breakers in the panel for the owner's 120V miscellaneous electrical loads.

G. Terminal Strips

1. All terminal strips shall be installed using 35mm aluminum DIN rail.

2. All terminal connections shall have a protective coating to resist corrosion from hydrogen sulfides.

3. All terminal strips shall use a quality terminal block such as those manufactured by Phoenix Contact, Weidmuller or Allen-Bradley and sized to accommodate 26 – 10 AWG, be rated to 1000V and 30 amps, with a width of .250. These specifications are the minimum.

4. All terminal strip components shall be gray in color except for ground connections which shall be green and terminal strips for devices going into the well/sump shall be blue.

5. There shall be at least a 20% quantity of the total number of terminal blocks used for control in the panel available as spares.

6. AC and DC control wires shall be terminated on different terminal strips or isolated on the same DIN rail using raised terminal block end caps and terminal end blocks, with a six-inch gap between them.

7. Terminal blocks shall be labeled with plastic type press in labels, including spares.

H. Relays

1. All relays and relay bases shall be 8-pin octal or 12-pin octal.

2. All relays shall come with an integral LED type light to indicate when the relay is energized.

3. All relays and relay sockets shall have a protective coating to resist corrosion from hydrogen sulfides.

4. All relays shall come with an integral lever to manually close the relay.

5. Relays and socket bases shall be sourced from a common manufacturer such as Allen-Bradley, Omron, Schneider Electric, Finder.

6. Alternating relays shall be from Diversified Electronics, Macromatic, Eaton, Square- D or Time Mark. If a pump controller is not provided which including includes a pump alternator.

7. Time delay relays shall come from a common manufacturer such as Allen-Bradley, Omron, Schneider Electric, Finder.

I. Variable Speed Drives and Motor Soft Starts

1. Variable Speed Drives and Motor Soft Starts shall be from either of these two common and reputable manufacturers, Schneider Electric and Allen-Bradley.

2. Remote panel mounted, program storing keypads with display shall be installed.

3. All hardware components and terminal connections shall have a protective coating to resist corrosion from hydrogen sulfides.

J. Motor Starters:

1. Motor starters shall be sourced from a common brand such as Square-D or Schneider Electric.

2. All terminal connections shall have a protective coating to resist corrosion from hydrogen sulfides.

3. Motor starters shall use thermal overload or solid-state overload relays, both with auxiliary contacts to indicate overload is tripped and to remove neutral circuit from the associated contactor control coil.

4. Control coil voltages shall not exceed 120Vac.

K. Transformers:

Control transformers shall provide the 120 VAC and/or 24 VAC for control circuits. Transformers shall be fused on the primary and secondary circuits. One leg of the secondary shall be grounded. The 120V control transformer shall have additional 500VA capacity for owner's 120V miscellaneous electrical loads.

L. Phase Monitor:

A line voltage rated, adjustable phase monitor shall be installed to sense low voltage, loss of power, reversed phasing and loss of a phase. Control circuits shall be de-energized upon sensing any of the faults and shall automatically restore service upon return to normal power.

M. Alarm System:

1. The alarm light shall be a weatherproof, shatterproof, red-light fixture with a 40-watt bulb to indicate alarm conditions. The alarm light shall be turned on by the alarm condition.

2. The alarm horn shall be mounted on the exterior of the cabinet. The alarm horn shall provide an aural signal of not less than 90db at 10 feet.

3. An alarm silence switch shall deactivate the alarm horn; however, the alarm light shall flash until the alarm condition ceases to exist. Provide an alarm system connection and equipment to meet City's current monitoring requirements.

N. Control System:

1. Pump controllers shall be the Xylem/Flygt MULTISMART MSM 3MP2, MTDPC, MT2PC, or MT3PC
model, or approved equal.

2. All hardware components and terminal connections shall have a protective coating to resist corrosion from hydrogen sulfides.

3. Other level controllers such as level transducers and probe must be compatible with approved controller.

4. Backup Float Controller - If primary level control is accomplished with a level/pressure transducer then a backup float control system (separate independent PLC or smart relay such as the Micro820) is required where the pumps will be turned ON and OFF using the HIGH- and Low-level floats, this system shall be automatically turned on when the HIGH float is activated, then the controls will require a manual reset to put the controls back to using the primary level transducer. In float mode, if VFDs are included they shall be commanded to 100% speed via digital input (bypassing the analog speed demand). Pumps shall be commanded to come on in a staggered fashion based on how long the High-level float remains active (Lead pump immediately on, lag pump 10 to 15 seconds after lead if high float still active and backup pump 10 to 15 seconds after lag if high float still active).

The pump control panel shall provide the following functions:

a). "ON/Off" pumping facility with settings for "PUMPS OFF", "START LEAD", "START LAG", "HIGH LEVEL ALARM" and "LOW LEVEL ALARM". In addition, backup system shall include floats "HIGH WATER ALARM", "LOW WATER ALARM" and "PUMP ON AT HIGH WATER ALARM".

b). Provide six-digit non-settable elapsed time meters for indication of pump run times.

5. No unnecessary programming shall be included. All programming shall be universal, simple and function with all other Lift stations without very minor changes.

6. All PLCs shall have the same Ethernet addressing to the cellular router.

7. All programming shall be done using the most current version.

8. Externally mounted (minimum of 3 feet from top of RTU panel, side/rear mounted) antenna for cellular routers or other future communication devices (make radiation safe for personal).

9. All panels shall be NEMA 4X, with hinged cover, sun guard and lockable (example: master lock Steel Padlock ¾ shackle type)

10. Cellular Router shall be a GE MDS Orbit cellular transceiver or GE equivalent to be able to accommodate the communications protocol required by the City.

O. Miscellaneous:

1. Drawings: A final as built drawing encapsulated in mylar shall be attached to the inside of the front door. A list of all legends shall be included.

2. Panel Markings: All component parts in the control panel shall be permanently marked and identified as they are indicted on the drawing. Marking shall be on the back plate adjacent to the component. All control conductors shall be identified with wire markers as close as practical to each end of conductors.

3. Testing: All panels shall be tested to the power requirements as shown on the plans to assure proper operation of all the components. All communication shall be verified. Each control function shall be activated to check for proper operation and indication.

4. Guarantee: All equipment shall be guaranteed for a period of one (1) year from date of acceptance. The guarantee shall be effective against all defects in workmanship or defective components. The warranty is limited to replacement or repair of the defective equipment.

5. Manufacturer: The manufacturer shall be a UL listed shop for industrial control systems and shall provide evidence of such on request from the Engineer or using authority.

6. All cables shall be enclosed in electrical conduit from the control panel through the wet well wall. Conduit shall be sized to allow easy removal of the cables and shall be sealed at both ends.

7. Site lighting shall be accompanied with a 150-watt floodlight mounted on a service pole 12’ above ground on a separate breaker with switch.

END OF SECTION

SECTION 15215
VERTICAL TURBINE PUMPS

PART 1 - GENERAL

1.01 APPLICABLE STANDARDS

A. American Water Works Association (AWWA):

E-101 Well Pumps

1.02 SCOPE

The work of this section involves furnishing and installing submersible sewage pumps complete with controls, access covers, and accessories necessary for a complete installation. Controls shall be as specified in paragraph 2.03, below.

1.03 SUBMITTAL OF INFORMATION

A. Six (6) copies of the manufacturer's standard drawings and catalog cuts of the following items shall be submitted for approval by the Engineer:

1. Name, type, and model number of pump & motor.

2. Size and materials of bowls, discharge column, pump shaft, screens and screen openings, guide bars and brackets, cable holders, control panels, float, all other accessories, and any other size necessary for the complete evaluation of the units.

3. Shop drawing of the complete unit, including equipment installation, layout, and dimensions.

4. Characteristic curves certified by the manufacturer including capacity, total head, required horsepower, and set pump hydraulic efficiency.

5. Electric motor information.

6. Six (6) Operation and Maintenance manuals which include specific instructions for receiving and handling, disassembly, wiring, installation repair, and service troubleshooting pumps and controls, and a full parts list.

B. Failure to submit the above information will be grounds for rejection of the installation.

PART 2 - PRODUCTS

2.01 PUMPS

A. The pumps shall be designed and constructed to meet all those applicable portions of AWWA E101 77.

B.

Parameters	EFFLUENT P.S.
Quantity:	2
Manufacturer:	National Pump Company
Operating Conditions	
1. Capacity (GPM):	1250 GPM
2. Total Dynamic Head (ft):	135 ft
3. Minimum Motor HP:	45 HP
4. Max. Speed:	1770 rpm
5. Base Elbow Size:	8 in
6. Bowl:	E12MC 2 Stg
7. Liquid:	STORMWATER
Materials of Construction	
1. Casing:	Cast Iron
2. Impeller:	Cast Bronze
3. Shaft:	Stainless Steel, integral pump, and motor supported by upper and lower ball bearings.
4. Exposed Fasteners:	Stainless Steel
Impeller	
Diameter:	9.75 in
Adjustment:	Provided at top of the head shaft by an adjusting nut which shall be locked in place. Dynamically balanced to ISO 1940 G63 or better.

C. The pump outer housing shall be suitable for containing the pump diffusers and impellers and shall serve to support the entire weight of the complete pumping assembly. It shall be constructed of high-quality seamless steel tubing capable of bearing the maximum head shut-off pressures of the pump and also include an adequate safety factor.

D. The pump diffusers shall be accurately machined from a single piece of a suitable metal, cast iron, or equal. The bushing surface of the diffusers shall be designed to provide maximum alignment for the impeller.

E. With electric power the pump motor shall be of the full voltage starting, vertical hollow-shaft squirrel-cage induction type, and shall comply with ANSI C50.2. The connection to the top shaft shall be through coupling or clutch in the motor head. The motor shall be of the proper size to drive the pump continuously over the specified operating range without the load exceeding the nameplate rating on the motor. The motor shall be rated as dip-proof with class B insulation and with a 1.15 service factor. Motor thrust bearing shall be precisely aligned and shall be sized to carry all residual pump thrust and still provide an adequate safety factor. The motors shall not "drag" during the startup but shall reach full operating speed within 21 cycles after being energized.

2.02 DISCHARGE PIPE

A. The discharge pipe for each pump shall be the size and material shown on the drawings.

B. The pipes shall be 8 inches in diameter for the best connection to the existing system. The pipes shall tie into swing check valves and plug valves, which shall also be replaced as indicated by the manufacturer.

2.03 ELECTRICAL CONTROLS

A. The Contractor shall furnish electrical controls compatible with the pump motor furnished.

B. All electrical controls shall meet the requirements of the National Electrical Code.

C. The pump shall be equipped with a combination circuit breaker magnetic starter with quick trip relays and a hand-off automatic switch in NEMA 1 enclosure suitable for manual or automatic operation.

D. For the three-phase motor, provide three-line protection.

E. Overload relays shall be equipped with properly sized heaters and shall be ambient compensated.

F. A phase failure relay which operates on phase current unbalance shall be provided in the starter enclosure for protection against single phasing conditions.

G. The relay shall have an adjustable pickup value and an adjustable time delay of 0 30 seconds in order to prevent nuisance tripping on transient disturbances.

PART 3 - EXECUTION

3.01 PUMP

A. The pump shall be installed by the Contractor to the manufacturer's instructions.

B. The pump bowl shall be set at the specified elevation. See construction plans.

3.02 DISCHARGE PIPING

A. The piping shall be handled and installed in such a manner that the pipe will not be damaged and shall be installed in accordance with the manufacturer’s recommendations.

B. All piping shall be installed as shown on the plans.

3.03 ELECTRICAL CONTROLS

A. Installation of any electrical equipment will conform to the electrical section of this specification.

END

SECTION 16000
ELECTRICAL

PART 1 - GENERAL

1.01 CODES

A. Installation shall comply with all laws applicable to electrical installations which are enforced by local authorities, with the regulations of the 2014 National Electrical Code, where such regulations do not conflict with local laws and with regulations of utility company.

1.02 PERMITS AND CERTIFICATES

A. Contractor shall obtain all permits required by local authorities and, after completion of work, shall furnish the Engineer, for Owner, a certificate of final inspection and approval from the inspection bureau having jurisdiction. The contractor shall notify the Engineer and Owner that the certificate has been furnished to the utility company and an application for service can be filed.

1.03 STANDARDS FOR MATERIALS AND WORKMANSHIP

A. All materials shall be new and shall be listed by Underwriters' Laboratories, as conforming to its standards, where such a standard has been established for the particular type of material in question. All installed work shall present a neat and mechanical appearance when completed.

B. Catalog numbers of devices, fixtures, equipment, etc., are used for ease in describing the standard of quality desired. Devices, fixtures, equipment, etc., by other manufacturers, performing the same functions and considered equal in quality by the Engineer will be acceptable.

1.04 SUBSTITUTIONS

A. Substitutions require a 14-day prior approval as outlined in Instructions to Bidders.

1.05 SHOP DRAWINGS

A. Contractor, as soon as practical after awarding of contract, shall submit shop drawings of the various systems and materials.

B. Shop drawings and samples shall be thoroughly checked and coordinated by the Contractor for details and fulfillment of contract requirements prior to submittal. Approval of any item does not relieve the Contractor of responsibility for coordinating dimensions and work required by other trades.

1.06 RECORD DRAWINGS

A. Contractor shall keep a record set of electrical drawings showing all changes and deviations from contract drawings, including, but not limited to change

orders, addenda, and direct field changes. These record drawings shall be kept up-to-date daily and show as-built final location of equipment where at variance with contract drawings. Locate, by dimensions from building walls, all outside electrical conduits.

B. At the completion of work, transfer changes to a set of reproducible drawings and deliver them to Engineer for his approval. The contractor shall bear all costs for these records as-built drawings.

1.07 DRAWINGS

A. Wiring layouts are schematic and are not intended to show the exact location of the raceway, outlets, etc. Contractor shall refer to architectural plans and details for dimensions and shall fit his work to conform to the details of building construction. The right is reserved to shift any switch, receptacle, ceiling, or another outlet a maximum of 10 feet from its location, as shown on drawings, before it is permanently installed, without incurring additional expense.

1.08 WIRING METHODS

A. Wiring shall be in a raceway or conduit and the following shall govern the type used throughout the project:

1. Rigid Galvanized Steel Conduit: Use for main service main risers and feeders serving panel boards, distribution equipment, and motors; below grade in earth; in concrete slab on earth fill; wet, damp, and hazardous locations and where vibrations are present.

2. Liquid tight Flexible Steel Conduit: Use for final connections to all motors, transformers, vibrating equipment, and in wet or damp installations. The outer covering shall be polyvinyl chloride and the inner core shall be galvanized steel.

3. Raceways entering boxes, cabinets, panels, or similar equipment shall have double locknuts and insulating bushing.

4. In flexible steel conduits and liquid-tight flexible steel conduit, provide a green grounding conductor sized per NEC. Bond at fixture, motor, transformer, or device and also bond at the box where flexible conduit originates or the next box line.

1.09 TESTS

A. A full-scale working test, with all lights, equipment machinery, and appliances in operation shall be made and electrical systems have proven satisfactory for operation and free from defects. Any defects shall be remedied immediately by the Contractor.

PART 2 - MATERIAL

2.01 CONDUIT

A. Rigid steel shall be mild steel, hot-dipped galvanized or standardized.

B. Liquid tight flexible steel conduit shall be galvanized steel with an outer covering of PVC.

C. All conduits shall bear the UL label and manufacturer's name or symbol.

2.02 CONDUIT FITTINGS

A. Rigid Conduit - threaded fittings.

B. Liquid tight Flexible - compression type, liquid tight fittings.

2.03 CONDUCTORS

A. Conductors shall be insulated and be of 98% conductivity copper with #10 AWG and smaller solid and #8 and above, stranded.

B. Conductors shall be a minimum of #12 AWG, except as otherwise noted on drawings.

C. Conductors in underground feeders in concrete slab or in direct contact with the earth or in trapped or permanently wet locations shall be typed RHH/RHW/ USE, dual rated, 75 °C. and 90 °C., cross-linked polyethylene insulation.

D. Conductors for control, signal, or communications circuits shall be stranded.

E. Power cables to meet requirements of the National Electrical Code.

PART 3 – EXECUTION

3.01 GENERAL

A. Conduits entering cabinets, panels, and junction boxes shall be fitted with double locknuts and bushing. One locknut inside and one outside the box.

B. Feeder cable conductors shall be pulled into the conduit using a soapstone lubricant. Pull conductors with a pulling eye attached the conductor so as not to stretch or injure insulation.

C. Conductor insulation shall be color-coded, 600 V. Sequential phasing color coding of conductors shall be adhered to throughout the system in all panel boards, switchboards, switches, outlets, boxes, control centers, and devices.

3.02 EQUIPMENT CONNECTIONS

A. Equipment not specified in this Section of the specifications, such as unit ventilators, motors, etc., will be furnished and installed by others. The Contractor will provide electrical service and connection to equipment only as mentioned herein and as directed on drawings.

B. Contractor shall be responsible for coordinating the proper connection at each item of equipment requiring service and connect accordingly. The term "set-up" and "connect" used on drawings imply a full connection as required for each piece of equipment to place it in satisfactory operation.

END

SECTION 16500
VARIABLE FREQUENCY DRIVE UNITS

PART 1 - GENERAL

1.01 THE SUMMARY

A. General

1. The CONTRACTOR shall provide variable frequency drive (VFD) units, complete and operable, as indicated in accordance with the Contract Documents.

2. It is the intent of this Section to require complete, reliable, and fully tested variable frequency drive systems suitable for attended or unattended operation.

B. Single Manufacturer

1. Like products shall be the end product of one manufacturer in order to standardize appearance, operation, maintenance, spare parts, and manufacturer's services.

2. This requirement, however, does not relieve the CONTRACTOR of overall responsibility for the WORK.

C. Coordination

1. Equipment provided under this Section shall operate the electric motor driver and the driven equipment as indicated under other equipment specification Sections.

1.02 CONTRACT SUBMITTALS

A. Shop Drawings: Include the following information:

1. Equipment Information

a. Name of drive manufacturer
b. Type and model
c. Assembly drawing and nomenclature
d. Maximum heat dissipation capacity in kw

2. Conduit entrance provisions

3. Circuit breaker type, frames, and settings

4. Information related to relays, timers, pilot devices, control transformer va, and fuse sizes, including catalog cuts

5. Ladder Diagram

a. Submit the system schematic ladder diagram and interconnection diagrams.
b. The schematic ladder diagram shall include remote devices.
c. The ladder diagram shall incorporate the control logic on the corresponding elementary schematic as indicated.
d. Submittals with drawings not meeting this requirement will not be reviewed further and will be returned to the CONTRACTOR stamped "REJECTED."

6. Factory test data certifying compliance of similar equipment from the same manufacturer with requirements of this Section

B. The Technical Manual shall include the following documentation:

1. Manufacturer's 2-year warranty
2. Harmonic analysis report
3. Field test report
4. Programming procedure and program settings

C. Spare Parts List

1. Submit information for parts required by this Section plus any other spare parts recommended by the controller manufacturer.

PART 2 - PRODUCTS

2.01 GENERAL

A. The CONTRACTOR shall provide variable frequency drives as indicated on the drawings.

2.02 EQUIPMENT

A. General

1. The power supply shall be an adjustable frequency inverter designed to convert incoming 3-phase, 480-volt, 60-Hertz power to a DC voltage and then to adjustable frequency AC by use of a 3-phase inverter.

2. Inverters shall be sized to match the KVA and inrush characteristics of the motors actually provided.

3. Match the controller to the load (variable torque or constant torque) as well as the speed and current of the actual motor being controlled.

4. Variable Frequency Drive permitted configuration

a. “Clean power” 18-Pulse VFD
b. 6-Pulse VFD with AP Broadland Filters for motors greater than or equal to 50Hp.
c. Active front end VFD designs with 3 level type active rectification with TDI at drive input terminals is no more than 5%.
d. VFD with internal DC links reactors.

5. Harmonic Reduction

a. The VFD shall be provided with line-side harmonic reduction, as required, to insure that the current distortion limts, as defined in table 10.3 of IEEE 519-1992, are met. PCC, defined as the low voltage side of the distribution transformer, is used for purposes of calculation and referred, by the turns ratio of the transformer, to the PCC deinfed by the IEEE Recommended Practices as the Consumer-Utility interface. The tables of limits set forth therein are with reference to the PCC (primary side of the main transformer).

b. Harmonic solutions shall be designed to withstand up to 2% line imbalances with the maximum Current Distortion not to exceed 11% at 100% load.

c. Harmonic solutions shall be capable of withstanding up to 2% ambient voltage distortion with the maximum Current Distortion not to exceed 12% at 100% load.

d. To ascertain the harmonic contribution of the VFD's at the PCC and to show compliance with IEEE 519-1992, harmonic analysis shall be performed and provided in the submittal package. The contractor shall provide the VFD vendor the below listed information for submittal.

1) kVA rating of the low voltage distribution transformer(s)
2) X/R Ratio of utility low voltage distribution transformer(s)
3) Primary voltage
4) Secondary voltage
5) Secondary %IZ (impedance)
6) Length, size and number of conductors between transformer LV side and distribution panel
7) System Single Line Diagram and electrical equipment list showing transformer and VFD detail
8) Total linear load kW to be connected to the distribution transformer
9) Anticipated maximum demand load (15 minute or 30 minute) on the distribution transformer (IEEE 519)

B. Inverter

1. The inverter shall be of a voltage-source design, producing a pulse-width-modulated type output.

2. Six-step and current-source inverters will not be accepted.

3. Motor Coordination

a. Inverters shall be capable of operating with 460-volt, 3-phase, 60-Hertz, squirrel-cage, high-efficiency, inverter duty, induction motors.

b. Inverters shall be capable of operating motors over the range of 50-100 percent of base speed without derating or requiring any motor modifications.

4. Inverters shall be capable of delivering the nameplate horsepower exclusive of service factor without the need for mandatory thermostats or feedback tachometers.

5. The VFD shall vary both the AC voltage and frequency simultaneously in order to operate the motor at required speeds.

C. The minimum VFD inverter efficiency shall be 95 percent at 100 percent speed and load, and 85 percent efficiency at 50 percent speed and load.

D. Power Outage

1. The VFD shall shut down in an orderly manner when a power outage occurs on one or more phases.

2. Upon restoration of power and a START signal, the motor shall restart and run at the speed corresponding to the current process input signal.

E. The VFD shall be provided with the following features:

1. Inrush current adjustment between 50 and 110 percent of motor full load current (factory set at 100 percent)

2. Overload capability at 110 percent for 60 seconds for variable torque loads and 150 percent for constant torque loads.

3. Adjustable acceleration and deceleration

4. Input signal of 4 - 20 ma from process

5. Output speed signal of 4 - 20 ma; signals other than 4 - 20 mA will not be accepted.

6. Upon loss of input signal, the VFD shall operate at a preset speed.

7. A minimum of 2 selectable frequency jump points in order to avoid critical resonance frequency of the driven system.

8. Additional devices and functions as indicated

F. The VFD shall be provided with, as a minimum, the following protection features:

1. Input line protection with metal oxide varistor (MOV) and RC network

2. Protection against single phasing

3. Instantaneous overcurrent protection

4. Electronic overcurrent protection

5. Ground fault protection

6. Overtemperature protection for electronics

7. Protection against internal faults

8. Ability to start into rotating motor (forward or reverse rotation)

9. Additional protection and control as indicated and as required by the motor and driven equipment

G. The VFD shall be designed and constructed to satisfactorily operate within the following service conditions.

1. Elevation

   a. Elevation to 3300 feet
   b. For elevation greater than 3300 feet, the VFD shall be derated in accordance with the manufacturer's recommendation

2. Ambient Temperature: 0 to 40 degrees C.

3. Humidity: 0 to 95 percent, non-condensing

4. AC Line-Voltage Variation: plus 10 percent to minus 10 percent

5. AC Line-Frequency Variation: plus and minus 2 Hertz

H. Electrical equipment provided in addition to the adjustable frequency inverter for each drive shall include:

1. 2-1/2-percent (minimum) line and load reactors integral to the drive enclosure.

2. Provide a dV/dT filter device at VFD output per the manufacturer’s recommendation.

3. Fused 480-to-120-volt control transformer to provide system control power for the logic and pilot lamps.

4. Provide an input circuit breaker.

I. Inverter Signal Circuits

1. The inverter signal circuits shall be isolated from the power circuits and shall be designed to accept an isolated 4-20 mA signal in the automatic mode of operation.

2. The inverter shall follow the setting of a remote or local potentiometer control while in the manual mode.

3. Refer to the Elementary Schematic indicated on the Drawings for speed control and START/STOP methods.

4. Access to set-up and protective adjustments shall be protected by key-lockout.

5. The following operator monitoring and control devices for the inverter shall be provided on the face of the VFD enclosure, either as discrete devices or as part of a multi-function microprocessor-based keypad access device:

    a. AUTO/HAND selection from a remote logic relay or switch
    b. While in AUTO, the inverter shall operate from the remote 4-20 mA input, where applicable, and while in HAND control shall operate from a local or remote manually operated speed potentiometer; speed pot ratings shall be coordinated with the supplier of the Local Control Station.
    c. Speed indicator calibrated in percent speed
    d. Inverter fault trip pilot light and output alarm contacts
    e. Trip reset pushbutton
    f. RUN and OFF indicating lights
    g. Provide other controls and readouts normally furnished as standard equipment, or as otherwise indicated on the Elementary Schematics indicated on the Drawings.

J. Properly identified screw type terminal boards shall be provided for interconnection to remote controls and instrumentation

K. Refer to the Elementary Schematics for hardwired VFD control inputs. The electrical design is based on 120VAC. Where the drive is not provided with “wetting” voltage of 120VAC the supplier shall provide interposing relays so that all field wiring remains 120VAC.

2.03 HARMONIC ANALYSIS FOR DRIVES

A. The CONTRACTOR shall perform a harmonic study of the facilities included in this Project.

B. The following assumptions shall be utilized for the harmonic analysis:

1. The distribution system is a "general" system as classified by IEEE 519 under low voltage systems.

2. Assume 95 percent of total operating load is motor load and 5 percent is resistive.

3. Assume a 70 percent diversity factor (i.e., 70 percent of the total load is operating), with motors other than VFDs operating at 90 percent of their nameplate horsepower.

4. Assume all VFDs are operating except as shown in paragraph 2.1.

5. Report

a. Results of the harmonic analysis shall be submitted prior to VFD shipment.
b. Excessive harmonic distortion shall be specifically denoted.
c. Corrective measures shall be submitted for action by the ENGINEER.

2.04 SPARE PARTS

A. Furnish the spare parts listed below, suitably packaged and labeled with the corresponding equipment number.

B. Modified Parts

1. At any time prior to Substantial Completion, the CONTRACTOR shall notify the ENGINEER in writing about any manufacturer's modification of spare part numbers, interchangeabilities, or model changes.

2. If the ENGINEER determines that the modified parts no longer apply to the equipment provided, the CONTRACTOR shall furnish other applicable parts as part of the WORK.

C. The following spare parts shall be furnished:

1. Provide one set of spare power fuses of each form, voltage, and current rating.
2. Provide 10 spare control and power fuses of each type and rating.
3. Provide 10 panel lamps of each type (form, voltage, and current rating).
4. Provide one of each type of circuit board, as applicable:

a. Control boar
b. Power board
c. Diode bridge
d. Transistor module

5. Provide one of each size and type power diode and transistor.
6. Provide one set of any special tools required for maintenance of the VFD units

2.05 MANUFACTURERS, OR EQUAL

a. Schneider Electric/Square D
b. Eaton
c. GE
d. Yaskawa
e. Siemens

PART 3 - EXECUTION

3.01 MANUFACTURER'S SERVICES

A. General

1. An authorized service representative of the manufacturer shall be present at the Site for 1 day to furnish the services listed below.

2. For the purpose of this Paragraph, a Day is defined as an 8-hour period excluding travel time.

B. The authorized service representative shall supervise the following and shall certify that the equipment and controls have been properly installed, aligned, and readied for operation:

1. Installation of the equipment
2. Inspection, checking, and adjusting the equipment
3. Startup and field testing for proper operation
4. Performing field adjustments such that the equipment installation and operation comply with requirements

C. Instruction of OWNER's Personnel

1. The authorized representative shall instruct the OWNER's personnel in the operation and maintenance of the equipment, including step-by-step troubleshooting with test equipment.

2. The instruction shall be specific to the VFD models provided.
3. Training shall be scheduled a minimum of 3 weeks in advance of the first session.
4. Training shall include individual sessions for personnel.
5. Proposed training materials shall be submitted for review, and comments shall be incorporated.
6. Training materials shall remain with the trainees.
7. The OWNER may videotape the training for later use with the OWNER's personnel.

3.02 INSTALLATION

A. Conduit stub-ups for interconnected cables and remote cables shall be located and terminated in accordance with the drive manufacturer's recommendations.

B. Programming

1. The CONTRACTOR shall perform programming of drive parameters required for proper operation of the VFDs included in this project.

2. Submit records of programming data in the equipment Technical Manual, including setup and protective settings.

3.03 FIELD TESTING

A. Testing, checkout, and startup of the VFD equipment in the field shall be performed under the technical direction of the manufacturer's service engineer.

B. Under no circumstances shall any portion of the drive system be energized without authorization from the manufacturer's representative.

C. Verify proper operation of control logic in every mode of control.

D. Harmonic Analysis

1. The CONTRACTOR shall test the completed installation for actual harmonic distortion at the point of common coupling.

2. Harmonic analysis shall be performed in accordance with IEEE 519 - Harmonic Control and Reactive Compensation of Static Power Converters at unit full load using a harmonic analyzer by Hewlett Packard, or equal

3. Tests shall demonstrate that the harmonic voltage distortion at the 480-volt distribution bus of the panelboard, motor control center, or switchgear serving the VFD is limited to a magnitude of 5 percent of the fundamental, with the isolation transformer in the circuit as indicated and with the maximum number of drives, as permitted by the process, in operation and in conformance with the applicable requirements of IEEE-519.

4. Provide a report that shall include the following:

   a. Expected harmonic voltage (THD) through the 35th harmonic, calculated with isolation transformers
   b. Actual RMS value and measured percentage of the THD in the field.

END OF SECTION

SECTION 16621
STANDBY POWER GENERATOR

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. WORK described in this section shall consist of furnishing a portable standby power generator.

B. CONTRACTOR shall furnish all material and labor to perform the work.

1.02 CODES AND STANDARDS

A. WORK performed under this section shall conform to the 1996 edition of the National Electrical Code.

B. Equipment and material furnished under this section shall be new, unused, and shall be manufactured to the following standards:

1. I.E.E.E. – Institute of Electrical and Electronic Engineers

2. A.N.S.I. – American National Standards Institute

3. U.L. – Underwriters Laboratories, Inc.

4. I.C.E.A. – Insulated Conductor Engineers Association

PART 2 - PRODUCTS

2.01 STANDBY GENERATOR

A. Generator shall be Generac Model RG 150 propane fueled standby generator rated 150 KW, 188 KVA, 480V, 3-Phase, 60 Hz, General 6.7 L Engine, or approved equal.

B. Generator shall have engine block heater system.

C. Generator shall include starting battery, rack and cables, installed.

D. Automatic transfer switch shall be rated 300 AMPs, 480V, 3-Phase, 3 Pole, 4 wire, solid neutral with deluxe control system and system exerciser.

E. Generator shall be secured to monolithic reinforced concrete slab with a minimum thickness of six inches.

F. A minimum two year warranty shall be included for the generator.

G. All panels, conduit, connectors and supports must be rated for outdoor use.

H. Rotating parts shall be guarded against accidental contact.

I. The engine-generator set shall be mounted on a heavy duty steel base to maintain proper alignment between components. The engine-generator set shall incorporate a battery tray with hold-down clamps within the base rails.

J. Engine-generator set control shall have automatic remote start capability. A panel-mounted switch shall stop the engine in the STOP position, start and run the engine in the RUN position, and allow the engine to start and run by closing a remote contact, and stop by opening the remote contact when in the REMOTE position.

K. Exhaust muffler shall be provided for the engine, size and type as recommended by the generator set manufacturer. The muffler shall be residential grade, mounted so its weight is not supported by the engine.

Flexible exhaust connection shall be provided as required for connection between the engine exhaust manifold and exhaust line in compliance with applicable coded and standards.

A rain cap at the stack outlet with all necessary flanges and fittings shall be provided for proper installation.

L. Outdoor weather-protective housing with residential grade exhaust muffler installed and location within the housing. The housing shall have hinged side-access doors and rear control door. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color. Vibration isolators, quantity and type as recommended by the generator set manufacturer shall be provided.

M. Provide a sub-base fuel storage tank with capacity required to provide 28 hours of runtime under full load. The tank shall be made of corrosion-resistant steel.

PART 3 - EXECUTION

3.01 TESTING

A. Services of manufacturer's authorized representative shall be provided for supervision of the installation, check-out and start-up.

B. The generator set shall be tested under full load. The diesel fuel and other equipment and materials required for the testing shall be provided by the generator set supplier. The generator set supplier will be responsible for hauling the generator set to the site.

C. Upon completion of the check-out and testing, the manufacturer's representative shall provide written certification that the system has been properly installed, tested, and is functioning properly.

3.02 INSTRUCTIONS

A. Provide after the successful testing one "Instructions and Training Session" with the Owner's designated personnel. Give instructions on operation, function, and maintenance.

Provide three (3) sets complete Operation and Maintenance Manuals.

3.03 SYSTEM SERVICE CONTRACT

A. Provide for Owner's consideration a copy of the manufacturer's standard service contract after the successful start-up.

END OF SECTION

D. GDOT SPECIFICATIONS

Section 647—Traffic Control Signal Installation

647.1 General Description

This section contains requirements for installing traffic control signal equipment, submittal processes, testing, warranty, and contractor's signal maintenance responsibilities. The contractor shall install all equipment, poles, bases, wiring, and incidental materials required for a complete and functional traffic control signal installation according to this section.

Traffic control signal installations include traffic signals, ramp meters, Pedestrian Hybrid Beacons (PHB), Rectangular Rapid Flashing Beacons (RRFB), flashing beacons, and school speed zone flashing beacons.

The Department shall perform reviews and grant approval on projects constructed at intersections and any other location under the jurisdiction of the Department. For intersections and locations not under the jurisdiction of the Department, the local agency having jurisdiction shall perform reviews and grant approval.

All specified traffic control signal equipment shall be installed without modification. The contractor shall install the traffic control signal equipment according to the contract.

For traffic control signal installations, no deviations in the design and operation of the traffic control signal are permitted without the written approval of the Engineer.

647.1.01 Definitions, Acronyms, and Abbreviations

A. Definitions

1. **Activation:** a traffic control device becomes operational for the purposes of controlling traffic during the construction project.
2. **Authority Having Jurisdiction (AHJ):** refers to GDOT, counties, or local municipalities.
3. **Construction Manager:** representative of the Engineer from the District Construction Office.
4. **Controller Cabinet Assembly:** a controller cabinet assembly equipped with a controller unit and auxiliary equipment necessary to regulate a flow of motorized and non-motorized users at signalized intersection or meter the flow of traffic onto a full access-controlled road facility.
5. **Controller Unit:** that part of a controller assembly that can receive and analyze field inputs, reacting to those inputs per programmed timing parameters, and providing outputs to the proper signal indications.
6. **Failure:** traffic control device or ancillary equipment element becoming unable to comply with the Project requirements and applicable standards described in the contract.

7. **Field Cabinet:** a cabinet used to house electronic devices for traffic control device installations, UPS, flashing beacon, or other auxiliary equipment as defined in the contract.

8. **Make Ready Work:** work required by utility companies to adjust the position of power and communication lines in advance of attaching traffic control signal or network infrastructure.

9. **Operational Test:** consists of field test performed by the Department (all sections), followed by a burn-in period of a minimum of 30 calendar days (all sections), a final inspection and acceptance. These tests verify completion according to the contract, full functionality of all systems and, if applicable, communication over the GDOT network.

10. **Pedestrian Hybrid Beacon (PHB):** an electrical device located primarily at mid-block locations to serve non- motorized users that is intentionally placed in a dark mode (no indications displayed) between periods of operation and, when operated, displays both steady and flashing traffic control signal indications (yellow and red) designed to control traffic.

11. **Power Disconnect:** Master switch to disconnect electrical power from the local utility to the traffic control signal.

12. **Power Service:** The point of electrical power provided by the local utility. Encompasses the power service drop and meter.

13. **Ramp Meter:** an electrical device located on a full access-controlled road facility that assigns motorized users the right-of-way as part of a lane merging process.

14. **Rapid Rectangular Flashing Beacon (RRFB):** an electrical warning device located primarily at mid-block locations to serve non-motorized users that is intentionally placed in dark mode (no indications displayed) between periods of operation and, when operated, displays a flashing warning (yellow) indication when actuated by pedestrians.

15. **Repair Time:** the time it takes, exclusive of requirements for mobilization, travel time, and/or the coordination of any lane closures, to diagnose, repair, and re-establish full functionality and operations of the site(s).

16. **Response Time:** the time it takes the contractor to mobilize repair technician(s) from the time they receive the problem notification from the Department and arrive at the site(s).

17. **Submittal:** documentation required by the contract that the contractor must submit for the Department's review, acceptance, or approval. Submittals may include product cut-sheets, shop drawings, working drawings, material test reports, material certifications, Project progress schedules, and schedule updates.

18. **Traffic Control Signal Installation:** a complete installation with a controller assembly, detection systems and required accessories, including necessary cabling, wiring, detection systems, controller, and communications to comprise an operational traffic signal, ramp meter, PHB, or RRFB per the contract.

19. **Traffic Control Signal:** an electrical device that provides visual information for transportation users to manage the movements of motorized and non-motorized users, including traffic signal, ramp meter, PHB, and RRFB.

20. **Traffic Signal:** an electrical device that assigns the right-of-way to motorized and non-motorized users, as defined by the MUTCD.

21. **Uninterruptible Power Supply (UPS):** a power management device that serves a dual purpose of normalizing the flow of electricity from the power service and supplies backup power to the controller cabinet assembly when power is lost.

B. Acronyms and Abbreviations

The following acronyms, abbreviations, and terminology are used throughout the traffic control signal specifications.

1.	AASHTO	American Association of State Highway and Transportation Officials
2.	ADA	Americans with Disabilities Act
3.	ANSI	American National Standards Institute
4.	API	Application Programming Interface
5.	ASTM	American Society of Testing and Materials
6.	ATMS	Advanced Traffic Management System
7.	AWG	American Wire Gauge
8.	AWW	A.W. Williams Inspection
9.	CALTRANS	California Department of Transportation
10.	CF	Configuration Change Log
11.	CRC	Cyclic Redundancy Check
12.	CSA	Canadian Standards Association
13.	DHCP	Dynamic Host Configuration Protocol
14.	DIN	Deutsche Industrie Norm
15.	DNS	Domain Name System
16.	EIA	Electronic Industries Association
17.	FCC	Federal Communications Commission
18.	FCS	Frame Check Sequence
19.	FHSS	Frequency-Hopping Spread Spectrum

20.	FHWA	Federal Highway Administration
21.	FYA	Flashing Yellow Arrow
22.	GDOT	Georgia Department of Transportation
23.	GND	Ground Connection
24.	GSM	Global System for Mobile
25.	GRS	Galvanized Rigid Steel
26.	HDPE	High-Density Polyethylene
27.	IEC	International Electrotechnical Commission
28.	IMSA	International Municipal Signal Association
29.	IP	Internet Protocol
30.	ITE	Institute of Transportation Engineers
31.	ITS	Intelligent Transportation System
32.	IVDS	Intersection Video Detection System
33.	LCD	Liquid Crystal Display
34.	LED	Light Emitting Diode
35.	LOFO	Last On, First Off
36.	MOT	Maintenance of Traffic
37.	MOV	Metal Oxide Varistors
38.	MPEG	Moving Picture Experts Group
39.	MUTCD	Manual on Uniform Traffic Control Devices
40.	MVDS	Microwave Vehicle Detection System
41.	NEC	National Electrical Code
42.	NEMA	National Electrical Manufacturers Association
43.	NESC	National Electrical Safety Code
44.	NPT	National Pipe Thread
45.	OD/ID	Outer Diameter/Inner Diameter
46.	PCA	Printed Circuit Assembly
47.	PCB	Printed Circuit Board
48.	PDF	Portable Document Format
49.	PHB	Pedestrian Hybrid Beacon

50.	PVC	Polyvinyl Chloride
51.	QPL	Qualified Products List
52.	RJ	Registered Jack
53.	RMS	Root Mean Square
54.	RRFB	Rapid Rectangular Flashing Beacon
55.	TEES	Transportation Electrical Equipment specifications (CalTrans)
56.	UL	Underwriters Laboratories
57.	UPS	Uninterruptible Power Supply
58.	USB	Universal Serial Bus
59.	UV	Ultraviolet Light
60.	VAC	Voltage Alternating Current
61.	VDS	Vehicle Detection System
62.	WDT	Watchdog Timer
63.	WMDS	Wireless Magnetometer Detection System
64.	WVDS	Wireless Vehicle Detection System
65.	XHHW XPLE	High Heat-Resistant Water-Resistant
66.	XLPE	Cross-linked Polyethylene

647.1.02 Related References

A. GDOT Standard Specifications

1. Section 105— Control of Work
2. Section 106— Control of Materials
3. Section 107—Legal Regulations and Responsibility to the Public
4. Section 108— Prosecution and Progress
5. Section 150—Traffic Control
6. Section 500— Concrete Structures
7. Section 501— Steel Structures
8. Section 535— Painting Structures
9. Section 615—Jacking or Boring Pipe

10. Section 631— Dynamic Message Signs
11. Section 636— Highway Signs
12. Section 639—Strain Poles for Overhead Sign and Signal Assemblies
13. Section 645— Repair of Galvanized Coatings
14. Section 680— Highway Lighting
15. Section 681—Lighting Standards and Luminaires
16. Section 682— Electrical Wire, Cable, and Conduit
17. Section 700—Grassing
18. Section 755— Electrical Work
19. Section 800— Coarse Aggregate
20. Section 801— Fine Aggregate
21. Section 832— Curing Agents
22. Section 833—Joint Fillers and Sealers
23. Section 850—Aluminum Alloy Metals
24. Section 852— Miscellaneous Steel Materials
25. Section 853— Reinforcement and Tensioning Steel
26. Section 854— Castings and Forgings
27. Section 861— Piling and Round Timber
28. Section 870— Paint
29. Section 886— Epoxy Resin Adhesives
30. Section 910— Sign Fabrication
31. Section 911—Sign Posts
32. Section 912—Sign Blanks and Panels
33. Section 913— Reflectorizing Materials
34. Section915— Mast Arm Assemblies
35. Section 922— Electrical Wire and Cable
36. Section 923— Electrical Conduit
37. Section 924— Miscellaneous Electrical Materials
38. Section 925—Traffic Control Signal Equipment
39. Section 926 — Wireless Communications Equipment

40. Section 927 — Wireless Communications Installation
41. Section 935— Fiber Optic System
42. Section 936— Closed Circuit Television (CCTV)
43. Section 937— Detection Systems
44. Section 939— Communications and Electronic Equipment
45. Section 942— ITS General Requirements

B. Referenced Documents

Americans with Disabilities Act (ADA), Chapter 6 Curb Ramps and Pedestrian Crossings

Manual on Uniform Traffic Control Devices (MUTCD), latest edition

National Electrical Safety Code (NESC)

NEMA TS 2, Traffic Controller Assemblies with NTCIP Requirements, latest edition

647.1.03 Submittals

A. General

1. All submittals shall consist of a single file in electronic PDF file format as specified herein.
2. All submittals shall be submitted to the Construction Manager.
3. All incidental materials required for any pay item shall be contained in the submittal regardless of whether it was listed in the specifications.
4. Do not submit partial submittals for a pay item.
5. Items with long procurement times, such as poles, may be submitted separately to accommodate work schedule.
6. Do not procure or install materials or components proposed on the contract until material submittals or shop drawings are submitted for review and approved by the Department.
7. The Department will not be liable for any equipment or material purchased, work done, or delay incurred prior to the Department's approval of said equipment or material through the materials submittal data process.
8. The Department will approve or reject all submittals within 21 calendar days of receipt of a complete package, unless otherwise specified or indicated by the Department.
9. Do not interpret approval of the submittals as approval of any deviation unless such deviation is identified in writing in the submittal cover letter.

10. Any failure of the Department to discover or note any unsatisfactory material will not relieve the contractor of his responsibility for providing a complete operable Traffic Control device installation as called for under the terms of the contract.

B. Material Selection

1. Use only product materials that are on the Department's QPLs. These products have been evaluated by the Department and may be used without sampling or pre-testing. They include, but are not limited to:

    a. QPL-5 Electrical Conduit

    b. QPL-34 Work Zone Traffic Control Devices

    c. QPL-35 Drive Type Galvanized Steel Sign Posts

    d. QPL-46 Traffic Markings Producers

    e. QPL-48 Traffic Signal & ITS Equipment

    f. QPL-52 Overhead Signs Supports, Strain Poles, and Lighting Standards

    g. QPL-61 Reinforcement Steel Rolling Mills

    h. QPL-63 Ground Mounted Breakaway Sign Supports

    i. QPL-69 Flexible Delineator Post

    j. QPL-71 Glass Beads

    k. QPL-72 Guy Wire/Span Cable

    I. QPL-75 Inductive Loop Sealants

    m. QPL-76 Raised Pavement Markers and Channel Markers

    n. QPL-78 Traffic Signal Pull and Junction Boxes

    o. QPL-80 Highway Sign Manufacturers

2. Submit a letter to the Construction Manager stating which QPL items will be used. Submittal letter shall include QPL number and product description.

3. The Construction Manager or designee will determine that the construction item is the same material identified on the appropriate QPL and will acknowledge receipt of these items in the project diary or as required by the construction manual. Support poles are verified by the Office of Bridge and Structures.

4. The Construction Manager or designee will notify the contractor of the acceptability of any accessories not covered by the QPL for use on the project.

C. Material Submittal Process

1. Written approval of product materials not listed on the QPL is required from the Construction Manager or designee.

2. The Construction Manager or designee may determine that submitted material is approved, in which case no further action is required. If rejected, the Contractor shall re-submit materials within 21 calendar days of notification of rejection. Resubmittal of subsequent materials for review shall be considered the start point of a new approval cycle as described.

3. The Construction Manager or designee will advise, in writing, as to the acceptability of the material submitted.

D. Submittal Costs

1. No separate measurement or payment will be made for submittal costs.

2. All costs associated with reproduction of submittal material documents, samples, and mailing expenses shall be the responsibility of the contractor and are not subject to reimbursement by the Department.

3. All submittal material becomes the property of the Department.

E. Submittal Requirements

1. Steel Strain Pole, Concrete Strain Pole, or Steel Pole Certification

    a. Prior to ordering signal poles, locate utilities and stake the Right-of-Way for the purpose of adjusting pole locations, if necessary. Coordinate with the District office and local agencies to verify the location of any buried traffic/ITS communication lines. The Department is not a member of 811.

    b. Obtain approval from the Construction Manager or designee for any design deviation from the contract.

    c. Final pole locations will be approved by the Construction Manager or designee. Determine the final length of mast arms based on field adjusted pole locations.

    d. Instruct the supplier or manufacturer of the strain poles or steel poles with mast arms to submit a certification, including mill certificates to the Construction Manager and:

        Georgia Department of Transportation Office of Materials and Testing 15 Kennedy Drive Forest Park, GA 30297

    e. Instruct the supplier or manufacturer to include the following in the certification:

i. A statement that the items were manufactured according to the specifications, including the specification section number

ii. Project number

f. Instruct the supplier or manufacturer to send the transmittal letter to the Department in PDF file format.

g. Prepare shop drawings and related signal strain pole design calculations, following the vertical clearance requirements and span wire sag requirements.

h. Show roadway and pole base elevations on the drawings. Account for any pole locations that deviate from the proposed plans.

i. Show all dimensions and material designations of the designs on the drawings.

j. Submit all shop drawings and related signal strain pole design calculations to the Construction Manager. The pole submittal information will be forwarded to the State Bridge and Structural Design Engineer for review and approval.

k. Provide bending moment at yield to determine the foundation size according to the signal strain pole foundation drawings. Obtain written approval prior to pole fabrication and installation.

l. Upon acceptance of the pole certification, provide one copy of the design calculations and shop drawings to the agency responsible for maintaining the traffic control signal installation.

2. Traffic Control Signal Item Certification

a. Submit material catalog product numbers and descriptions to the Department and maintaining agency.

b. Reference the P.1. number and QPL number for the following traffic control signal items:

i. Signal faces (vehicular and pedestrian)

ii. LED signal modules (vehicular and pedestrian) Mounting hardware

iii. Controller units

iv. Controller cabinet assemblies UPS

v. Detection system Monitors

vi. Cable

vii. Load switches Blank-out signs Lane use signals

viii. Preformed cabinet bases

ix. Other related signal equipment (including conduit, pullboxes, grounding electrodes, enforcement indications, etc.)

3. Test Results Submittals

a. Submit applicable quality control testing from the manufacturers for the following items:

i. Controller unit

ii. Controller cabinet assembly

iii. Conflict monitor testing

iv. Detection system testing

v. Signal cable and inductance loop wire

vi. Other operational testing required by the Department

b. Provide a copy of the applicable test result submittals to the maintaining agency, if different than the Department.

c. Refer to Section 647.3 for details on testing requirements.

4. Mast Arm Pole Charts

a. For locations with mast arm pole installations, submit Mast Arm Pole Chart for review and approval by the State Bridge and Structural Design Engineer. The Mast Arm Pole Chart shall be a drawing formatted on an 11 in. x 17 in. (279 mm x 432mm) ANSI B sheet showing the following in both plan and cross-section views:

i. Curb lines

ii. Location of mast arm pole based on utility information and field location verified by contractor. (Final location of mast arm pole shall meet the criteria for setback from the road as specified in the AASHTO Roadside Design Guide and in the Standard Detail Drawings.)

iii. Distance labeling from both adjacent curbs to mast arm pole

iv. Distance labeling along mast arm from pole to curb and from curb to each proposed traffic signal face

v. Directional arrow Street names

vi. Position of luminaire arms

b. Once the Master Arm Pole Chart is approved, use the distances measured to the proposed traffic signal face locations when ordering the mast arm to verify that the mast arm is fabricated with pre-drilled holes for traffic signal face wiring in the correct locations.

647.2 Materials

647.2.01 Delivery, Storage, and Handling

A. Include shipping and handling fees in the Contractor's base price.

B. Be responsible for equipment, components, and materials prior to installation and final acceptance.

C. Take precautions to protect materials from theft, vandalism/tampering, dents, scratches, dust, temperature, weather, cutting, paint, and other hazardous conditions prior to installation.

D. Replace damaged or lost material as required by the Department.

647.2.02 Tools and Equipment

A. Furnish equipment, tools, and superintendence for the completion of the work to be done in accordance with contract.

B. Verify equipment and tools mobilized for the work are in 100% working order and calibrated, if applicable, such as loop and ground testing equipment, prior to placing it in commission for the project.

C. Verify equipment and tool operators are trained and qualified before operating equipment on the project.

647.2.03 State-Supplied Equipment

A. Coordinate with the Construction Manager or designee to receive Traffic Control Signal Equipment from the Department.

B. contractor shall acknowledge receipt of equipment, noting an itemized list of equipment and quantities, on Department 592 form.

C. Inspect the equipment for damage and verify that equipment will power on within 14 calendar days after receiving the equipment.

1. Report to the Department, in writing, that the state-supplied equipment was received in good condition and operates when power is properly applied.

2. Notify the Department in writing if the state-supplied equipment is defective. The Construction Manager or designee will coordinate the replacement of defective equipment.

3. If no written dissent is received after 14 calendar days or if equipment is installed in the field, the Department shall consider this equipment to be satisfactory and accepted.

D. Supply new, like kind equipment to replace any state-supplied equipment that is lost or damaged while in contractor's possession.

647.3 Construction

647.3.01 Construction Management Requirements

A. Contractor Superintendent

1. Submit the name of the Traffic Control Device Contractor Superintendent and a summary of the individual's relevant experience and qualifications to the Department for approval.
2. Do not change the Traffic Control Device Contractor Superintendent without the prior written approval of the Department.
3. Traffic Control Device Contractor Superintendent or designee shall be present to supervise work performed by subcontractors.
4. Provide a Qualified Electrician as defined in Section 755 of GDOT STD Specifications when installing and connecting the power service to the traffic control equipment.

B. Utility Coordination

1. Utility Permit Application
    a) Establish the electrical power service for each traffic control device as specified in the contract.
    b) Furnish or install equipment and materials that shall become part of the regional utility facility.
    c) Coordinate such work with the utility representatives.
    d) Furnish and install additional power outlet strips in new and existing equipment racks if needed for the new equipment.
    e) Furnish equipment and materials and perform work in accordance with the contract and applicable utility agency standards and procedures.
    l) Meet standards required by utility companies as related to the equipment, materials, and installation associated with attachment to related power service feeds.
    g) Test the power utility service to confirm voltage levels and current capacity and the serviceability of any circuit connected to the traffic control device.
    h) Power utility representatives are not authorized to revoke, alter, or waive any requirements or design of materials or facilities provided under the specifications.
    i) The inspection of the contractor's work by the utility providers or the failure to inspect the contractor's work by the utility provider representatives shall not relieve the contractor of any requirements of the specifications.

j) Notify the Department and the utility providers' representatives of planned work.

2. Utility Maintenance

a) The contractor shall be responsible for establishing utility services and ongoing monthly costs related to utility services until Final Acceptance of the traffic control devices.

b) After Final Acceptance, provide an orderly transfer of the services and permits to the local government or maintaining agency.

3. Utility Adjustments

a. Refer to the local utility for utility clearance requirements.

b. Verify make ready work has been completed.

C. As Built Plans

1. Provide detailed as-built plans of the work performed.
2. Submit within 30 calendar days after completion of installation or as otherwise specified in the contract.
3. Show all changes and deviations from the original plans using electronic PDF file format, with markup shown in red text and lines.
4. Include all materials and installation work, along with all structural elements, assemblies and communications for each traffic control device in the as built plans.
5. Provide the following information regarding electrical service:

a. Address of the service pole.

b. Power services from the meter base, including all cables from the service point.

c. The electric provider's name, the account number and the meter base information.

d. Show routes and locations of the final cable installation.

6. Include any other device-specific details that are required in the individual specifications.

D. Traffic Control Signal Equipment Modification and Removal

1. The Department may continue to maintain project related traffic control devices after issuance of Notice to Proceed. The Construction Manager or designee will coordinate the contractor assuming responsibilities for maintenance, operations, and response to existing traffic control devices at the time work begins.

2. Remove existing signal equipment that is not used in the final installation when the new signal equipment is operational.

3. Carefully remove equipment to minimize damage and retain it in its original form. This equipment may include:

    a. Strain poles, including the foundation down to 3 ft. (0.9 m) below ground level finished grade.

    b. Timber poles shall be completely removed, including the portion below ground level.

    c. Controller cabinet assembly, including contents, preformed cabinet base, and work pads.

    d. Original traffic signal faces, including span wire support.

    e. CCTV cameras

    f. Vehicle and pedestrian detection systems

    g. Other equipment not retained in the final installation.

4. Verify that unused equipment is secured and disposed of in accordance with all regulations and the Department's specifications.

5. Replace traffic control signal equipment that the Construction Manager or designee determines has been damaged or destroyed during installation, modification, or removal of the traffic control signal, at no expense to the Department. Replace with new material.

6. If the Department finds that the existing material shown in the contract to be relocated is unsatisfactory, replace with new material. The costs shall be paid for at contract prices, if applicable, or as extra work.

7. Remove old traffic signal faces by the end of the day that the new signal equipment is placed in operation. Remove all other signal equipment within 7 calendar days after operations of the newly installed equipment.

E. Equipment Disposal

1. Return all removed or replaced traffic control signal equipment to District Traffic Signal Shops unless otherwise noted in the contract or as directed by the Construction Manager or designee.

2. Provide an inventory list and arrange a mutually agreeable delivery time with the Construction Manager or designee 24 hours in advance.

3. Contractor shall be responsible for proper disposal of all materials not returned to the District Traffic Signal Engineer.

647.3.02 Warranty and Maintenance

A. General

1. If a traffic signal that is the responsibility of the contractor is not functioning:

    a. Non-Emergency

        i. Commence work on this signal within 48 hours of the written notice from the Department. Failure to respond will result in a per calendar day charged against monies due or that may become due until the maintenance work is started.

        ii. In addition, the cost of labor and material will be charged by the Department if the Department takes corrective action using its own forces or local municipality forces.

        iii. The contractor shall be responsible for all materials, equipment, and expertise necessary to correct signal malfunction or repair.

        iv. The Department or local municipality shall not be held responsible or liable for alleged damage to the signal or as a result of the signal malfunction due to problems that may occur after the Department or local municipality forces make repairs. Emergency

        v. If the Department determines that the signal malfunction or failure is an operational hazard, take corrective action within three hours of the first attempt of notification.

        vi. Response shall be considered only when qualified personnel and equipment are provided.

        vii. Failure to respond within three hours shall result in a non-refundable deduction of money of $1,000.00 with an additional charge of $500.00 per hour thereafter until qualified personnel and equipment arrive onsite and begin corrective action.

        viii. In addition, the cost of labor and material will be charged by the Department if the Department takes corrective action using its own forces or local municipality forces.

        ix. The Department shall not be held responsible or liable for alleged damage to the signal or as a result of the signal malfunction due to problems that may occur after Department or local municipality forces make emergency repairs.

        x. The contractor shall be responsible for all materials and equipment necessary to correct signal malfunction or repair.

        xi. Final Acceptance will not be given until payment for such work is received.

B. Maintenance

1. Provide maintenance support services and assume responsibility of existing traffic control devices, the Department's communications network, and ancillary equipment damaged by the contractor, including labor, equipment, and materials associated with the repair or replacement of said materials and equipment from the first day of field impact continually until project acceptance.

2. Provide maintenance support services during construction between construction initiation and project acceptance by the Department as follows:

    a. The Department reserves the right to deduct the cost of maintenance activity from monies due or to become due the contractor if the contractor fails to remedy unsatisfactory maintenance within 48 hours after receipt of such notice.

    b. During the construction period, the Construction Manager or designee will send a written problem notification of the issue.

    c. Provide a technical support phone line and the ability to provide replacement parts/material for both warranty and non-warranty repair.

    d. Provide full technical support, including material and labor, and consultation to the Department or a user that is responsible for maintenance of the traffic control devices during the contract.

    e. Enter a precise description of repair work performed into the log book (supplied by the Department and located in the controller cabinet assembly).

    f. The Department will designate representatives and alternates as contact persons for the contractor.

3. Provide maintenance support services following project acceptance during the remaining warranty period. The traffic control device equipment manufacturer(s) or the party designated by the manufacturer(s) shall be responsible for providing repairs or replacements for failed equipment as follows:

    a. During the warranty period, the Department's coordinator of maintenance or designee will send problem notification to the manufacturer(s) or the party designated by the manufacturer(s).

    b. The manufacturer or designated party shall respond to the Department, the Department's designee, or maintaining agency within one business day of receiving the problem notification.

    c. As requested by the Department, the Department's designee, or maintaining agency, perform remote diagnostic tests and provide a technical support phone line to assist with troubleshooting and repair activity.

d. Furnish replacements for any non-critical part or equipment found to be defective during the warranty period at no cost to the Department, the Department's designee, or maintaining agency within 14 calendar days of notification by the Department.

e. Provide firmware or software updates provided by the manufacturer associated with the system at no cost to the Department, the Department's designee, or maintaining agency during the warranty period.

f. Updates provided by the manufacturer or the party designated by the manufacturer shall not degrade the original functionality of the product under warranty.

C. Warranty

1. Provide manufacturer's warranties on electrical, electronic, or mechanical equipment furnished, except state- supplied equipment.

2. Verify that warranties are consistent with those provided as customary trade and industry standard practices; or as otherwise specified in the contract.

3. Verify that warranties are continuous and state that they are subject to transfer.

4. Acceptance or approval of the work does not waive warranties where required by the specifications. Final Acceptance will not be granted until all warranties are received.

5. Repair and/or replace all equipment and material supplied under the contract that have been determined by the Department to not meet specifications.

6. The Department reserves the sole right to determine suitability or unsuitability of the supplied equipment and material. The contractor shall bear the total cost of delivery and transportation related to the repair and replacement of equipment and material throughout the duration of the contract unless otherwise approved by the Department.

7. Transfer to the Department any warranties remaining on all items after Final Acceptance. Perform transfer at 12:01 AM of the day following acceptance.

647.3.03 Testing

A. Department Responsibilities

1. The Department will observe, provide inspection and testing oversight, review, accept, and reject inspections and operational tests.

2. During the Operational Test:

   a. The Department will notify the Contractor upon failure or malfunction of equipment.

b. If the contractor does not provide the services enumerated above under the contract responsibilities, the Department or its authorized agents may, in the interest of public safety, take emergency action.

c. The Department will deduct costs from the monies due or to become due the contractor under the contract as a result of these emergency actions.

d. Such action by the Department will not void any guaranties or warranties or other obligations set forth in the contract.

B. Test Results Submittal

1. Submit the results of the testing of the following items to the Construction Manager.
2. A copy of the test result submittals shall be provided to the maintaining agency.
3. Submit test results of the following applicable items:

   a. Controller and Cabinet Testing from Manufacturer (Including conflict monitor)

   b. Inductance Loop Detector or other Detection System Testing

   c. IP Communications

   d. Audible Pedestrian Pushbuttons

   e. UPS

   f. Railroad Preemption

   g. Connected Vehicle Devices

   h. Other specialized equipment by other agency (e.g., emergency pre-emption, bus rapid transit, etc.)

C. Activation of Traffic Control Device

1. Traffic Control Signals may be activated prior to full completion to meet the traffic control needs of the contract.
2. contractor shall pretest all furnished and installed hardware, wiring and connections prior to the Department's field tests.
3. The Department shall conduct a field test to verify that essential elements are installed and in working order prior to activation. The field test of partial installation shall follow the field test procedure as defined for the Operational Test.
4. An Operational Test shall not be performed until all equipment is installed.

D. Operational Test

1. An Operational Test is a multiple step procedure that shall be performed upon each traffic control device to verify working order of assembled components of the traffic control device and perform the desired functions for a specific installation is met per the contract.

2. Operational Tests shall be coordinated with the Construction Manager or designee.

3. Contractor shall pretest all furnished and installed hardware, wiring and connections prior to the Department's field tests.

4. The Operational Test shall consist of the following steps:

    a. Field test

        i. The Department shall conduct a field test to verify all traffic control device components are installed and the device is ready for full operation.

        ii. The field test shall demonstrate that all components:

            a) Hardware, cable, and connections furnished and installed by the contractor operates correctly.

            b) All functions are in conformance with the contract.

            c) All circuits have continuity.

            d) Grounded according to this Section.

            e) Unless otherwise directed by the Department, sidewalks and ramps shall be complete and accessible to the pedestrian detection system and pedestrian signal faces shall be operational to begin the burn-in period.

            f) Contractor shall promptly address any corrective list items identified during the field test.

            g) The traffic control device shall not be activated, and the operational test shall not continue until the field test is accepted by the Department.

        iii. Conflict Monitor Test for Traffic Signals

            a) The conflict monitor field test only tests for proper detection and triggering of a conflict monitor in response to a displayed pattern.

            b) Test the conflict monitor for each traffic signal.

c) Provide a law enforcement officer to provide traffic control during the conflict monitor test.

d) Conflicting Signal Test

1) Verify and record the allowed channel configurations.

2) Use stop time feature to hold phase and apply line voltage to each conflicting signal phase. Verify the conflict is detected and controller cabinet assembly is sent to into flash mode.

3) Advance controller unit to next phase and apply line voltage to each conflicting phase.

e) Red Failure Test

1) Check Red Failure feature by removing and reinserting load switches in sequence.

2) Verify that all monitored channels indicate Red failure.

b. Burn-in Period

i. Demonstrate through burn-in of day-to-day full operations (all components installed and operational) of the traffic control device, defined in the contract, including functional/system performance requirements, electrical requirements, vehicle and pedestrian detection system requirements, data communication requirements, environmental requirements, documentation, and interface requirements with other components of the system are fully satisfied.

ii. Repair or replace system failure or failed device during any portion of the burn-in test without disrupting the system's operation. After repairing the equipment, the Department will determine proper function.

iii. All costs associated with the maintenance, repair, or replacement of the traffic control devices shall be the responsibility of the contractor between the time the contractor initiates work and traffic control device acceptance from the Department.

iv. The duration of the burn-in test will be maintained by the Department as follows:

a) The test period shall be a minimum of 30 calendar days, which may be consecutive or non- consecutive calendar days. The test duration may be extended based on the issues or failures experienced during the test.

b) The test period shall be paused in the event of a device or system failure and restarted upon correction of the failure(s).

c) Successful completion to be granted on the 30th day of the test period if no failures occur.

d) If any cabinet equipment failure occurs, final acceptance will be withheld until all the equipment is functioning properly for 30 consecutive calendar days after repair. Cabinet equipment shall include:

1) All components supplied with the cabinet shell as prescribed in Section 925 of GDOT STD Specifications.

2) The 2070 controller chassis or any modules within the controller.

3) All electronic components or wiring of the vehicle detection system

e) If equipment failure occurs during the 16th through 30th day, final acceptance will be withheld until all the equipment is functioning properly for 15 consecutive calendar days after repair. These items shall include only:

1) LED signal indications

2) Piezo driven pedestrian pushbuttons

3) 222L loop detector cards

4) 242L DC isolators

5) Load switches

f) If a specific piece of equipment has malfunctioned more than three times during the test period, replace the equipment with a new unit and continue the test period for an additional 30 calendar days.

g) The burn-in period shall not be measured separately for individual components or subsystems.

h) Burn-in test applies to all furnished and installed equipment.

i) If failed or malfunctioning of equipment furnished by others prevents the burn-in test from continuing, the Department will suspend the burn-in test and resume when all equipment failures are corrected.

j) At the conclusion of the burn-in period, a final field inspection shall be performed by the Department to verify all components are working in a satisfactory manner.

k) On projects with multiple traffic control devices, each device will be considered an individual device and burn-in tests shall be in independent of each other. Equipment failures at one location shall not impact the burn-in period of other locations.

v. Upon successful completion of the overall burn-in test, the traffic control device will be eligible for maintenance acceptance and final inspection and acceptance.

vi. The Department will determine burn-in period acceptance after satisfactory completion of the required burn-in period and based on a comprehensive field inspection of the complete system in accordance with the specifications.

5. For Maintenance Acceptance, perform the following tasks:

i. Conduct final inspection and close-out after successfully completing the burn-in test and providing written notification of substantial completion and receiving Department approval.

ii. The final inspection and close-out activities include:

a) Demonstrate the overall system is fully operational.

b) Verify traffic control devices and components are in their correct final configuration.

c) Verify submittals including test reports are submitted and approved by the Department.

d) Verify final punch list items are completed.

e) Verify final cleanup requirements are completed and the field conditions are restored to their original condition.

f) Obtain approval of final as-built plans.

g) Deliver spare parts and materials.

h) Complete all training services.

i) Transfer all warranties to the Department.

6. Contractor shall maintain all work under the contract in accordance with the specifications during the burn-in period.

7. Contractor shall replace or repair the defective equipment during the burn-in period within 48 hours of notification by the Department, unless an emergency is declared.

8. Notification of substantial completion is defined by the Department as 100% of the infrastructure and traffic control devices and components have been furnished, installed, configured, integrated, and tested. When substantial completion has

been met, as determined by the Department, the final inspection and close-out activities will be conducted.

E. Sequence

1. The contractor shall notify the Construction Manager in writing that the installation and pretests of the furnished equipment is complete.
2. The Construction Manager or designee will perform the field test within 14 calendar days.
3. The Construction Manager or designee will provide an in-depth inspection and provide a written corrective list of items for the contractor to correct. Within 14 calendar days of the notification, the contractor shall correct the items noted.
4. When defects are resolved, the Construction Manager or designee will authorize the contractor to activate the traffic control device and begin 30-day burn-in test.
5. If programming of the controller unit's firmware application is not a pay item for the contract, the Construction Manager or designee will coordinate programming the controller unit within 14 calendar days.
6. The Construction Manager or designee will send the Construction Manager a letter showing the start, termination, suspension, or successful completion of the operational test.
7. Request in writing the Department's approval to start the Traffic Control Device final inspection a minimum of 14 calendar days prior to the requested start date. The Department reserves the right to reschedule the start date if needed. The start date for the final inspection shall not be prior to the successful completion of the overall burn-in test.
8. Upon unsuccessful or incomplete Traffic Control Device final inspection, the contractor will make the necessary corrections and conduct a new Traffic Control Device final inspection. Allow the Department up to 14 calendar days to conduct a final inspection.
9. The Department reserves the right to require, at no additional expense to the Department, the attendance of a qualified technical representative of the equipment or software manufacturers to attend a portion of a Traffic Control Device final inspection.

F. Final Inspection and Acceptance

1. The contractor shall obtain written acceptance of the traffic control device installation from the Construction Manager or designee before Final Acceptance.

G. Communications Testing

1. Install basic network device configuration and test IP addressable equipment with the Department's network.
2. Provide notice of testing and submit test results to the Department.
3. Include notification and review periods, testing periods, and burn-in time in the overall progress (construction) schedule.

H. UPS Testing

1. Each UPS shall be given a minimum of five, 4-hour full battery cycle tests during the Operational Test period.
2. Tests to be administered manually, if necessary. The UPS log may be used to demonstrate proper operation during power outages of 4 hours to supplement the Operational test.

647.3.04 Construction Requirements

A. General

1. Traffic Control Signal installations shall meet the appropriate NESC requirements.
2. Comply with NEC requirements for grounding and bonding requirements for the power service.
3. The NEC will apply up to the power service termination within the traffic control device cabinet. Beyond that point, IMSA shall apply unless stated otherwise in this Section.
4. No splicing of cables or exposed wiring is permitted except for loop wires to loop lead-in cable.
5. Provide wiring entry and exits that are made at the side or underneath components; no exposed top entry or exits are permitted. This requirement extends to enclosures, junction boxes, support arms, or any other externally exposed devices.
6. Route and secure wiring and cabling to avoid sharp edges and to avoid conflicts with other equipment or cabling.
7. Electrical work shall comply with applicable requirements of the local power utility.
8. Install equipment in new or existing rack space in accordance with the equipment manufacturer's recommendations, including mounting, interconnection wiring and electrical service.

9. Furnish and install mounting hardware and incidental materials, including fasteners and auxiliary supporting frames/brackets, as recommended by the manufacturer.

10. Furnish and install hardware, materials, wiring/cabling, configuration, and any other incidental items necessary for fully operational components and subsystems shown in the contract, except when specifically identified as existing or as work to be performed by the Department.

11. Cables, Conduit, and Power Service

    a. Cables

        i. Furnish and install electrical cables for traffic control devices and the power service as required by the Contract.

        ii. Identify all conductors of all cables by color and number.

        iii. Identify the conductor function in as-built documentation included in the controller cabinet assembly documentation.

        iv. Cut unused conductors to a length that can reach any appropriate terminal.

        v. Bend back unused conductors over their outer jackets and individually tape them.

        vi. Install cabling inside new hollow metal or concrete support poles unless otherwise specified.

        vii. Neatly install and route cabling to minimize movement in the wind and chafing against the pole, device, or bracket.

        viii. Use weatherheads on all nipple and exposed conduit openings.

        ix. Form a drip loop at the weatherhead and route cabling to minimize water entry into the cable connector. Use a 24 in. (600 mm) diameter drip loop where cables enter a weatherhead.

    b. Conduit

        Where devices are installed on existing wood poles, install power service cabling on the wood poles in rigid metal conduit risers.

        Provide conduit with a minimum 1 in. (25 mm) diameter for power service cabling.

    c. Install meter base per Standard Details. Do not install the meter base on the cabinet.

    d. Safety switch

        i. For aerial power service attachments, install on signal poles at the top of the pole.

ii. For underground power service, install a minimum of 15 feet high above ground.

iii. Safety switches shall not be installed on the cabinet.

12. Surge Protection Devices

a. Protect all copper wiring and cabling entering the controller cabinet assembly by surge protection devices as specified in this section.

b. Use a minimum No. 16 AWG grounding for each surge protection device, or larger if recommended by the surge protection device manufacturer.

c. Use insulated green wire and connect the ground wire directly to the ground buss bar.

d. Do not daisy chain the grounding wires of other devices, including other surge protection devices.

e. Label all surge protection devices with silk-screened lettering on the mounting panel.

f. Furnish and install all necessary transient surge protection device to protect detector and controller cabinet assembly equipment.

13. Grounding

a. Ground the controller cabinet assemblies, controller, poles, pullboxes, and conduit to reduce extraneous voltage to protect personnel or equipment.

b. Ground all span wire and down guy assemblies as shown on Standard Detail Drawings. Bond all span wire together and bond to ground at every pole.

c. Provide permanent and continuous grounding circuits with a current-carrying capacity high enough and an impedance low enough to limit the potential above the ground to a safe level.

d. Join the grounding electrodes and connect them to the grounding buss of the controller cabinet assembly with No. 6 AWG solid copper wire.

e. Use the shortest possible ground lead to the grounding source.

f. All components, including mounting hardware, shall be grounded and bonded per manufacturer's recommendations and NEC. Dress and route grounding wires separately from all other controller cabinet assembly wiring.

B. Installation of Grounding Conductors and Electrodes

1. Install grounding electrodes of size, length and material specified in Section 682 of GDOT STD Specifications.

2. Ground any pole-mounted equipment to the pole, except 336 controller cabinet assemblies and power service if pole mounted.

3. Install grounding electrodes adjacent to the traffic signal pole bases, preformed controller cabinet assembly bases, and in pullboxes to protect the grounding system.

4. Install a minimum of 3 grounding electrodes for each pole, pedestal and the controller cabinet assembly.

5. Grounding electrode stacking may be permitted in areas where ground conditions allow. The contractor shall coordinate with the Construction Manager or designee to have a Department representative observe stacked electrode installation.

6. Test electrodes according to Section 682 of GDOT STD Specifications. Report final test results.

7. Timber Poles

   a. Use a minimum No. 6 AWG solid copper wire bonded to the grounding electrode and extending upward to a point perpendicular to the uppermost span.

   b. Place wire staples no greater than 2 ft. (600 mm) apart to secure the ground wire to the pole.

   c. Connect the span wire to the pole ground using copper split bolt connectors

8. Cabinets

   a. All cabinets

      Connect the power company neutral, conduit ground, and grounds of equipment housed in the controller cabinet assembly to the buss-bar.

      Use a No. 6 AWG solid copper wire bonded between the buss and grounding electrode.

      Connect neutral conductors to the controller cabinet assembly buss-bar and ground them at each terminal point.

      Ground the controller cabinet assembly with a No. 6 AWG solid copper wire between the buss-bar to the grounding electrodes. Bends shall not exceed 4 in. (100 mm) radius.

   b. 336 Cabinet Assembly

      Provide a separate grounding electrode for pole mounted controller cabinet assemblies. Do not use the pole ground as the cabinet assembly ground.

      Bond the pole grounding electrode to the pole mounted cabinet assembly's grounding electrode.

647.3.05 Installation of Traffic Control Devices

A. Controller Cabinet Assembly

1. Location
    a. Locate in accordance with the contract.
    b. If field conditions require the controller cabinet assembly location needs to be moved, the following criteria shall be met:
        i. Controller cabinet assembly and technician work pads shall remain within the provided right-of-way.
        ii. Locate controller cabinet assembly away from the edge of pavement or curb line to prevent damage from errant vehicles and protect maintenance personnel.
        iii. Position the front panel door of the controller cabinet assembly away from the intersection, providing a view of the vehicular and pedestrian traffic signal faces for technicians.
        iv. Comply with ADA sidewalk horizontal clearance requirements. This includes when controller cabinet assembly doors are open.
        v. Avoid low lying and drainage areas likely to collect and hold surface water.
2. Installation
    a. Install pole or base-mounted as indicated in the contract.
    b. Verify controller cabinet assembly prefabricated base does not extend more than 9 in (225 mm) above final grade.
    c. Seal base-mounted controller cabinet assemblies to their base using silicone-based sealer. Pliable sealant used shall not melt or run at temperatures as high as 212 °F (100 °C).
    d. Mount ground-mounted cabinet to prefabricated base.
    e. Install technician pad in front and rear of the controller cabinet assembly door, and if applicable in front of UPS auxiliary cabinet door. See Standard Detail Drawings for pad information.
    f. Close all unused conduits in the controller base with an appropriately sized PVC cap. Do not permanently affix the conduit cap to the conduit.
3. Controller Cabinet Assembly Field Wiring
    a. Install cabling and conductors the comply with NEC, UL and IMSA.
    b. Install all cabling and conductors in a neat and secured fashion.

c. Cut signal conductor cables, inductance loop lead-in cable or other detection system cabling, and fiber optic drop cable to provide 10 ft. (3 m) of slack inside the controller cabinet assembly or pullbox adjacent to the controller cabinet assembly. Neatly coil and organize wire in the bottom of the controller cabinet assembly.

d. Use at least No. 6 AWG wire for the conductors between service drop and AC+ and the AC- terminals.

e. Do not mount electrical meter to the controller cabinet assembly. Submit power pedestal or other method of providing location for mounting.

f. Label all field terminals and conductors to identify the specific field input.

g. Crimp terminal connections to conductors with a ratchet-type crimping tool that does not release until the crimping operation is completed.

h. Supply the controller cabinet assemblies with wiring diagrams, schematic drawings, pin assignment charts, and manuals for circuits and components. Store these documents in the controller cabinet assembly in a resealable, weathertight container.

i. Label individual conductors with a label maker using UV-protected labels and attach to each wire/cable and cover with transparent tape.

B. Auxiliary Controller Cabinet Assembly Equipment

1. Provide auxiliary controller cabinet assembly equipment or special purpose equipment with connecting harnesses, if necessary, or as shown in the contract.

2. Position the equipment in the controller cabinet assembly. Additional wiring may be necessary to install the equipment. Verify additional cabling meets appropriate specifications for the application, is enclosed in NEMA enclosure and is neatly secured.

3. Connect the auxiliary equipment to appropriate cable harness, pre-mounted rack, or socket.

C. Controller Unit

1. Identify the controller unit and other auxiliary equipment by model and revision numbers. These numbers shall agree with previously submitted and approved catalog submittals.

2. Assemble the controller unit, controller cabinet assembly, and auxiliary equipment to provide the operational phasing sequence specified in the contract.

3. Verify the controller unit functions as a unit with the controller cabinet assembly.

4. Verify controller unit and auxiliary equipment are provided AC power from receptacles marked for controller power.

5. Controller units shall be purchased with the Department's firmware preinstalled (current version). Firmware version shall be considered current as of the activation date.

6. For ramp metering application, verify the Watchdog Timer Muzzle Jumper is selected on the field input/output module of the controller unit. This is required for operating with a 208 monitor.

D. Conflict Monitor

1. Mount conflict monitor in a rack with appropriate connectors to attach to the wiring harness.

2. Program the conflict monitor according to the signal operation indicated in the contract before activation of the traffic control device.

3. Provide conflict monitoring programming tools to the maintaining agency.

4. Configure and equip the conflict monitor to monitor all red signal indication.

5. Verify that the red output for unused or vacant load bays or output slots is jumpered to 120 VAC+.

6. At ramp meters, mount model 208 monitor in rack and program the monitor per the contract.

E. Signal Poles and Support

1. General Installation Requirements

   a. See Section 501 of GDOT STD Specifications for signal pole materials certification and Section 925 of GDOT STD Specifications for traffic control signal equipment.

   b. Refer to the contract for pole locations.

   c. Where necessary, adjust pole location to avoid utility conflicts. Relocations greater than 5 ft. (1.5 m) shall require updates to the design plans.

   d. Provide minimum clearance distances between the signal pole and the roadway as specified in the contract.

NOTE: Field drilled holes to any traffic signal pole or mast arm pole requires written approval from the Office of Bridge and Structural Design.

e. Concrete Testing

i. The Construction Manager may create concrete cylinders for testing during the pour.

ii. The Construction Manager shall the make cylinder and submit it for testing to the Office of Materials and Testing.

iii. If the concrete foundation fails to meet the requirements and is not accepted, the foundation shall be replaced upon notification of failure.

f. Verify that the pole foundations and pedestals with the anchor-type base that meet the requirements of Section 500 and Section 639 of GDOT STD specifications.

g. The Office of Materials and Testing will inspect the anchor bolts. If approved, the Office of Materials and Testing will display the inspector's hammer stamp mark on the top of the bolt.

h. Instruct the supplier to furnish a mill certificate that shows the alloy and physical properties of the steel used in fabricating the anchor bolts. The bolts may be subjected to a tensile and shear strength test.

i. Do not install or locate poles without the Department's approval.

j. Install pole foundations according to soil zones identified in the Standard Detail Drawings.

k. After installing poles and applying the load of the signal span, inspect them for plumb and for the horizontal position of the mast arm, when applicable.

I. Verify all threads of the nut are threaded onto the anchor bolt.

m. Power Service Attachment

i. Install a service bracket and insulator on one pole at each intersection to attach power service wire as specified in the contract.

ii. Install a disconnect box on the controller cabinet assembly pole at each intersection to attach power service. Underground services may utilize a ground mounted power service assembly.

n. Install poles to which controller cabinet assemblies are attached with mounting plates, bolts, nipples, and at least two (2) 2.5 in. (64 mm) threaded openings at the top and at least two (2) 2.0 in. (50 mm) at the bottom of the pole.

o. Galvanized Finish (Steel Poles)

i. Correct deficiencies by using the leveling nuts on the anchor bolts or by adjusting the mast arm.

ii. After the Department approves the pole installation, provide an acceptable method of protecting the area between the pole base and the top of the foundation to prevent the accumulation of debris.

iii. The Department will examine the pedestals and poles for damaged paint or galvanizing. Restore the finish coating where necessary.

iv. If the finish or galvanized steel materials is scratched, chipped, or damaged, the material will be rejected. The finish shall be replaced as specified under Section 645 of GDOT STD specifications with the Department's approval.

v. For poles or arms that need galvanization, thoroughly clean the steel poles and arms and touch up non-galvanized parts with i-d red or original-type primer.

p. Attach the fittings to the poles as specified by the manufacturer. The fittings may include:

i. Cast aluminum cap

ii. Pole clamp hardware for span wire attachment

iii. Weatherhead with chase nipples and couplings

iv. Galvanized elbow with bushing installed by cutting the pole and welding in place around the entire circumference

2. Concrete Strain Poles

a. Provide concrete strain poles that meet the requirements of Section 639 and Standard Detail drawings.

b. Verify pole hole orientations for pedestrian signal faces, pedestrian pushbutton stations, luminaire arms, etc., with the Department prior to proceeding with traffic control signal installation. For poles at controller cabinet assembly location, provide at least two (2) 2.5 in. (64 mm) openings at the top of pole and at least two (2) 2.0 in. (50 mm) threaded openings at the bottom.

c. Provide caissons or foundations that conform to the Construction Detail for Strain Pole and Mast Arm Pole Foundations in the Standard Detail Drawings.

d. Determine the required foundation size based on the manufacturer's specified bending moment at field for each pole.

e. Rake the poles during installation to provide a pole that is plumb once the load is applied.

f. Install concrete strain poles so that the angle of variance between the eye bolt on the pole and the span wire is less than 10 degrees.

g. Plug all unused holes. Use grout or threaded fittings. Match the finish of the pole.

3. Steel Strain Poles

a. Verify that anchor bolts, reinforcing bars, and grounding electrodes conform to Section 639 and Section 852 of GDOT STD specifications and are placed in the excavation.

b. Support the anchor bolts with a template to provide the proper bolt circle for the pedestal or pole to be installed.

c. Install anchor bolts without modifications. Refer to signal details for proper installation.

d. Wire the reinforcing bars together or to the anchor bolts.

e. Wire the conduits in the base to the reinforcing bars for support. Verify that they are accessible above and beyond the foundation's finish level.

f. Before pouring the foundation concrete, determine that the anchor bolt orientation is correct so that the tensile load is divided between at least two anchor bolts. Pour and vibrate the concrete with the Department present.

4. Mast Arms

a. Install mast arms that can accommodate signal face mounting hardware and that adhere to the manufacturer's recommended procedures and Section 925 and Section 915 of GDOT STD specifications. Do not add holes.

b. Seal the openings in the mast arms to prevent pests from entering.

c. Align the mast arm to allow the traffic signal faces to hang plumb at the correct height without using extensions.

d. Verify all mast arms are galvanized unless indicated otherwise in the contract.

NOTE: Submit a Mast Arm Pole Chart to the Department and the Office of Bridge and Structural Design for review and approval

e. Verify pole hole orientations for pedestrian signal faces, pedestrian pushbutton stations, luminaire arms, etc., with the Department prior to proceeding with traffic control signal installation.

5. Pedestrian Pedestals

a. Install aluminum pedestal poles that adhere to Section 850 of GDOT STD specifications on breakaway aluminum bases that meet the requirements for breakaway construction. See Section 925 of GDOT STD specifications for breakaway base requirements. See the Standard Detail Drawings for Pole and Foundation Details.

b. Secure at least four anchor bolts in a concrete foundation as shown in the Construction Detail.

c. As an alternate to a concrete foundation, install a pedestal pole foundation anchor assembly.

d. Install the foundation until the top of the base plate is level with the ground.

e. Slide bolt heads through the keyhole and under the base plate against the bolt head keepers with threads up.

f. Adhere to the manufacturer's instructions for installation.

g. Use a universal driving tool with the correct kelly bar adaptor and bolts supplied with the tool.

h. Attach driving tool assembly to the foundation base plate using the bolts provided with each foundation. Be sure to align the tool soothe holes in the tool line up with the proper bolt circle on the foundation.

i. Stand the foundation, with the attached drive tool assembly, upright and attach the drive-tool-foundation to the kelly bar.

j. Raise the kelly bar until the foundation swings free of the ground.

k. Maneuver the kelly bar until the point of the foundation is over the marked installation location.

l. Lower the kelly bar until the point of the foundation is forced into the ground and the helix is flush with the ground surface.

m. Verify the shaft of the foundation is plumb by checking the shaft with a level on two sides that are at least 90 degrees from each other.

n. Recheck the shaft to be sure it is plumb when the foundation has penetrated 1 ft. (300 mm) into the ground.

o. When the base plate of the foundation is 1 in. (25 mm) to 2 in. (50 mm) above the ground line, remove driving tool.

p. Contain the wiring inside the pole or in approved hardware. Do not allow conduit outside the pole.

q. Position the pedestal pole plumb and high enough to clear the pedestrian's signal face as shown in the contract.

r. Verify that the bottom of the pedestrian signal housing including brackets at the preferred mounting height of 10 ft. (3 m) above the ground line. If

conditions dictate, or specified in the contract, pedestrian signal housings may be mounted at a minimum of 7 ft. (2.1 m) above the ground line

s. If using a vehicle signal housing, verify pole is adequate to give traffic signal face a height of 12 ft. (3.6 m).

6. Timber Poles

a. Timber poles do not require the use of concrete for filling the cavity around the pole base.

b. Use timber poles that meet the requirements of Section 861 and Section 639 of GDOT STD Specifications.

c. Use Class II for all signal support poles. Use Class IV for aerial loop lead-in or communication cable if approved by the Department. Poles shall be inspected and include AWW stamp.

d. Use guy wires with guy timber poles as shown in the contract.

e. Use guy helper cables with separate guy wires when helper signal span cables are indicated in the contract.

NOTE: Never attach down guy wires to eye bolts. Attach down guy wires to angle guy attachment only and install insulating rods on all down guy installations as detailed on Standard Detail Drawings.

F. Power Disconnect

1. Install a power disconnect box at each intersection as shown in the contract and Standard Detail Drawings.

G. Uninterruptable Power Supply (UPS)

1. General

a. Install UPS according to the contract.

b. Install UPS and battery bank in accordance with manufacturer's recommendations.

c. With the UPS submittal, provide calculations for determining the size of the inverter and batteries based on the power requirements for each location.

d. Verify that all auxiliary items are included in the power calculations.

e. Verify the submittal specifies the model number and the firmware revision that is being supplied.

2. Refer to the contract for the appropriate external cabinet mounting installation, if applicable.

a. Type A mounting shall be typically used for installing at locations with an existing traffic control device cabinet.

   i. Total of 8 bolts per cabinet with 2 flat washers per bolt and 1 K-lock nut per bolt

   ii. Cabinet mounting bolts shall be:

      a) 18-8 Stainless Steel Hex Head (Fully Threaded) b) 0.375 in. (10 mm) — 16 X 1 in. (25 mm)

   iii. Washers shall be:

      a) Designed for 0.375 in (10 mm) bolt

      b) 18-8 Stainless Steel 1 in OD round flat type

      c) K-lock washer shall be:

         1) 18-8 Stainless Steel, Hex Nut Assembled with Free-Spinning Tooth Washer

         2) 0.375 in. (10 mm) — #16 Screw size

   iv. External cabinet couplings to the controller cabinet shall provide a conduit for power connections between the Model 332 Cabinet and the external cabinet.

      a) The couplings shall consist of three parts and meet the following requirements:

         1) 2 in. Nylon Insulated, Steel Chase Nipple

         2) 2 in. Sealing, Steel Locknut

         3) 2 in. Nylon Insulated, Steel Bushing

      b) Provide external cabinet with all bolts, washers, nuts, and cabinet-cabinet coupler fittings for mounting the external cabinet to the Cabinet.

b. Type B mounting shall be typically used for locations with a new traffic controller cabinet and foundation.

   i. The cabinet installation shall provide the external battery cabinet as a base mount cabinet on the same foundation as the Cabinet.

   ii. Connections between the cabinets shall be through conduit in the cabinet base.

   iii. The external cabinet shall be installed so that it is centered on the 30 in. (762 mm) left side of the cabinet.

   iv. Bolt UPS cabinet to pre-fab base.

   v. UPS cabinet opening shall be larger than the pre-fab base opening.

H. Traffic Signal Faces

1. General

    a. Place traffic signal faces according to the contract. If a change to traffic signal placement is required, the revised location shall be approved by the Department in advance of installation and in compliance with the MUTCD.

    b. Verify all traffic signal faces at an installation have the same appearance for the signal faces and the LED modules.

2. Vertical clearance

    a. Measure the vertical clearance from the pavement to the lowest part of the assembly, including brackets and backplates.

    b. For traffic signal faces located above the roadway, provide vertical clearance that is a minimum of 17 ft. (5.2 m), 18 ft. (5.5m) preferred minimum, and a maximum of 19 ft. (5.8 m) above the roadway surface.

    c. For traffic signal faces located on a pole, provide vertical clearance that is a minimum of 12 ft. (3.6 m) and a maximum of 19 ft. (5.8 m) above the sidewalk or pavement grade of the center of the highway, whichever grade is higher.

    d. Adjust signal faces on the same approach to have the same vertical clearance.

3. Housing

    a. Mount one aluminum reinforcing support plate in the top of the red (top) section of all three and four- section traffic signal face for the installation of mounting hardware.

    b. Provide traffic signal faces that use stainless steel hardware and are weathertight.

    c. Provide traffic signal faces that sealed for mounting in all possible configurations.

    d. Provide traffic signal faces that have housing door that positively latches using two eyebolts and wing nuts.

    e. Verify the signal door has hinge lugs molded on one side and two latch jaws are molded on the other side.

    f. When constructing side by side signal sections, verify that both doors can open at the same time (butterfly).

    g. When doors are open, verify that the door will remain attached to housing

    h. Verify bottom section has drainage holes.

4. Wiring

    a. Connect the signal cable to the wire in each traffic signal face to provide the correct signal indication when the cables are connected to the controller cabinet assembly back panels.

    b. Use wire nuts to make the connections to the LED signal modules lead-in.

    c. Make all connections in the top section of the traffic signal face.

    d. Do not splice cables.

    e. Verify that the black signal conductor jacket is inserted into the traffic signal face a minimum of 6 in. (150 mm).

5. Optically Programmable Signal Faces

    a. Install optically programmable (OP) traffic signal faces as shown in the contract, and as directed by the manufacturer.

    b. Mount OP signal faces securely or tether them to limit movement.

    c. Mask the OP lamp for directing visibility under the Department's supervision.

    d. Tether traffic signal faces that have tunnel visors longer than 12 in. (300 mm).

    e. Attach traffic signal faces to mast arms using rigid mounting brackets.

    f. Adjust traffic signal faces on mast arms so that all red indications on the same mast arm are at the same elevation.

6. Ramp Meter Signal Faces

    a. Install ramp metering traffic signal faces as shown in the contract.

    b. Mount and adjust ramp metering signal faces as per the Standard Detail Drawings.

    c. Mount and adjust ramp meter enforcement device (light) as per the Standard Detail Drawings.

    d. The enforcement device shall be able to be viewed from downstream on the ramp.

7. Lane Use Signal Faces

    a. Install lane control signal faces for reversible lane systems as shown in the contract.

    b. Center each signal over the lane or lanes under signal control.

    c. Leave a vertical clearance for blank-out signs shall be a minimum of 17 ft. (5.2 m) above the roadway surface.

d. Use a spirit level to verify that the bottom edge of each sign is horizontal.

e. Label all LED modules with their turn on date on the backside of the LED insert.

I. Pedestrian Signal Faces

1. Install pedestrian signal faces as directed in the contract.
2. Install the pedestrian signal faces as shown on the Standard Detail Drawings.
3. Leave a vertical clearance from the bottom of the pedestrian signal face to the ground at a preferred height of 10 ft. (3 m) unless specified in the contract or by the Department.
4. Use serrated locking devices that firmly hold the pedestrian signal faces in the required alignment.

J. Cable

1. General

   a. Install and connect electrical cable to the proper equipment to produce an operating traffic control signal system.

   b. All wiring from the control cabinet assembly input and output files to field terminations shall be in accordance with IMSA, NEMA, UL, and the Department's Traffic Signal Wiring Standards. Referenced IMSA specification cables and applications can be found in Section 925 of GDOT STD specifications.

   c. Make a minimum 1 ft. (300 mm) diameter 3-turn weather drip loop as shown in the Standard Detail Drawings at the entrance to each traffic signal face.

   d. Neatly tie signal cables leaving a structure or weatherhead to enter a signal fixture. Tie the cables to the messenger cable as illustrated in the Standard Detail Drawings.

2. Traffic signal face

   a. Install one 7-conductor signal cable for each signal phase and right turn overlap from the controller cabinet assembly to the appropriate signal face.

   b. From this leftmost traffic signal face, install a 7-conductor signal cable to every other traffic signal face on the same phase, if present.

   c. The standard wiring color code for vehicular signal faces shall be in accordance with Table 3.

Table 3 – Vehicular Signal Face Wiring Standards					
Signal Indications / Function	3- Section Signal Heads Seven Conductor Cable Conductor		5-Section Head	4-Section FYA and Right Turn Overlaps	3-Section FYA and Right Turn Overlaps
	Solid Ball Signal Indications (Typ. Phases 2, 4, 6, and 8)	Protected Only Turn Signal Indications (Typ. Phases 1, 3, 5, and 7)			
Red	Red Wire	N/A	Red Wire	N/A	N/A
Yellow	Orange Wire	N/A	Orange Wire	N/A	N/A
Green	Green Wire	N/A	Green Wire	N/A	N/A
Red Arrow	N/A	White Wire with Black Tracer	N/A	White Wire with Black Tracer	White Wire with Black Tracer
Yellow Arrow	N/A	Black Wire	Black Wire	Black Wire	Black Wire
Flashing Yellow Arrow	N/A	N/A	Orange Wire (Bi-Modal Indication Only	Orange Wire	Orange Wire
Green Arrow	N/A	Blue Wire	Blue Wire	Blue Wire	N/A
Neutral	White Wire	White Wire	White Wire	White Wire	White Wire
Spare(s)	White Wire with Black Tracer, Black and Blue Wires	Red, Orange, and Green Wires		Red, Orange, and Green Wires	Red, Orange, Blue, and Green Wires
NOTE: 3-Section Bi-Modal FYA shall use same wiring standard as a 4-section FYA					

3. Pedestrian signal face

   a. Install one 7-conductor signal cable from the controller cabinet assembly to each location with a pedestrian signal face.

   b. Seven-conductor cable can operate either one or two pedestrian signal faces.

   c. The standard wiring color code for pedestrian signal faces shall be in accordance with Table 4.

Table 4 – Ramp Meter Signal Face Wiring Standards		
Signal Indications / Function		
	Phases 2 and 6	Phases 4 and 8
Don't Walk	Red Wire	Orange Wire
Walk	Green Wire	Blue Wire
Neutral	White Wire	White Wire

4. Ramp meter signal face

   a. Install one 7-conductor signal cable for each lane of the ramp meter operation from the controller cabinet assembly.

   b. The wiring color code for ramp meter signal faces shall be in accordance with Table 5.

Table 5 – Ramp Meter Signal Face Wiring Standards	
Signal Indications / Function	3- Section Signal Heads Seven Conductor Cable Conductor
Red	Red Wire
Yellow	Orange Wire
Green	Blue Wire

K. Span Wire

1. Span Wire Sag Minimum Sag Requirements

   a. Meet minimum sag requirements specified by the pole manufacturer.

   b. Span wire used with strain pole installation shall have a minimum 5% sag.

   c. Span wire used with timber pole installation shall have a minimum 2.5% sag.

2. Span Wire Sag Calculation Requirements

   a. Sag is the amount of vertical drop measured from the pole attachment point to lowest part of the span.

   b. Allowable sag is calculated by measuring the longest distance between poles and multiplying by the desired percentage of sag, unless specified by the pole manufacturers.

   c. Calculate attachment points for the messenger strand at the signal pole according to the Standard Detail Drawings.

   d. Provide the Construction Manager or designee with sag calculations for review and approval.

3. Span Wire Type

   a. Use minimum 0.375 in. (9.5 mm) span wire to support traffic signal faces, signal conductors, and other hardware only. Larger messenger cable shall be used as required based on span calculations.

   b. Use minimum 0.25 in. (6.35 mm) messenger cable to support the aerial communications cable plant and aerial loop lead installations.

   c. All messenger strand installations shall include standard industry bonding and grounding including NEC Article 770 and NESC Section 9.

d. Ground all span wire and down guy assemblies as shown on Standard Detail Drawings. Bond all span wire together and bond to ground at every pole.

e. All cabling and messenger installed shall meet the requirements provided by the utility pole owner.

f. Install span wire and messenger wire where specified in the contract and in accordance with the Standard Detail Drawings.

g. Use helper cables where specified in the contract and on the Standard Detail Drawings.

h. For construction of a box or modified box span, use bullrings. Be consistent throughout the intersection in use of bull rings or strand vices. If bull rings are not used, strand vices shall be interlocked.

4. Span Wire Cable Mounting

a. When using aluminum wrap or aluminum ties, space at a maximum of 6 in. (150 mm) increments.

b. Aluminum wrap shall have at least three turns of wrap.

c. Use lashing wire only for aerial loop lead-in and fiber optic cabling.

5. Installation

a. Attach cables to messenger cable using lashing wire, aluminum ties, or lashing rods.

b. Verify that messenger strand clearances conform with local utility company standards.

c. Only use lashing rods that are of the same material as the messenger strand.

d. If lashing rods are used, use lashing rods sized for the cables and messenger strand.

e. Before erecting the messenger strand, determine the suspension strand length to span the distance between the poles.

f. Run the messenger strand from structure to structure without splicing.

g. Drill wood poles to receive the eye bolts so that the span wire and eyebolt at each connection form a straight angle.

h. The angle of variance shall be continuously maintained at less than 10 degrees.

i. Attach down guy wires to guy hooks. Use a minimum 0.375 in. (9.5 mm) messenger cable for down guys.

j. Make stranded messenger cable attachment points with the appropriate size strand vices or two bolt suspension clamps.

k. Use standoff brackets as needed to prevent damage from poles, trees, or other structures.

L. Underground Cable for Signal Circuits

1. Install underground cable for signal circuits includes cable, with conduit, as shown in the contract.
2. Do not exceed 40% conduit fill per the NEC.
3. Pull cables into conduits without electrical or mechanical damage.
4. Pull all cables through a single conduit simultaneously.
5. Pull cables by hand only. The use of trucks or other motorized equipment is not permitted, unless approved by the Department. If mechanical pulling is approved, do not exceed the manufacturer's tension rating for the cable.
6. Pull cables with a cable grip that firmly holds the exterior covering of the cable.
7. Handle and install the conductors to prevent kinks, bends, or other distortion that may damage the conductor or outer covering.
8. Use powdered soapstone, talc, or other inert lubricants to place conductors in conduit according to manufacturer's recommendations.
9. When pulling cables through hand holes, pole shafts, etc., use a pad of firm rubber or other material between the cable and the opening edges to prevent cable damage.
10. Splicing of signal conductors is not permitted.

M. Communications Coble

See Section 935 of GDO STD specifications for fiber optic cable communication system requirements.

N. Pullboxes

1. Install pullboxes as shown in the contract.
2. Verify that pullboxes conform to the Standard Detail Drawings.
3. Do not relocate pullboxes on the curb side of the signal pole in the intersection radius return.

4. Horizontal adjustments of less than 5 ft. (1.5 m) may be made to pullbox locations to avoid obstacles, if necessary.

5. Orient pullboxes with the longest dimension parallel to the roadway.

6. Include provisions for drains in pullbox excavations as specified.

7. Do not place the aggregate for the drain until the Department approves the excavation.

8. Do not set the pullbox until the aggregate is in place.

9. Obtain the Department's approval and begin backfilling and installing the frame and cover.

10. The distance between pullboxes in a run of conduit shall not be greater than 100 ft (30 m), unless otherwise shown in the plans or approved by the Engineer, except for fiber optic cable.

11. Set the pullboxes in place, level, and install conduits.

    a. Conduit entrance shall be through the open bottom in Types 1, 2, 3, 4S, and 5S.

    b. Conduit entrance shall be directly through cored holes in the side walls in Types 4 and 5.

    c. Conduit entrance shall be through the conduit terminators in Types 6 and 7.

12. Where conduit entrance shall be through the side wall in Types 4 and 5, or for conduit other than the terminator size provided in Types 6 and 7, use field cored conduit entrance holes in the side wall of the box. All field coring shall be made with a diamond-tipped masonry hole saw and according to the pullbox manufacturer's recommendations.

13. Use an approved HDPE to EPVC coupling or an underground-type conduit adhesive where joining conduit or conduit bodies of dissimilar materials, such as HDPE-to-EPVC sweeps into pullboxes or installing into pullbox conduit terminators.

14. Install the pullbox at a location that is level with the surrounding ground or pavement. Do not place a pullbox in a ditch or depression. Unless otherwise shown in the contract, when installed either in a sidewalk or in the ground, the top of the pullbox shall be level with the sidewalk or ground surface.

15. Metal lids or covers shall be properly grounded.

0. Conduit and Fittings

1. Install conduit by type (GRS, HDPE, PVC) as shown in the contract.

2. Refer to the NEC for conduit fill percentages. Install additional conduits as necessary to meet 40 percent maximum fill.

3. Verify that conduit conforms to Section 682, Section 923, and Section 925 of GDOT STD Specifications with the addition of flexible conduit only where shown in the Details or as directed to do so in writing by the Construction Manager or designee.

4. Use the conduit size specified in the contract. Obtain a supplemental agreement from the Department prior to installing conduit other than the size specified in the contract.

5. See Section 682.3 of GDOT STD Specifications for the construction of underground conduit.

6. See Section 682.3 of GDOT STD Specifications for the construction of encased conduit.

7. See Section 682.3 of GDOT STD Specifications for the construction of backfilling conduit.

8. In addition to the installation requirements of Section 682 of GDOT STD Specifications:

    a. Coat metallic conduit threads with red- or white-lead pipe compound, thermoplastic, or Teflon seal. Verify that they are securely connected.

    b. Install bushings in the conduit to protect the conductors.

P. Blank-out Signs

1. Install blank-out signs as shown in the contract.

2. Fasten the signs to a stationary structure or to a messenger strand support system.

3. Center each sign over the lane or lanes under sign control, where applicable.

4. Leave a vertical clearance for blank-out signs as shown in the contract.

5. Use a spirit level to verify that the bottom edge of each sign is horizontal.

Q. PHB Installation Requirements

1. Install PHB as shown in the contract.

2. Install solar or electrical power service as indicated in the contract.

3. Provide pedestrian detection system, controller cabinet assembly and necessary components for a fully functional PHB.

R. RRFB Installation Requirements

1. Install RRFB as shown in the Contract.
2. Install solar or electrical power service as indicated in the contract.
3. Provide pedestrian detection system.

S. Flashing Beacon

1. Furnish and install the flashing beacon controller at the locations shown in the contract.
2. Install it as a complete unit (solid state flasher and field cabinet with time clock, if applicable) and verify that it conforms to this section.
3. Install solar or electrical power service as indicated in the contract.