114 North Commerce Street
Hinesville, Georgia 31313
(912) 368-5664 Office
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T R LONG ENGINEERING, P.C.

1000 Towne Center Blvd.
Suite 304
Pooler, Georgia 31322
(912) 355-1046

PINE FOREST SEWER SYSTEM INPROVEMENTS
FOR
THE CITY OF PORT WENTWORTH

BID DOCUMENTS

AUGUST 2022

PREPARED FOR

CITY OF PORTWENTWORTH
7224 GA HIGHWAY 21
PORT WENTWORTH, GEORGIA 31407

2021-285

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ADVERTISEMENT FOR BIDS FOR

PINE FOREST SEWER SYSTEM IMPROVEMENTS
FOR
THE CITY OF PORT WENTWORTH

Sealed bids will be received by the City of Port Wentworth at 7224 GA Highway 21 Port Wentworth, Georgia 31407 until 2:00 P. M. local time on October 6, 2022, at which time and place they will be publicly opened and read. No submitted bid may be withdrawn after the scheduled closing time for receipt of bids for a period of sixty (60) days.

The work to be done consists of the installation of approximately 1,853 feet of 8" PVC gravity sewer and approximately 9 concrete manholes. The improvements to the Sewer System Improvements and portions of the gravity sewer will be completed by others.

Bids for the complete work in one or more general contracts shall be made on the bid form provided and shall contain prices in words and figures for the work bid. All bids shall he accompanied by a Bid Bond drawn in favor of the City of Port Wentworth, in the amount of at least five percent (5%) of the lump sum bid for the complete work; such Bid Bond representing that the Bidder, if awarded the contract will promptly enter into a contract and furnish Performance Bond and Payment Bond as provided by law and approved by the Attorney for the City of Port Wentworth. Each bond shall be equal to one hundred percent (100%) of the contract amount. The Bid Bond shall be forfeited to the City of Port Wentworth as liquidated damages if the Bidder fails to execute the contract and provide Performance and Payment Bonds within ten (10) days after being notified that he has been awarded the contract.

Drawings and Specifications are open to public inspection at the office of the City of Port Wentworth and at the offices of T. R. Long Engineering, P.C.

Copies of the plans and specifications must be obtained from T. R. Long Engineering, 114 North Commerce Street, Hinesville, Georgia, 31313, upon receipt of $150.00. Such fees represent reproduction cost and are non-refundable. Bidders must purchase a Bid Packet to be a registered bidder. Only bids from registered bidders will be opened.

The Owner reserves the right to reject any or all bids and to waive informalities.

INSTRUCTIONS TO BIDDERS

1. INTENTION: It is intended that the Project Documents shall cover the complete work to which they relate.

2. DEFINITION: Where the following words, or the pronouns used instead occur herein, they shall have the following meaning:

   “Owner” shall mean the City of Port Wentworth party of the first part to the "Contract Agreement" or its authorized and legal representative.

   "Engineer" shall mean **T. R. Long Engineering, P.C** of 114 North Commerce Street, Hinesville, GA, 31313 acting for the Owner or other representative of such party.

   "Contractor" shall mean the party of the second part to the following agreement, or the legal authorized representatives of such party.

   WORK TO BE DONE: The work to be done consists of furnishing all materials, labor and equipment for construction of **Pine Forest Sewer System Improvements for the City of Port Wentworth** complete with appurtenances, all as set forth in the Bid, as specified herein, and as shown on the Drawings.

3. MATERIALS AND WORK BY THE OWNER: The Owner will neither furnish materials nor perform labor for construction of work under this contract, unless otherwise stipulated elsewhere in the Project Documents.

4. SITE EXAMINATION: The Bidder is expected and requested to examine the location of the work, and to inform himself fully as to the structural and mechanical conditions; the conformation of the ground; the character, quality, and quantity of the materials to be encountered; the character of equipment and facilities needed to execute the work; the general and local conditions; and all other matters which can in any way affect the work to be done under the contract.

   A sub-surface investigation has not been made on any portion of the work. Rock quantities shown in the Bid are estimated based on results of similar work in the area. The prospective bidder must form his own opinion of the character of the sub-surface materials to be encountered in excavating for and the construction of the various facilities.

5. BIDS: All Bids must be made upon the Bid forms provided and shall be for materials and work called for in the specifications and shown for each item in the Bid. The total amount bid for the work in the Bid shall be given in words and figures in the spaces provided. Bid forms shall not be detached from these Specifications. All blank spaces in the bid form shall be filled in with black ink in words and figures. The Certification must be completed and executed when submitted.

   A. Unit Price Items: The itemized quantities given in the Bid for unit price work shall be considered by the Contractor as the quantities required to complete the work. Should the actual quantities required in the construction of the work be greater or less than the quantities shown in the items, an amount equal to the difference in quantities at the unit prices bid for the item will be added to or deducted from the contract price.

   B. Lump Sum Price: Where itemized prices are not given in the Bid, the Contractor shall consider the lump sum prices bid for the work shown on the Drawings and/or specified to be sufficient for completion of his Contract.

   C. Total Amount Bid: The correct total amount bid is defined as the correct sum total of the amount bid for the items in the Bid. The correct amount bid for each unit price item is defined as the product of the quantity listed in the Bid for the item, multiplied by the unit price bid.

D. The bids must be enclosed in a sealed envelope addressed to the **City of Port Wentworth and marked "Pine Forest Sewer System Improvements for the City of Port Wentworth".** Bids may be submitted intact in this book or may be submitted detached from the book. The sealed bid must contain items listed below if any item is missing the bid may be considered irregular and bid may not be considered.

1. Completed Proposal Form and Schedule of Items.
2. Completed and executed surety documents.
3. Executed Surety Requirement Form.
4. Completed Statement of Bidder's Qualifications with References.
5. Completed Corporate Certificate Form
6. Completed Illegal Immigration Reform Affidavit for contractor.

6. RECEIPT AND OPENING OF BIDS: Bids must be filed with the Owner at or before the hour specified in the advertisement, and Bids filed after the specified time will not be considered. Bids sent by mail must be mailed with sufficient time allowed for the bid to reach the Owner prior to the opening of bids.

   The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw a bid within sixty (60) days after the actual date of the opening thereof.

   Conditional bids shall not be considered.

   Bidders are requested to be present at the opening of Bids, which will be in public.

7. BID SECURITY: Each Bid must be accompanied by a certified check or by a Bid Bond in an amount equal to not less than five percent (5%) of the amount of the Bid, to guarantee that the Successful Bidder will, within ten (10) days from the date of the notice of award of contract, enter into an Agreement with the Owner, and execute to the Owner a Performance Bond and Payment Bond, each equal to 100% of the contract amount, the agreement and bonds to be in the form set forth in this Book. If for any reason whatsoever the Bidder withdraws from the competition after the Bid opening time, or refuses to execute the required agreement and bonds, if his Bid is accepted, the Owner may retain the amount of the certified check, or proceed on the Bid Bond. The surety on the Performance Bond and the Payment Bond shall be a surety company authorized to do business in the State of Georgia and shall be countersigned by an agent residing in the State of Georgia. The bonds and surety thereon shall be subject to approval by the Attorney for the Owner.

8. RIGHT TO REJECT BIDS: The Owner reserves the right to reject all bids, and to waive informalities. No bids will be received after the Bid opening time. Unauthorized conditions, limitation, and provisions attached to the Bid, except as provided herein, will render it informal and cause its rejection. Unbalanced bids will be subject to rejection. Any Bidder may withdraw his bid, either personally or by telegraphic or written request, at any time prior to the Bid opening time.

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

10. DETERMINATION OF LOW BID: The contract will be awarded, if it is awarded, to the low, responsible, responsive bidder. The Owner will decide which is the low, responsible, responsive bidder. Responsiveness shall be defined by (a) the completeness and regularity of Bid Form, (b) a bid form without exclusions or special conditions, and (c) a bid form having no substitute bids for any items except as allowed under these Specifications. Responsibility will be based on whether the Bidder involved (a) maintains permanent place of business; (b) has adequate equipment to do the work properly and within the time limit established; (c) has suitable financial status to meet obligations incident to the work; and (d) has appropriate technical experience.

    A. The Bidder is requested to list prices of at least two manufacturers for each item of major equipment if listed on the Bid form. Use lowest price for base bid. If the make of any item listed in the base bid column does not meet specifications, the next lowest priced make listed for that item which does meet specifications will be used in determining the lowest bid price. If all of the listed makes of the item failed to meet specifications, the bid will be rejected on the grounds that it is nonresponsive.

    B. The Owner has the right to apply any or all "Deductions or Additions" (if any), listed in the proposal by the Engineer, for the purpose of making an award.

11. RETURN OF BID SECURITY: Owner will, within ten (10) days following the Bid opening, return the Bid security of all Bidders, except the Security posted by the three lowest Bidders; upon the award and execution of the contract, the remaining Bid securities will be promptly returned.

12. INTERPRETATION OF DRAWINGS AND SPECIFICATIONS: If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of -the Drawings, Construction Specifications and other documents, and as to the scope of any part of the work, he must submit to the Engineer a written request for an interpretation thereof The person submitting the request will be responsible for its prompt delivery in ample time for an interpretation to be issued before the Bid opening date. Interpretations of the Project Documents will be made only by Addendum; a copy of each Addendum will be mailed or delivered to each person receiving a set of the Project Documents. The Engineer will not be responsible for other interpretations of the Project Documents.

13. COMPLETE WORK REQUIRED: The Construction Specifications, Drawings and all other documents are essential parts of the contract; requirements occurring in one are as binding as though occurring in all. Documents are intended to be cooperative, and to describe and provide for a complete work. In case of discrepancies on the Drawings, figured dimensions shall govern. In case of omissions from the Construction Specifications as to items of equipment, and materials or quantities therefore, the Drawings shall govern. It shall be the responsibility of the Bidder to call to the attention of the Engineer obvious omissions of those magnitudes which would affect the strength, adequacy, function, completeness (and cost of any part of the work, and in ample time for amendment by Addendum prior to the Bid opening date).

14. SUBCONTRACTS: The Bidder's attention is directed to the General Conditions concerning subcontracts. The Bidder is specifically advised that any person, firm or other party to whom it is proposed to award a subcontract under this contract.

    A. Must be acceptable to the Owner. Approval will not be given until the Contractor submits to the Owner a written statement concerning the proposed award to the subcontractor, which statement shall contain such as the Owner may require.

    B. Must provide insurance equal to that of the bidding contractor. Approval of the proposed subcontract award cannot be given by the Owner unless and until the proposed subcontractor has submitted the Certification and or other evidence showing that it has fully complied with any reporting requirements to which it is or was subject.

Although the bidder is not required to attach such Certifications by proposed subcontractors to his bid, the bidder is here advised of this requirement so that appropriate action can be taken to prevent subsequent delay in subcontract awards.

15. DRAWINGS: The character, location, and essential details of the work are shown upon a set of Drawings, entitled:

PINE FOREST SEWER SYSTEM IMPROVEMENTS
FOR
THE CITY OF PORT WENTWORTH

The Drawings and Specifications shall form a part of the contract for the work. The Drawings shall be supplemented by working drawings as necessary. All authorized alterations affecting the requirement and information given on the Drawings shall be in writing.

16. EXTRA WORK ITEMS IN BID: The Bid contains certain unit price items entitled "Extra Work If Ordered by Engineer". In each of those items, the estimated quantity is based upon the average amount of extra work encountered in a typical job. The stated quantities are not guaranteed to be required or not to be required, but are included in the Bid in order to determine, in advance of construction, the actual low bidder. No work described by those items will be approved for payment without advance authorization by the Engineer.

17. NOTICE OF SPECIAL CONDITIONS: Attention is particularly called to those parts of the Contract Documents and Specifications which deal with the following:

    A. Inspection and testing of material
    B. Insurance requirements

18. POWER OF ATTORNEY: Attorneys-in-fact who sign Bid Bonds or Contract Bonds must file with each bond a certified and effectively dated copy of their Power of Attorney.

19. AUTHORITY TO SIGN: If a Bid is made by an individual, his name and Post Office address must be shown. If made by a firm, or partnership, the name and Post Office address of each member of the firm or partnership must be shown. If made by a Corporation, the person, or persons, signing the Bid must show the name of the State under the laws of which the Corporation is chartered and his or their, authority for signing same, and the names, titles and addresses of the President Secretary and Treasurer, and the Corporate Authority for doing business in this state.

20. WORKING DRAWINGS: Working drawings for any structure shall consist of such detailed plans as may be required for the prosecution of the work but not included in the plans. All necessary working drawings shall be furnished by the Contractor. They shall include shop details, erection plans, masonry layout diagrams, and bending diagrams for reinforcing steel, approval of which by the Engineer must be obtained before any work involving these plans may be performed. Plans for false-work, centering and form work may also be required and such cases shall be likewise subject to approval by the Engineer.
    It is expressly understood, however, that approval by the Engineer of the Contractor's working drawings does not relieve the Contractor of any responsibility for accuracy of dimensions and details. The Contractor shall be responsible for agreement and conformity of his working drawings with the Drawings and Specifications.

    The contract price shall include the cost of furnishing all working drawings and the Contractor will be allowed no extra compensation for such drawings.

21. COOPERATION OF CONTRACTOR: The Contractor will be supplied with five (5) copies of the Drawings and Specifications. The Contractor shall have available on the work, at all times, one (1) copy of each of said Drawings and Specifications. He shall give the work the constant attention necessary to facilitate the progress thereof and shall cooperate with the Engineer and with other

contractors in every way possible. The Contractor shall at all times have a Superintendent, satisfactory to the Engineer, capable of acting as his agent on the work, who shall receive instructions from the Engineer or his authorized representatives. The superintendent shall have full authority to execute the orders or directions of the Engineer without delay and to promptly supply such materials, tools, plant equipment and labor as may be required.

22. CONSTRUCTION STAKES: Subsidiary lines and grades shall be laid out by the Contractor from the controlling lines and bench marks furnished by the Engineer or from measurements shown on the Drawings. All lines and grades shall be subject to checking by the Engineer, but this checking shall in no way relieve the Contractor from responsibility for their correctness.

    The Contractor shall provide such stakes, materials, and such labor and assistance as the Engineer may require in laying out work, establishing bench marks and checking and measuring the work.

23. AUTHORITY AND DUTIES OF INSPECTOR: Inspectors shall be authorized to inspect all work done and materials famished, including preparation, fabrication and manufacture of the materials to be used. The Inspector shall not be authorized to alter or waive any requirements of the Specifications. He shall call the attention of the Contractor to any failure of the work or materials to conform to the Specifications and Contract. He may reject materials or suspend the work until any questions at issue can be referred to and decided by the Engineer.

    The presence of the Inspector shall in no way lessen the responsibility of the Contractor. The Contractor in no way relieves himself of responsibility for adequacy of the work by following the directives of the Inspector.

24. INSPECTION: The Contractor shall furnish the Engineer with every reasonable facility for ascertaining whether or not the work performed and materials used are in accordance with the requirements and intent of the Specifications and Contract. No work shall be done or materials used without suitable supervision or inspection by the Engineer or his representative. Failure to reject any defective work or materials shall not in any way prevent later rejection when such defect is discovered, or obligate the Owner to final acceptance.

    All materials furnished and work done when not in accordance with the Specifications and Contract will be rejected and shall immediately be removed and other work done and materials furnished in accordance therewith. If the Contractor fails to remove the work and materials as above ordered, within forty-eight (48) hours, then the Engineer shall have the right and authority to stop the Contractor and his work at once and to supply men and material at the cost and expense of the Contractor to remove said work and materials.

25. DEFECTIVE WORK AND MATERIALS: The inspection of the work shall not relieve the Contractor of any of his obligations to fulfill his Contract and defective work shall be made good, notwithstanding that such work and materials have been previously inspected by the Engineer and accepted or estimated for payment. The failure of the Engineer to condemn improper materials or workmanship shall not be considered as a waiver of any defect which may be discovered later, or as preventing the Owner at any time subsequently from recovering damages for work actually defective. All work shall be guaranteed against defects in workmanship or materials for a period of one year after final acceptance.

26. CORRECTIONS: Should any portions of the Drawings and Specifications be obscure or in dispute, they shall be referred to the Engineer and he shall decide as to the true meaning and intent. He shall also have the right to correct any errors or omissions at any time when such corrections are necessary for the proper fulfillment of said Drawings and Specification.

27. DISAGREEMENT: Should any disagreement or difference arise as to the estimated quantities or classifications or as to the meaning of the Drawings or Specifications, on any point concerning the character, acceptability and nature of the several kinds of work, any materials and construction

thereof, the decisions of the Engineer shall be final and conclusive and binding upon all parties to the Contract.

28. WEATHER: During unseasonable weather, all work must stop when the Engineer so directs and all work must be suitably protected.

29. RIGHT OF WAY: The necessary land for the construction of the work will be furnished by the Owner. The Contractor is directed to the Owner for right-of-way actually acquired. The Owner will provide no right-of-way over other property. The contractor shall take every possible precaution to inconvenience as little as possible the owners and tenants of adjacent property. Public highways shall not be obstructed in such a way as to cut off traffic. The Contractor shall, at his own expense, repair any damage or injury to either public or private property during the progress of the work. Wholesale cutting of trees on the right-of-way will not be permitted except as necessary for construction.

30. CONSTRUCTION SCHEDULE: A construction schedule showing the work in the order proposed by the Contractor and the time required to complete each phase will be required and shall be submitted to the Engineer for approval. Approval of the construction schedule is required prior to receipt of the notice to proceed. This schedule shall include the dates for beginning and completion of all phases of the work. If, in the opinion of the Engineer, the Contractor falls behind in his schedule or will not be able to complete the project in the time limits, he may require the Contractor to revise his schedule and put additional equipment on the job as so ordered.

31. ORDER OF WORK: The order or sequence of the work shall be as provided herein or as approved by the Engineer, which approval shall in no way affect the responsibility of the Contractor.

32. COMPETENT LABOR: The Contractor shall employ only competent and skilled personnel on the work. The Contractor shall at all times have a Superintendent satisfactory to the Engineer, capable of acting as the Contractor's agent on the work and who shall receive instructions from the Engineer or his authorized representative. The Superintendent shall have full authority to execute the orders and directions of the Engineer without delay, and to promptly supply the materials, tools, plant equipment, and labor as may be required. The Contractor shall upon demand by the Engineer, immediately remove that Superintendent, Foreman, and Workman whom the Engineer may consider to be incompetent or undesirable, or both.

33. LAWS AND REGULATIONS: The Contractor shall keep himself fully informed of all laws, ordinances, and regulations of State and County in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same. If any discrepancy or inconsistency should be discovered in this Contract, or in the Drawings or Specifications herein referred to, in relation to any such law, ordinance, regulation, order or decree, he shall forthwith report the same in writing to the Owner. He shall at all times himself observe and comply with all such existing and future laws, ordinances and regulations, and shall protect and indemnify the Owner and its agents against any claims or liability arising from or based on the violation of any such law, ordinance, regulation, order of decree, whether by himself or by his employees.

34. PROTECTIVE WORKS: The Contractor shall furnish and install all necessary temporary works for the protection of the work, including barricades, warning signs, and lights at night.

35. SAFETY AND OSHA REGULATIONS: The performance of work under this Contract shall comply with safety regulations prescribed by the Owner, those of the National Occupational Safety and Health Act of 1970. (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-054), and the requirements of the State where project is located. Each bidder shall satisfy himself as to the character and extent of such regulations.

36. SANITARY REGULATIONS: Necessary sanitary conveniences for the use of the laborers on the work shall be erected and maintained by the Contractor in such a manner and at such points as shall be approved by the Engineer. Their use shall be strictly enforced.

37. STORAGE FACILITIES: Should the Contractor so desire, he may build storage facilities or other structures for housing men, tools, machinery and supplies, but they will be permitted only at approved places, and their surroundings shall be maintained at all times in a sanitary and satisfactory manner. On or before the completion of the work, all such structures shall be removed, together with all rubbish and trash, at the expense of the Contractor.

38. WATER SUPPLY: The water for the Contractor's use shall be supplied by the Contractor. The Contractor shall make his own arrangements for obtaining a water supply for his construction operations.

39. ELECTRIC POWER: The Contractor shall make his own arrangements for electrical power supply for his construction operations.

40. SOIL EROSION: The Contractor shall be required to take the necessary steps to minimize siltation and soil erosion during construction.

41. ACCESS ROADS: Streets, roads and drives used by the Contractor for access to and from the site of his work shall be protected from damage in connection with construction work. Any such damage done shall be repaired immediately and left in good condition at the end of the construction period.

42. PROGRESS PAYMENT: On or before the 15th day of each calendar month the Owner shall make progress payments to the Contractor on the basis of a duly certified and approved estimate of work performed during the preceding calendar month by the Contractor, including materials delivered to the site and undelivered specifically manufactured equipment, less retainage as per Paragraph 19 of the General Conditions which is to be retained by the Owner until all work has been performed strictly in accordance with the Contract Documents and until such work has been accepted by the Owner. Progress payment requests from the Contractor shall be submitted to the Engineer for approval on or before the 1st day of each calendar month.

43. ALLOWABLE TIME FOR COMPLETION: The time allowed for completion on all work to be done under this contract shall begin after notification by the Engineer to proceed with the work. Such notification will be issued upon completion of the contract arrangements, and in accordance with approved construction schedule, arranged to be within the contract time for completion. The time allowed for completion of the work is for 120 calendar days.

44. LIQUIDATED DAMAGES: The Contractor shall pay to the Owner as liquidated damages the sum of **FOUR HUNDRED ($400.00)** dollars for each calendar day that he shall be in default of completing the work in his Contract within the time limit named therein.

45. SALES TAX AND/OR USE TAX: Bidders shall include in amounts bid in the Bid an allowance for payment of state Sales Tax and/or Use Tax on 0 taxable materials specified to be furnished by the Contractor and incorporated into the work under this Contract.
46. CONTRACTOR'S LOCAL OFFICE: The Contractor shall maintain a local office with a telephone in the general area of the work, and will be required to have a responsible representative on call at all times.

47. MUTUAL RESPONSIBILITY OF CONTRACTORS: If, through acts of neglect of the part of the Contractor, any other Contractor or any subcontractor shall suffer loss or damage on the work, the Contractor agrees to settle with such other Contractor or subcontractor by agreement of arbitration if such other Contractor or subcontractor shall assert any claims against the Owner, on account of any damage alleged to have been so sustained, the Owner shall notify the Contractor who shall indemnify and save harmless the Owner against such claim.

48. EMERGENCY WORK: The Contractor shall at all times (nights, weekends or holidays) have a responsible man available to act in case of emergency repairs who the Owner may contact. Upon notification of emergency work necessary, the Contractor's representative shall immediately take steps to make such repairs.

49. INSURANCE REQUIREMENTS: The Contractor's attention is directed to requirements for insurance coverage as set forth in the General Conditions.

50. FLOOD HAZARD INSURANCE: The Contractor will be required to acquire and maintain during the life of the contract any flood insurance made available under the National Flood Insurance Act of 1968, as amended. The insurance shall be in an amount at least equal to the contract amount costs, excluding cost of uninsurable improvements, or to the maximum limit of coverage made available under the National Flood Insurance Act of 1968, as amended, whichever is less.

51. BUILDING PERMITS AND BUSINESS LICENSE: The Contractor shall be required to obtain applicable Building Permits and Business Licenses as required by Chatham County, Georgia.

CHATHAM COUNTY, GEORGIA

BID FORM

TO: CITY OF PORT WENTWORTH
7224 GA HIGHWAY 21
PORT WENTWORTH, GEORGIA 31407

Gentlemen:

In compliance with your Notice To Contractors, the undersigned, hereinafter termed the Bidder, proposes to enter into a Contract with City of Port Wentworth to provide the necessary machinery, tools, apparatus, and other means of construction, and all materials and labor specified in the Contract, necessary to complete the work in the manner therein specified within the time specified, as therein set forth, for:

PINE FOREST SEWER SYSTEM IMPROVEMENTS
FOR
THE CITY OF PORT WENTWORTH

The Bidder has carefully examined and fully understands the Contract, Plans and Specifications, and other Contractual Documents hereto attached, and has made a personal examination of the Site of the proposed Work, and has satisfied himself as to the actual conditions and requirements of the Work, and hereby proposes and agrees that if his bid is accepted, he will contract with the City of Port Wentworth in full conformance with the Contract Documents.

It is the intent of this Bid to include all items of construction and all Work indicated on the Drawings and called for in the Specifications.

In accordance with the foregoing, the undersigned proposes to furnish and construct the items listed in the attached Schedule of Items for the unit prices stated.

The Bidder agrees that the cost of any work performed, materials furnished, services provided or expenses incurred, which are not specifically delineated in the Contract Documents but which are incidental to the scope, intent, and completion of the Contract, shall be deemed to have been included in the prices bid for the various items scheduled.

The bidder further proposes and agrees hereby to promptly commence the Work with adequate force and equipment within ten (10) calendar days from receipt of Notice to Proceed, and to complete the Work within 120 calendar days.

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 County 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.

Attached hereto is an executed Bid Bond or certified check on the (Bank) _____ of (City, State) _____ for _____ Dollars. ($_____) (Five Percent of Amount of Bid).

If this Bid shall be accepted by the City of Port Wentworth and the undersigned shall fail to execute a satisfactory contract in the form of said proposed Contract, and give satisfactory Performance and Payment Bonds, or furnish satisfactory proof of carriage of the insurance required, within fifteen days from the date of Notice of Award of the Contract, then the City of Port Wentworth may at its option, determine that the undersigned abandoned the Contract and thereupon this Bid shall be null and void, and the sum stipulated in that attached Bid Bond or certificate check shall be forfeited to the City of Port Wentworth as liquidated damages.

Bidder acknowledges receipt of the following addenda:

Addendum No.	Date Received
_____	_____
_____	_____

Bidder further declares that the full name and resident address of all persons and parties interested in the foregoing bid as principals are as follows:

_____
By (Signature)

Printed Name _____

Title _____

Signed, sealed, and dated this _____ day of _____, 20__.

Bidder: _____ (Seal)
(Company Name)

Bidder Mailing Address:
_____

_____

_____

Phone #_____

By: _____

Title: _____

PINE FOREST SEWER SYSTEM IMPROVEMENTS
FOR
THE CITY OF PORT WENTWORTH

SCHEDULE OF ITEMS

Item	Description	Quantity	Units	Per Unit	Total Cost
1	Clearing and Grubbing	1	SUM		
2	Connect to Existing Manhole	2	EA		
3	Connect to eExisting Sewer Stub-Out	2	EA		
4	Concrete Manhole (0-6')	8	EA		
5	Manhole Verticle Riser	6.3	FT		
6	8" PVC Gravity Sewer	350	TONS		
a.	0-6' Cut	1,070	LF		
b.	6-8' Cut	610	LF		
c.	8-10' Cut	180	LF		
7	8" X 4" WYE or TEE	20	EA		
8	4" PVC Sewer Lateral	600	LF		
9	Connect to Existing Service Lateral (Including Fittings)	20	EA		
10	Silt Fence (Sensitive)	1,300	LF		
11	Silt Fence (Non-Sensitive)	3,300	LF		
12	Mulching	1.8	AC		
13	Temporary Grassing	2	AC		
14	Permanent Grassing	1.8	AC		
15	Remove and Replace Wooden Privacy Fence	100	LF		
16	Remove and Replace 4' Chain Link Fence	260	LF		
17	Mobilization 3% Max	1	SUM		
			GRAND TOTAL		
GRAND TOTAL IN WORDS					

STATEMENT OF BIDDER'S QUALIFICATIONS

To accompany bid submitted for construction of **City of Port Wentworth, Pine Forest Sewer System Improvements for the City of Port Wentworth.**

Full legal name of Bidder: _____

Business Address: _____

Business Phone Number: _____

Bidder is a (check one) Corporation ___ Partnership ___ Individual Proprietorship ___

Other ___ (Specify) _____

Year Organized: _____ Year Incorporated: _____

If Bidder is a partnership, list all names of all partners: _____

_____

How many years have you been in the contracting business under the present firm name?

_____

Credit available for this contract: $_____

Contracts now in hand, Gross Amount: $_____

Have you ever refused to sign a contract at your original bid? _____

Have you ever defaulted on a contract? _____

Remarks: _____

(The above statements must be subscribed and sworn to before a Notary Public)

Sworn to and subscribed before me,

This _____ day of _____ , 20__.

_____

(Notary Public)

Date: _____

Firm Name: _____

_____

By: _____

Title: _____

REFERENCES:

Provide references for work completed, minimum of six, three within the last 12 months of similar size and nature. References will afford the owner opportunity to judge as to capabilities and performance of the contractor.

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

CHATHAM COUNTY, GEORGIA

CORPORATE CERTIFICATE

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

This _____day of _____, 20__.

_____ (SEAL)

Signature

CHATHAM COUNTY, GEORGIA

SURETY REQUIREMENTS

A Bid Bond for five percent (5%) of the amount of the bid is required to be submitted with each bid.

A Performance Bond for one hundred percent (100%) of the bid will be required of the successful bidder.

The Bidder certifies that he/she has examined all documents contained in this bid package, and is familiar with all aspects of the Bid and understands fully all that is required of the successful bidder. The Bidder further certifies that his/her bid shall not be withdrawn for ninety (90) days from the date on which the bid is publicly opened and read.

The Bidder agrees, if awarded this bid, he/she will:

A. Furnish, upon receipt of an authorized City of Port Wentworth Purchase Order or Notice of Award, all items indicated thereon as specified in this bid proposal for the bid amount, or;

B. Enter a contract with City of Port Wentworth to do and/or furnish everything necessary to provide the service and/or accomplish the work as stated and/or specified in this bid proposal for the bid amount, and;

C. Furnish, if required, a Performance Bond, and acknowledges the right of the City of Port Wentworth to require a Performance Bond of a specific kind and origin, and;

D. Forfeit the amount of the Bid Bond as liquidated damages if he/she fails to enter a contract with the City of Port Wentworth as stated in (B) above, within ten (10) days of the date on which he/she is awarded the bid, and/or;

E. Forfeit the amount of the Performance Bond as liquidated damages if he/she fails to execute and fulfill the terms of the contract entered. The amount of forfeiture shall be:

1. The difference between his/her bid and the next lowest, responsible bid that has not expired or been withdrawn, or;

2. The difference between his/her bid and the amount of the lowest, responsible bid received as a result of re-bidding, including all costs related to re-bidding.

COMPANY_____ DATE_____

SIGNATURE_____ TITLE_____

TELEPHONE NUMBER_____

CHATHAM COUNTY, GEORGIA

BID BOND

KNOW ALL MEN BY THESE PRESENTS, THAT WE _____ (hereinafter called the Principal) and _____ (hereinafter called the Surety), a Corporation chartered and existing under the laws of the State of Georgia with its principal offices in the City of Port Wentworth and authorized to do business in the State of Georgia, are held and firmly bound unto CHATHAM COUNTY, GEORGIA in the full and just sum of_____ Dollars ($_____) good and lawful money of the United States of America, to be paid upon demand of CHATHAM COUNTY, GEORGIA, to which payment well and truly to be made, we bind ourselves, our heirs, executors, administrators, and assigns jointly and severally and firmly by these presents.

WHEREAS, the Principal is about to submit, or has submitted, CHATHAM COUNTY, GEORGIA, a Bid for furnishing materials, labor and equipment for:

PINE FOREST SEWER SYSTEM IMPROVEMENTS
FOR
THE CITY OF PORT WENTWORTH

WHEREAS, the Principal desires to file this Bond in accordance with law in lieu of a certified Bidder's check otherwise required to accompany this Bid.

NOW, THEREFORE, the conditions of this obligation are such that if the Bid be accepted, the Principal shall within ten (10) days after receipt of notification of the acceptance, execute a Contract in accordance with the Bid and upon the terms, conditions, and prices set forth in the form and manner required by CHATHAM COUNTY, GEORGIA, and execute a sufficient and satisfactory Performance Bond and Payment Bond payable to CHATHAM COUNTY, GEORGIA, each in an amount of 100% of the total contract price, in form and with security satisfactory to said CHATHAM COUNTY, GEORGIA, and otherwise, to be and remain in full force and virtue in law; and the Surety shall, upon failure of the Principal to comply with any or all of the foregoing requirements within the time specified above, immediately pay to CHATHAM COUNTY, GEORGIA, upon demand, the amount hereof in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

IN TESTIMONY THEREOF, the Principal and Surety have caused these presents to be duly signed and sealed this _____ day of _____, 20__.

_____ (SEAL)
Surety

_____ (SEAL)
Principal

BY: _____

BY: _____

OCCUPATIONAL TAX CERTIFICATE - Vendors/Contractors whose Business is located within the unincorporated area of CHATHAM COUNTY, GEORGIA, or within any of the incorporated areas of the CHATHAM COUNTY, GEORGIA are to submit a copy of the appropriate Business License.

CURRENT OCCUPATIONAL TAX CERTIFICATE NUMBER _____

CITY NUMBER _____

COUNTY NUMBER _____

OTHER _____

SIGNATURE _____ DATE _____

PRINTED NAME _____

CHATHAM COUNTY, GEORGIA

OATH OF SUCCESSFUL BIDDER

Personally appeared before the undersigned officer duly authorized by law to administer oaths and _____ who, after being first duly sworn, depose and say that they are all the officers, agents, persons, or employees who have acted for or represented (Company Name)_____in bidding or procuring a Contract with CHATHAM COUNTY, GEORGIA on the following project:

PINE FOREST SEWER SYSTEM IMPROVEMENTS
FOR
THE CITY OF PORT WENTWORTH

and that said _____ has not by (himself, themselves) or through any persons, officers, agents, or employees prevented or attempted to prevent by any means whatsoever competition in such bidding; or by any means whatsoever prevented or endeavored to prevent anyone from making a bid therefore, or induces or attempted to induce another to withdraw a bid for said work.

BY: _____
Signature of Successful Bidder

_____
Name - Printed

_____
Title

Sworn to and subscribed before me this
_____Day of _____, 20__.

_____
Notary Public

SEAL

CONTRACT AGREEMENT

THIS AGREEMENT made and entered into as of the (Date) _____, 20__, by and between CHATHAM COUNTY, GEORGIA, (Party of the First Part, Hereinafter called the County) and _____ (Contractor Name) (Party of the Second Part, Hereinafter called the Contractor).

WITNESSETH: That the said Contractor has agreed, and by these presents does agree with the said County, for and in consideration of _____ ($_____) and other good and valuable consideration, and under the penalty expressed in Bonds hereto attached, to furnish all equipment, tools, materials skill, and labor of every description necessary to carry out and complete in good, firm, and substantial, and workmanlike manner, the Work specified, in strict conformity with the Drawings and the Specifications hereinafter set forth, which Drawings and Specifications together with the base bid pproposal made by the Contractor, General Conditions, Special Provisions, Detailed Specifications, and this Agreement, shall all form essential parts of this Contract. The Work covered by this Contract includes all Work indicated on Plans and Specifications and listed in the Bid entitled:

PINE FOREST SEWER SYSTEM IMPROVEMENTS
FOR
THE CITY OF PORT WENTWORTH

The Contractor shall commence the Work with adequate force and equipment within (10) ten days from receipt of Notice to Proceed from the Chatham County, and shall complete the Work within 120 calendar days.

The Contractor hereby assumes the entire responsibility and liability for any and all injury to or death of any and all persons, including the Contractor's agents, servants, and employees, and in addition thereto, for any and all damages to property caused by or resulting from or arising out of any act or omission in connection with this Contract or the prosecution of Work hereunder, whether caused by the Contractor or the Contractor's agents, servants, or employees, or by any of the Contractor's subcontractors or suppliers.

This Contract, executed in triplicate, constitutes the full agreement between the parties, and the Contractor shall not sublet, assign, transfer, pledge, convey, sell or otherwise dispose of the whole or any part of this Contract or his right, title, or interest therein to any person, firm or corporation without the previous consent of the Chatham County in writing.

CONTRACT AGREEMENT

IN WITNESS WHEREOF, the Parties hereto, acting through their duly authorized agents, have signed and sealed this agreement.

Executed this _____day of _____, 20__.

CHATHAM COUNTY, GEORGIA

ATTEST: _____ BY: _____
(SEAL) Administrator, Chatham County Chairman, Chatham County

CONTRACTOR

ATTEST:_____ BY: _____
(SEAL)

TITLE: _____ TITLE:_____

APPROVED AS TO FORM:

BY: _____
Attorney
Chatham County, Georgia

Executed in Triplicate

CONTRACT PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, THAT WE_____
(hereinafter called the Principal) and _____
(hereinafter called the Surety) are held and firmly bound unto CHATHAM COUNTY, GEORGIA (hereinafter known as the Owner), for the use of said oblige and all persons doing work or furnishing skill, tools, machinery, supplies, or material under or for the purpose of the Contract hereinafter referred to, in the full and just sum of _____ _____($_____) lawful money of the United States of America, to be paid to said Owner, its successors, and assigns to which payment well and truly to made we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severely, firmly by these presents.

WHEREAS, the above bound Principal has entered into a contract or contracts with the said OWNER, bearing date of_____, 20__, for furnishing material, labor and equipment for:

PINE FOREST SEWER SYSTEM IMPROVEMENTS
FOR
THE CITY OF PORT WENTWORTH

WHEREAS, it was one of the conditions of the award by said Owner pursuant to which said Contract was entered into, that these presents shall be executed.

NOW THEREFORE, the conditions of this obligation are such that if the above bound Principal shall in all respects fully comply with the terms and conditions of said Contract and his obligation thereunder, including the Specifications and Bid, therein referred to and made a part thereof, and such alterations as may be made in said Specifications as therein provided for, and including one-year guarantee period from date of final acceptance, and shall indemnify and save harmless the Owner against and from all costs, expenses, damages, injury or loss, to which the said Owner may be subjected by reason of any wrongdoing, misconduct, want of care or skill, negligence, or default, including patent infringement, on part of said Principal, his agents, or employees, in the execution or performance of said Contract, and shall promptly pay all just claims for damages or injury to property and for all work done, or skills, tools, and machinery, supplies, labor, and materials furnished and debts incurred by said Principal in our about the construction or improvement contracted for this obligation to be void; otherwise, in full force and effect.

And the said Surety to this Bond, for value received, hereby stipulates and agrees that no change, extensions of time, alterations, or additions to the terms of the Contract or to the Work to be performed thereunder or the Specifications accompanying same shall in any wise affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alterations, or additions to the terms of the Contract or to the Work or the Specifications.

CONTRACT PERFORMANCE BOND

This Bond shall be for the use of all persons doing Work or furnishing skill, tools, machinery, or materials under or for the purpose of this Contract, in accordance with the provisions of the Official Code of the State of Georgia, as amended, and is intended to be and shall be construed to be a bond in compliance with the requirements thereof.

The life of this Bond extends through the life of the Contract including the sixty-day maintenance period, and until one year after the final acceptance of the Work by the Owner.

IN TESTIMONY THEREOF, the Principal and Surety have caused these presents to be duly signed and sealed in triplicate, this _____day of _____, 20__.

CONTRACTOR

_____
(Company Name)

Attest: _____ By: _____
(Seal)

Title: _____ Title: _____

SURETY

_____
(Company Name)

Attest: _____ By: _____
(Seal)

Title: _____ Title: _____

BY: _____
(Local Agent's Signature)

_____
(Name - Printed or Typed)

_____
(Company Name)

_____
(Address)

Executed in Triplicate

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, THAT WE _____
(hereinafter called the Principal) and _____
(hereinafter called the Surety) are held and firmly bound unto CHATHAM COUNTY, GEORGIA (hereinafter known as the Owner), in the full sum of _____ ($ _____)
for the use and protection of said Owner and all subcontractors and all persons supplying labor, materials, and machinery, and equipment for the performance of the Work provided for in the contract hereinafter referred to, for the payment of which well and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally by these presents.

WHEREAS, the above bound Principal has entered into a Contract or Contracts with the said OWNER, bearing date of _____, 20__, for furnishing material, labor and equipment for:

PINE FOREST SEWER SYSTEM IMPROVEMENTS
FOR
THE CITY OF PORT WENTWORTH

WHEREAS, it was one of the conditions of the award by the City of Port Wentworth pursuant to which said Contract was entered into, that these presents shall be executed.

NOW, THEREFORE, the conditions of this obligation are such that if the above bound Principal shall promptly pay all subcontractors and all other persons supplying labor, materials, machinery, and equipment furnished for the performance of the Work provided for by said Contract, and such alterations or additions as may be made therein or in the Plans and Specifications, then this bond to be void; otherwise, in full force and effect, and

The surety to this bond, for value received, agrees that no change, extensions of time, alterations or additions to the terms of the Contract or the Work to be performed thereunder of the Specifications accompanying the same shall in any way affect its obligation on this bond, and alterations or additions to the terms of the Contract or the Work or to the Specifications. It is agreed that this bond is executed pursuant to and in accordance with the provisions of the Official Code of the State of Georgia, as amended, and is intended to be and shall be construed to be a bond in compliance with the requirements thereof.

PAYMENT BOND

IN WITNESS WHEREOF, the Principal and Surety have caused these presents to be duly signed and sealed in triplicate, this _____day of_____, 20__.

CONTRACTOR

_____
(Company Name)

Attest: _____
(Seal)

By: _____

Title: _____

Title: _____

SURETY

_____
(Company Name)

Attest: _____
(Seal)

By: _____

Title: _____

Title: _____

BY: _____
(Local Agent's Signature)

_____
(Name - Printed or Typed)

_____
(Company Name)

_____
(Address)

Executed in Triplicate

Illegal Immigration Reform and Enforcement Act of 2011

House Bill 87, also known as the Illegal Immigration Reform and Enforcement Act of 2011, was passed during the 2011 session of the Georgia General Assembly and was signed by Governor Nathan Deal on May 13, 2011. The bill, status history, votes, and sponsors, can be viewed on the Georgia General Assembly's website:

http://www.legis.ga.gov

All bidders are strongly encouraged to review the contents of this law.

O.C.G.A. §13-10-91(b) (1) states, in part, "A public employer shall not enter into a contract … for the physical performance of services unless the contractor registers and participates in the federal work authorization program. Before a bid for any such service is considered by a public employer, the bid shall include a signed, notarized affidavit from the contractor attesting to the following:

A. The affiant has registered with and is authorized to use, and uses the federal work authorization program;
B. The user identification number and date of authorization for the affiant;
C. The affiant will continue to use the federal work authorization program throughout the contract period; and
D. The affiant 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 same information required by subparagraphs (A), (B) and (C) of this paragraph."

O.C.G.A. §13-10-91(b) (2) states, in part, "A contractor shall not enter into any contract with a public employer for the physical performance of services unless the contractor registers and participates in the federal work authorization program."

A subcontractor shall not enter into any contract with a contractor unless such subcontractor registers and participates in the federal work authorization program. A subcontractor shall submit, at the time of such contract, an affidavit to the contractor in the same manner and with the same information required in O.C.G.A. §13-10-91(b) (1). It shall be the duty of any subcontractor receiving an affidavit from a sub-subcontractor to forward notice to the contractor of the receipt, within five business days of receipt, of such affidavit. It shall be the duty of a subcontractor receiving 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. Requirements for sub-subcontractors are also contained in this law. The "Illegal Immigration Reform and Enforcement Act of 2011" establishes alternatives to the required affidavits for reporting purposes. Only the authorized alternatives will be considered.

It shall be the duty of the contractor to submit copies of all affidavits, drivers' licenses, and identification cards required pursuant to this subsection to the public employer within five business days of receipt.

Copies of the required affidavits for the contractor, subcontractor and sub-sub contractor are included in the package. **The contractor submitting a bid/proposal for the work covered in these documents is required to supply a fully completed affidavit with the submission of the bid/proposal. Bids received that do not include the required affidavit, or allowed substitution, will not be considered.**

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 Port Wentworth has registered with, is authorized to use and uses the federal work authorization program commonly known as E-Verify, or any subsequent replacement program, in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91. Furthermore, the undersigned contractor will continue to use the federal work authorization program throughout the contract period and the undersigned contractor will contract for the physical performance of services in satisfaction of such contract only with subcontractors who present an affidavit to the contractor with the information required by O.C.G.A. § 13-10-91(b). Contractor hereby attests that its federal work authorization user identification number and date of authorization are as follows:

_____
Federal Work Authorization User Identification Number

_____
Date of Authorization

_____
Name of Contractor

Pine Forest Sewer System Improvements
Name of Project

The City of Port Wentworth
Name of Public Employer

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

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

_____
Signature of Authorized Officer or Agent

_____
Printed Name and Title of Authorized Officer or Agent

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

_____
NOTARY PUBLIC

My Commission Expires: _____

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 Port Wentworth 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

Pine Forest Sewer System Improvements
Name of Project

The City of Port Wentworth
Name of Public Employer

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

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

_____
Signature of Authorized Officer or Agent

_____
Printed Name and Title of Authorized Officer or Agent

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

_____
NOTARY PUBLIC

My Commission Expires: _____

Sub-subcontractor Affidavit under O.C.G.A. § 13-10-91(b) (4)

By executing this affidavit, the undersigned sub-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 for_____ (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract) and _____ (name of contractor) on behalf of the City of Port Wentworth 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 sub-subcontractor will continue to use the federal work authorization program throughout the contract period and the undersigned sub-subcontractor will contract for the physical performance of services in satisfaction of such contract only with sub-subcontractors who present an affidavit to the sub-subcontractor with the information required by O.C.G.A. § 13-10-91(b). The undersigned sub-subcontractor shall submit, at the time of such contract, this affidavit to_____ (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Additionally, the undersigned sub-subcontractor will forward notice of the receipt of any affidavit from a sub-subcontractor to _____ (name of subcontractor or sub-subcontractor with whom such sub-subcontractor has privity of contract). Sub-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 Sub-subcontractor

Pine Forest Sewer System Improvements
Name of Project

The City of Port Wentworth
Name of Public Employer

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

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

_____
Signature of Authorized Officer or Agent

_____
Printed Name and Title of Authorized Officer or Agent

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

_____
NOTARY PUBLIC
My Commission Expires: _____

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

EJCDC®
ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

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STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. 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, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document 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, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.

23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

    a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.

28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

29. *Notice to Proceed*—A written notice 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.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.

32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.

36. *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.

37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

38. *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, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

40. *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.

41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *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 of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.

44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, 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 a Subcontractor.

46. *Technical Data*

    a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.

    b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.

    c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or

chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *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; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*: 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 Article 10 or any other provision of the Contract Documents.

C. *Day*: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*: The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

1. does not conform to the Contract Documents;

2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

3. 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 15.03 or Paragraph 15.04).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, means 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, means 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, means to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.

G. 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 Performance and Payment Bonds; Evidence of Insurance*

A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).

B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.

C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), 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;

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.

2.04 *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 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, 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 and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *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 the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will 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 the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one Contract Document 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.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

A. *Standards Specifications, Codes, Laws and Regulations*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract 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, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer 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 part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or 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) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) 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 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

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 part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); 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 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers 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 versions, or 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; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

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

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract 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 Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

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

4.03 *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.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 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 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, 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 Contract Price or Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and

interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

   1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

   2. Abnormal weather conditions;

   3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and

   4. Acts of war or terrorism.

D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

   1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

   2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

   3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

   1. The circumstances that form the basis for the requested adjustment;

   2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;

   3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;

   4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and

   5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

   Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.

G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor in writing 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.

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 permanent improvements are to be made 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.

5.02 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, 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 any such claim, and against all 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 directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will 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 and adjacent areas 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 of 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 structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;

2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and

3. Technical Data contained in such reports and drawings.

B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

D. *Limitations of Other Data and Documents*: Except for such reliance on 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;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;

3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;

2. is of such a nature as to require a change in the Drawings or Specifications;

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 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, 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 fall within any one or more of the categories described in Paragraph 5.04.A;

   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 Paragraph 13.03; and,

   c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

   a. Contractor knew of the existence of such condition at the time Contractor made a 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 otherwise;

   b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract

Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:

1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

C. *Engineer's Review*: Engineer will:

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;

3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and

4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

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

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. 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 Paragraph 13.03;

    b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and

    c. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on 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;

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 removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) 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 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. 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, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

H. 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, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. 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, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. 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 failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond 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 must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.

E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.

F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.

H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.

D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.

F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.

I. If either party does not purchase or maintain the insurance required of such party by the Contract, 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.

J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.

M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.

N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

A. *Required Insurance*: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.

B. *General Provisions*: The policies of insurance required by this Paragraph 6.03 as supplemented must:

1. include at least the specific coverages required;

2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;

3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

4. apply with respect to the performance of the Work, whether such performance is 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; and

5. include all necessary endorsements to support the stated requirements.

C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:

1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;

2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;

3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and

5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.

B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the 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, risks, 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 Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, 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.

2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. 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 all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

C. The waivers in this Paragraph 6.05 include the waiver of rights 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 insured peril, risk, or cause of loss.

D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, 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 fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *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.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *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 maintain good discipline and order at the Site.

B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

C. 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 will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *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, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will 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 must 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.

7.05 *"Or Equals"*

A. *Contractor's Request; Governing Criteria*: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item 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 is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that the proposed item:

1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) 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;

3) has a proven record of performance and availability of responsive service; and

4) is not objectionable to Owner.

b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:

a. will certify that the proposed substitute item will:

1) perform adequately the functions and achieve the results called for by the general design;

2) be similar in substance to the item specified; and

3) be suited to the same use as the item specified.

b. will state:

1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;

2) 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

3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1) all variations of the proposed substitute item from the item specified; and

2) available engineering, sales, maintenance, repair, and replacement services.

d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. 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.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.

F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.

K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.

L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *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 an 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 will be disclosed 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.

7.09 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. 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 the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *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.

7.11 *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. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and 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 such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within

30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

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

7.13 *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.

B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.

C. 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, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.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 at its expense (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).

E. 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.

F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

H. 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.

I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as 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.

7.15 *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 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 by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

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

a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determine and verify:

1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;

2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;

c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the

Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings must 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 7.16.C.

2. *Samples*

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall 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 7.16.C.

3. 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. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. 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, comply with the requirements of 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, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.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 will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

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.

2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:

a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.

b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *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 is entitled to rely on Contractor's warranty and guarantee.

B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only

by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:

1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and
2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, or improper modification, 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.

D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:

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;
6. The issuance of a notice of acceptability by Engineer;
7. The end of the correction period established in Paragraph 15.08;
8. Any inspection, test, or approval by others; or
9. Any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, 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 losses, damages, costs, and judgments (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 from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage 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 7.18.A will 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.

7.19 *Delegation of Professional Design Services*

A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.

B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;

2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and

3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange

to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.

D. 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.

E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, 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.

F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. An itemization of the specific matters to be covered by such authority and responsibility; and

3. The extent of such authority and responsibilities.

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

8.03 *Legal Relationships*

A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract

Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) 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 any such claims, and against all 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 damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

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

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *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.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *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 (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

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.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *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.

10.02 *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 10.07. 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.

10.03 *Resident Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.

B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

A. Engineer has the authority to reject Work in accordance with Article 14.

B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.

C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.

D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

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

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, 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, will 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 Contractor under Paragraph 15.06.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 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. Changes in 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;

2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

B. If Owner has issued a Work Change Directive and:

1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.

2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

A. Engineer may authorize minor changes in the Work if the changes 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. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-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. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *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, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.

B. 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, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);

2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or

3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will 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 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;

b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 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 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and

f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the

costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

11.09 *Change Proposals*

A. *Purpose and Content*: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

   a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.

   b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

   The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.

4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change

Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *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.

ARTICLE 12—CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and

4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will 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 in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be

apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will 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 accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will 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, which 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 will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.

5. Other costs consisting of 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, 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.

        1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

    c. *Construction Equipment Rental*

        1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.

        2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.

3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed 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 builder's risk or other property insurance established in accordance with Paragraph 6.04), 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 include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will 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 communication 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 that Contractor is required by the Contract Documents to purchase and maintain.

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

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.

3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

6. Expenses incurred in preparing and advancing Claims.

7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:

    a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.

    b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:

        1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.

        2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.

2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 *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*: Contractor agrees that:

1. 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

2. 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 for any of the foregoing will be valid.

C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's 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 for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 *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. Payments to Contractor for Unit Price Work will be based on actual quantities.

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. 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, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction 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 with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.

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, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;
2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;
3. by manufacturers of equipment furnished under the Contract Documents;
4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and
5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. 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. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then 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, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages 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 pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. 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, 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, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *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, then 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 will 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.

14.07 *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 defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, 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, 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 incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. 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 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *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.

2. 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 must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, 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 13.03, 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; 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;

    b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;

    c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;

    d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; 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 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

    a. the Work is defective, requiring correction or replacement;

    b. the Contract Price has been reduced by Change Orders;

    c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

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

E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. The Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. The Contract Price has been reduced by Change Orders;

i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. 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; or

l. Other items entitle Owner to a set-off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, 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, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *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 and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

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 preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. 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 punch list.

15.04 *Partial Use or Occupancy*

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. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be 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 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work 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 15.03 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 6.04 regarding builder's risk or other property insurance.

15.05 *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, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *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, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
2. The final Application for Payment must be accompanied (except as previously delivered) by:
    a. all documentation called for in the Contract Documents;
    b. consent of the surety, if any, to final payment;
    c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.
    d. a list of all duly pending Change Proposals and Claims; and
    e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) 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, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Final Application and Recommendation of Payment*: 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 have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. 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. *Notice of Acceptability*: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.

E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *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 Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect

Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;
2. correct such defective Work;
3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.

B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.

C. If, after receipt of a notice of defect within 60 days and within the correction period, 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. Contractor shall pay all 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). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

D. 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.

E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, 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.

F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *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 written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and 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);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, 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 complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.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 the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds 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.

F. 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, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

A. Upon 7 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; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 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 16.03.

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, 7 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 are not intended to preclude Contractor from submitting a Change Proposal 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 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person, by a commercial courier service or otherwise, to the recipient's place of business;

2. by registered or certified mail, postage prepaid, to the recipient's place of business; or

3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract 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.

18.03 *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. 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.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

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

18.07 *Controlling Law*

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

18.08 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the

written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

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

SUPPLEMENTARY CONDITIONS

01. GENERAL CONDITIONS

The "Standard General Conditions of the Construction Contract", Engineers Joint Contract Documents Committee, 2018 Edition, Articles 1 through 18 inclusive, included herein preceding these supplements, is a part of this Contract.

ARTICLE 6 – BONDS AND INSURANCE

Contractor's protective liability insurance, with limits as follows:

Personal injury including death - limits of $100,000. for each person and $1,000,000. for each occurrence.

Property damage - $100,000. for each and $1,000,000. for the aggregate for operations.

Contractor's public and automobile liability insurance (including contractual liability insurance as applicable to the Contractor's obligations under paragraph 4.18) with limits as follows:

Personal injury including death - limits of $100,000. for each person and $1,000,000. for each occurrence.

Property damage - limits of $100,000. for each occurrence and $1,000,000. for the aggregate of operations.

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.

Owner's protective liability insurance, in the name of the Owner, his professional consultants and their agents as additional insureds under the contractor's general liability insurance policy with respect to the services performed by the Contractor for the Owner, with the following limits:

Personal injury including death - limits of $100,000. for each person and $1,000,000. for each occurrence.

Property damage - limits of $100,000. for each occurrence and $1,000,000. for the aggregate of operations.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

Add the following sentence as paragraph 5 of Section 15.01 B:

“Each payment request shall be accompanied with record drawings showing as-built conditions of all work requested during the pay period.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 B 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.

SECTION 02200
SITE PREPARATION

PART 1 GENERAL

1.01 SCOPE

This Section describes materials and equipment to be utilized and requirements for their use in preparing the work site for construction. The Contractor shall furnish all materials, equipment and labor necessary to complete the work. The contractor is required to contact the **Utilities Protection Center, Inc.** in the **State of Georgia call 1-800-282-7411** prior to any excavation or construction.

1.02 REFERENCES

Georgia Manual for Erosion and Sedimentation Control, current edition. .

1.03 QUALITY ASSURANCE

A. Comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction.

B. Layout work shall be done under supervision of a Civil Engineer or Registered Land Surveyor, registered in Georgia.

C. Transit and measuring devices shall be calibrated to layout site and construction work.

1.04 SITE CONDITIONS

The area to be cleared and grubbed is shown schematically on the Drawings or specified below.

PART 2 PRODUCTS

2.01 EQUIPMENT

The Contractor shall furnish equipment of the type normally used in clearing and grubbing operations including, but not limited to, tractors, dozers, chippers, trucks, loaders, and root rakes.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect and maintain all benchmarks, monuments and reference points. Replace if disturbed or destroyed. If found at variance with the Drawings, notify the Engineer before proceeding with layout work.

B. Install erosion and sedimentation control structures as shown on the Drawings.

C. Protect all trees, vegetation, structures, utilities, and buildings not designated for removal for demolition.

3.02 TOPSOIL STRIPPING AND STOCKPILING

A. Topsoil (top 6" – 8" of material) is to be removed from all cleared and grubbed areas and placed in designated stockpile areas as shown on the plans. The Contractor shall then grade the entire work site to conform, in general, to the finish elevations shown on the Plans.

B. Shape topsoil stockpiles to drain without ponding water.

C. Where trees are indicated to remain, stop topsoil stripping at drip line.

3.03 TREE PROTECTION

A. Construct tree protection barricades, minimum 3'-0" high around individual trees and groups of trees designated to remain. Construct barricades at drip line.

B. Protect tree root systems from damage due to deleterious materials caused by run-off or spillage during mixing, use or discarding of construction materials or drainage from stored materials. Protect root systems form compaction, flooding, erosion or excessive wetting.

3.04 EXCAVATION AROUND TREES TO REMAIN

A. Where trenching for utilities is required within drip line, hand dig under or around roots. Cut no lateral roots or tap roots; cut smaller roots which interfere with new construction.

B. Where excavation for new construction is required within drip line of trees, hand excavate to minimize damage to root systems. Use narrow tine spading forks and comb soil to expose roots. Relocate roots in backfill areas. If large, main lateral roots are encountered, expose beyond excavation limits, bend and relocate without breaking. If encountered immediately adjacent to location of new construction and relocation is not practical, cut roots approximately 3" back from new construction.

C. Allow no exposed roots to dry out before permanent backfill is places; provide temporary earth cover, or pack with peat moss and wrap with burlap. Water and maintain in moist condition and temporarily support and protect from damage until permanently relocated and covered with backfill.

D. Prune braches in accord with standard horticultural practice to balance loss to root system caused by damage or cutting of root system. Engage qualified arborist approved by the Engineer to prune branches.

3.05 REPAIRS FOR DAMAGED TREES

A. Engage a qualified arborist approved by the Engineer to perform tree repair work.

B. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees.

C. Remove dead trees and damaged trees in construction area which are determined by the tree arborist to be incapable of restoration to normal growth pattern.

3.06 CLEARING AND GRUBBING

A. Clear and grub each area before excavating. All trees, herbaceous growth and stumps are to be chipped for mulch. Mulch will be stockpiled in the areas designated on the Plans or used for erosion control as required. All other debris is to be removed to an approved landfill.

B. Materials to be removed from the project site include, but are not limited to trash, organic matter, construction waste materials (i.e. paving, concrete miscellaneous structures, houses), debris and abandoned utilities.

C. Grubbing shall consist of completely removing roots, stumps, trash and other debris from all graded areas so that topsoil is free of roots and debris. Topsoil is to be left sufficiently clean so that further picking and raking will not be required.

D. All foundations and planking embedded in the ground shall be removed and disposed. Butts of utility poles shall be removed.

E. Landscaping features shall include, but not limited to, fences, cultivated trees and shrubbery, property corners, man made improvements and signs. The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features.

F. Surface rocks and boulders shall be grubbed from the soil and removed from the site if not suitable as rip rap.

G. The entire construction area shall be grubbed by heavy tractors with root rakes. Raking shall generally proceed along the contour rather than up and down slopes so as to inhibit soil erosion.

H. Where the tree limbs interfere with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility.

I. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.

J. All fences adjoining any excavation or embankment that, in the Contractor's opinion, may be damaged or buried, shall be carefully removed, stored and replaced. Any fencing that, in the Engineer's opinion, is significantly damaged shall be replaced with new fence material.

K. Stumps and roots shall be grubbed and removed to a depth not less than two feet below grade. All holes or cavities which extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as the surrounding material.

L. The Contractor shall exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, etc. situated within the limits of the construction area but not directly within excavation and/or fill limits. The Contractor shall be held liable for any damage the Contractor's operations have inflicted on such property.

M. The Contractor shall be responsible for all damages to existing improvements resulting from Contractor's operations.

3.07 DISPOSAL OF DEBRIS

A. The debris resulting from the clearing and grubbing operation shall be removed from the site and disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property. In no case shall any material or debris be left on the Project, shoved onto abutting private properties or buried on the Project.

B. When approved in writing by the Engineer and when authorized by the proper authorities, the Contractor may dispose of such debris by burning on the Project site provided all requirements set forth by the governing authorities are met. The authorization to burn shall not relieve the Contractor in any way from damages which result from the Contractor's operations. On easements through private property, the Contractor shall not burn on the site unless written consent is also secured from the property owner, in addition to authorization from the proper authorities.

END OF SECTION

SECTION 02220
DEMOLITION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

Construction Plans and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK

A. Extent of demolition work is indicated on the Construction Plans.

B. Demolition includes all operations necessary for demolition of the existing structures, foundations and utilities as shown.

C. Remove debris, rubbish and other materials resulting from demolition operations from the site. Transport and legally dispose of materials off site.

1.03 SUBMITTALS

A. Schedule: Submit schedule indicating proposed methods and sequence of operations for demolition work to Owner's Representative for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. The submittal shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operation.

B. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.

C. Coordinate with Owner's continuing occupation of portions of existing building/site, with Owner's partial occupancy of completed new addition/site.

1.04 JOB CONDITIONS

A. Occupancy: Owner will be continuously occupying areas of the building/site immediately adjacent to areas of selective demolition. Conduct selective demolition work in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations.

B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.

C. Conditions existing at time of commencement of contract will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of selective demolition work.

D. Partial Demolition and Removal: Items indicated to be removed but of salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

E. Storage or sale of removed items on site will not be permitted.

F. Protection: Provide temporary barricades and other forms of protection as required to protect Owner's personnel and general public from injury due to selective demolition work.

G. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to and from occupied portions of building/site.

H. Erect temporary covered passageways as required by authorities having jurisdiction.

I. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.

J. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

K. Protect floors with suitable coverings when necessary.

L. Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.

M. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to insure that no water leakage or damage occurs to structure or interior areas of existing building.

N. Remove protections at completion of work.

O. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

P. Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

Q. Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

R. Explosives: Use of explosives will not be permitted unless otherwise noted.

S. Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

T. Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

U. Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

V. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

W. NESHAP Compliance: The Contractor is responsible for being aware of and complying with the National Emission Standard for Hazardous Air Pollutants (NESHAP) Section 112 of the Federal Clean Air Act regarding asbestos.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.01 INSPECTION

Prior to commencement of demolition work, inspect areas in which work will be performed. Photograph existing conditions to structure surfaces, equipment or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Owner's Representative prior to starting work.

3.02 PREPARATION

A. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

B. Cease operations and notify the Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

C. Cover and protect furniture, equipment and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such item have not been removed.

D. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.

E. Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dust-proof partitions of minimum 4" studs, 5/8" drywall (joints taped) on occupied side 1/2" fire-retardant plywood on demolition side, and fill partition cavity with sound-deadening insulation.

F. Provide weatherproof closures for exterior openings resulting from demolition work.

G. Locate, identify, stub off and disconnect utility services that are not indicated to remain.

H. Provide by-pass connections as necessary to maintain continuity of service to occupied areas of building. Provide minimum of 72 hours advance notice to Owner if shut-down of service is necessary during change-over.

3.03 DEMOLITION

A. Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on the Plans in accordance with demolition schedule and governing regulations.

B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.

C. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.

D. All existing structures shall be completely removed where denoted on the Plans. All foundations and slabs shall be broken up and removed from the site. Sidewalks, curbs, gutters, streets and street light bases shall be completely removed. It is not anticipated that piling will be encountered under any of the structures to be removed; however, where piling are encountered they shall be removed to a point three feet below existing ground.

E. When approved in writing by the Engineer and when authorized by the proper authorities, the Contractor may dispose of such debris by burning on the Project site provided all requirements set forth by the governing authorities are met. The authorization to burn shall not relieve the Contractor in any way from damages which result from the Contractor's operations. On easements through private property, the Contractor shall not burn on the site unless written consent is also secured from the property owner, in addition to authorization from the proper authorities.

F. Demolish foundation walls to a depth of not less than 12" below existing ground surface. Demolish and remove below-grade wood or metal construction. Break up below-grade concrete slabs.

G. For interior slabs on grade, use removal methods that will not crack or structurally disturb adjacent slabs or partitions. Use power saw where possible.

H. Completely fill below-grade areas and voids resulting from demolition work. Provide fill consisting of approved earth, gravel or sand, free of trash and debris, stones over 6" diameter, roots or other organic matter.

I. If anticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive form Owner's Representative rearrange selective demolition schedule as necessary to continue overall job progress without delay.

3.04 SALVAGE MATERIALS

A. Salvage Items: Where indicated on the Plans as "Salvage-Deliver to Owner", carefully remove indicated items, clean, store and turn over to Owner and obtain receipt.

B. Historic artifacts, including cornerstones and their contents, commemorative plaques and tables, antiques, and other articles of historic significance remain the property of the Owner. Notify Owner's Representative if such items are encountered and obtain acceptance regarding method of removal and salvage for Owner.

3.05 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove debris, rubbish and other materials resulting from demolition operations from the site. Transport and legally dispose of materials off site.

B. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.

1. Burning of removed materials is not permitted on project site.

3.06 CLEAN-UP AND REPAIR

A. Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to commencement of selective demolition work. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

SECTION 02300
EARTHWORK

PART 1 GENERAL

1.01 SCOPE

A. This Section includes earthwork and related operations, including, but not limited to dewatering, excavating all classes of material encountered, pumping, draining and handling of water encountered in the excavations, handling, storage, transportation and disposal of all excavated and unsuitable material, construction of fills and embankments, backfilling around structures, compacting, all sheeting, shoring and bracing, preparation of subgrades, surfacing and grading, and any other similar, incidental, or appurtenant earthwork operations which may be necessary to properly complete the work.

B. The Contractor shall provide all services, labor, materials, and equipment required for all earthwork and related operations, necessary or convenient to the Contractor, for furnishing complete work as shown on the Drawings or specified in these Contract Documents.

1.02 RELATED SECTIONS

A. Geotechnical Report: Section 00320

B. Site Preparation: Section 02200

C. Trench Excavation and Backfill: Section 02317

D. Erosion and Sedimentation Control: Section 02370

1.03 GENERAL

A. The elevations shown on the Drawings as existing are taken from the best existing data and are intended to give reasonably accurate information about the existing elevations. They are not precise and the Contractor shall become satisfied as to the exact quantities of excavation and fill required.

B. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards.

C. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments, and channels shall be maintained by the Contractor in good condition at all times until final acceptance by the Owner. All damage caused by erosion or other construction operations shall be repaired by the Contractor using material of the same type as the damaged material.

D. The Contractor shall control grading in a manner to prevent surface water from running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water can be uninterrupted in existing gutters, other surface drains, or temporary drains. Free access must be provided to all fire hydrants and meters.

E. Tests for compaction and density shall be conducted by the Engineer or by an independent testing laboratory selected in accordance with Section 01450 of these Specifications.

1. The soils testing laboratory is responsible for the following:
    a. Field compaction testing shall be based on using the maximum dry density determined by the Standard Proctor Compaction Test in accordance with ASTM D 698.
    b. Determination of in-place backfill density shall be done in accordance with ASTM D 1556, "Density and unit weight of Soil In Place by the Sand-Cone Method", ASTM D 2937, "Density of Soil In Place by the Drive-Cylinder Method" or ASTM D 2922, "Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)".
    c. Field density tests for each lift; one test for each 5,000 square feet of fill or minimum one test per lift.
    d. Inspecting and testing stripped site, subgrades and proposed fill materials.
2. Contractor's duties relative to testing include:
    a. Notifying laboratory of conditions requiring testing.
    b. Coordinating with laboratory for field testing.
    c. Providing representative fill soil samples to the laboratory for test purposes. Provide 50 pound samples of each fill soil.
3. Inspection
    a. Earthwork operations, suitability of excavated materials for fill and backfill, and placing and compaction of fill and backfill is subject to inspection. Engineer will observe earthwork operations.
    b. Foundations and shallow spread footing foundations are required to be inspected by an engineer to verify suitable bearing and construction.

F. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations, and shall be conducted in a manner acceptable to the Engineer.

G. It is understood and agreed that the Contractor has made a thorough investigation of the surface and subsurface conditions of the site and any special construction problems which might arise as a result of nearby watercourses and floodplains. The Contractor shall be responsible for providing all services, labor, equipment, and materials necessary or convenient to the Contractor for completing the work within the time specified in these Contract Documents.

H. Safety

Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The Contractor shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P "Excavation, Trenching & Shoring" as described in OSHA publication 2226.

PART 2 PRODUCTS

2.01 SOILS CLASSIFICATIONS

Bedding materials listed here include a number of processed materials plus the soil types defined according to the Unified Soil Classification System (USCS) in ASTM D 2487, Standard Method for Classification of Soils for Engineering Purposes. (See below for description of soil classification). These materials are grouped into five broad categories according to their suitability for this application:

A. Class I - Angular, 1/4 to 1 1/2 inches (6 to 40 mm) graded stone, including such as coral, slag, cinders, crushed shells and crushed stone. Note - The size range and resulting high voids ratio of Class I material make it suitable for use to dewater trenches during pipe installation. This permeable characteristic dictates that its use be limited to locations where pipe support will not be lost by migration of other embedment materials into the Class I material. When such migration is possible, the material's minimum size range should be reduced to finer than 1/4 inch (6 mm) and the gradation properly designed to limit the size of the voids.

B. Class II - Coarse sands and gravels with maximum particle size of 1 1/2 inch (40 mm), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW and SP are included in this class. Note - Sands and gravels which are clean or borderline between clean and with fines should be included. Coarse-grained soils with less than 12% but more than 5% fines are neglected in ASTM D2487 and the USCS and should be included. The gradation of Class II material influences its density and pipe support strength when loosely placed. The gradation of Class II material influences its density and pipe support strength when loosely placed. The gradation of Class II material may be critical to the pipe support and stability of the foundation and embedment if the material is imported and is not native to the trench excavation. A gradation other than well graded, such as uniformly graded or gap graded, may permit loss of support by migration into void spaces of a finer grained natural material from the trench wall and foundation.

C. Class III - Fine sand and clayey (clay filled) gravels, including fine sands, sand-clay mixtures and gravel-clay mixtures. Soil Types SM, GC, SM, and SC are included in this class.

D. Class IV - Silt, silty clays and clays, including inorganic clays and silts of not to high plasticity and liquid limits. Soil Types MH, ML, CH, and CL are included in this class. Note- Caution should be used in the design and selection of the degree and method of compaction for Class IV soils because of the difficulty in properly

controlling the moisture content under field conditions. Some Class IV soils with medium to high plasticity and with liquid limits greater than 50% (CH, MH, CH-MH) exhibit reduced strength when wet and should only be used for bedding, haunching and initial backfill in arid locations where the pipe embedment will not be saturated by ground water, rainfall and/or exfiltration from the pipeline system. Class IV soils with low to medium plasticity and with liquid limits lower than 50% (CL, ML, CL-ML) also require careful consideration in design and installation to control moisture content but need not be restricted in use to arid locations.

E. Class V - This class includes the organic soils OL, OH, and PT as well as soils containing frozen earth, debris, rocks larger than 1 1/2 inch (40 mm) in diameter, and other foreign materials. These materials are not recommended for bedding, haunching or initial backfill.

DESCRIPTION OF EMBEDMENT MATERIAL CLASSIFICATIONS

SOIL CLASS	SOIL TYPE	DESCRIPTION MATERIAL CLASSIFICATION
Class I Soils *	---	Manufactured angular, granular material, 3/4 to 1 1/2 inches (6 to 40 mm) size, including materials having regional significance such as crushed stone, or rock, broken coral, crushed slag, cinders, or crushed shells.
Class II Soil **	GW	Well-graded gravels and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean..
	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean
	SW	Well-graded sands and gravely sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	SP	Poorly graded sands and gravelly sand, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
Class III Soil ***	GM	Silty gravels, gravel-sand-silt mixtures. 50% or more retained on No. 200 sieve.
	GC	Clayey gravels, gravel-sand-clay mixtures. 50% or more retained on No. 4 sieve. More than 50% retained on No. 200 sieve.
	SM	Silty sands, sand-silt mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve.
	SC	Clayey sands, sand-clay mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve.

Class IV Soils	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands. Liquid limit 50% or less. 50% or more passes No. 200 sieve.
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. Liquid limit 50% or less. 50% or more passes No. 200 sieve.
	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.
	CH	Inorganic clays of high plasticity, fat clays. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.
Class V Soils	OL	Organic silts and organic silty clays of low plasticity. Liquid limit 50% or less. 50% or less. 50% or more passes No. 200 sieve.
	OH	Organic clays of medium to high plasticity. Liquid limit 50% or less. 50% or more passes No. 200 sieve.
	PT	Peat, muck and other highly organic soils.

* Soils defined as Class I materials are not defined in ASTM D2487.
** In accordance with ASTM D2487, less than 5% pass No. 200 sieve.
*** In accordance with ASTM D2487, more than 12% pass No. 200 sieve. Soils with 5% to 12% pass No. 200 sieve fall in borderline classification, e.g. GP-GC.

2.02 FILL MATERIAL

A. Sand Fill: Material shall consist of a clean sand with a fineness modulus of 1.6 to 3.1 and containing not more than 10 percent by weight finer than No. 200 U.S. Standard Sieve.

B. Earth Fill: Material shall consist of inorganic material free of roots, cobbles and boulders and classified as SM, ML, SC, or CL by ASTM D2487-85 "Standard Methods for Classification of Soils for Engineering Purposes". Earth Fill shall also conform to the following:

1. Liquid Limit = 50 maximum
2. Plasticity Index = 20 maximum
3. Dry Unit Weight = 90 pcf minimum maximum density

C. Coarse Aggregate (Crushed Stone): Coarse aggregate shall conform to the Georgia Department of Transportation Standard Specifications for Construction of Road and Bridges, Table 800.01 H, Size No. 57.

2.03 UNSUITABLE SITE FILL MATERIAL

Material which does not conform to the above classifications (soil classification SP, SW.GM, CH, MH, OH, OL, and PT) may be used as Site Fill material in areas identified on the drawings as "spoil areas", in areas with no structures and or roads and other non-critical areas.

2.04 TOPSOIL

See specification Section "02230 Topsoil".

2.05 SHEETING, BRACING AND TIMBERING

A. Sheeting, Bracing and Timbering: The Contractor shall furnish, place and maintain all sheeting, bracing and timbering required to properly support trenches and other excavations in open cut and to prevent all movement of the soil, pavement, structures, or utilities outside of the trench or pit.

1. General
   a. Cofferdams and bracing design, including computations, shall be prepared before commencing construction operations. Drawings and design computations shall be signed and sealed by a professional engineer registered in the State of Georgia. The drawings and design computations shall be submitted to the Engineer for informational purposes only.
   b. Sheeting, bracing and timbering shall be so placed as to allow the work to be constructed to the lines and grades shown on the Drawings and as ordered by the Engineer.
   c. If at any time the method being used by the Contractor for supporting any material or structure in or adjacent to any excavation is not reasonably safe, the Contractor shall provide additional bracing and support necessary to furnish the added degree of safety.
   d. All sheeting in contact with the concrete or masonry shall be cut off as directed by the Engineer and left in place.

2. Timber: Timber may be substituted for steel sheet piling when approved by the Engineer. Timber for shoring, sheeting or bracing shall be sound and free of large or loose knots, and in good condition. Size and spacing shall be in accordance with OSHA regulations.

3. Steel Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth, and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and/or live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The Contractor shall provide closure and sealing between sheet piling and existing facilities. Steel piling shall be removed, unless otherwise directed by the Engineer.

4. Remove bracing and sheeting in units when backfill reaches the point necessary

to protect the structures and adjacent property. Leave sheeting in place when, in the opinion of the Engineer, it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.

2.06 FILTER FABRIC

A. Filter fabric associated with bedding shall be a UV stabilized, spunbonded, continuous filament, needle punched, polypropylene, nonwoven geotextile.

B. The fabric shall have an equivalent open size (EOS or AOS) of 120 - 70. The fabric shall also conform to the minimum property values listed in the following table:

Fabric Property	Unit	Test Procedure	Average Value	
			Typical	Minimum
Weight	Oz/yd^2	ASTM D 3776	8.3	
Thickness	mils	ASTM D 1777	105	
Grab Strength	lbs.	ASTM D 4632	240	210
Grab Elongation	%	ASTM D 4632	>50	50
Tear Strength	lbs.	ASTM D 4533	100	85
Mullen Burst	psi	ASTM D 3786	350	320
Puncture Resistance	lbs.	ASTM D 4833	115	100
Permittivity	sec^{-1}	ASTM D 4491	1.7	
Water Permeability	Cm/sec	ASTM D 4491	0.4	
Water Flow Rate	gpm/ft^2	ASTM D 4491	120	
UV Resistance (500 hrs)	%	ASTM D 4355	>85	
PH			2 – 13	

C. Filter fabric shall be Polyfelt TS 700, Trevira 1125 or SuPac 7-MP.

2.07 CONCRETE

Concrete for initial backfill or encasement shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and

5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

2.08 FLOWABLE FILL

Flowable fill, where required for backfill, shall meet the requirements of Georgia Department of Transportation Standard Specifications, Section 600 for Excavatable or Non-Excavatable type.

PART 3 EXECUTION

3.01 GENERAL

A. Safety: Comply with local regulations and with the provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc., Occupational Safety and Health Act and all other applicable safety regulations.

B. Topsoil

1. Remove all topsoil to a depth at which subsoil is encountered, from all areas under buildings, pavements, and from all areas which are to be cut to lower grades or filled.
2. With the Engineer's approval, topsoil to be used for finish grading may be stored on the site.
3. Other topsoil may be used for fill in non-critical areas with approval of the Engineer.
4. Properly dispose of all excess topsoil in the designated area.

C. Bracing and Sheeting

1. Furnish, put in place, and maintain all sheeting, bracing, and shoring as may be required to properly support the sides of all excavations and to prevent all movement of earth which could in any way injure the work, adjacent property or workers.
2. Properly support all excavations where necessary to conform to all pertinent rules and regulations and these Specifications, even though, such locations are not indicated on the Drawings.
3. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the work and adjacent property.
4. Do not leave any sheeting or bracing in the trench or excavation after completion of the work, unless approved by the Engineer.

D. Obstructions

1. Remove and dispose of all boulders, sidewalks, driveways, pavement, pipes, and the like, as required for the performance of the work.

2. Exercise care in excavating around catch basins, inlets and manholes so as to not disturb or damage these structures.
3. Avoid removing or loosening castings or pushing dirt into catch basins, inlets and manholes.
4. Damaged or displaced structures or casting shall be repaired, replaced and dirt entering the structures during the performance of the work shall be removed at no additional cost to the Owner.

E. Utilities to be Abandoned

1. When pipes, conduits, sewers, or other structures are removed from the trench, leaving dead ends in the ground, such ends shall be fully plugged or sealed with brick and non-shrink grout.
2. Abandoned structures such as manholes or chambers shall be entirely removed.
3. All materials from abandoned utilities shall be removed from the site.
4. All salvageable materials shall become the property of the Owner.
5. All equipment to be salvaged is noted in the Specifications and shall be turned over to the Owner at a designated location.

F. Extra Earth Excavation

1. In case soft or excessively wet material which, in the opinion of the Engineer, is not suitable, is encountered below the final subgrade elevation of an excavation or underneath a structure, the Engineer may order the removal of this material and its replacement with crushed stone, filter fabric, or other suitable material in order to make a suitable foundation for the construction of the structure.

G. Cutting Paved Surfaces and Similar Improvements

1. Remove existing pavement as necessary for installing pipe utilities and appurtenances or as otherwise shown on the Drawings.
2. Before removing any pavement, mark the pavement neatly, paralleling pipe lines and existing street lines. Space the marks the width of the trench.
3. Break asphalt pavement along the marks using rotary saws or other suitable tools. Break concrete pavement along the marks by use of scoring with a rotary saw and breaking below the score by the use of jackhammers or other suitable tools.
4. Do not pull pavement with machines until completely broken and separated from pavement to remain.
5. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement. No additional payment will be made for removing and replacing damaged adjacent pavement.

6. Remove and replace sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.
7. The Contractor may tunnel under curbs that are encountered. Remove and replace any curb disturbed by construction to the nearest undisturbed joint.

3.02 EXCAVATION

A. Method

1. All excavation shall be by open cut from the surface except as indicated on the Drawings.
2. All excavations for pipe appurtenances and structures shall be made in such a manner, and to such depth and width, as will give ample room for building the structures, and for bracing, sheeting, and supporting the sides of the excavation, for pumping and draining groundwater which may be encountered, and for the removal from the excavation of all materials excavated.
3. Take special care so that the soil below the bottom of the structure to be built is left undisturbed.

B. Grades: Excavate to grades indicated on the Drawings. Where excavation grades are not indicated on the Drawings, excavate as required to accommodate installation.

C. Disposal of Excavated Material

1. Remove and properly dispose of all excavated material not needed to complete filling, backfilling and grading.
2. Dispose of excess earth and rock excavated materials at locations on-site designated by the Engineer. Off-site disposal of all other material shall be and in accordance with all requirements of federal, state, county, and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or on any street. No debris shall be deposited on any private property, except by written consent of the property owner. In no case shall any material be shoved onto abutting private properties, or be buried in embankments or trenches on the Project.

3.03 EXCAVATING FOR STRUCTURES

A. Earth Excavation: Earth excavation shall include all substances to be excavated other than rock. Earth excavation for structures shall be to limits not less than two feet outside wall lines, to allow for formwork and inspection, and further as necessary to permit the trades to install their work. All materials loosened or disturbed by excavation shall be removed from surfaces to receive concrete or crushed stone.

B. Excavation for Foundations: Footings and slabs on grades shall rest on undisturbed earth, rock or compacted materials to insure proper bearing.

1. Unsuitable Foundation Material: Any material, in the opinion of the Engineer, which is unsuitable for foundation shall be removed and replaced with compacted crushed stone, or with compacted fill material as directed by the Engineer. No determination of unsuitability will be made until all requirements for dewatering are satisfactorily met.
2. Foundation in Rock: Foundations for a structure shall be on similar materials.

Should excavation for a foundation be partially in rock, the Contractor shall undercut that portion of the rock 12-inches and bring the excavation to grade with compacted crushed stone.

3. Pipe Trenches Beneath Structures: Where piping or conduit passes beneath footings or slabs resting on grade, trenches shall be excavated to provide a minimum 6-inch clearance from all surfaces of the pipe or conduit. The trench shall be backfilled to the base of the structure with concrete.
4. Unauthorized Excavation: Care shall be taken that excavation does not extend below bottom levels of footings or slabs on earth or rock. Should the excavation, through carelessness or neglect, be carried below such levels, the Contractor shall fill in the resulting excess excavation with concrete under footings and compacted crushed stone or other approved material under slabs. Should excavation be carried beyond outside lines of footings such excess excavation shall be filled with concrete, or formwork shall be provided, as directed by the Engineer.

C. Unsuitable Bearing

1. If suitable bearings for foundations are not encountered at the elevations indicated on the Drawings, immediately notify the Engineer.
2. Do not proceed further until instructions are received.

3.04 DEWATERING REQUIREMENT

A. The Contractor may use any dewatering method he deems feasible so long as it results in working in the dry and stable soil conditions.

B. The Contractor shall conform and meet all conditions, obtain necessary permits and requirements of the regulatory agencies that have jurisdiction.

C. It is the intent of these specifications that an adequate dewatering system be installed to lower and control the groundwater in order to permit excavation, construction, grading and the placement of fill materials, all to be performed under dry conditions. The dewatering system shall be adequate to pre-drain the water-bearing strata above and below the bottom of the excavation.

D. The Contractor shall be solely responsible for the arrangement, location and depths of dewatering system necessary to accomplish the work described under this section of the specifications. The dewatering shall be accomplished in a manner that will reduce the hydrostatic head below any excavation to the extent that the water level in the construction area are a minimum of three (3) feet below the prevailing excavation surface and any surface to be compacted; will prevent the loss of fines, seepage, boils, quick conditions, or softening of the foundation strata; will maintain stability of the sides and bottom of the excavation; and will result in all construction operations being performed in the dry.

E. The Contractor shall promptly dispose of all water removed from the excavations in such a manner as will not endanger public health, damage public or private property,

or affect adversely any portion of the work under construction or completed by him or any other Contractor. Contractor shall obtain written permission from the Owner for any property involved before digging ditches or constructing water courses for the removal of water.

F. The disposal of water from the dewatering system shall meet the requirements of all regulatory agencies having jurisdiction.

G. If the dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, then loosening of the foundation strata, or instability of the slopes, or damage to the foundations or structures may occur. The supply of all labor and materials, and the performance of all work necessary to carry out additional work for reinstatement of the structures of foundation soil resulting from such inadequacy or failure shall be undertaken by the Contractor subject to the approval of the Engineer, and at no additional expense to the Owner.

3.05 ROCK EXCAVATION

A. Definition of Mass Rock (only for payment purposes where payment is on a unit quantity basis): Any material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (comparable to Caterpillar D 8K or comparable to Caterpillar 973 front-end loader, and occupying an original volume of at least one cubic yard). The Engineer shall be the sole determinate as to the limits to which the material is classified as rock.

B. Definition of Trench Rock (only for payment purposes where payment is on a unit quantity basis): Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 25,700 pounds (Caterpillar Model 225 or equivalent), and occupying an original volume of at least one-half (1/2) cubic yards.

C. Excavation: Where rock is encountered within excavation for structures, it shall be excavated to the lines and grades indicated on the Drawings or as otherwise directed by the Engineer. The Contractor shall be responsible for obtaining any blasting permits required.

D. Blasting: Blasting operations shall be conducted in accordance with all existing ordinances and regulations. All structures shall be protected from the effects of the blast. Blasting shall be performed and supervised by qualified and licensed workers. Dispose of excavated rock in accordance with applicable federal, state, county and local regulations.

E. If excess excavation is made or the material becomes disturbed so as to require removal below final subgrade elevations or beyond the prescribed limits, the resulting space shall be refilled with concrete in accordance with Section 2.07 of this Specification

3.06 COMPACTION

A. Fill materials supporting roadways, parking areas, sidewalks, structures, and buildings and backfill around structures shall be compacted to 95 percent of the standard proctor density. The top 12-inches of fill materials supporting structures, concrete pads, pavement, curb and gutter shall be compacted to 98 percent of the standard proctor density. Fill placed for general site grading shall be compacted to 90 percent of the standard proctor density.

B. Compaction of embankments shall be by vibratory sheepsfoot or pad-foot rollers with staggered, uniformly spaced knobs and suitable cleaning devices. The projected area of each knob and the number and spacing of the knobs shall be such that the total weight of the roller and ballast when distributed over the area of one row of knobs shall be 250 psi. Placement and compaction of materials shall extend at least 5 feet beyond the final contours sufficiently to insure compaction of the material at the resulting final surface. Final contours shall then be achieved by a tracked bulldozer shaping the face of the embankment.

C. Compaction of backfill next to walls shall be accomplished with hand-powered tamping equipment. The backfill shall be placed in 8-inch maximum lifts, with each lift compacted to 95 percent of standard proctor density.

D. If tests indicate that density of fill is less than that specified, the area shall be, as directed by the Engineer, either recompacted or undercut, filled, and compacted until specified density is achieved.

3.07 FILL

A. Controlled Fill

1. The fill for roadways, parking areas, walks, structures, and building slabs on grade shall be controlled fill.
2. After the existing ground or excavated area has been proofrolled and examined by the Engineer, all holes and other irregularities shall be filled and compacted before the main fill is placed.
3. The fill shall be placed in even layers not exceeding 8-inches in depth and shall be thoroughly compacted as herein specified.
4. If an analysis of the soil being placed shows a marked difference from one location to another, the fill being placed shall not be made up of a mixture of these materials.
5. Each different type of material shall be handled continuously so that field control of moisture and density may be based upon a known type of material.
6. No fill shall be placed following a heavy rain without first making certain on isolated test areas that compaction can be obtained without damage to the already compacted fill.

B. Proofrolling

1. All areas where roadways, parking areas, sidewalks, structures, and buildings are to be constructed on cut areas, compacted fill, and other areas where indicated on the Drawings, shall be proofrolled to detect soft spots prior to the placement of fill material or building foundations.
2. Proofrolling shall be performed using a fully loaded tandem-axle dump truck 20 tons or other suitable pneumatic tired equipment over the subgrade before the subgrade is shaped.
3. Proofrolling shall be witnessed by the Engineer.
4. Subgrade shall be proofrolled with one (1) overlapping passes of the roller. Depressions that develop during the proofrolling operation shall be filled with suitable material and those filled areas shall be proofrolled with six passes of the roller. If, after having been filled and proofrolled, the subgrade areas that still "pump" or "rut", shall be further evaluated by a geotechnical engineer, and remedial work be determined based on the conditions found at locations under structures or pavement. The contractor shall execute remedial work determined by the geotechnical engineer to achieve a subgrade acceptable to the Engineer.
5. After the proofrolled subgrade has been accepted by the Engineer, the surface of the subgrade shall be finish rolled with a smooth steel wheel roller weighing not less than 10 tons. Finished surface of the subgrade shall be within a tolerance of 1/4-inch at every point.
6. Conduits, pipes, culverts, and underdrains shall be neither disturbed nor damaged by proofrolling operations. Rollers shall neither pass over, nor approach closer than five feet to, conduits, pipes, culverts, and underdrains unless the tops of those products are deeper than three feet.

C. Placement

1. Prior to placement of any material in embankments, the area within embankment limits shall be stripped of topsoil and all unsuitable materials removed in accordance with this Section. The area shall then be scarified to a depth of at least 6-inches.
2. Fill materials shall be placed in continuous, approximately horizontal layers extending the full width of the embankment cross-section and the full dimension of the excavation where practical and having an uncompacted thickness of not over 8-inches.

D. Final Grading: Upon completion of construction operations, the area shall be graded to finish contour elevations and grades shown on the Drawings. Graded areas shall be made to blend into conformation with remaining ground surfaces. All surfaces shall be left smooth and free to drain.

E. Excess Material: Surfaces and slopes of waste fills shall be left smooth and free to drain.

F. Moisture

1. Fill materials shall be placed at optimum moisture content within practicable limits, but not less or more than two percent of optimum. Optimum moisture shall be maintained by sprinkling the layers as placed or by allowing materials to dry before placement.
2. If fill material is too wet, provide and operate approved means to assist the drying of the fill until suitable for compaction.
3. If fill material is too dry, provide and operate approved means to add moisture to the fill layers.

3.08 BACKFILLING

A. Backfill carefully to restore the ground surface to its original condition. Dispose of excess material in accordance with this Section.

B. Compact backfill underlying roadways, parking areas, sidewalks, structures and buildings in accordance with the requirements of Article 3.06 of this Section.

C. Backfilling Around Structures

1. General
   a. Remove debris from excavations before backfilling.
   b. Do not backfill against foundation walls until so directed by the Engineer nor until all indicated perimeter insulation and/or waterproofing is in place.
   c. Protect such insulation and/or waterproofing during filling operations.
   d. Do not backfill against water retaining structures until successful leakage tests have been completed.
   e. Wherever possible, backfilling shall be simultaneous on both sides of walls to equalize lateral pressures.
   f. Do not backfill against walls until all permanent construction is in place to furnish lateral support on both top and bottom of wall.
   g. Backfilling against walls shall take place after all the concrete in the affected members has attained the specified strengths.
   h. To prevent excessive lateral pressure on external walls, large compaction equipment shall not be allowed within a zone wall footing.
2. Materials: Backfill material placed against structures built or encountered during the work of this Section shall be suitable fill material. No broken concrete, bricks or similar materials will be permitted as backfill.

3.09 GRADING

A. General: Perform all rough and finish grading required to attain the elevations indicated on the Drawings. Perform finish grading to an accuracy of $\pm$0.10 foot.

B. Treatment After Completion of Grading

1. After grading is completed, permit no further excavation, filling or grading, except with the approval of the Engineer.
2. Use all means necessary to prevent the erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

3.10 SETTLEMENT

A. The Contractor shall be responsible for all settlement of backfill, fills and embankments which may occur within one year after final acceptance of the Work by the Owner.

B. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from the Engineer or Owner.

3.11 CLEAN-UP

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials; leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 02317
TRENCH EXCAVATION AND BACKFILL

PART 1 GENERAL

1.01 SCOPE

A. The work under this Section consists of furnishing all labor, equipment and materials and performing all operations in connection with the trench excavation and backfill required to install the site utilities, including all pipelines, electrical conduits, and duct banks as shown on the plans and as specified.

B. Excavation shall include the removal of any tree stumps, brush, debris or other obstacles which remain after the clearing and grubbing operations, which may obstruct the work, and the excavation and removal of all earth, rock or other materials to the extent necessary to install the pipe and appurtenances in conformance with the lines and grades shown on the plans and as specified.

C. Backfill shall include the filling and compaction of the trenches and excavations up to the surrounding ground surface or road grade at crossing.

D. The trench is divided into five specific areas:

1. Foundation: The area beneath the bedding, sometimes also referenced to as trench stabilization.
2. Bedding: The area above the trench bottom (or foundation) and below the bottom of the barrel of the pipe.
3. Haunching: The area above the bottom of the barrel of the pipe up to a specified height above the bottom of the barrel of the pipe.
4. Initial Backfill: The area above the haunching material and below a plane 12-inches above the top of the barrel of the pipe.
5. Final Backfill: The area above a plane 12-inches above the top of the barrel of the pipe.

E. The choice of method, means, techniques and equipment rests with the Contractor. The Contractor shall select the method and equipment for trench excavation and backfill depending upon the type of material to be excavated and backfilled, the depth of excavation, the amount of space available for operation of equipment, storage of excavated material, proximity of man-made improvements to be protected, available easement or right-of-way and prevailing practice in the area.

1.02 RELATED SECTIONS

A. Geotechnical report

B. Site Preparation: Section 02200.

C. Erosion and Sedimentation Control: Section 02370

1.03 GENERAL

A. The elevations shown on the Drawings as existing are taken from the best existing data and are intended to give reasonably accurate information about the existing elevations. They are not precise and the Contractor shall become satisfied as to the exact quantities of excavation and fill required.

B. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards.

C. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments, and channels shall be maintained by the Contractor in good condition at all times until final acceptance by the Owner. All damage caused by erosion or other construction operations shall be repaired by the Contractor using material of the same type as the damaged material.

D. The Contractor shall control grading in a manner to prevent surface water from running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water can be uninterrupted in existing gutters, other surface drains, or temporary drains. Free access must be provided to all fire hydrants and meters.

E. Tests for compaction and density shall be conducted by the Engineer or by an independent testing laboratory selected in accordance with Section 01450 of these Specifications.

1. The soils testing laboratory is responsible for the following:
    a. Field compaction testing shall be based on using the maximum dry density determined by the Standard Proctor Compaction Test in accordance with ASTM D 698.
    b. Determination of in-place backfill density shall be done in accordance with ASTM D 1556, “Density and unit weight of Soil In Place by the Sand-Cone Method”, ASTM D 2937, “Density of Soil In Place by the Drive-Cylinder Method” or ASTM D 2922, “Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)”.
    c. Test frequency for trenches and confined areas of 1 test per two foot vertical lift for every 100 linear feet.
    d. Inspecting and testing stripped site, subgrades and proposed fill materials.

2. Contractor's duties relative to testing include:
    a. Notifying laboratory of conditions requiring testing.
    b. Coordinating with laboratory for field testing.
    c. Providing representative fill soil samples to the laboratory for test purposes. Provide 50 pound samples of each fill soil.

3. Inspection
    a. Earthwork operations, suitability of excavated materials for fill and backfill, and placing and compaction of fill and backfill is subject to inspection. Engineer will observe earthwork operations.
    b. Foundations and shallow spread footing foundations are required to be inspected by an engineer to verify suitable bearing and construction.

F. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations, and shall be conducted in a manner acceptable to the Engineer.

G. It is understood and agreed that the Contractor has made a thorough investigation of the surface and subsurface conditions of the site and any special construction problems which might arise as a result of nearby watercourses and floodplains. The Contractor shall be responsible for providing all services, labor, equipment, and materials necessary or convenient to the Contractor for completing the work within the time specified in these Contract Documents.

H. SAFETY

Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The Contractor shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P "Excavation, Trenching & Shoring" as described in OSHA publication 2226.

PART 2 PRODUCTS

2.01 SOILS CLASSIFICATIONS

Bedding materials listed here include a number of processed materials plus the soil types defined according to the Unified Soil Classification System (USCS) in ASTM D 2487, Standard Method for Classification of Soils for Engineering Purposes. (See below for description of soil classification). These materials are grouped into five broad categories according to their suitability for this application:

A. Class I - Angular, 1/4 to 1 1/2 inches (6 to 40 mm) graded stone, including such as coral, slag, cinders, crushed shells and crushed stone. Note - The size range and resulting high voids ratio of Class I material make it suitable for use to dewater trenches during pipe installation. This permeable characteristic dictates that its use be limited to locations where pipe support will not be lost by migration of other embedment materials into the Class I material. When such migration is possible, the material's minimum size range should be reduced to finer than 1/4 inch (6 mm) and the gradation properly designed to limit the size of the voids.

B. Class II - Coarse sands and gravels with maximum particle size of 1 1/2 inch (40 mm), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW and SP are included in this class. Note - Sands and gravels which are clean or borderline between clean and with fines should be included. Coarse-grained soils with less than 12% but more than 5% fines are neglected in ASTM D2487 and the USCS and should be included. The gradation of Class II material influences its density and pipe support strength when loosely placed. The gradation of Class II material influences its density and pipe support strength when loosely placed. The gradation of Class II material may be critical to the pipe support and stability of the foundation and embedment if the material is imported and is not native to the trench excavation. A gradation other than well graded, such as uniformly graded or gap graded, may permit loss of support by migration into void spaces of a finer grained natural material from the trench wall and foundation.

C. Class III - Fine sand and clayey (clay filled) gravels, including fine sands, sand-clay mixtures and gravel-clay mixtures. Soil Types SM, GC, SM, and SC are included in this class.

D. Class IV - Silt, silty clays and clays, including inorganic clays and silts of not to high plasticity and liquid limits. Soil Types MH, ML, CH, and CL are included in this class. Note- Caution should be used in the design and selection of the degree and method of compaction for Class IV soils because of the difficulty in properly controlling the moisture content under field conditions. Some Class IV soils with medium to high plasticity and with liquid limits greater than 50% (CH, MH, CH-MH) exhibit reduced strength when wet and should only be used for bedding, haunching and initial backfill in arid locations where the pipe embedment will not be saturated by ground water, rainfall and/or exfiltration from the pipeline system. Class IV soils with low to medium plasticity and with liquid limits lower than 50% (CL, ML, CL-ML) also require careful consideration in design and installation to control moisture content but need not be restricted in use to arid locations.

E. Class V - This class includes the organic soils OL, OH, and PT as well as soils containing frozen earth, debris, rocks larger than 1 1/2 inch (40 mm) in diameter, and other foreign materials. These materials are not recommended for bedding, haunching or initial backfill.

DESCRIPTION OF EMBEDMENT MATERIAL CLASSIFICATIONS

SOIL CLASS	SOIL TYPE	DESCRIPTION MATERIAL CLASSIFICATION
Class I Soils *	---	Manufactured angular, granular material, 3/4 to 1 1/2 inches (6 to 40 mm) size, including materials having regional significance such as crushed stone, or rock, broken coral, crushed slag, cinders, or crushed shells.
Class II Soil **	GW	Well-graded gravels and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines. 50% or more retained on No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	SW	Well-graded sands and gravely sands, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
	SP	Poorly graded sands and gravelly sand, little or no fines. More than 50% passes No. 4 sieve. More than 95% retained on No. 200 sieve. Clean.
Class III Soil ***	GM	Silty gravels, gravel-sand-silt mixtures. 50% or more retained on No. 200 sieve.
	GC	Clayey gravels, gravel-sand-clay mixtures. 50% or more retained on No. 4 sieve. More than 50% retained on No. 200 sieve.
	SM	Silty sands, sand-silt mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve.
	SC	Clayey sands, sand-clay mixtures. More than 50% passes No. 4 sieve. More than 50% retained on No. 200 sieve.
Class IV Soils	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands. Liquid limit 50% or less. 50% or more passes No. 200 sieve.
	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. Liquid limit 50% or less. 50% or more passes No. 200 sieve.
	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.
	CH	Inorganic clays of high plasticity, fat clays. Liquid limit greater than 50%. 50% or more passes No. 200 sieve.

SOIL CLASS	SOIL TYPE	DESCRIPTION MATERIAL CLASSIFICATION
Class V Soils	OL	Organic silts and organic silty clays of low plasticity. Liquid limit 50% or less. 50% or less. 50% or more passes No. 200 sieve.
	OH	Organic clays of medium to high plasticity. Liquid limit 50% or less. 50% or more passes No. 200 sieve.
	PT	Peat, muck and other highly organic soils.

* Soils defined as Class I materials are not defined in ASTM D2487.
** In accordance with ASTM D2487, less than 5% pass No. 200 sieve.
*** In accordance with ASTM D2487, more than 12% pass No. 200 sieve. Soils with 5% to 12% pass No. 200 sieve fall in borderline classification, e.g. GP-GC.

2.02 PIPE BEDDING CLASSES

A. Class A Bedding shall consist of a continuous concrete cradle as determined by the Engineer.

B. Class B Bedding: The pipe shall be bedded with No. 57 stone bedding material placed on the trench foundation. The bedding shall have a minimum thickness beneath the pipe of 4 inches or one-eighth of the outside diameter of the pipe, whichever is greater, and shall extend up the side to the springline. Initial backfill from the pipe horizontal centerline to a level not less than 12 inches above the top of the pipe and shall be bedding material or carefully placed native soil, compacted to 90% of Standard Proctor Density. The final backfill of the soil to ground surface shall be compacted to the specified density.

C. Class C Bedding: The pipe shall be bedded in No. 57 stone bedding material placed on the trench foundation. The bedding shall have a minimum thickness beneath the pipe of 4 inches or one-eighth of the outside diameter of the pipe, whichever is greater, and shall extend up the sides of the pipe one-sixth the outside diameter of the pipe. Initial backfill between the top of haunching and a point 12 inches above the top of pipe shall be compacted to 90% of Standard Proctor Density. The final backfill of the soil to ground surface shall be compacted to the specified density.

D. Crushed stone utilized for bedding and haunching shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble or dolomite) or Group II (quartzite, granite or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.

2.03 TRENCH FOUNDATION MATERIALS

When unsuitable material is encountered and extends more than 6 inches below the pipe. Crushed stone shall be utilized for trench foundation (trench stabilization) and shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I

(limestone, marble or dolomite) or Group II (quartzite, granite or gneiss). Stone size shall be between No. 57 and No. 4, inclusive or Class I material.

2.04 FILTER FABRIC

A. Filter fabric associated with bedding shall be a UV stabilized, spunbonded, continuous filament, needle punched, polypropylene, nonwoven geotextile.

B. The fabric shall have an equivalent open size (EOS or AOS) of 120 - 70. The fabric shall also conform to the minimum property values listed in the following table:

Fabric Property	Unit	Test Procedure	Average Value	
			Typical	Minimum
Weight	oz/yd^2	ASTM D 3776	8.3	
Thickness	mils	ASTM D 1777	105	
Grab Strength	lbs.	ASTM D 4632	240	210
Grab Elongation	%	ASTM D 4632	>50	50
Tear Strength	lbs.	ASTM D 4533	100	85
Mullen Burst	psi	ASTM D 3786	350	320
Puncture Resistance	lbs.	ASTM D 4833	115	100
Permittivity	sec^{-1}	ASTM D 4491	1.7	
Water Permeability	cm/sec	ASTM D 4491	0.4	
Water Flow Rate	gpm/ft^2	ASTM D 4491	120	
UV Resistance (500 hrs)	%	ASTM D 4355	>85	
PH			2 – 13	

C. If ordered by the Engineer, the filter fabric manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe. This service will be furnished for a minimum of 10 days during initial pipe

installation.

D. Filter fabric shall be Polyfelt TS 700, Trevira 1125 or SuPac 7-MP.

2.05 BEDDING AND HAUNCHING MATERIALS

A. Crushed stone utilized for bedding and hunching shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble or dolomite) or Group II (quartzite, granite or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.

B. Earth materials shall be suitable materials selected from the trench excavation. Suitable materials shall be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements. When necessary, earth bedding and haunching materials shall be moistened to facilitate compaction by tamping.

2.06 INITIAL BACKFILL

A. Initial backfill material shall be earth materials or crushed stone as specified for bedding and haunching materials. Soil shall be tamped to 90% of Standard Proctor Density (ASTM D698).

B. Earth materials utilized for initial backfill shall be suitable materials selected from materials excavated from the trench. Suitable materials shall be clean and free of rock larger than 2-inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements. When necessary, initial backfill materials shall be moistened to facilitate compaction by tamping. If materials excavated from the trench are not suitable for use as initial backfill material, provide select material conforming to the requirements of this Section.

2.07 FINAL BACKFILL

A. Final backfill material shall be general excavated earth materials, shall not contain rock larger than 2-inches at its greatest diameter, cinders, stumps, limbs, man-made wastes and other unsuitable materials. If materials excavated from the trench are not suitable for use as final backfill material, provide select material conforming to the requirements of this Section.

B. In areas not used for streets or driveways, carefully refill in layers not exceeding 8 inches in thickness and thoroughly tamp with hand tamps to one foot above the top of the pipe. Finish filling by machine without tamping. As trench settles, bring back to grade by adding more material. Maintain trenches in safe condition

at all times. Restore all special grassing and shrubbery, fences, etc., to original condition. The remaining backfill shall be thoroughly compacted in 8 inch layers to at least 95% (percent) of the Standard Proctor Density (ASTM D698).

C. In streets, roadways and driveways, carefully refill in layers not exceeding 8 inches in thickness and thoroughly tamp with hand tamps to one foot above the top of the pipe. The remaining backfill shall be thoroughly compacted in 8 inch layers to at least 98% (percent) of the Standard Proctor Density (ASTM D698).

D. Backfilling and tamping work in state highway right-of-ways and streets under jurisdiction of the State Highway Department will be in accordance with the State of Georgia Department of Transportation "Policy and Procedure for Accommodation of Utilities".

2.08 CONCRETE

Concrete for bedding, haunching, initial backfill or encasement shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

2.09 FLOWABLE FILL

Flowable fill, where required for trench backfill, shall meet the requirements of Georgia Department of Transportation Standard Specifications, Section 600 for Excavatable or Non-Excavatable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage. The contractor is required to contact the Utilities Protection Center, Inc. in the State of Georgia call 1-800-282-7411 prior to any excavation or construction. Additional information is available at www.gaupc.com. The contractor shall first, Call Before You Dig. Second, Wait the Required Amount of Time. Third, Respect the Marks and Lastly, Dig With Care.

C. Notify utility company to remove and relocate utilities.

3.02 TRENCH EXCAVATION

A. Notify of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches O.D of pipe plus two feet minimum or O.D. of pipe plus four feet maximum wide enough to allow installation and inspection of utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter which could damage piping or impede consistent backfilling or compaction.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd (0.25 cu m) measured by volume.

H. Remove excavated material that is unsuitable for re-use from site.

I. Stockpile excavated material to be re-used in areas designated on site.

J. Remove excess excavated material from site.

K. In areas not used for streets and in unpaved streets, maximum trench width shall be the pipe diameter plus 24 inches. Protect all trees, shrubs and structures. Protect all fences and replace those damaged/removed with like kind. Keep work and equipment within easement limits. Repair and replace any damage.

L. Paved streets shall have a maximum trench width of pipe diameter plus 24 inches. Shore and brace trench walls as necessary to prevent damage to existing paving. Do not cut existing sidewalk, or curb and gutter without approval by the Engineer. Use rubber tired equipment only on streets. Repair and replace all damage. Saw cut all pavements for smooth edge on replacement.

3.03 DEWATERING REQUIREMENT

A. The Contractor may use any dewatering method he deems feasible so long as it results in working in the dry and stable soil conditions.

B. The Contractor shall conform and meet all conditions, obtain necessary permits and requirements of the regulatory agencies that have jurisdiction.

C. It is the intent of these specifications that an adequate dewatering system be installed to lower and control the groundwater in order to permit excavation, construction, grading and the placement of fill materials, all to be performed under dry conditions. The dewatering system shall be adequate to pre-drain the water-bearing strata above and below the bottom of the excavation.

D. The Contractor shall be solely responsible for the arrangement, location and

depths of dewatering system necessary to accomplish the work described under this section of the specifications. The dewatering shall be accomplished in a manner that will reduce the hydrostatic head below any excavation to the extent that the water level in the construction area are a minimum of two (2) feet below the prevailing excavation surface and any surface to be compacted; will prevent the loss of fines, seepage, boils, quick conditions, or softening of the foundation strata; will maintain stability of the sides and bottom of the excavation; and will result in all construction operations being performed in the dry.

E. The Contractor shall promptly dispose of all water removed from the excavations in such a manner as will not endanger public health, damage public or private property, or affect adversely any portion of the work under construction or completed by him or any other Contractor. Contractor shall obtain written permission from the Owner for any property involved before digging ditches or constructing water courses for the removal of water.

F. The disposal of water from the dewatering system shall meet the requirements of all regulatory agencies having jurisdiction.

G. If the dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, then loosening of the foundation strata, or instability of the slopes, or damage to the foundations or structures may occur. The supply of all labor and materials, and the performance of all work necessary to carry out additional work for reinstatement of the structures of foundation soil resulting from such inadequacy or failure shall be undertaken by the Contractor subject to the approval of the Engineer, and at no additional expense to the Owner.

3.04 ROCK EXCAVATION

A. Definition of Mass Rock (only for payment purposes where payment is on a unit quantity basis): Any material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a minimum draw bar pull rated at not less than 56,000 pounds (comparable to Caterpillar D 8K or comparable to Caterpillar 973 front-end loader, and occupying an original volume of at least one cubic yard). The Engineer shall be the sole determinate as to the limits to which the material is classified as rock.

B. Definition of Trench Rock (only for payment purposes where payment is on a unit quantity basis): Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 25,700 pounds (Caterpillar Model 225 or equivalent), and occupying an original volume of at least one-half (1/2) cubic yards.

C. Excavation: Where rock is encountered within excavation for structures, it shall be excavated to the lines and grades indicated on the Drawings or as otherwise directed by the Engineer. The Contractor shall be responsible for obtaining any blasting permits required.

D. Blasting: Blasting operations shall be conducted in accordance with all existing

ordinances and regulations. All structures shall be protected from the effects of the blast. Blasting shall be performed and supervised by qualified and licensed workers. Dispose of excavated rock in accordance with applicable federal, state, county and local regulations.

E. If excess excavation is made or the material becomes disturbed so as to require removal below final subgrade elevations or beyond the prescribed limits, the resulting space shall be refilled with concrete in accordance with Section 2.08 of this Specification

3.05 SHEETING, BRACING AND SHORING

A. Trench Shield: A trench shield or box may be used to support the trench walls. The use of a trench shield does not necessarily preclude the additional use of bracing and sheeting. When trench shields are used, care must be taken to avoid disturbing the alignment and grade of the pipe or disrupting the haunching of the pipe as the shield is moved. When the bottom of the trench shield extends below the top of the pipe, the trench shield will be raised in 6-inch increments with specified backfilling occurring simultaneously. At no time shall the trench shield be "dragged" with the bottom of the shield extending below the top of the pipe or utility.

B. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the utility and adjacent property. Leave sheeting in place when in the opinion of the Engineer it cannot be safely removed or is within three feet of an existing structure, utility, or pipeline. Cut off any sheeting left in place at least two feet below the surface.

C. Sheet piling within three feet of an existing structure or utility shall remain in place, unless otherwise directed by the Engineer.

3.06 TRENCH FOUNDATION AND STABILIZATION

A. The bottom of the trench shall provide a foundation to support the utility and its specified bedding. The trench bottom shall be graded to support the utility and bedding uniformly throughout its length and width.

B. If, after dewatering as specified above, the trench bottom is spongy, or if the trench bottom does not provide firm, stable footing and the material at the bottom of the trench will still not adequately support the utility, the trench will be determined to be unsuitable.

C. If in the opinion of the Engineer the undisturbed material at the trench bottom constitutes an unstable pipe foundation, then the Contractor shall replace such unstable materials with crushed stone.

D. If the crushed stone does not provide adequate foundation, then the trench shall be excavated to a depth of at least two feet below the specified trench bottom. The over excavation shall be filled with No. 4 foundation stone to the bottom of the

bedding stone or the over excavation shall be lined with filter fabric, with the fabric being supported along the sides of the trench to a point above the top of the utility. The trench shall then be filled with No. 57 foundation stone to the top of the pipe and the filter fabric shall be overlapped above the pipe and stone.

3.07 BEDDING AND HAUNCHING

A. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders or large dirt clods.

B. Bedding material shall be placed to provide uniform support along the bottom of the pipe and to maintain the pipe at the proper elevation. The initial layer of bedding placed to receive the pipe shall be brought to the grade and dimensions indicated on the Drawings. All bedding shall extend the full width of the trench bottom. The pipe shall be placed and brought to grade by tamping the bedding material or by removal of the excess amount of the bedding material under the pipe. Adjustment to grade line shall be made by scraping away or filling with bedding material. Wedging or blocking up of pipe shall not be permitted. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except at joints.

C. At each joint, excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.

D. After the pipe section is properly placed, add the haunching material to the specified depth. The haunching material shall be shovel sliced, tamped, vigorously chinked or otherwise consolidated to provide uniform support for the pipe barrel and to fill completely the voids under the pipe, including the bell hole. Prior to placement of the haunching material, the bedding shall be clean and free of any water, loose rocks, boulders or dirt clods.

E. Gravity Pipelines and Accessories: Lay PVC (plastic pipe) gravity sewer pipe with minimum Class B bedding. Lay all other gravity sewer pipelines with Class C bedding, unless shown or specified otherwise. All trenches under paving, concrete, etc. shall be placed in Class B bedding only.

F. Bedding for storm drain piping shall be as specified in Section 02635 Storm Drainage Piping.

G. Manholes: Excavate to a minimum of 12-inches below the planned elevation of the base of the manhole. Place and compact crushed stone bedding material to the required grade before constructing the manhole.

H. Pressure Mains

Bedding and haunching for pressure pipe shall be with Class II or III soils compacted to 90% of standard proctor density. All trenches under paving, concrete, etc. shall be placed in Class B bedding only.

I. Excessive Width and Depth

1. If the trench is excavated in excess of the pipe diameter plus two feet, provide the next higher bedding type.

2. If the trench is excavated to excessive depth, provide foundation stone to the bottom of the bedding material.

J. Compaction: Bedding and haunching materials under pipe, manholes and accessories shall be compacted to a minimum of 95 percent of the maximum dry density, unless shown or specified otherwise.

3.08 CONCRETE ENCASEMENT FOR PIPELINES

Where concrete encasement is shown on the Drawings for pipelines not under structures, excavate the trench to provide a minimum of 6-inches clearance from the bell of the pipe. Lay the pipe to line and grade on concrete blocks. In lieu of bedding, haunching and initial backfill, place concrete to the full width of the trench and to a height of not less than 6-inches above the pipe bell. Do not backfill the trench for a period of at least 24 hours after concrete is placed.

3.09 CONCRETE ENCASEMENT FOR ELECTRICAL DUCT BANKS

A. Install top of duct bank minimum 18-inches below finished grade with plastic warning tape 12-inches below finished grade.

B. Terminate conduit in end bell at manhole entries.

C. Stagger conduit joints in concrete encasement 6-inches minimum.

D. Provide minimum 3-inch concrete cover at bottom, top, and sides of duct bank. Use suitable separators and chairs installed not greater than four feet on center to provide conduit spacing as indicated. Securely anchor conduit to prevent movement during concrete placement.

E. Where duct bank passes beneath footings or slabs, excavate to provide a minimum of 6-inches clearance between the conduits and the structure. Backfill to the base of the structure with concrete.

3.10 INITIAL BACKFILL

A. Fill up to subgrade elevations unless otherwise indicated.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction

density.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

G. Correct areas that are over-excavated.

1. Thrust bearing surfaces: Fill with concrete.
2. Other areas: Use general fill, flush to required elevation, compacted to minimum 98 percent of standard proctor dry density.

H. Compaction Density Unless Otherwise Specified or Indicated:

1. Under paving, slabs-on-grade, and similar construction: 98 percent of standard proctor density.
2. At other locations: 95 percent of standard proctor density.

3.11 FINAL BACKFILL

A. Backfill to contours and elevations indicated using suitable materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

G. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

H. Compaction Density Unless Otherwise Specified or Indicated:

1. Under paving, slabs-on-grade, and similar construction: 98 percent of standard proctor density.
2. At other locations: 95 percent of standard proctor density.

I. Reshape and re-compact fills subjected to vehicular traffic.

3.12 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.13 CLEAN-UP

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 02370
EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 SCOPE

A. This section covers the control measures required but not limited to during construction until final acceptance to control water run-off, erosion, sedimentation, and unreasonable amounts of dust. Measures to adequately control erosion and siltation throughout project construction are required whether or not they are shown on the plans. This control shall be accomplished through the use of berms, dikes, sediment basins and barriers, slope drains, grassing, and other devices as outlined in the **Georgia Erosion and Sedimentation Control Act of 1975 and any additional federal or local ordinances. All erosion and control measures shall be designed for a 25 year storm event and installed according to the Manual for Erosion and Sediment Control in Georgia (1975 and as amended in the latest edition) and/or The Department of Transportation, State of Georgia, Standard Specifications Construction of Roads and Bridges Latest Edition. Also, Storm Water Discharge(s) will be in strict compliance with State of Georgia Department of Natural Resources Environmental Protection Division General Permit No. GAR 100001, 100002, OR 100003 effective August 13, 2003 (as applicable).**

B. The section also specifies the subsequent removal of temporary erosion and sedimentation controls.

C. Grassing in accordance with this Specification is considered a temporary measure to prevent soil erosion until the permanent grassing can be established. See Section 02920 Lawns and Grassing for permanent grassing requirements.

D. Land disturbance activity shall not commence until the Commercial Development Permit/Land Disturbance Permit has been issued.

E. The LDP/Land disturbance permit shall be obtained and paid for by the Owner.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 – Site Preparation.

B. Section 02920 - Lawns and Grassing.

C. Section 02921 - Sodding.

1.03 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of these Specifications as if incorporated herein, except as modified herein to the extent referenced. Referenced standards and recommended practices shall be the latest versions of any such documents. The contractor shall be responsible for complying with requirements of these regulations.

B. Environmental Protection Agency (EPA) Regulations:

1. 40 CFR 112 Oil Pollution Prevention
2. 40 CFR 116 Designation of Hazardous Substances
3. 40 CFR 122 EPA Administered Permit Programs: The National Pollutant Discharge Elimination System (NPDES)
4. 40 CFR 136 The National Pollutant Discharge Elimination System (NPDES)
5. 40 CFR 257 Criteria for Classification of Solid Waste Disposal Facilities and Practices
6. 40 CFR 258 Criteria for Municipal Solid Waste Landfills (Effective 10-9-93)
7. 40 CFR 261 Identification and Listing of Hazardous Waste
8. EPA 833-B-92-001 "NPDES Storm Water Sampling Guidance Document

C. Georgia Environmental Protection Division (EPD) Rules:

1. Chapter 391-3-4 Solid Waste Management Rules

1.04 QUALITY ASSURANCE

A. The temporary and permanent erosion and sedimentation control measures shown on the Drawings are minimum requirements. Any additional erosion and sedimentation control measures required by the Contractor's means, methods, techniques and sequence of operation will be installed by the Contractor at the unit price bid indicated on the Bid Schedule.

B. **The Contractor shall be required to meet the requirements of the National Pollution Discharge Elimination System (NPDES) GAR 100001, 100002, or 100003 dated August 13, 2003 (as applicable).** The Contractor will be required to follow all BMPs (Best Management Practices) as shown on the Erosion, Sedimentation and Pollution Control Plan and shall inspect, monitor and maintain those BMPs as required by the above permit. The Contractor will be required to notify the storm water sampling subcontractor whenever there is a storm occurrence and to make required reports to EPD General Permit.

C. Basic Principles

1. Coordinate the land disturbance activities to fit the topography, soil types and conditions.
2. Minimize the disturbed area and the duration of exposure to erosive elements.

3. Provide temporary or permanent stabilization to disturbed areas immediately after rough grading is complete.
4. Safely convey run-off from the site to a stable outlet to prevent flooding and damage to downstream facilities resulting from increased runoff from the site.
5. Retain sediment on-site that was generated on-site.
6. Minimize encroachment upon watercourses.

D. Implementation:

1. The Contractor is solely responsible for the control of erosion within the Project site and the prevention of sedimentation from leaving the Project site or entering waterways.
2. The Contractor shall install temporary and permanent erosion and sedimentation controls, which will ensure that runoff from the disturbed area of the Project site, shall pass through a filter system before exiting the Project site.
3. The Contractor shall provide temporary and permanent erosion and sedimentation control measures to prevent silt and sediment from entering the waterways.
4. The Contractor shall limit land disturbance activity to those areas shown on the Drawings.
5. The Contractor shall maintain erosion and sedimentation control measures within disturbed areas on the entire site at no additional cost to the Owner until the acceptance of the Project. Maintenance shall include mulching, re-seeding, re-sodding, clean-out of sediment barriers and sediment ponds, replacement of washed-out or undermined rip rap and erosion control materials, to the satisfaction of the Engineer.
6. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor.

PART 2 PRODUCTS

2.01 BEST MANAGEMENT PRACTICES

The vegetative measures and structural practices shall be in accordance with chapter six of the "Manual for Erosion and Sediment Control in Georgia" as currently amended.

2.02 NPDES STORMWATER SAMPLING

Please refer to Part IV.D.5 of the specifications for NPDES Permit No. GAR 100001, 100002 or 100003 (as Applicable). Also, refer to the Erosion, Sediment and Pollution Control Narrative and Comprehensive Monitoring Program general notes on the construction plans. Monitoring locations are shown on the plans and shall be sampled with the following Automatic Sampler.

The Global Water Stormwater Sampler, SS505 or approved equal, is designed specifically to meet federal and state storm water sampling requirements. The Global Stormwater Sampler shall consist of a rugged, rainproof lockable carrying enclosure. Inside the enclosure shall be

a 1.0 liter polyethylene sample bottle, a peristaltic sampling pump, a logic timer/controller, and a rechargeable 5 Ah gel cell battery. Electronic circuits shall be fully encapsulated in epoxy eliminating failure due to moisture. The sampler shall include an auto-drain rain gauge, sampler pickup hose and a battery charger.

PART 3 EXECUTION

3.01 GENERAL

A. The 24-hour contact is: **???.**

B. All erosion and sedimentation control devices and structures shall be inspected by the Contractor at least once a week and immediately after each rainfall occurrence. Any device or structure found to be damaged will be repaired or replaced by the end of the day**.**

C. All erosion and sedimentation control measures and devices shall be constructed and maintained as indicated on the Drawings or specified herein until adequate permanent disturbed area stabilization has been provided and accepted by the Engineer. Once adequate permanent stabilization has been provided and accepted by the Engineer, all temporary erosion and sedimentation control structures and devices shall be removed.

3.02 INSTALLATION

A. Construction Exit

1. Construction exit(s) shall be placed as shown on the Drawings and as directed by the Engineer. A construction exit shall be located at any point traffic will be leaving a disturbed area to a road, driveway, sidewalk or parking area.
2. Placement of Construction Exit Material: The ground surface upon which the construction exit material is to be placed shall be prepared to a smooth condition free from obstructions, depressions or debris. The plastic filter fabric shall be placed to provide a minimum number of overlaps and a minimum width of one foot of overlap at each joint. The stone shall be placed with its top elevation conforming to the surrounding roadway elevations. The stone shall be dropped no more than three feet during construction.
3. Construction Exit Maintenance: The Contractor shall regularly maintain the exit with the top dressing of stone to prevent tracking or flow of soil onto public rights-of-way and paved surfaces as directed by the Engineer.
4. Construction Exit Removal: Construction exit(s) shall be removed and properly disposed of offsite when the disturbed area has been properly stabilized, the tracking or flow of soil onto public rights-of-way or paved surfaces has ceased and as directed by the Engineer.

B. Sediment Barriers

1. Sediment barriers shall include, but are not necessarily limited to, silt fences,

hay bales, rock check dams, inlet sediment traps or any other device which prevents sediment from exiting the disturbed area.

2. Silt fences, hay bales and rock check dams shall not be used in any flowing stream, creek or river.
3. Sediment barriers shall be installed as shown on the Drawings and as required by the Contractor's construction sequence and methods.
4. Sediment barriers shall be maintained to ensure the depth of impounded sediment is no more than one-half of the original height of the barrier. Torn, damaged, destroyed or washed-out barriers shall be repaired, reinforced or replaced with new material.
5. Sediment Barrier Removal

    a. Sediment barrier shall be removed once the disturbed area has been stabilized with a permanent vegetative cover and the sediment barrier is no longer required.
    b. Accumulated sediment shall be removed from the barrier and spread over excess soil disposal area.
    c. All non-biodegradable parts of the barrier shall be disposed of properly. Used bales may be spread evenly across the disposal area as a mulching material.
    d. The disturbed area created by barrier removal shall be permanently stabilized.

C. Temporary Sediment Basins and Water Quality Ponds

1. Pond maintenance shall follow the following outline.

    a. Initial Cleaning.
    Clean all ponds of accumulated silt to low level elevation shown on drawings. Initial cleaning shall be accomplished within 90 days of the Notice to Proceed.
    b. Intermediate Cleanings.
    Whenever silt accumulation reaches the maximum level shown on drawings, silt shall be removed to the low level as shown in the drawings. Intermediate cleanings shall be done as often as necessary to keep silt accumulation below the maximum level.
    c. Final Cleaning.
    After all utility work, final grading, sidewalks and roads, and soil stabilization is complete, the Contractor shall clean the ponds of accumulated silt to their low level.
    d. After final cleaning of ponds, the slopes and bottoms shall be seeded for a permanent grass establishment. The contractor shall schedule the cleaning to coincide with the proper planting season for the permanent grass.

D. Rip Rap

1. Rip rap shall be placed as shown on the Drawings and as directed by the Engineer. Rip rap shall be placed at all points where natural vegetation is

disturbed on the banks of streams or drainage ditches. Compact backfill and place rip rap to prevent subsequent settlement and erosion. This requirement applies equally to construction along side a stream or drainage ditch as well as crossing a stream or drainage ditch.

2. When trenching across a stream or drainage ditch, rip rap to be placed shall be brought to the correct lines and grades before placement is commenced. Where filing of depressions is required, the new material shall be compacted with hand or mechanical tampers. Unless at creek banks or otherwise shown or specified, rip rap shall begin in a toe ditch constructed in original ground, and the side next to the fill or cut shall have that same slope. After the rip rap is placed, the toe ditch shall be backfilled and the excess dirt hauled off of the site and disposed of properly.

E. Filter Fabric

1. Plastic filter fabric shall be placed under all rip rap unless shown or specified otherwise.
2. Filter fabric shall not be placed under rip rap on stream or drainage ditch crossings.
3. The surface to receive filter fabric shall be prepared to a smooth condition free from obstructions, depressions and debris. The filter fabric shall be installed with the long dimension running up the slope and shall be placed to provide a minimum number of overlaps. The fabric shall be placed to provide a minimum width of one foot of overlap at each joint. The fabric shall be anchored in place with securing pins of the type recommended by the fabric manufacturer. Pins shall be placed on or within 3-inches of the centerline of the overlap. The fabric shall be placed loosely to avoid stretching and tearing during the placement of the stone. The fabric shall be protected at all times during construction from clogging due to clay, silts, chemicals or other contaminants. Contaminated fabric or fabric damaged during installation or during placement or rip rap shall be removed and replaced with uncontaminated and undamaged fabric at no additional cost to the Owner.

F. Temporary Stream Crossing

Construction operations in rivers, streams, and impoundments shall be restricted to those areas, which must be entered for the construction of temporary or permanent structures. As soon as conditions permit, rivers, streams, and impoundments shall be promptly cleared of all false work, piling which are to be removed, debris, and other obstructions placed therein or caused by the construction operations. Frequent fording of live streams with construction equipment will not be permitted; therefore, temporary bridges or other structures shall be used whenever an appreciable number of stream crossings are necessary. Mechanized equipment shall not be operated in live streams except as may be required to construct channel changes and temporary or permanent structures, and to remove temporary structures.

3.03 INSTALLATION (VEGETATIVE MEASURES)

A. Mulching

Temporary mulching or grassing may be required by the Engineer where construction or conditions prohibit completion in a continuous manner and surface erosion is probable. See Section 02920 - Lawns and Grassing and Section 02921 – Sodding for additional requirements.

B. Grassing

1. Seed rate, fertilization and other requirements shall be provided as shown on the Drawings.
2. Temporary stabilization: Temporary stabilization shall be provided as shown on the Drawings and conforming to these specification to control erosion on the site. Temporary stabilization shall be provided to any area which will not receive permanent stabilization within the next 14 calendar days. Partial payment requests may be withheld for those portions of the Project not complying with this requirement.
3. Permanent Stabilization

    a. Permanent stabilization shall be provided as shown on the Drawings and conforming to specification Sections 02920 and 02921 to control erosion on the site. Permanent stabilization shall be provided to all areas of land disturbance within seven calendar days of the completion of land disturbance for nay area greater than 0.25 acre. Partial payment requests may be withheld for those portions of the Project not complying with requirement.
    b. Where permanent stabilization cannot be immediately established because of an inappropriate season, the Contractor shall provide temporary stabilization. The Contractor shall return to the site at the appropriate season to provide permanent stabilization in areas that received only temporary stabilization.

C. Matting and Blankets

Matting and Blankets (Mb) shall be installed on all slopes four horizontal to one vertical and steeper. The Mb shall be installed immediately after slope is final graded and seeding is complete. The matting shall be secured with staples one per square yard.

3.04 FIELD QUALITY CONTROL

All erosion and sedimentation control devices and structures shall be inspected by the Contractor at least once a week and immediately prior to each rainfall occurrence. Any device or structure fund to be damaged will be repaired or replaced by the end of the day. Sediment ponds shall be cleaned out prior to the silt reaching the height or elevation shown on the Drawings.

3.05 CLEAN-UP

A. Dispose of all excess erosion and sedimentation control materials in a manner satisfactory to the Engineer.

B. Final clean-up shall be performed in accordance with the requirements of these Specifications.

END OF SECTION

SECTION 02531
SANITARY SEWER FORCE MAIN

PART 1 GENERAL

1.01 SCOPE

A. Furnish all labor, equipment, materials for the construction of all sanitary sewer force main(s) shown on the drawings, including pipe, bends, connections, air release/and or vacuum valves, and all other appurtenances specified and/or required.

B. Site piping covered under this Section shall begin at the outside face of structures and buildings, except where there is no joint at the outside face, then site piping shall begin not more than two feet beyond the face of the structure or building. Piping covered under this section shall also include piping within miscellaneous vaults such as valve vaults.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02317 - Trench Excavation and Backfill

B. Section 02445 – Jack and Bore Crossings

C. Section 02532 – Sanitary Sewers

D. Section 03305 – Cast-In-Place Concrete

1.03 SUBMITTALS

Complete product data and engineering data, including shop drawings, shall be submitted to the Engineer in accordance with the requirements of Section 01330 of the Contract Documents.

1.04 TRANSPORTATION AND HANDLING

A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.

B. Handling: Handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front end loader. Do not use material damaged in handling. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe. Do not use chains in handling pipe, fittings and appurtenances.

1.05 STORAGE AND PROTECTION

A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.

B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves shall be drained and stored in a manner that will protect them from damage by freezing.

C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.

D. Stored mechanical and push-on joint gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

E. Mechanical-joint bolts shall be handled and stored in such a manner that will ensure proper use with respect to types and sizes.

PART 2 PRODUCTS

2.01 FORCE MAIN PIPE

A. PVC PIPE:
PVC Force main pipe shall be factory dyed industry standard GREEN in color.

1. MATERIAL

PVC Pipe for sewer force mains 4” inches through 12” inches shall conform to AWWA C900, DR 18 (100psi), latest revision.
PVC Pipe less than 4” inches in diameter shall be Class 200, DR21 conforming to ASTM D2241, latest revision with pipe made from PVC 1120 material.

B. DUCTILE IRON PIPE:

Ductile Iron Pipe – DIP shall be pressure class 350 for 4" thru 12", and class 250 for 14" thru 20". The pipe shall be coated on the interior with 40 mils nominal dry film thickness of PROTECTO 401 Ceramic Epoxy within 8 hours of surface preparation as manufactured by U.S. Pipe or “SewperCoat” with Calcium Aluminate as manufactured by Lafarge or approved equal. Ductile Iron Pipe designed and manufactured in accordance with ANSI A21.51 centrifugally cast in metal or sand lined molds. Exterior surface shall be seal coated with 1 mil thick approved asphaltic coating in accordance with ANSI/AWWA C151/A21.51.

C. HIGH DENSITY POLYETHYLENE PIPE (C906): **Sanitary Sewer Force Mains**:

High density polyethylene **Sanitary Sewer Force Main** pipe in sizes 4" and above shall be joined by means of zero leak-rate heat-fusion, and approved mechanical joints, meeting the specifications and requirements of American Water Works Association Standard C906 and ASTM F714.

The polyethylene pipe and fittings shall be made from virgin resins exhibiting a cell classification of PE 345464C for black and a cell classification of PE 345464E for stripes per ASTM D3350; and shall be Listed in the name of the pipe and fitting Manufacturer in PPI (Plastics Pipe Institute) TR-4, *Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds*, with a standard grade HDB rating of 1600 psi at 73°F.

The wall thickness shall follow the Dimension Ration (DR) system prescribed in AWWA C906. Laying lengths are 40 ft standard. The pipe is to be joined by heat fusion, flanges or other mechanical joint systems proven for HDPE pipes. HDPE shall be the DR as shown on plans or Bid Form. The DIPS longitudinal color stripe pattern shall have three equally spaced pairs of **GREEN** color stripes extruded into the pipe OD for **Sanitary Sewer Force mains**. The pipe shall be DRISCOPLEX 4300 or approved equal.

D. HIGH DENSITY POLYETHYLENE PIPE: **Raw, Treated or Reclaimed Water:**

High density polyethylene **Raw, Treated or Reclaimed Water** pipe in sizes 4" and above shall be joined by means of zero leak-rate heat-fusion, and approved mechanical joints, meeting the specifications and requirements of American Water Works Association Standard C906 and ASTM F714.

The polyethylene pipe and fittings shall be made from virgin resins exhibiting a cell classification of PE 345464C for black and a cell classification of PE 345464E for stripes per ASTM D3350; and shall be Listed in the name of the pipe and fitting Manufacturer in PPI (Plastics Pipe Institute) TR-4, *Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds*, with a standard grade HDB rating of 1600 psi at 73°F.

The wall thickness shall follow the Dimension Ration (DR) system prescribed in AWWA C906. Laying lengths are 40 ft standard. The pipe is to be joined by heat fusion, flanges or other mechanical joint systems proven for HDPE pipes. HDPE shall be the DR as shown on plans or Bid Form. The DIPS longitudinal color stripe pattern shall have three equally spaced pairs of **GREEN** color stripes extruded into the pipe OD for **Raw, Treated or Reclaimed Water** mains. The pipe shall be DRISCOPLEX 4500 or approved equal.

2.02 JOINTS AND GASKETS

A. PUSH-ON JOINTS:

1. DIP Push-on joints shall conform to AWWA C111/ANSI A21.11 (latest revision) - Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings. Details of the joint design shall be in accordance with the manufacturer's standard practice such as "Fastite", "Bell-Tite," "Tyton," or equal joints. Gasket material shall be standard styrene butadiene copolymer (SBR).

   Whenever the pipe is cut in the field, the cut end shall be conditioned so it can be used in making up a joint by filing or grinding the cut end to remove burrs or sharp edges that might damage the gasket.

2. PVC Push-on joints shall be an elastomeric gasketed joint. Insertion and lubrication of the elastomeric gasket in the annular groove must be as recommended by the manufacturer.

B. RESTRAINED JOINTS:

Restrained joints for DIP shall be obtained by the installation of “Field Lok”, “TR Flex”, “Fast-Grip”, “Flex-Ring”, MEGALUG by EBAA Iron, Inc.or approved equal. These restraint glands shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1.

Tyton Joint Pipe with “Field Lok Gaskets”, Fastite Pipe with “Fast-Grip Gaskets” or DIP or PVC Pipe with EBAA Iron, Inc. pipe restraints or approved equal.

All underground creek crossings and jack and bores with steel casing shall use “Field Lok” or “Fast-Grip” restrained joints.

C. FLEXIBLE JOINTS:

Flexible joints shall be American Pipe "Flex Lok", Clow "Ball and Socket", U. S. Pipe "Usiflex", EBAA Iron Inc. FLEX-900 or approved equal. Piping shall have a minimum working pressure rating of 250 PSI and a minimum allowable joint deflection of 15^{o}.

D. MECHANICAL JOINTS:

Mechanical joints for DIP and PVC shall consist of a bolt joint of the stuffing box type as detailed in AWWA C110/ANSI A21.10 (latest revision) and described in AWWA C111/ANSI A21.11 (latest revision) - Rubber Gasket Joints shall be SBR rubber and conform to AWWA C111/ANSI A21.11 (latest revision).

E. FLANGED JOINTS:

Flanged joints shall conform to AWWA C110/ANSI A21.10 (latest revision). Gaskets shall be SBR rubber per ANSI/AWWA C111/A21.11. This rubber compound is NSF 61 certified for contact with potable water or other approved quality shall be used in all flanged joints. The bolts and nuts shall conform in dimensions to the American Standard heavy series.

"KWIK" or Uni-Flange adaptors for plain and pipe shall be used only when authorized by the Engineer. Set screws shall be self-torquing or be properly torqued during installation with a torque wrench.

F. FUSION JOINTS:

1. Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. All welds will be made using a Data Logger to record temperature, fusion pressure, with a graphic representation of the fusion cycle shall be part of the Quality Control records.
2. Sidewall fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer’s specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused.
3. Mechanical joining will be used where the butt fusion method can not be used. Mechanical joining will be accomplished by either using a HDPE flange adapter with a Ductile Iron back-up ring or HDPE Mechanical Joint adapter with a Ductile Iron back-up ring.
4. Socket fusion, hot gas fusion, threading, solvents, and epoxies will not be used to join HDPE pipe.

G. Transition Couplings – Couplings shall be ductile iron conforming to ASTM A-536. Coupling shall be as manufactured by Ford, Dresser, and JCM or approved equal.

2.03 PIPE FITTINGS, SPECIALS AND MISC.

A. POLYVINYL CHLORIDE PIPE:

Fittings used on 4" thru 10” PVC Pipe transitions shall be mechanical or restrained joints as manufactured by American Pipe, U.S. Pipe, Clow or EBAA Iron Inc.

B. DIP FITTINGS AND SPECIALS:

Shall be manufactured in the USA. Mechanical joint fittings shall conform to either AWWA C110 or AWWA C153 (Compact Fittings). Minimum pressure rating for fittings shall be 350 psi. All other fittings shall conform to AWWA C110. The pipe shall be coated on the interior with 40 mils nominal dry film thickness of PROTECTO 401 Ceramic Epoxy within 8 hours of surface preparation as manufactured by U.S. Pipe or “SewperCoat” with Calcium Aluminate as manufactured by Lafarge or approved equal. Unless otherwise noted on the plans, fittings for underground installation shall be mechanical joint conforming to AWWA C111, and fittings for above ground installation shall be flanged conforming to ANSI B16.1 Class 125. Minimum pressure rating for fittings shall be 250 psi. Fittings and specials shall be completed with rings, bolts, gaskets, etc., for joints.

C. POLYETHYLENE PIPE (HDPE):

1. Butt Fusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded & fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified in the plans. Fabricated fittings are to be manufactured using Data Loggers. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records. All fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the Working Pressure Rating (WPR) of the fitting.
2. Electrofusion Fittings - Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans. All electrofusion fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the Working Pressure Rating (WPR) of the fitting.
3. Flanged and Mechanical Joint Adapters - Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D3261. Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans.

PART 3 EXECUTION

3.01 EXISTING UNDERGROUND UTILITIES AND OBSTRUCTIONS

A. The plans indicate utilities and obstructions that are known to exist according to the best information available to the Owner.

B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.

1. Expose the facility, for a distance of at least 100 feet in advance of pipeline construction, to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.
2. Avoid utility damage and interruption by protection with means or methods recommended by the utility owner.

C. Conflict with Existing Utilities

1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed piping does not permit safe installation of the piping by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the piping to avoid horizontal conflicts if the new alignment complies with regulatory agency requirements and after a written request to and subsequent approval by the Engineer. Where such relocation of the piping is denied by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.
2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed piping does not permit the crossing without immediate or potential future damage to the utility, main, service, or the piping. The Contractor may change the proposed grade of the piping to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the Engineer.

D. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

E. Sewer and Water Separation

1. Sewer force mains should maintain a minimum 10 foot edge-to-edge separation from potable water lines. If the main cannot be installed providing the 10 foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of 18-inches above the top of the sewer. Should neither of these two separation criteria be possible, the potable water main shall be installed below the sewer with a minimum vertical separation of 18-inches and

the water main shall be encased in concrete with a minimum depth of 6-inches.

2. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.

3.02 INSTALLATION IN TRENCH

A. Proper and suitable tools and appliances for safe and convenient handling and installing of pipe and fittings shall be used. Great care shall be taken to prevent pipe coatings from being damaged, particularly calcium aluminate cement linings on the inside of D.I.P. pipes and fittings. Any damage shall be remedied as directed. All pipe and fittings shall be carefully examined by the Contractor for defects just before installing and no pipe or fitting shall be installed which is defective.

B. If any defective pipe or fitting is discovered after having been installed, it shall be removed and replaced in a satisfactory manner with a sound pipe or fitting by the Contractor at his own expense. All pipes and fittings shall be cleaned before they are installed and shall be kept clean until they are used in the completed work. Open ends of pipe shall be kept plugged with a bulkhead during construction.

C. Force mains shall be installed on a 4" Class II or III select natural material bedding as specified in Section 02317 Trench Excavation and Backfill with O.D./2 haunching. The compaction for bedding and haunching shall be 90% of Standard Proctor Density as determined by (ASTM D698). Pipe shall not be installed within 6 inches of rock. In trench rock conditions, a minimum of 6 inches of sand or approved suitable soil shall be placed on rock prior to pipe installation. Trenches shall be kept free of water.

D. Where bends and tees occur in pressure mains, the Contractor will pour a block of concrete at the bend or tee as detailed on the Plans. The block shall consist of 3000 psi concrete, and shall be of size and shape as shown on the plans or as directed by the Engineer. The Contractor may use forms or either walls to mold the "thrust block;" however, if earth walls are used they shall be cut true to shape with all excess earth removed and the work shall be done in such a manner that no loose earth will become mixed with the fresh concrete. The Engineer shall inspect all thrust blocks prior to them being covered.

E. All ductile iron pipe laid underground shall be mechanical joint pipe and fittings or "push-on" type joint unless otherwise shown on the plans or directed by the Engineer.

F. All force mains laid underground shall have a minimum of 42 inches of cover above the top of the pipe in non GA DOT R/W and a minimum of 48 inches of cover above the top of the pipe in GA DOT R/W unless otherwise shown on the plans, or unless otherwise directed by the Engineer.

G. All force mains laid under existing water mains, sewers, storm drains, culverts, structures, etc., shall have a minimum clearance of 18 inches between the outside

wall of the force main pipe and the outside surface of the existing pipe or structure.

3.03 PIPE JOINTING

A. MECHANICAL AND RESTRAINED JOINTS:

Clean spigot and bell of foreign material and apply soapy water containing chlorine solution before slipping gasket and gland over spigot end of pipe. Small side of gasket and lip of gland must face the socket. Paint gasket with soapy solution and place spigot end of pipe securely home in socket. Push gasket evenly into position in socket, slide gland into position and tighten bolts with fingers.

Tighten bolts to uniform tightness with ratchet wrench by tightening bottom bolt and then top bolt. Thereafter, all bolts shall be tightened in sequence of 180 degrees apart until all bolts are within the range of torque recommended by the manufacturer.

B. PUSH-ON JOINTS:

Jointing shall be made with rubber gaskets and lubricant furnished by the manufacturer in strict accordance with the manufacturer's recommendations. Prepare field cut pipe by filing 1/8 inch 30 degree bevel on pipe end to avoid injuring gasket.

C. THREADED FLANGE JOINT:

Insert recommended manufacturer’s gasket and tighten bolts to uniform tightness with ratchet wrench by tightening bottom bolt and then top bolt. Thereafter, all bolts shall be tightened in sequence of 180 degrees apart until all bolts are within the range of torque recommended by the manufacturer.

D. POLYVINYL CHLORIDE PIPE:

Do not thread PVC pipe. When threads are necessary, adaptors will be used. Use strap wrenches to couple threaded PVC pipe fittings and use lubricant recommended by pipe manufacturer.

Avoid excessive torque and do not score pipe. Use couplings furnished with pipe for fittings and install in strict accordance with the manufacturer's recommendations.

E. POLYETHYLENE PIPE (HDPE):

Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. All welds will be made using a Data Logger to record temperature, fusion pressure, with a graphic

representation of the fusion cycle shall be part of the Quality Control records.

3.04 PIPELINE DETECTION MARKING

A. All metallic force mains shall be protected by a 6" wide plastic marking tape placed a minimum of 12 inches above the top of pipe for its full length. The tape shall be equal to Reef Industries Terra Tape Extra Stretch™. It will have sufficient thickness; tensile strength; elongation and resistance to alkalis, acids and other destructive agents to remain a permanent marker of the line buried below. A message shall be printed on the tape at least every 30 inches "**CAUTION SEWER LINE BURIED BELOW**", "**CAUTION RAW WATER LINE BURIED BELOW"** or **"CAUTION TREATED/RECLAIM WATER LINE BURIED BELOW"**.

B. All non-metallic force mains shall be protected by a 6" wide metalized foil tape buried a minimum of 12 inches above the top of the pipe for its full length. The foil shall be protected by plastic film laminated on each side. The lamination shall be strong enough to prevent the separation of foil and plastic film. The tape should be equal to Reef Industries Terra Tape Sentry Line® Reinforced Detectable. It shall be inductively locatable and conductively traceable using a standard pipe and cable-locating device. A message shall be printed on the tape every 30 inches "**CAUTION SEWER LINE BURIED BELOW**", "**CAUTION RAW WATER LINE BURIED BELOW"** or **"CAUTION TREATED/RECLAIM WATER LINE BURIED BELOW"**.

C. Tracing Wire shall be single strand #12 AWG, Vinylon – A THWN or THHN or gasoline and oil resistant II VW 600V or AWM.

3.05 PRESSURE TESTING

A. Hydrostatic testing shall be performed on lines after pipe has been laid and backfilled between joints, all newly laid pipe, or any valved section thereof. The pipe shall be subjected to a hydrostatic gauge pressure of at least (150%) of the rated working pressure of the pipe for two hours and not less than (125%) at the high point per AWWA C600 (DIP) and AWWA C605 (PVC). Working pressure is defined as maximum anticipated sustained operating pressure. In no case shall the test pressure be allowed to exceed the design pressure for pipe, appurtenances, or thrust restraints.

1. The Contractor shall have the responsibility to ensure that all outlets are closed by valves or plugged and braced to prevent blowouts. Pressurizing equipment shall be constantly monitored or include a regulator or relief valve to avoid over pressurizing and damaging an otherwise acceptable line. No one shall be allowed in manholes, wet wells, valve pits, etc. during testing.
2. To prepare the line for testing, the contractor shall backfill all pipe and provide all reaction blocking before hydrostatic testing. The Engineer may direct the Contractor to leave certain joints and connections uncovered until testing has been completed. All pipe outlets shall be secured to resist the test pressure. Clean out all debris in the pipe.

   The section of pipe under test shall be slowly filled with water and all air shall be expelled from the pipe. If blow-offs are not available at high places,

taps at points of highest elevation shall be made before the test and plugged during and after test.

3. Procedure; the specified test pressure, based on the elevation of the lowest point of the line or lowest point of the section under test and corrected to the elevation of the test gauge, shall be applied by means of a gasoline driven test pump connected to the pipe in a manner satisfactory to the Engineer. The Contractor shall meter the amount of water used during the test. The duration of the test shall be at least two consecutive hours.
   The Contractor shall locate and repair any and all leaks that may develop. All exposed pipe, fittings, valves, hydrants, and joints will be carefully examined during the test. Any cracked or defective pipe, fittings or valves discovered as a result of this test shall be removed and replaced with sound material, and the test shall be repeated until satisfactory to the Engineer.

B. Allowable leakage. The contractor shall furnish the gauges and measuring device for the leakage test, pump, pipe, connections, and all other necessary apparatus, unless otherwise specified, and shall furnish the necessary assistance to conduct the test. The duration of each leakage test shall be 2 hours, unless otherwise specified. During the test, the pipeline shall be subjected to the pressure stated above. Leakage shall be defined as the quantity of water that must be supplied into the pipe section being tested to maintain a pressure within 5 psi of the specified leakage-test pressure after the pipe has been filled with water and the air in the pipeline has been expelled. No installation will be accepted if the leakage is greater than that determined by the formula per AWWA C600 (DIP) and AWWA C605:

1) For DIP use:

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

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

This formula is based on an allowable leakage of 11.65 gpd/mi/in. of nominal diameter at a pressure of 150 psi.

2) For PVC use:

$$L = \frac{ND\sqrt{P}}{7{,}400}$$

Where:
L = allowable leakage, in gallons per hour
N = number of joints in the length of pipeline tested
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

This formula is based on an allowable leakage of 10.50 gpd/mi/in. of nominal diameter at a pressure of 150 psi.

3) Hydrostatic Leak Testing for HDPE:

This hydrostatic leak test procedure consists of filling, an initial expansion phase, a test phase, and depressurizing in accordance with **Chevron Phillips Chemical Co. Publication – Technical Note 802 – Leak Testing.**

a) Filling: Fill the restrained test section completely with a test liquid acceptable to the Owner.

WARNING – Ensure that there is no air trapped in the test section. Failure with entrapped air can result in explosive release and result in death or serious bodily injury. Use equipment vents at high points to remove air.

b) Initial Expansion Phase:
Gradually pressurize the test section to test pressure, and maintain test pressure for three (3) hours. During the initial expansion phase, polyethylene pipe will expand slightly. Additional test liquid will be required to maintain pressure. It is not necessary to monitor the amount of water added during the initial expansion phase.

c) Test Phase:
This alternative is applicable when the test pressure is 150% of the system design pressure.
Immediately following the initial expansion phase, monitor the amount of make-up water required to maintain test
pressure for one (1), or two (2), or three (3) hours. If the amount of make-up water needed to maintain test pressure does not exceed the amount in Table 2, no leakage is indicated.

Table 2 Test Phase – Make-Up Water Allowance:

Make-Up Water Allowance for Test Phase – (U.S. Gal/100 ft of pipe)			
Nominal Pipe size (in.)	1-Hour Test	2-Hour Test	3-Hour Test
4	0.13	0.25	0.40
6	0.3	0.6	0.9
8	0.5	1.0	1.5
10	0.8	1.3	2.1
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.0	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3

d) Depressurizing:

At the conclusion of the test, carefully depressurize the test section by the controlled release of test liquid. The test liquid may need to be drained and its disposal may be subject to regulations.

3.06 CLEANUP

Remove all surplus materials, tools, excess dirt, rubbish, and debris from the site as installation progresses. Clean as directed by the Engineer. Obtain letter of approval from the State Highway Department covering work installed in areas of State Highway jurisdiction. Contractor to maintain surface of ditches, unpaved streets, road shoulders, sod, grass, and other disturbed surfaces for a period of thirty (30) days thereafter.

END OF SECTION

SECTION 02532
SANITARY SEWERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. General:

Extent of sanitary sewer work is indicated on drawings and schedules, and by requirements of this section.

B. Damage to Existing Utility Lines:

Any damage done to existing utility lines, services, poles and structures of every nature shall be repaired or replaced by the Contractor at his own expense. The approximate position of certain known underground lines are shown on the Plans for information. Existing small lines may not be shown. The Contractor shall locate these and other possible unknown utility lines and shall excavate and expose all existing underground lines in advance of trenching operations.

Removing and relaying of such lines and appurtenances which constitute an obstruction to the completed lines and grade of the new work will be made at the expense of the Owner, unless otherwise shown on Plans to be altered by the Contractor.

At locations where the sewer is to be constructed in roadways, the Contractor shall take all precautions, and comply with all requirements, as may be necessary to protect the improvements, including installation and maintenance of lights and barricades for protection of traffic.

1.03 RELATED WORK:

Section 02317 - Excavation, Trenching and Backfilling for Utility Systems

1.04 QUALITY ASSURANCE:

A. Manufacturer's Qualifications:

Firms regularly engaged in manufacture of sanitary sewer system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installers Qualifications:

Firm with at least 3 years of successful installation experience on projects with sanitary sewage work similar to that required for project.

1.05 SUBMITTALS:

A. Product Data:

Submit manufacturer's technical product data and installation instructions for sewage system materials and products.

B. Certification:

Each length of pipe shall be marked with the following information: Manufacturer, Size, PVC Cell Classification, Type PSM, SDR, PVC Gravity Sewer Pipe, ASTM D3033, D3034, F679 or F789 and Code Number.

At the time of shipment, the manufacturer shall submit 3 copies of written certification and test results to the Engineer that the pipe was manufactured and tested in accordance with the specifications.

C. Shop Drawings:

Submit shop drawings in accordance with Section 01800 for sanitary sewage systems, showing piping materials, size, locations, and inverts. Include details of underground structures, connections, and cleanouts. Show interface and spatial relationship between piping and proximate structures.

D. Maintenance Data:

Submit maintenance data and parts lists for sanitary sewage system materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual.

PART 2 - PRODUCTS

2.01 IDENTIFICATION:

A. Underground-Type Plastic Line Markers

Manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, intended for direct-burial service; not less than 5.0 MIL overall thickness. Tape shall be a minimum of 3" wide. Tape shall be buried continuously over the pipeline no more than 18" below the ground surface. For sanitary sewer lines provide green tape with black printing reading "CAUTION SEWER LINE BURIED BELOW".

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering identification markers which may be incorporated in the work include, but are not limited to, the following:

Allen Systems, Inc.
Emed Co., Inc.
Seton Name Plate Corp.

2.02 PIPES AND PIPE FITTINGS:

A. General:

Provide pipes of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.

B. Ductile Iron Pipe:

ANSI A21.51. Ductile iron pipe shall be of the thickness in accordance with ANSI A21.50 for Laying Condition 2, Class 50 minimum. The pipe shall be coated on the interior with with Protecto 401 Ceramic Epoxy interior lining thickness according to AWWA C150, Laying Condition 2, Class 50 minimum unless otherwise indicated. Ductile Iron Pipe designed and manufactured in accordance with ANSI A21.51 centrifugally cast in metal or sand lined molds. Exterior surface shall be seal coated with 1 mil thick approved asphaltic coating in accordance with ANSI/AWWA C151/A21.51. Joints shall conform to AWWA C111, push-on-type unless otherwise indicated.

1. Fittings: ANSI A21.10, push-on type unless otherwise shown; Ductile-iron, exterior one mil petroleum asphaltic seal coat AWWA C110 or 153; mechanical joint type, 40 mils nominal dry film thickness of Protecto 401 Ceramic Epoxy interior lining.

2. Joints: ANSI A21.11, push-on type unless otherwise shown.

3. Exterior Coating: Exterior coating shall be an approved bituminous coating 1 mil thick unless otherwise shown and/or specified.

C. Polyvinyl Chloride (PVC) Sewer Pipe:

ASTM D 3033, Type PSP, SDR 26; or ASTM D 3034, Type PSM, SDR 26.

1. Fittings: PVC, ASTM D3033 or ASTM D 3034, elastomeric joints complying with ASTM D 3212 using elastomeric seals complying with ASTM F 477.

2.04 CLEANOUTS:

A. General:

Provide as indicated, pipe extension to grade with furrule and countersunk cleanout plug. Provide round cast-iron access frame over cleanout, with heavy-duty secured scoriated cover with lifting device.

PART 3 - EXECUTION

3.01 INSTALLATION OF IDENTIFICATION:

A. General:

During back-filling/top-soiling of sanitary sewage systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade.

3.02 INSTALLATION OF PIPE AND FITTINGS:

A. General:

Install piping in accordance with governing authorities having jurisdiction, except where more stringent requirements are indicated.

B. Inspect Piping:

Inspect piping before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.

C. Lay Pipe:

Lay piping beginning at low point of system, true to grades and alignment indicated, with unbroken continuity of invert.

D. Bell Ends:

Place bell ends or groove ends of piping facing upstream.

E Gaskets:

Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.

F. Ductile Iron Pipe:

Install in accordance with 1994 DIPRA, “Installation Guide to Ductile Iron Pipe”.

G. PVC or ABS Pipe:

Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D 2321.

H. Cleaning Piping:

Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

In large, accessible piping, brushes and brooms may be used for cleaning.

Place plugs in ends of uncompleted conduit at end of day or whenever work stops.

Flush lines between manholes if required to remove collected debris.

I. Joint Adapters:

Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.

J. Interior Inspection:

All sewer pipes, manholes and appurtenances shall be inspected by the Engineer and the Contractor. Inspection shall include lamping each sewer segment from manhole to manhole. If inspection indicates poor alignment, debris, displaced pipe, infiltration, or other defects, correct such defects, and reinspect.

3.03 SANITARY MANHOLES:

A. General:

Place precast concrete sections as indicated. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.

B. Installation:

Install in accordance with ASTM C 891.

C. Rubber Joint Gasket:

Provide rubber joint gasket complying with ASTM C 443 at joints of sections.

D. Stone Bedding:

Precast manholes shall be bedded on not less than 6 inches of compacted crushed stone. The crushed stone shall extend not less than 6 inches outside the walls of the manhole and under the entire length of pipe within the excavation for the manhole.

E. Drop Manholes:

Drop manholes shall be built at the locations and in conformance with the details shown where the difference in invert elevation between incoming pipe and manhole invert is more that 2 feet. The drop pipe shall be the same size as the influent sewer. Payment for drop manholes will be made at the unit prices for the various depths stated in the Proposal, and shall include all necessary pipe, pipe fittings, concrete encasement of drop pipe, extension of manhole base slab and compacted crushed stone under sewer spanning the manhole excavation.

F. Interior Coating
Coating requires 2 coats of 100% solids, coal tar epoxy resin, for a final thickness of 21 mils.

G. Ring and Cover
Shall be heavy duty rated equal to U.S. Foundry Co. USF 195-ORS. Total weight 325# Type "C" lid to have machined bearing surfaces. Lid to be lettered 2 ½ "-3" letter height **"SANITARY"** (non-vented). Manhole ring shall include a watertight gasket. Stacking cleats on the bottom of the cover shall not be allowed.

3.04 SERVICE CONNECTIONS:

Service connections shall be provided at locations shown on the Plans. The connection shall be made as shown on the Drawings, or shall be a pipe stubbed out from a manhole, and shall extend to the street right of-way line at an elevation at least 2 feet below the finished floor elevation of the building being served or deeper if necessary to provide service to a building or to the property line as shown on the Plans. Service connections shall be inspected and approved prior to any backfill being placed.

Service pipe shall be extra strength cast iron soil pipe or PVC Sewer Pipe conforming to ASTM D3034 SDR 35. Mylar detectable tape shall be installed where PVC pipe is used.

A 2" x 4" 30 inch long pressure treated flag stake painted red shall be located at the end of each sewer lateral.

3.05 CONCRETE ENCASEMENT OF PIPE:

Where called for on the Plans sewer pipe shall be completely encased with concrete. The trench shall first be excavated not less than 6 inches below the bell of the pipe and the pipe laid to the line and grade on concrete blocking. Concrete shall then be placed to the full width of the trench, but in no case less than 6 inches from the pipe bell on either side of the trench, and to a height of not less than 6 inches above the top of the pipe bell. No backfill material shall be placed in the trench for a period of at least 24 hours after the concrete encasement has been placed. Payment for concrete encasement will be according to the unit price bid in the Proposal and in accordance with Section 01200.

3.06 FIELD QUALITY CONTROL:

A. Testing and Cleaning:

Before acceptance of the sewer lines, they shall be tested and cleaned. Where obstruction is met, the Contractor shall be required to clean the sewers by means of rods or swabs or other instruments. The pipe line shall be straight and show a uniform grade between manholes.

The Contractor shall notify the Engineer when the sewer lines have been cleaned and are ready for inspection. The Engineer in cooperation with the Contractor and the Owner will agree upon a date when all parties will be present and make the inspection and perform the tests specified hereinafter.

B. Test for Deflection:

When PVC Sewer Pipe is used, the Contractor will be required to perform a deflection test. The deflection may be checked by one of two techniques. One of these is through the use of a specially designed deflectometer which when pulled through a sewer section automatically measures and records at frequent intervals the pipe's vertical and horizontal diameters.

The other technique is to use a "go, no-go" mandrel which is sized to such dimension that it will not "go" when encountering a deflection greater than 5 percent. This type of mandrel, as well as a deflectometer, must be of such design as to minimize the possibility of its being hung up in the pipe by silt or other residues.

If a deflection of 5 percent or greater is encountered, the Contractor shall repair the pipe as necessary, wait 30 days, and retest that portion of the pipe repaired. The cost of the deflection tests and any required repairs shall be included in the appropriate bid item and no separate payment will be made for them.

C. Infiltration and Exfiltration Tests:

Test all sewers for infiltration by one of the following methods. The Contractor shall furnish, install and maintain a V-notch sharp crested weir in a wood frame tightly secured in a manhole at the low end of each sewer lateral and at locations on the main sewers designated by the Engineer. Maximum allowable infiltration shall be 25 gallons per mile per inch of diameter of sewer per 24 hour day at any time. All joints shall be tight and any visible leakage in the joints or leakage in excess of that specified above shall be repaired at the Contractor's expense. When infiltration is demonstrated to be within the allowable limits, the Contractor shall remove the weirs. Prior to making an infiltration test, all groundwater drainage shall be stopped to permit the groundwater to return to its normal level.

In areas where groundwater is not encountered, exfiltration tests shall be run to determine the acceptance of the sewer. The Contractor shall furnish and install all necessary materials, equipment, water supply, etc. for the tests. The maximum allowable exfiltration shall be 25 gallons per mile per inch of diameter of sewer per 24 hour day at any time, based on a 2 foot minimum internal head. An allowance of 10 percent of gallonage shall be permitted for each additional 2 foot head over the basic head. The joints shall be tight and leakage in excess of that specified above shall be repaired at the Contractor's expense. Precaution shall be taken to prevent forcing of stoppers from house service laterals.

Infiltration and exfiltration tests will be made as soon as possible after construction of sufficient lines to warrant a test. The Contractor shall notify the Engineer when he is ready to conduct the tests. The cost of these tests shall be included in the appropriate bid item and no separate payment will be made for them.

D. Air Testing:

Air test shall be conducted in strict accordance with testing equipment manufacturer's instructions, including all recommended safety precautions. No one will be allowed in manholes while testing. Equipment used for air testing shall be specifically designed for this type of test and is subject to the approval of the Engineer. The Contractor shall furnish an air compressor, which will provide at least three hundred cubic feet per minute of air at one hundred pounds per square inch along with all necessary plugs, valves, air hoses, connections and other equipment necessary to conduct air test. Pressure gauges on test apparatus shall be a minimum of 4-inch diameter with a minimum of 1-psi graduations and a maximum range of 0-10 psi. Plugs in sewer eighteen inches (18") in size and larger shall be connected by cable for thrust protection.

The sewer section shall be plugged at both ends and air pressure shall be applied until the pressure inside the pipe reaches 4 psig. When a stable condition has been reached, the pressure shall be bled back to 3.5 psig above the average backpressure of any ground water above the pipe's invert. At this starting pressure, the time shall be observed and recorded. If there has been no leakage (zero pressure drop) after one hour of testing, the test section shall be accepted and the test complete.

If the time for the air pressure to decrease from the starting pressure (3.5 psig) to 3.0 psig is equal to that shown in the following table, the pipe shall be presumed to be free of defects. When designated times are not attained, pipe breakage, joint leakage, or leaking plugs are indicated the cause must be determined and corrected. After repairs have been made, the sewer sections shall be retested. This process shall be repeated until all sewer sections pass the air test.

AIR TEST LEAKAGE ALLOWANCE TIMETABLE (PER 100 FEET OF PIPE)

PIPE SIZE (INCHES)	MINUTES	SECONDS
4	**1**	**53**
6	**2**	**50**
8	**3**	**47**
10	**4**	**43**
12	**5**	**40**
15	**7**	**05**
18	**8**	**30**
21	**9**	**55**
24	**11**	**24**
27	**14**	**25**
30	**17**	**48**
36	**25**	**39**
42	**34**	**54**
48	**45**	**35**

3.07 MEASUREMENT AND PAYMENT:

RESERVED

END OF SECTION

SECTION 02533
SEWER FLOW CONTROL

PART 1 GENERAL

1.01 SCOPE

It is the intent of these specifications to provide a basis by which the sewage flow in a sanitary sewer line may be controlled or by-passed for the purpose of making renovations to the existing pump station and/or sewer line. It shall be the responsibility of the Contractor to make provisions to meet all requirements of these specifications and to correct any problems, which may arise as a result of the flow control operations.

A. The contractor shall use all procedures and equipment necessary for controlling or by-passing (the pumping of raw sewage from one manhole to another to eliminate flow through a section of pipe) flow at no additional costs to the owner.

B. The contractor is solely responsible for ensuring coordination with the owner and/or appropriate officials in re-routing flows.

PART 2 PRODUCTS

2.01 MATERIALS: Furnish as required.

PART 3 EXECUTION

3.01 PROCEDURES AND METHODS

A. Plugging or Blocking

A sewer line plug shall be inserted into the line at a manhole upstream from the section being inspected and/or sealed. The plug shall be so designed that all or any portion of the sewage flows can be released. After the work tasks have been completed, flow shall be restored to normal.

B. Pumping and Bypassing

When pumping/bypassing is required, the Contractor shall supply the necessary pumps, conduits and other equipment to divert the flow of sewage around the manhole section in which work is to be performed and to supply the necessary labor and supervision to set up and operate the pumping and bypassing system. The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during periods of rain. If pumping is required on a 24-hour basis, all engines shall be equipped in a manner to keep the pump noise at a minimum.

C. Discharge Pumping

Pumping or bypassing of raw wastewater onto the ground, or to areas not intended for sewage (i.e.: ditches, creeks and storm sewers), or into receiving streams is prohibited.

END OF SECTION

SECTION 02535
TELEVISING SANITARY SEWER LINES

PART 1 GENERAL

1.01 SCOPE

It is the intent of these specifications to provide a basis for which a sanitary sewer line can be internally inspected by means of a closed circuit television camera. This basis shall include all aspects of televising including method, equipment, and payment for work.

A. Televising of sanitary sewer lines shall be defined as television inspection by the insertion of a closed circuit television camera into a sanitary sewer line for the purpose of visual inspection of the interior portion of the sewer line.

B. The sewer lines for which televising are required is as specified shall be as shown on the construction drawings and as directed by the Engineer in the field.

C. All visual observations shall be duly recorded on a "Television Inspection Report Form" as supplied by the Contractor. A report form shall be made for each line inspected and shall be turned over to the Engineer after inspection is made.

D. It shall be the Contractor's responsibility to provide for the televising of sewer lines.

E. If there is an interference in the sewer line that will not allow the television camera to pass, then the camera shall be backed out of the line and an attempt shall be made to televise the line from the manhole at the other end. If the entire length of the sewer line cannot be televised because of two or more obstructions, then the Engineer shall be notified and a determination of how to proceed shall be made by the Engineer.

PART 2 PRODUCTS

2.01 The method by which televising sewer lines shall take place shall follow the procedure listed below and shall conform to all standard practices used.

The television camera shall be pulled through the sewer line by use of a mechanical or power-driven winch. It shall be pulled at a rate which will allow the inspector at the monitor to completely and thoroughly inspect the sewer line.

2.02 Video tapes shall be made upon the request of the Engineer. When requested, the videotape shall be made continuously as the camera is pulled through the line. Each tape shall be of the grade and quality best adapted to show the sewer in sharp detail. Each tape shall be numbered, dated and identified with sewer line number and location. The tape shall become the property of the Owner.

2.03 Black and white or colored Polaroid photographs shall be taken at the discretion of the Engineer to show bad joints, cracks, and any other problem spots.

2.04 A sewer line shall be cleaned prior to insertion of the television camera.

2.05 Any electrical service required by the Contractor for televising sewer lines shall be provided for by the Contractor.

2.06 Visual inspection shall be done one manhole section at a time and the flow in the section being inspected shall be controlled as specified in Section 02533-Sewer Flow Control.

2.07 If any equipment becomes "hung up" in the sewer line it is the responsibility of the Contractor to retrieve the equipment. If in freeing the equipment the Contractor has to make an excavation, he does so at his own expense, and any pipe, pavement or other existing structure has to be broken to retrieve equipment, it shall be replaced to original condition of following required specifications. No equipment shall be left in the sewer line unattended or overnight.

2.08 EQUIPMENT

The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor and other components of the video system shall be capable of producing a minimum 500 line resolution video satisfaction of the Owner's representative and if unsatisfactory, equipment shall be removed and no payment made for unsatisfactory inspections.

The television system shall be a contained system complete with winches, (power and mechanical), cable, closed circuit television camera, monitor, video tape recorder, Polaroid camera, film, suitable measuring device to accurately determine the position of the camera in the line being televised at all times, and all necessary equipment for the successful completion of television inspection.

2.09 INSPECTION

All televising of sewer lines shall be inspected daily by the Engineer or his duly authorized representative. A daily log of work accomplished shall be duly recorded and acknowledged by the Engineer and/or inspector and the Contractor's superintendent. Printed location records shall be kept by the Contractor and will clearly show the location, in relation to adjacent manholes, of each infiltration point discovered by the television camera. In addition, other points of significance such as locations of building sewer, joints, unusual conditions, roots, storm sewer connections, collapsed sections, presence of scale and corrosion and other discernible features will be recorded and a copy of such records will be supplied to the Engineer.

END OF SECTION

SECTION 02539
TESTING AND SEALING SEWER LINES

PART 1 TESTING SEWER LINES

1.01 GENERAL

1. Scope: This section consists of furnishing all labor, equipment and material to complete testing and sealing of sewer lines as shown on the drawings and specified in the following paragraphs.

2. Provide equipment such as pumps, gauges, regulators, and hoses necessary to perform air tests of each joint in all gravity sewer mains during final inspection. Equipment configuration shall be such that there are no valves on or along airline between measuring point at joint and pressure transducer or sensing device located in control unit on surface. Amount of pressure being exerted on joints shall be readable above ground on pressure gauge.

3. A reliable testing firm shall have certified the accuracy and calibration of the pressure sensing/monitoring system within a one-month period preceding use of equipment. Proof of certification shall be submitted.

PART 2 PRODUCTS/EQUIPMENT

2.01 TESTING EQUIPMENT

1. Equipment consists of a television camera and joint testing device that can be pulled through sewer lines. Construct testing device so one joint can be tested at a time.

2. Maintain continuous monitoring of void pressure at all times by means of an electronic pressure measuring system and pressure meter read-out on control panel.

3. Pressure meter device shall accurately show PSIG to nearest tenth (1/10) of one pound and shall respond and record any change in void pressure instantly. Make pressure measurements at void area.

4. Systems which incorporate bladders, hoses or the like for monitoring the pressures and which have questionable accuracy will not be allowed.

2.02 SEALING PRODUCTS & EQUIPMENT

1. Equipment used for mixing and pumping of chemical solutions shall consist of two approved, separate pumping and proportioning systems capable of supplying an uninterrupted flow of sealing material to completely fill point of infiltration and providing seal which will withstand specified joint air testing.

2. Sealing equipment shall not damage, break, move or cause settlement, assuming lines are structurally sound.

3. Repairs shall take place at joints, cracks, holes or similar points of infiltration as identified.

4. Method of repair shall be such that original cross-sectional area and shape of interior of sewer pipe shall not be permanently reduced or changed.

5. Materials; 3M 5610 polyurethane gel is the preferred material. Alternates will be evaluated upon request and must be approved by the engineer prior to installation.

PART 3 EXECUTION

3.01 TESTING

1. Clearing of Testing Device

2. Prior to performing pressure test and subsequent to sealing joint or crack, clear pressure-testing device.

3. This will normally require that sealing packer be deflated and the testing system purged to assure that hoses, check valves or other assemblies are free of the grouting material or other restrictions.

4. Pipe Test Criteria

5. Some pipe materials are porous. To confirm that joint testing is not a more severe test than the pipe itself can pass, perform an on-job barrel test between joints in each pipe line to be tested to determine that pipe barrel can pass test criteria.

6. If pipe barrel will not pass decay rate limits, it may be necessary to adjust maximum test pressure applied.

7. Adjustment of maximum pressure levels will be evaluated jointly between CONTRACTOR, ENGINEER and OWNER. OWNER will render final decision on each situation.

8. Barrel test shall be performed for each line segment and results documented.

9. Testing Procedures

10. Test by isolating area to be tested within testing device and applying positive pressure into created void area.

11. Apply positive air pressure to each pipe joint.

12. Introduce pressurized air into isolated void created by testing device.

a) Apply until:

It is determined pressure cannot be built in void.

Until test pressure of one-half (1/2) PSI per foot of depth plus four (4) PSI to maximum of ten (10) PSI is reached as recorded by void pressure monitor.

b) When either of these conditions is reached, shut off air supply.

13. If required pressure cannot be developed, joint shall have failed test. If required test pressure in void was built to one-half (1/2) PSI per foot of depth plus four (4) PSI, rate of decay of this pressure should not exceed ½ PSI in 30 seconds. Joint being tested will also have failed if pressure drops more than ½ PSI in 30 seconds.

14. Failure of joint indicates need for sealing. Sealing shall be as specified in this section.

15. Testing of ductile iron pipe joints is not required except at points where a transition from ductile iron to another pipe material occurs.

16. Where joints show obvious evidence of past leakage, testing of the joint is not required, unless directed by the Engineer.

17. Test Records

18. During joint testing, records shall be kept which includes:

a) Identification of sewer line section tested.

b) Test pressure used.

c) Location (footage) of each joint tested and location of joints not tested due to close proximity to building service connections and sanitary sewer manholes.

d) Statement indicating test results (passed or failed) for each joint tested.

e) Test pressure achieved and maintained for each joint passing air test.

f) Weekly equipment pressure test results.

g) Sewer line section barrel test results.

h) Daily gel check results.

i) Air temperature at time of testing joints.

j) VHS tape of televised testing and sealing procedures. Recorder may be turned off in between joints, or left running, at the direction of the Engineer.

19. SEALING

1. Do not inject chemical sealant at an excessive pressure to damage existing pipe. Repair damage to existing pipe, which may result due to excessive chemical sealant injection pressures. Sealing shall be performed in accordance with the latest National Association of Sewer Service Companies Specification Guidelines.

2. Handling of Materials

3. Mixing and handling of chemical grout may be toxic by passing through unbroken skin, by inhalation of dust or droplets of materials, by swallowing or by ingestion. Safe mixing, handling and pumping of chemicals shall be the responsibility of the Contractor and shall be done by personnel thoroughly familiar with handling of chemicals involved.

4. Furnish appropriate safety equipment.

5. Placement of Chemical Grout

6. Position sealing packer over area of infiltration by means of metering device at surface and closed circuit television camera in line. Accurate measurement of location of defect to be sealed shall be made using portion sealing packer as "Datum" or measurement point or target. Such measurement, target or joint shall also be used to obtain necessary measurement for positioning injection area of sealing packer over area to be sealed.

7. Expand sealing packer sleeves using controlled pressures. Expanded sleeve shall seal against inside periphery of pipe to form void area at point of infiltration, completely isolated from remainder of pipeline. Pump sealant materials into this isolated area through hose systems at controlled pressures, which are in excess of groundwater pressures.

8. Integrate pumping, metering and scaling packer device so that proportions and quantities of materials and pressures for material and sealing can be instantly regulated in accordance with type and size of leak, percentage of voids be filled, type of soil surrounding pipe, and rate of flow of sealing solution in relation to back pressures.

9. Upon completion of injection, retest point of repair. If retesting shows seal was not completely effective, process shall be repeated until defect successfully passes pressure test.

10. After sealing entire sewer line section, remove surplus grouting material from section at immediate downstream manhole. Removal shall not be permitted at succeeding downstream manholes except where immediate manhole is located within private property. If surplus-grouting materials left in sewer line section by Contractor result in surcharging and subsequent damage to public or private property, Contractor shall be responsible for damage to property and expenses incurred by Owner and shall hold Owner harmless.

11. Volume of sealant per joint shall be recorded. Sealant shall be pumped "to resist." Sealant volume shall not exceed 1 gallon per inch diameter of sewer line without authorization from Engineer.

12. Sealing of sewers may require grouting to occur against the flow of sewage in a number of locations due to access and bypassing pumping may be required.

13. Gel Checks

14. Make gel checks daily for each sealing vehicle to monitor both induction period and gel characteristics.

15. Make checks for every mixed batch or at least twice a day if only one batch is used.

16. Owner reserves the right to request adjustment of gel times or reject entire batch if acceptable gel characteristics do not exist.

17. Periodic gel checks shall also be made in pipe (at the request of Owner) by seating sealing packer on pipe barrel and filling packer void with grout solutions. Pressure will then be monitored until rise in pressure is observed, indicating that grout has gelled in packer void.

18. Field Records

19. Keep field records for each sewer line section prior to, during and after completion of chemical grouting operation.

20. Records shall include information such as accurate locations, gel times, grout volumes, grout pressure, air temperatures and joint not sealed due to close proximity to building service connections and sanitary sewer manholes.

21. VHS tapes of the sealing shall be furnished to the Owner.

22. Retesting

23. After a period of time equal to two times gel set time has elapsed, each point of repair shall be subjected to pressure of one-half (1/2) PSI per foot of depth plus 4 PSI. Rate of decay of this pressure shall not exceed ½ PSI in 30 seconds, except as otherwise approved by the Owner.

24. Repairs failing to meet this condition shall be resealed and retested until an acceptable result is obtained.

25. Final Acceptance Test

26. Upon completion of testing and sealing of all joints in the project the Owner shall select approximately 10% of the line for final acceptance testing.

27. Final acceptance testing shall consist of a low-pressure air test of entire line segments. Contractor shall plug line segments at upstream and downstream manholes and have entire line segment pressurized to 3 ½ PSI.

28. Pressure drop of 1 PSI in the time period as defined in ASTM C828 shall constitute a failure of the final acceptance testing.

29. If the line segment fails, Contractor shall retest each joint along this line segment and seal individual joints at no additional cost to the Owner.

30. Field Quality Assurance

31. The work of the Contractor shall be warranted for a period of 24 months following substantial completion.

32. At the time agreed by the Owner (approximately 24 months after initial sealing) an initial retest area consisting of specific sewer line sections shall be conducted. Sewer line sections to be retested will be randomly selected throughout Project Area by the Owner and shall be representative of majority of sealing work performed. Initial retest area shall consist of approximately 10% of linear feet contained in Work.

33. Within initial retest area, retest pipe joints and cracks designated. Joints and cracks, which were sealed previously and fail retest, shall be resealed.

    a) If failure rate of these retested joints and cracks is less than 5% of joints and cracks retested, work shall be considered satisfactory and no further retesting will be required.

    b) If failure rate of retested joints and cracks exceeds 5% of joints and cracks retested, an additional retest area of equivalent size shall be selected and all pipe joints and cracks shall be retested. Additional testing and sealing, if necessary, will continue until failure rate of less than 5% of total retested joints or cracks is met.

34. Grout joints, which were tested previously and passed air test but retest, failed. These joints will not be included in determining if initial work was completed satisfactorily.

35. Should as much as 25% of work be retested and fail to meet 5% requirement, Contractor shall provide same number of crews as utilized in original project so that retesting will proceed at a rapid rate.

36. Field Personnel: Personnel as named in the information submitted with the bid shall not be replaced without approval of the Owner.

END OF SECTION

SECTION 02541
PROTECTIVE COATING FOR SANITARY SEWER STRUCTURES

PART 1 – GENERAL

1.01 RELATED DOCUMENTS:

A. Section 02531 – Sewer Force Mains

B. Section 02532 - Sanitary Sewers.

C. Section 02547 - Lift Station Wetwell.

1.02 DESCRIPTION OF WORK:

Lift station wetwell and receiving manhole rehabilitation to prevent/stop inflow, infiltration, and exfiltration; repair voids; restore structural integrity; and provide protection against corrosion. A monolithic, fiber-reinforced, structurally enhanced, cementitious-based liner material is spray applied to the wall, bench surfaces of the manhole and the underside of the top slab.

1.03 DESCRIPTION OF WORK:

REFERENCES

A. ASTM C 78 - Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading).

B. ASTM C 94 - Ready-Mixed Concrete.

C. ASTM C 109 - Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).

D. ASTM C 234 - Comparing Concretes on the Basis of the Bond Developed with Reinforcing Steel.

E. ASTM C 267 - Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings.

F. ASTM C 321 - Bond Strength of Chemical-Resistant Mortars.

G. ASTM C 496 - Splitting Tensile Strength of Cylindrical Concrete Specimens.

H. ASTM C 596 - Drying Shrinkage of Mortar Containing Portland Cement.

I. ASTM C 666 - Resistance of Concrete to Rapid Freezing and Thawing.

J. ASTM C 827 - Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

K. ASTM C 952 - Bond Strength of Mortar to Masonry Units.

L. ASTM C 1244 - Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

1.04. SUBMITTALS

A. Product Data: Submit manufacturer's product data, including physical properties, surface preparation, repair, application, curing, and field quality control.

B. Manufacturer Qualifications: Submit list of a minimum of 10 manhole rehabilitation projects completed during past 3 years.

C. Applicator Qualifications: Submit qualifications of applicator.

1. Certification stating applicator is factory trained and approved by manufacturer in application of the specified products.
2. List of recently completed manhole rehabilitation projects, including project name and location, names of owner and engineer, and description of products used, substrates, and application procedures.

1.05. QUALITY ASSURANCE

A. Material Qualifications: Minimum of 9 year history of being used for rehabilitation of sanitary system manholes.

B. Applicator Qualifications:

1. Factory trained and approved by manufacturer in application of the specified products.
2. Employs persons trained for the application of the specified products.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage:

1. Store materials in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.
3. 3. Store materials in a cool dry environment. c) Handling: Protect materials during handling and application to prevent damage.

1.07. ENVIRONMENTAL CONDITIONS

A. Do not apply materials if ambient temperature is below 40 degrees F.
B. Do not apply materials to frozen surfaces or if freezing is expected within substrate within 24 hours after application.
C. Keep mix temperature at time of application below 90 degrees F.
D. Do not exceed water temperature of 80 degrees F.

1.08. PRODUCTS

A. MANUFACTURER

Strong-Seal Systems Corporation, PO Box 9209, Pine Bluff, Arkansas 71611. Toll Free (800) 982-8009. Fax (870) 850-6933. Web Site www.strongseal.com. or approved equal.

1.09. MATERIALS

A. General:

1. Materials from single manufacturer.
2. Materials compatible with substrate and with each other.
3. Materials approved by manufacturer.

B. Patching Material: Strong-Seal QSR. Rapid-setting, fiber-reinforced, high-early-strength, corrosion-resistant, hand-mixed and hand-applied, calcium aluminate based cementitious material.

1. Cement: Calcium aluminate cement.
2. Minimum Compressive Strength, ASTM C 109: 1,400 psi at 6 hours.
3. Minimum Bond, ASTM C 321: 145 psi at 28 days.
4. Applied Density: 105 plus or minus 5 pounds per cubic foot. Shrinkage, ASTM C 596: 0 percent at 90 percent relative humidity.

C. Infiltration Control Material: Strong-Seal Strong-Plug. Rapid-setting, high-early-strength, hand-applied, cementitious material.

1. Compressive Strength, ASTM C 109: 400 to 600 psi at 1 hour; 1,800

to 2,400 psi at 24 hours.
2. Expansion, ASTM C 827: 0.10 percent.
3. Sulfate Resistance, ASTM C 267: No weight loss after 15 cycles; 2,000 ppm; test continuing.
4. Freeze/Thaw Resistance, ASTM C 666, Method A: 100 cycles.
5. Pull-Out Strength, ASTM C 234: 14,000 pounds.
6. Placement Time: Less than 1 minute.

D. Cementitious Grout: Strong-Seal Grout 1000. Cementitious grout, volume stable.

1. Minimum Compressive Strength, ASTM C 109: 1,000 psi at 28 days.

E. Liner Material: Strong-Seal MS-2C. Fiber-reinforced, spray-applied, cementitious mortar. (Apply as skim coat.)

1. Cement: Calcium aluminate cement.
2. Minimum Compressive Strength, ASTM C109: 5,000 psi at 28 days.
3. Minimum Tensile Strength, ASTM C 496: 580 psi at 28 days.
4. .Minimum Flexural Strength, ASTM C 78: 780 psi at 28 days.
5. Shrinkage, ASTM C596: 0 percent at 28 days, 90 percent relative humidity.
6. Minimum Bond, ASTM C952: 2000 psi at 28 days.
7. Applied Density: 115 plus or minus 5 pounds per cubic foot.
8. Freeze/Thaw Resistance, ASTM C666, Method A: 100 cycles, no visible damage.
9. Factory Blended: Requires only addition of water at site.
10. Minimum Cement Content: 40 percent of total bag weight.
11. Dry Bulk Density: 65 to 67 pounds per cubic foot
12. Fiber Reinforcement: 2 to 5/8 inch alkaline-resistant fiberglass rods

F. Liner Material: Strong-Seal High Performance Mix. Fiber-reinforced, spray-applied, cementitious mortar.

1. Cement: 100 percent pure fused calcium aluminate clinker and calcium aluminate cement.
2. Minimum Compressive Strength, ASTM C 109: 8,000 psi at 28 days.
3. Minimum Tensile Strength, ASTM C 496: 800 psi at 28 days.
4. Minimum Flexural Strength, ASTM C 78: 1,200 psi at 28 days.

5. Shrinkage, ASTM C 596: 0 percent at 28 days, 90 percent relative humidity.
6. Minimum Bond, ASTM C 952: 2000 psi at 28 days.
7. Applied Density: 150 plus or minus 5 pounds per cubic foot.
8. Freeze/Thaw Resistance, ASTM C 666, Method A: 100 cycles, no visible damage.
9. Factory Blended: Requires only addition of water at site.
10. Dry Bulk Density: 88 to 92 pounds per cubic foot.
11. Fiber Reinforcement: 1/2 to 5/8 inch alkaline-resistant fiberglass rods.

G. Water: Clean and potable. Test nonpotable water in accordance with ASTM C 94.

1.10. EXAMINATION

Examine surfaces to receive protective coating. Notify the Engineer in writing if surfaces are not acceptable. Do not begin surface preparation, repair, or application until unacceptable conditions have been corrected.

1.11. SURFACE PREPARATION

A. Prepare surfaces in accordance with manufacturer's instructions.

B. Protection: Place covers over invert to prevent extraneous material from entering sewer lines.

C. Cleaning: Clean manhole walls and bench by using a minimum of 1,500 psi water spray to remove contaminants, dirt, debris, and other foreign materials.

D. Remove loose, unsound, and protruding brick, mortar, and concrete.

E. Inspection by Engineer: Before application of each material, surfaces to be sprayed or coated will be inspected by the Engineer. Correct defects or deficiencies identified by the Engineer before application of subsequent material.

F. Voids: Repair and fill voids greater than 2 inches in depth with patching material. Apply patching material in accordance with manufacturer's instructions.

G. Active Leaks:

1. Stop active leaks with patching material or infiltration control material. Apply material in accordance with manufacturer's instructions.
2. Install weep holes as required to localize infiltration during application of patching material or infiltration control material.
3. Plug weep holes after application with infiltration control material before application of liner material.
4. Severe Infiltration: Drill as required to pressure grout using a cementitious grout. Apply grout in accordance with manufacturer's instructions.

H. Advance Notice: Give the Engineer a minimum of 3 days advance notice of start of application.

1.12. INVERT REPAIR

A. Remove loose and unsound materials and wash walls, after surface preparation is complete.

B. Repair bench, invert, or service line using patching material. Apply in accordance with manufacturer's instructions.

C. Repair inverts with visible damage, where infiltration is present, or when vacuum testing is specified.

D. Apply patching material to invert, after blocking flow through manhole and thoroughly cleaning invert.

E. Uniformly trowel patching material onto damaged invert at a minimum thickness of 1/2 inch at invert. Extend out onto bench of manhole sufficiently to tie into liner material.

F. Ensure finished invert surfaces are smooth and free of ridges.

G. Reestablish flow in manhole after a minimum of 30 minutes after application of patching material.

1.13. APPLICATION OF LINER MATERIAL

A. Apply liner material in accordance with manufacturer's instructions.

B. Equipment: Spray apply liner material using approved equipment designed and manufactured by material manufacturer for the specific application.

C. Mixing:

1. Mix liner material with water in accordance with manufacturer's
2. instructions.
3. Discharge prepared mix into hopper.
4. Continue mixing as liner material is continuously sprayed.

D. Cleaning: Ensure surface is clean and free of foreign material.

E. Saturated Surface: Ensure surface is damp and totally saturated with water without noticeable free water droplets or running water, just before application of liner material.

F. Apply skim coat.

G. Spraying: Spray apply liner material in 1 or more passes from bottom of wall to bottom of frame to form a structurally enhanced monolithic liner. The underside of the top slab is included.

1. Minimum Total Thickness: 1 inch.

H. Finishing:

1. Trowel surface of sprayed liner material to relatively smooth finish. Do not over trowel.
2. Apply brush finish to trowel finished surface.

I. Follow manufacturer's instructions whenever more than 24 hours have elapsed between applications.

J. Application to Bench:

1. Remove wood covers.
2. Spray bench with liner material mixed in accordance with manufacturer's instructions.
3. Spray apply liner material to produce a gradual slope from walls to invert to form a structurally enhanced monolithic liner. Minimum thickness at invert of 1/2 inch.
4. Round full circumference of intersection of wall and bench to a uniform radius.

K. Application to New Cast-In-Place or Precast Concrete Wetwells:

1. Prepare surface with bonding agent in accordance with manufacturer's instructions.
2. Apply skim coat.
3. Spray application of Strong-Seal High Performance Mix liner material in one or more coats.
4. Walls, bottom slab and underside of top slab are included.
5. Minimum Total Thickness: 1 inch.

1.14. CURING

A. Cure materials in accordance with manufacturer's instructions.

B. Exposure:

1. Minimize exposure of applied materials to sunlight and air movement.
2. Cover structure if time between application of additional coats is to be longer than 15 minutes.
3. Do not expose finished materials to sunlight or air movement for longer than 15 minutes before covering or closing access.
4. Shade manhole while rehabilitation is in process in hot and arid climates.

C. Concrete Curing Compound:

1. Apply concrete curing compound if relative humidity is less than 70 percent within manhole.

2. Apply curing compound in accordance with manufacturer's instructions.

D. Cure Time: Allow a minimum of 6 hours cure time before subjecting wetwells or manholes to flows.

1.15. FIELD QUALITY CONTROL

A. Inspection by the Engineer or the waiver of inspection of any portion of the work shall not relieve the Contractor of responsibility to perform the work as specified.

B. Field Quality Control Testing: Performed by the Engineer at Contractor's expense.

C. Compressive Strength Test:

1. Cast four 2 inch cubes each day or from each pallet of material.
2. Label, package, and mail cubes to manufacturer.
3. Manufacturer shall test cubes for compressive strength in accordance with ASTM C 109 and submit test results to the Contractor and Engineer.

D. Leaks: Visually verify absence of leaks.

E. Exfiltration Test: Perform exfiltration test. Wetwells and receiving manholes

F. Over 6 Feet Deep: New protective liner and manhole rehabilitation is acceptable if water loss is a maximum of 1 inch plus 1/8 inch for each additional foot of depth in five minutes.

END OF SECTION

SECTION 02542
PROTECTIVE COATING FOR WETWELL AND RECEIVING MANHOLES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK:

Lift station wetwell and receiving manhole rehabilitation to prevent/stop inflow, infiltration, and exfiltration; repair voids; restore structural integrity; and provide protection against corrosion. A monolithic, fiber-reinforced, structurally enhanced, cementitious-based liner material is spray applied to the wall, bench surfaces of the manhole and the underside of the top slab.

1.02 REFERENCES:

A. ASTM C 78 - Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading).

B. ASTM C 94 - Ready-Mixed Concrete.

C. ASTM C 109 - Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).

D. ASTM C 234 - Comparing Concretes on the Basis of the Bond Developed with Reinforcing Steel.

E. ASTM C 267 - Chemical Resistance of Mortars, Grouts, and Monolithic Surfacings.

F. ASTM C 321 - Bond Strength of Chemical-Resistant Mortars.

G. ASTM C 496 - Splitting Tensile Strength of Cylindrical Concrete Specimens.

H. ASTM C 596 - Drying Shrinkage of Mortar Containing Portland Cement.

I. ASTM C 666 - Resistance of Concrete to Rapid Freezing and Thawing.

J. ASTM C 827 - Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

K. ASTM C 952 - Bond Strength of Mortar to Masonry Units.

L. ASTM C 1244 - Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

1.04. SUBMITTALS

A. Product Data: Submit manufacturer's product data, including physical properties, surface preparation, repair, application, curing, and field quality control.

B. Manufacturer Qualifications: Submit list of a minimum of 10 manhole rehabilitation projects completed during past 3 years.

C. Applicator Qualifications: Submit qualifications of applicator.

1. Certification stating applicator is factory trained and approved by manufacturer in application of the specified products.
2. List of recently completed manhole rehabilitation projects, including project name and location, names of owner and engineer, and description of products used, substrates, and application procedures.

1.05. QUALITY ASSURANCE

A. Material Qualifications: Minimum of 9 year history of being used for rehabilitation of sanitary system manholes.

B. Applicator Qualifications:

1. Factory trained and approved by manufacturer in application of the specified products.
2. Employs persons trained for the application of the specified products.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage:

1. Store materials in accordance with manufacturer's instructions.
2. Keep containers sealed until ready for use.
3. Store materials in a cool dry environment.

C. Handling:
   1. Protect materials during handling and application to prevent damage.

1.07. ENVIRONMENTAL CONDITIONS

A. Do not apply materials if ambient temperature is below 40 degrees F.
B. Do not apply materials to frozen surfaces or if freezing is expected within substrate within 24 hours after application.
C. Keep mix temperature at time of application below 90 degrees F.
D. Do not exceed water temperature of 80 degrees F.

1.08. PRODUCTS

Coatings for Sanitary Sewer Manholes: ASTM C-881, 100% solids, high build epoxy resin, Sikaguard 62 or approved equivalent. Color-Tan

1.09. MATERIALS

A. General:

   1. Materials from single manufacturer.
   2. Materials compatible with substrate and with each other.
   3. Materials approved by manufacturer.

B. Patching Material: Strong-Seal QSR. Rapid-setting, fiber-reinforced, high-early-strength, corrosion-resistant, hand-mixed and hand-applied, calcium aluminate based cementitious material.

   1. Cement: Calcium aluminate cement.
   2. Minimum Compressive Strength, ASTM C 109: 1,400 psi at 6 hours.
   3. Minimum Bond, ASTM C 321: 145 psi at 28 days.
   4. Applied Density: 105 plus or minus 5 pounds per cubic foot. Shrinkage, ASTM C 596: 0 percent at 90 percent relative humidity.

C. Infiltration Control Material: Strong-Seal Strong-Plug. Rapid-setting, high-early-strength, hand-applied, cementitious material.

   1. Compressive Strength, ASTM C 109: 400 to 600 psi at 1 hour; 1,800 to 2,400 psi at 24 hours.
   2. Expansion, ASTM C 827: 0.10 percent.
   3. Sulfate Resistance, ASTM C 267: No weight loss after 15 cycles; 2,000 ppm; test continuing.
   4. Freeze/Thaw Resistance, ASTM C 666, Method A: 100 cycles.
   5. Pull-Out Strength, ASTM C 234: 14,000 pounds.
   6. Placement Time: Less than 1 minute.

D. Cementitious Grout: Strong-Seal Grout 1000. Cementitious grout, volume stable.

1. Minimum Compressive Strength, ASTM C 109: 1,000 psi at 28 days.

E. Liner Material: Strong-Seal MS-2C. Fiber-reinforced, spray-applied, cementitious mortar. (Apply as skim coat.)

1. Cement: Calcium aluminate cement.
2. Minimum Compressive Strength, ASTM C109: 5,000 psi at 28 days.
3. Minimum Tensile Strength, ASTM C 496: 580 psi at 28 days.
4. .Minimum Flexural Strength, ASTM C 78: 780 psi at 28 days.
5. Shrinkage, ASTM C596: 0 percent at 28 days, 90 percent relative humidity.
6. Minimum Bond, ASTM C952: 2000 psi at 28 days.
7. Applied Density: 115 plus or minus 5 pounds per cubic foot.
8. Freeze/Thaw Resistance, ASTM C666, Method A: 100 cycles, no visible damage.
9. Factory Blended: Requires only addition of water at site.
10. Minimum Cement Content: 40 percent of total bag weight.
11. Dry Bulk Density: 65 to 67 pounds per cubic foot
12. Fiber Reinforcement: 2 to 5/8 inch alkaline-resistant fiberglass rods

F. Liner Material: Strong-Seal High Performance Mix. Fiber-reinforced, spray-applied, cementitious mortar.

1. Cement: 100 percent pure fused calcium aluminate clinker and calcium aluminate cement.
2. Minimum Compressive Strength, ASTM C 109: 8,000 psi at 28 days.
3. Minimum Tensile Strength, ASTM C 496: 800 psi at 28 days.
4. Minimum Flexural Strength, ASTM C 78: 1,200 psi at 28 days.
5. Shrinkage, ASTM C 596: 0 percent at 28 days, 90 percent relative humidity.
6. Minimum Bond, ASTM C 952: 2000 psi at 28 days.
7. Applied Density: 150 plus or minus 5 pounds per cubic foot.
8. Freeze/Thaw Resistance, ASTM C 666, Method A: 100 cycles, no visible damage.
9. Factory Blended: Requires only addition of water at site.
10. Dry Bulk Density: 88 to 92 pounds per cubic foot.
11. Fiber Reinforcement: 1/2 to 5/8 inch alkaline-resistant fiberglass rods.

G. Water: Clean and potable. Test nonpotable water in accordance with ASTM C 94.

1.10. EXAMINATION

Examine surfaces to receive protective coating. Notify the Engineer in writing if surfaces are not acceptable. Do not begin surface preparation, repair, or application until unacceptable conditions have been corrected.

1.11. SURFACE PREPARATION

A. Prepare surfaces in accordance with manufacturer's instructions.

B. Protection: Place covers over invert to prevent extraneous material from entering sewer lines.

C. Cleaning: Clean manhole walls and bench by using a minimum of 1,500 psi water spray to remove contaminants, dirt, debris, and other foreign materials.

D. Remove loose, unsound, and protruding brick, mortar, and concrete.

E. Inspection by Engineer: Before application of each material, surfaces to be sprayed or coated will be inspected by the Engineer. Correct defects or deficiencies identified by the Engineer before application of subsequent material.

F. Voids: Repair and fill voids greater than 2 inches in depth with patching material. Apply patching material in accordance with manufacturer's instructions.

G. Active Leaks:

1. Stop active leaks with patching material or infiltration control material. Apply material in accordance with manufacturer's instructions.
2. Install weep holes as required to localize infiltration during application of patching material or infiltration control material.
3. Plug weep holes after application with infiltration control material before application of liner material.
4. Severe Infiltration: Drill as required to pressure grout using a cementitious grout. Apply grout in accordance with manufacturer's instructions.

H. Advance Notice: Give the Engineer a minimum of 3 days advance notice of start of application.

1.12. INVERT REPAIR

A. Remove loose and unsound materials and wash walls, after surface preparation is complete.

B. Repair bench, invert, or service line using patching material. Apply in accordance with manufacturer's instructions.

C. Repair inverts with visible damage, where infiltration is present, or when vacuum testing is specified.

D. Apply patching material to invert, after blocking flow through manhole and thoroughly cleaning invert.

E. Uniformly trowel patching material onto damaged invert at a minimum thickness of 1/2 inch at invert. Extend out onto bench of manhole sufficiently to tie into liner material.

F. Ensure finished invert surfaces are smooth and free of ridges.

G. Reestablish flow in manhole after a minimum of 30 minutes after application of patching material.

1.13. APPLICATION OF LINER MATERIAL

A. Apply liner material in accordance with manufacturer's instructions.

B. Equipment: Spray apply liner material using approved equipment designed and manufactured by material manufacturer for the specific application.

C. Mixing:

1. Mix liner material with water in accordance with manufacturer's
2. instructions.
3. Discharge prepared mix into hopper.
4. Continue mixing as liner material is continuously sprayed.

D. Cleaning: Ensure surface is clean and free of foreign material.

E. Saturated Surface: Ensure surface is damp and totally saturated with water without noticeable free water droplets or running water, just before application of liner material.

F. Apply skim coat.

G. Spraying: Spray apply liner material in 1 or more passes from bottom of

wall to bottom of frame to form a structurally enhanced monolithic liner. The underside of the top slab is included.

1. Minimum Total Thickness: 1 inch.

H. Finishing:

1. Trowel surface of sprayed liner material to relatively smooth finish. Do not over trowel.
2. Apply brush finish to trowel finished surface.

I. Follow manufacturer's instructions whenever more than 24 hours have elapsed between applications.

J. Application to Bench:

1. Remove wood covers.
2. Spray bench with liner material mixed in accordance with manufacturer's instructions.
3. Spray apply liner material to produce a gradual slope from walls to invert to form a structurally enhanced monolithic liner. Minimum thickness at invert of 1/2 inch.
4. Round full circumference of intersection of wall and bench to a uniform radius.

K. Application to New Cast-In-Place or Precast Concrete Wetwells:

1. Prepare surface with bonding agent in accordance with manufacturer's instructions.
2. Apply skim coat.
3. Spray application of Strong-Seal High Performance Mix liner material in one or more coats.
4. Walls, bottom slab and underside of top slab are included.
5. Minimum Total Thickness: 1 inch.

1.14. CURING

A. Cure materials in accordance with manufacturer's instructions.

B. Exposure:

1. Minimize exposure of applied materials to sunlight and air movement.
2. Cover structure if time between application of additional coats is to be longer than 15 minutes.
3. Do not expose finished materials to sunlight or air movement for longer than 15 minutes before covering or closing access.

4. Shade manhole while rehabilitation is in process in hot and arid climates.

C. Concrete Curing Compound:

1. Apply concrete curing compound if relative humidity is less than 70 percent within manhole.
2. Apply curing compound in accordance with manufacturer's instructions.

D. Cure Time: Allow a minimum of 6 hours cure time before subjecting wetwells or manholes to flows.

1.15. FIELD QUALITY CONTROL

A. Inspection by the Engineer or the waiver of inspection of any portion of the work shall not relieve the Contractor of responsibility to perform the work as specified.

B. Field Quality Control Testing: Performed by the Engineer at Contractor's expense.

C. Compressive Strength Test:

1. Cast four 2 inch cubes each day or from each pallet of material.
2. Label, package, and mail cubes to manufacturer.
3. Manufacturer shall test cubes for compressive strength in accordance with ASTM C 109 and submit test results to the Contractor and Engineer.

D. Leaks: Visually verify absence of leaks.

E. Exfiltration Test: Perform exfiltration test. Wetwells and receiving manholes

F. Over 6 Feet Deep: New protective liner and manhole rehabilitation is acceptable if water loss is a maximum of 1 inch plus 1/8 inch for each additional foot of depth in five minutes.

END OF SECTION

SECTION 02544
HDPE LINER

1. GENERAL:

a) Furnish and install all labor, materials, equipment, and incidentals required to supply and install High Density Polyethylene (HDPE) or Polypropylene Random Copolymer (PP-R) concrete protective liner (CPL) in the lift station/wet wells, receiving manholes, drop manholes, manholes receiving flow from force mains and manholes as required or as shown on the Drawings.

b) HDPE or PP-R concrete protective liner (CPL) shall be designed and installed to protect concrete surfaces from corrosion.

2. MATERIALS:

a) Liner shall be HDPE (high density polyethylene) or Polypropylene Random Copolymer (PP-R) with a minimum thickness of 2 mm. All HDPE liner sheets shall be extruded with a large number of anchoring studs, a minimum of ($420/m^2$,$39\ ft^2$), manufactured during the extrusion process in one piece with the sheet so there is no welding and no mechanical finishing work to attach the studs to the sheet. The liner shall have a pull out of 112.5 lbs./anchoring stud. Minimum distance between studs shall be no less than 2.1275@.

b) Flat liner sheet, non anchored, used for overlapping joints, shall have a minimum thickness of 3mm. All joints shall be sealed by means of thermal welding performed by welders certified by the manufacturer.

c) The lining shall have good impact resistance, shall be flexible, and shall have an elongation sufficient to bridge up to a 1/4@ settling crack, without damage to the lining. The liner shall be able to bridge any expansion cracks that may occur.

d) The lining shall be repairable at any time during the life of the structure.

e) A certified fabricator will custom fit the liner to the form work in order to protect the concrete surfaces from sewer gases. The interior surfaces to be protected shall include the walls, ceiling, and pipe entries.

f) For all lined manholes the use of HDPE Grade rings shall be used in lieu of brick or precast grade rings. Grade rings shall meet HS-25 load rating. Butyl sealant shall be used between each ring to make a watertight joint. The first grade ring will be welded to the liner to provide a gas tight seal.

2.1 PHYSICAL PROPERTIES:

a) The welding rod shall be manufactured from the same resins and meet the following properties:

Property	Testing Method	Unit	**HDPE**	**PP-R**
Density	ASTM D792-86.	g/cm3	.0945	1.78
MFI (Melt Flow Index)	ASTM D1238-88	g/10min	(190/5)	(190/5)
Heat Reversion (Dimensional Stability)	ASTM D1638-83	%	<2	<2
Yield Stress	ASTM D638-89	PSI	> 2,320	> 2,900
Elongation of Yield	ASTM D638-89	%	> 12	> 10
Elongation at break	ASTM D638-89	%	> 200	> 50
Fire Classification	UL-94		V2	V2
Maximum Working Temperature		C_ F_	60 140	90 194

b) Upon request, the manufacturer shall provide written certification that the liner used meets or exceeds the requirement of this specification.

3. WELDING:

a) All welding shall be performed in accordance with the published directives and procedures of the manufacturer and by welders certified by the manufacturer. Completion of welding will provide a one piece monolithic concrete protective liner system that will provide excellent resistance to hydrogen sulfide attack and will not pull off the wall in the event that infiltration occurs.

The following welding techniques are acceptable:

1 Extrusion Welding

2 Butt Welding

3 Hot Air Welding b) Testing and supervision of the installation and welding shall be performed by

qualified staff only and must be checked when completed by visually checking and by Spark Testing all welded joints.

c) Sample welds shall be taken from each jobsite during the field welding process and submitted to the quality assurance department for testing. The following tests are performed: Shear and Peel Test. Shear weld test results shall meet or exceed at least 80% strength of parent material in a destructive test, which pulls the sample apart to test the strength and integrity of the extrusion weld. The peel test pulls the weld apart from the backside of the weld using a peeling type motion. The results of this test shall meet or exceed 60% of the value of the parent material.

END OF SECTION

SECTION 02545
SUBMERSIBLE WASTEWATER PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section includes submersible wastewater pumps and controls.

1.02 RELATED SECTIONS

A. Division 16 – Electrical

1.03 REFERENCES

International Standards Organization Standards

1.04 SUBMITTALS

A. Submit shop drawings and product data for the proposed pumps

B. Any size pump 10hp or greater shall be equipped with a stand by power generator.

1.05 QUALITY ASSURANCE

All pumping systems shall be of a design used in similar operations. Contractor shall provide evidence of this.

1.06 DELIVERY, STORAGE, AND HANDLING

Deliver equipment in manufacturer's packaging and store per manufacturer's instructions.

1.07 PROJECT/SITE CONDITIONS

These pumps will be installed in a new, circular concrete wet well as shown on the drawings.

1.08 WARRANTY

The pump manufacturer shall warrant the pumps in writing against defects in workmanship and material for a period of five years or 10,000 hours of normal use, operation and service. The warranty shall be in printed form and apply to all similar units.

1.09 SYSTEM STARTUP

Representatives of owner and engineer must be present at start up.

1.10 OWNER'S INSTRUCTIONS

Prepare and submit operations and maintenance manuals.

1.11 MAINTENANCE

Maintain equipment until the Notice of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering pumps which may be supplied for the work include, but are not limited to, the following:

1. Flygt Corporation, Norwalk, Connecticut
2. Klein, Schanzlin & Baker, Inc. (KSB), Richmond, Virginia
3. ABS Pumps, Inc.
4. Approved Equal

2.02 SUBMERSIBLE WASTEWATER PUMPS

A. Design: Pump shall be electric motor driven, non-clogging submersible pump. Pump shall be suitable for service in raw, unscreened wastewater with 3-inch solids. Each pump shall have the following capacity: The pump shall operate within this range without being power limited.

Pump Station	**No. 1**	**No. 2**
Q (gpm) @ max static		
TDH (ft) @ max static		
Q (gpm) @ min static		
TDH (ft) @ min static		
Shutoff Head		
Min Static head		
Max Static Head		
Nominal HP		

The design of the pumps shall be such that the pump unit will be automatically and firmly connected to the discharge piping when lowered into place on its mating discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be disconnected. For this purpose, there shall be no need for personnel to enter the wetwell. The pumps and their appurtenances shall be capable of continuous submergence under water operation without loss of watertight integrity to a depth of 65 feet.

B. Pump Construction:

All major parts, such as the stator casing, oil casing, sliding bracket, volute and impeller shall be of ASTM A-48, Class 30 gray iron. All surfaces coming into contact with waste shall be protected by a coating suitable for use in raw sewage. The motor/impeller shaft shall be AISI Type 420 stainless steel designed for the maximum torque condition. All exposed bolts and nuts shall be of stainless steel.

A wearing ring system shall be installed to provide efficient sealing between the volute and impeller. The impeller shall be gray cast iron of non-clogging design, capable of handling solids, fibrous materials, heavy sludge and other matter found in normal waste applications. The impeller shall be constructed with a long throughlet without acute turns. The impeller shall be dynamically balanced. Static and dynamic balancing operations shall not deform or weaken it. The impeller shall be a slip fit to the shaft and key driven. Non-corroding fasteners shall be used.

Each pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly hydro-dynamically lubricated lapped seal faces. The lower seal unit between the pump and oil chamber shall contain one stationary and one positively driven rotating tungsten-carbide ring. The upper seal unit between the oil sump and motor housing shall contain one stationary tungsten-carbide ring and one positively driven rotating carbon ring. Each interface shall be held in contact by its own spring system supplemented by external liquid pressures. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. Shaft seals without positively driven rotating members of conventional double mechanical seals with a common single or double spring acting between the upper and lower units, requiring a pressure differential to offset external pressure and effect sealing shall not be considered acceptable nor equal to the dual independent seal system specified. The shaft sealing system shall be capable of operating submerged to depths of, or pressures equivalent to 65 feet.

No seal damage shall result from operating the pumping unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication.

A sliding guide bracket shall be an integral part of the pump unit. The volute casing shall have a machined discharge flange to automatically and firmly connect with the cast iron discharge connection, which when bolted to the floor of the sump and discharge line, will receive the pump discharge's connecting flange without the need of adjustment, fasteners, clamps, or similar devices.

Installation of the pump unit to the discharge connection shall be the result of a simple linear downward motion of the pump unit guided by no less than two schedule 40 316L stainless steel guide bars. Each pump shall be equipped with a pump bail and chain. The bail and chain shall be sized to support the pump weight plus 100%. The length of the chain shall be wetwell depth plus ten feet. The bail, chain and shackles shall be 316L stainless steel.

No other motion of the pump unit, such as tilting or rotating shall be required. Sealing of the discharge interface by means of a diaphragm, O-ring or other device will not be

considered acceptable nor equal to a metal to metal contact of the pump discharge flange and mating discharge connection specified and required. No portion of the pump unit shall bear directly on the floor of the wetwell. There shall be no more than one 90-degree bend allowed between the volute discharge flange and station piping.

C. Pump Motor:

The pump motor shall be housed in an air-filled watertight casing and shall have moisture resistant Class F, 155 Degrees C. insulation. The motor shall be dual voltage (230/460) NEMA Design B and designed for continuous duty. Motor shall be non-overloading at any point in the operating range.

D. Pump Motor Cable:

Pump motor cable when installed shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC Specifications for pump motors shall be of adequate size to allow motor voltage conversion without replacing the cable.

The cable entry into the motor shall be on of the following types:

1. Type 1: Provide a cast iron pressure-tight cable entry gland which is sealed by nitrile rubber ring and compression gland. The compression gland shall be so designed as to conform to the allowable bending radius of the power cable.

Cast each individual conductor wire in resin in such a manner to prevent water leakage in motor through capillary action, due to external cable damage or other causes.

2. Type 2: The cable entry water seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The power supply and pilot cable entries shall be comprised of single cylindrical elastomer grommets flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function, separate from the function of sealing the cable. The assembly shall bear against a shoulder in the pump top and direct the cable axially upwards. The cable entry shall isolate the motor from foreign material gaining access through the pump top.

Control cable shall be independent from the power cable. The power and control cables shall be supplied with the pump by the manufacturer.

E. Internal Pump Monitoring System:

Each pump unit shall be factory equipped with the following listed control and status monitors, factory connected with the control cable. The monitoring system shall be suitable for operation on 24 VAC.

The following sensors shall be factory installed in the pump assembly:

1. Three (3) motor winding temperature thermistor probes to activate a control circuit at 300 degrees F (140 degrees C).

2. One (1) thrust bearing thermistor resistance probe.

3. One (1) moisture sensor to activate a fault relay.

The control module, suitable for panel mounting in a standard width motor control center cabinet, shall provide the following functions:

1. LED. bar graph indication of motor winding temperature with manually closed contacts to open on over-temperature. Alarm and trip set-points shall be adjustable.

2. LED. bar graph indication of bearing temperature with normally closed contacts to open on over-temperature. Alarm and trip set-points shall be adjustable.

3. LED. status indication of moisture sensor with manually closed contacts to open on moisture in stator case.

The monitoring system shall include analog (4-20 mA Dc) and digital outputs for remote monitoring of all functions. System shall also include manual reset of faults.

Each unit shall be provided with an adequately designed cooling system. Thermal radiators integral to the stator housing, cast in one unit, are acceptable. Where water jackets alone or in conjunction with radiators are used, separate circulation shall be provided. Cooling media channels and ports shall be non-clogging by virtue of their dimensions. Provisions for external cooling and flushing shall be provided.

F. Painting:

The pump assembly shall be coated with a PVC epoxy primer and finish coated with a chloric rubber paint or a two-component epoxy resin.

2.03 ACCESSORIES

A. Access Frame and Guides:

Provide an access frame complete with hinged and hasp-equipped covers, safety hatch, upper guide holder and level sensor cable holder. Cover shall be of sufficient size to permit removal or replacement of the pumping equipment. Each door shall have a safety handle to maintain the door in the open position. Doors shall be of checkered aluminum plate. Cover guide bar holders shall be integral with the discharge connection. The guide bars shall not support any portion of the weight of the pump.

B. Liquid Level Sensors:

Provide liquid level sensors consisting essentially of a mercury switch encapsulated in corrosion-resistant casing. The switch cable shall enter the casing through a watertight compression type fitting suitable for use in corrosive environments. The casing shall

contain an eccentric weight which is positioned to insure that the mercury switch tilts in the proper direction. The entire float switch assembly shall be designed for use in raw sewage. Provide one float for high-level alarm and one float for low-level shut-off.

C. Controls:

Pumping Station Controls:

Furnish and install one automatic pump control center in NEMA 4X stainless steel or fiberglass enclosure for 460volt, 3 phase service for pumping station. For each pump there shall be included individual motor circuit breakers, magnetic contactors with three phase overload protectors, manual reset, hand-off automatic selector switches, running lights, ammeters and elapsed time meters. Provide phase failure / undervoltage relay to de-energize motors and include auxiliary contacts for remote indication. An alarm system consisting of an alarm light and horn, with silencing switch shall be provided. A 24 volt control circuit transformer with disconnect and overload protection shall be provided. A duplex weather proof convenience outlet shall be provided. Terminal strips shall be provided for interface wiring between control panel and pumping station. The controls shall automatically alternate the operation of the pumps. Two 20 amp, one pole breakers shall be provided in the control panel as spares with four required for service.

Pumps shall be controlled by the level monitor system specified below as a standard duplex pumping station. Variable frequency drives shall conform to the requirements of Section 16700, Article 2.05. For each pump there shall be included individual motor circuit breakers, magnetic contactors with three phase overload protectors, manual reset, hand-off automatic selector switches, running lights, ammeters and elapsed time meters. Provide phase failure / undervoltage relay to de-energize motors and include auxiliary contacts for remote indication. An alarm system consisting of an alarm light and horn, with silencing switch shall be provided. A 24 volt control circuit transformer with disconnect and overload protection shall be provided. A duplex weather proof convenience outlet shall be provided. Terminal strips shall be provided for interface wiring between control panel and pumping station. The controls shall automatically alternate the operation of the pumps. Two 20 amp, one pole breakers shall be provided in the control panel as spares with four required for service.

A high level alarm shall initiate a call-to-run to the standby trash pump and a stop sequence call to the submersible pumps.

D. Level Monitor:

The transducer shall be capable of operating over a range of 12 inches to 30 feet. The level monitor shall be as manufactured by Multitrode, or approved equal.

E. Pump Controller:

Pump shall be controlled with a Flygt Model FMC-200 or Multitrode Model MSM 3PC pump controller or equal.

PART 3 EXECUTION

3.01 INSTALLERS

The Contractor

3.02 EXAMINATION

Examine equipment to verify compliance with the specifications.

3.03 PREPARATION

Construct wet well with roof and hatch as shown on drawings.

3.04 INSTALLATION

Install per drawings and manufacturer's instructions.

3.05 FIELD QUALITY CONTROL

Test pumps as soon as practical.

3.06 ADJUSTING

Adjust equipment for fit and operation.

3.07 CLEANING

Remove dirt, grime, marks, etc, from pumps.

3.08 DEMONSTRATION

Demonstrate equipment as soon as practical.

END OF SECTION

SECTION 02546
PLUG VALVES

PART 1 GENERAL

1.01 SCOPE

A. This Section specifies Plug Valves.

1.02 RELATED SECTIONS

A. Section 15180—Control Valve Schedule.

B. Section 15090—Valve Actuators.

1.03 REFERENCES

A. ANSI B16.1—Cast Iron Pipe and Flanges and Flanged Fittings, Class 25, 125, 250, and 800

B. ASTM A126-84— Gray Iron Castings for Valves, Flanges, and Pipe Fittings

C. ASTM A536-84— Ductile Iron Castings

D. AWWA C504-87— Rubber-Seated Butterfly Valves

1.04 SUBMITTALS

A. Submit to the Engineer, within 30 days after execution of the Contract, a list of materials to be furnished, the names of the suppliers, and the date of delivery of materials to the site.

B. Complete shop drawings of all valves and appurtenances shall be submitted to the Engineer for approval in accordance with Section 01330 of these Specifications. Clearly indicate make, model, location, type, size and pressure rating.

C. Operating and maintenance data for all valves shall be furnished for each valve.

1.05 STORAGE AND PROTECTION

Valves and all associated accessories shall be stored and protected in accordance with the requirements of Section 01600 of these Specifications.

1.06 QUALITY ASSURANCE

The manufacturer shall provide written certification to the Engineer that all equipment furnished complies with all applicable requirements of these Specifications

PART 2 PRODUCTS

2.01 MANUFACTURERS—PLUG VALVES

A. DeZurik

B. Henry Pratt

2.02 MATERIALS

Materials of construction shall be as follows:

Component	Material
Body	Cast iron, ASTM A126, Class B
Plug	Cast iron, ASTM A126, class B, or cast iron ASTM A436 (Ni-resist), or ductile iron, ASTM A536
Plug facing	Neoprene or Buna-N
Body seats	
Less than 3 inches	Cast iron, ASTM A126, Class B
3 inches and larger	Stainless steel, ASTM A276, Type 304 or nickel
Packing	Buna V-flex or TFE

2.03 MANUFACTURE

A. General

1. Valves shall be straight-flow non-lubricated resilient plug type suitable for driptight, bi-directional shutoff at the specified design pressure as specified in Section 15050. Port areas for the valve shall be at least 80 percent of the adjacent full pipe area and shall be capable of passing solids 55 percent of pipe size. Ports for Grit Slurry service shall be round and shall be at least 81% of the nominal pipe size flow area (Milliken Series 600 or Equal). Valve body seats consisting of nickel for valves 3 inches and larger shall be constructed of a welded-in overlay of not less than 90 percent pure nickel. Upper and lower journal hearings shall be replaceable, sleeve-type, corrosion resistant, and permanently lubricated. Packing shall be self-adjusting chevron type replaceable without disassembling the valve.
2. Unless otherwise specified, valves shall, as a minimum, conform to the following pressure ratings:

Size, inches	Design pressure, psig
12 and smaller	175
14 through 36	150
42 through 54	125

B. End Connections: Valves 3 inches and smaller shall have threaded ends. Valve flange drilling for valves larger than 3 inches shall be per ANSI B16.1, Class 125. Grooved-end valves may be provided with grooved-end piping systems

C. Manual Operators: Unless otherwise specified, valves 4 inches and smaller shall be provided with a lever type manual operator. Valves larger than 4 inches shall be provided with totally enclosed worm gear operators. Where specified, manual operators shall have an adjustable stop. All operator components shall be sized for the valve design pressure in accordance with AWWA C504, Section 3.8. Operators shall comply with applicable portions of Section 15090and AWWA C151

D. Powered Valve Operators: Powered valve operators shall be provided for valves scheduled in Section 15180 or otherwise indicated. Operators shall conform to the requirements of Section 15090

PART 3 EXECUTION

3.01 INSTALLATION

A. All valves and appurtenances shall be installed in the locations shown on the Drawings, true to alignment and properly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.

B. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the Contractor shall check all plans and figures which have a direct bearing on their location and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structure.

3.02 FIELD PAINTING

All exposed, ferrous metal, non-buried or submerged valves and appurtenances specified herein shall be painted as part of the work in Section 09900 of these Specifications.

3.03 INSPECTION AND TESTING

Following installation, operating tests will be performed to demonstrate to the Engineer that all equipment and accessories will function in a satisfactory manner. The Contractor shall make, at Contractor's own expense, all necessary changes, modifications and/or adjustments required to ensure satisfactory operation.

3.04 CLEANING

In accordance with Section 01740 of these Specifications.

END OF SECTION

SECTION 02547
LIFT STATION WETWELL

1. SCOPE:

The work under this heading includes the wetwell for the lift station and receiving manhole as shown on the Drawings and specified herein, complete.

2. EXCAVATION, FILLING AND GRADING:

Excavation, filling and grading shall be as specified in Section 02317.

3. MATERIALS:

The wetwell shall be constructed of reinforced concrete pipe set vertically on a reinforced concrete base and shall have a reinforced concrete top as shown.

a) Concrete and Reinforcing. Concrete and reinforcing shall conform to the requirements as shown on the Drawings.

b) Pipe.

Pipe shall conform to ASTM 076, Class III, Wall B.

c) Joints. Joints between section of pipe shall be sealed with an approved two part epoxy adhesive material, containing 100 percent solids and shall meet or exceed the following requirements:

Flexure Strength - 4000 psi
Tensile Strength - 1200 psi
Bond Strength - Concrete shall fail before failure of epoxy.

4. INSTALLATION:

a) Setting Wetwell Walls. The first joint of the reinforced concrete pipe for the wetwell walls shall be precast monolithically or concurrently with the concrete bottom.

b) Cutting and Patching. Cutting and patching in the wet well walls shall be done in a neat and workmanlike manner.

c) Existing wetwell and receiving manhole that receive increased flow from new projects shall be completely lined (top, bottom, and sides) in accordance with Section 02542 - Protective Coating for Wetwell and Receiving MH or Section 02543 – Fiberglass Liner or Section 02544 HDPE Liner and in accordance with the details on Drawings.

END OF SECTION

SECTION 02635
STORM DRAINAGE PIPING

PART 1 GENERAL

1.01 SCOPE

Furnish all labor, equipment, supplies, and materials and perform all operations in connection with construction of storm sewers as shown on the plans or specified. Construction shall be in accordance with the Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, Latest Edition.

1.02 RELATED SECTIONS

A. Section 02317 – Trench Excavation, and Backfill.

B. Section 02532 – Sanitary Sewers.

C. Section 03300 or 03305 - Cast-In-Place Concrete.

D. Section 03400 - Precast Concrete Structures.

1.03 REFERENCES

A. AASHTO M 36/ASTM A 760 - Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains; American Association of State Highway and Transportation Officials and Georgia Department of Transportation Standard Specifications, Section 844 latest Edition.

B. AASHTO M 170 - Standard Specification for Reinforced Concrete Pipe and Georgia Department of Transportation Standard Specifications, Section 843 latest Edition.

C. AASHTO M 190/ASTM A 849 - Standard Specification for Bituminous Coated Corrugated Steel Culvert Pipe and Georgia Department of Transportation Standard Specifications, Section 844 latest Edition.

D. AASHTO M 294 - Corrugated Polyethylene Pipe (12" through 48") and Georgia Department of Transportation Standard Specifications, Section 845 latest Edition.

E. ASTM C 14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.

F. ASTM C 76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

G. ASTM C 443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gasket.

H. ASTM F405 – Standard Specification for Corrugated Polyethylene Pipe and Fittings.

I. ASTM F667 – Standard Specification for large diameter Corrugated Polyethylene Pipe and Fittings.

J. ASTM 949 – Standard Specificaion for Poly(Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings.

1.04 SUBMITTALS

Complete product data and engineering data, including shop drawings, shall be submitted to the Engineer in accordance with the requirements of Section 01330 of the Contract Documents.

1.05 TRANSPORTATION AND HANDLING

A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.

B. Handling: Handle pipe, fittings and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front end loader. Do not use material damaged in handling. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe. Do not use chains in handling pipe, fittings and appurtenances.

1.06 STORAGE AND PROTECTION

A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.

B. Stored materials shall be kept safe from damage.

C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.

PART 2 PRODUCTS

2.01 PIPE MATERIALS

A. Reinforced Concrete Pipe (RCP): Shall conform to the requirements of AASHTO M 170, ASTM C 76, ASTM C 361; mesh reinforcement; bell and spigot end joints.

B. Corrugated Zinc Coated (Galvanized) Steel Pipe (CMP): Steel shall conform to the requirements of AASHTO M 36 and M 218 / ASTM A 760 and A 929. All pipe shall be 14 gauge unless otherwise noted on the plans.

C. Bituminous Coated Corrugated Metal Pipe (BCCMP): Galvanized corrugated, Federal Spec. QQ-C-806, fully bituminous coated .05" shall conform to the requirements of AASHTO M 190 / ASTM A 849 with paved inverts. All pipe shall be 14 gauge unless otherwise noted on the plans.

D. Aluminized Type 2 Corrugated Steel Pipe (ACSP): Type 2 Aluminized Steel shall conform to the requirements of AASHTO M 36 and M 274 / ASTM A 760 and ASTM A 929. All pipe shall be 14 gauge unless otherwise noted on the plans.

E. Corrugated Aluminum Alloy Pipe (CAAP): Aluminum Alloy Pipe shall conform to the requirements of AASHTO M 196 / ASTM B 745. All pipe shall be 14 gauge unless otherwise noted on the plans.

F. High Density Polyethylene Pipe (HDPE): Smooth interior, corrugated exterior HDPE storm sewer pipe meeting the requirements of AASHTO M 252, M 294 and MP7. The pipe shall be AASHTO Type 'S' (N-12) WT as manufactured by Advanced Drainage Systems, Inc. (ADS) for sizes 4” through 60” or approved equal.

G. Poly(Vinyl Chloride) (PVC): Smooth interior, corrugated exterior PVC storm sewer pipe shall conform to the requirements of ASTM F949, F794 and AASHTO M304. The pipe shall be A-2000 PVC belled as manufactured by CONTECH Construction Products Inc. for sizes 4” through 36” or approved equal.

H. All storm drainage pipe shall meet or exceed the Georgia Department of Transportation Standard Specification, Section 550 unless otherwise noted on the plans or within this specification.

2.02 PIPE ACCESSORIES

A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal and Reinforced Concrete Pipe Joint Device: Shall conform to the requirements of AASHTO M 198 / ASTM C 361, ASTM C 443. “O”-ring type rubber gasketed concrete joints.

B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.
All fittings shall conform to manufacturers specifications.

C. Filter Fabric: Non-biodegradable, woven.

D. Coupling Bands: Aluminized steel, 0.052 inches thick x 10 inches wide; connected with two neoprene "O" ring gaskets and two galvanized steel bolts and shall conform to the requirements of AASHTO M 36.

2.03 CATCH BASIN

A. Construction shall be in accordance with the Georgia Department of Transportation Standard Specifications, Section 668 latest Edition.

B. Lids and Drain Covers: Shall be cast iron.

C. Catch Basin: as shown on drawings, per Georgia Department of Transportation Standards and Details.

D. Shaft Construction and Concentric Cone Top Section: Reinforced precast concrete pipe sections ASTM C478, lipped male/female dry joints, nominal diameter of 48 inches.

E. Base Pad: Cast-in-place concrete of type specified in Section 03300 or 03305, leveled top surface to receive concrete shaft sections, sleeved to receive sewer pipe sections.

F. See Section 02532 Manholes and Covers for additional information on manhole steps, brick, mortar etc.

2.04 HEADWALLS AND END SECTIONS

Construction shall be in accordance with the Georgia Department of Transportation Standards and Details.

2.05 BEDDING AND COVER MATERIALS

Bedding and Cover: As specified in Section 02317 - Trench Excavation and Backfill.

PART 3 EXECUTION

3.01 EXISTING UNDERGROUND UTILITIES AND OBSTRUCTIONS

A. The plans indicate utilities and obstructions that are known to exist according to the best information available to the Owner.

B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.

1. Expose the facility, for a distance of at least 100 feet in advance of pipeline construction, to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.
2. Avoid utility damage and interruption by protection with means or methods recommended by the utility owner.

C. Conflict with Existing Utilities

1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed piping does not permit safe installation of the piping by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the piping to avoid horizontal conflicts if the new alignment complies with regulatory agency requirements and after a written request to and subsequent approval by the Engineer. Where such relocation of the piping is denied by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.
2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed piping does not permit the crossing without immediate or potential future damage to the utility, main, service, or the piping. The Contractor may change the proposed grade of the piping to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the Engineer.

D. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

E. Water and Storm Sewer Separation

1. Potable water mains should maintain a minimum 10 foot edge-to-edge separation from storm sewer lines.
2. Where storm sewers cross the water main, the pipe joint adjacent to the pipe crossing the water main shall be cut to provide maximum separation of the pipe joints from the storm sewer.
3. No water main shall pass through, or come in contact with, any part of a storm sewer manhole.

3.02 TRENCHING

See Section 02317 - Trench Excavation and Backfill for minimum requirements.

3.03 INSTALLATION - PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on construction plans.

B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.

C. Lay pipe to slope gradients noted on construction plans; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Reinforced Concrete Pipe shall be installed in accordance with applicable provisions of the American Concrete Pipe Association (ACPA). RCP shall be installed on a Class C bedding as specified in Section 02317.

E. Bituminous Coated Corrugated Metal Pipe (BCCMP), Aluminized Type 2 Corrugated Steel Pipe (ACSP) and Corrugated Aluminum Alloy Pipe (CAAP) shall be installed on a Class B bedding as specified in Section 02317.

F. High Density Polyethylene Pipe (HDPE) shall be installed on a Class B bedding as specified in Section 02317.

G. Poly(Vinyl Chloride) (PVC) PIPE shall be installed on a Class B bedding as specified in Section 02317.

3.03 INSTALLATION - CATCH BASINS AND MANHOLES

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections.

C. All structures shall be placed on an 8-inch subbase of No. 57 stone.

D. Level top surface of base pad; sleeve concrete shaft sections to receive storm sewer pipe sections.

E. Establish elevations and pipe inverts for inlets and outlets as indicated.

F. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

3.04 FIELD QUALITY CONTROL

A. Perform field inspection and testing as directed by the engineer.

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to owner.

3.05 PROTECTION

Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

END OF SECTION

SECTION 02820
GALVANIZED CHAIN-LINK FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

This section consists of all labor, materials, and equipment and tools necessary for furnishing and installing chain link fence, gates and accessories in conformance with the lines, grades, and details as shown.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

B. A121 - Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.

C. A392 - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.

D. A817 - Standard Specification for Metal-Coated Steel Wire for Chain-Link Fence Fabric and Marcelled Tension Wire.

E. C94 - Standard Specification for Ready-Mixed Concrete.

F. F567 - Standard Practice for Installation of Chain-Link Fence.

G. F626 - Standard Specification for Fence Fittings.

H. F900 - Standard Specification for Industrial and Commercial Swing Gates.

I. F1043 - Standard Specification for Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework.

J. F1083 - Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

1.03 SUBMITTALS

See Section 01330 for submittal procedures.

PART 2 PRODUCTS

2.01 GENERAL

Materials shall conform to ASTM F1083 and ASTM A392 ferrous metals, zinc-coated; and detailed specifications forming the various parts thereto; and other requirements

specified herein. Zinc-coat metal members (including fabric, gates, posts, rails, hardware and other

2.02 FENCE MATERIALS

A. HEIGHT: The fabric shall be seven (7) feet in height with an overall height of eight (8) feet above grade when erected including extension arms for barbed wire or as shown on the plans.

B. FABRIC

1. No. 9 gauge fabric wire (Steel)
2. Two inch (2") mesh chain link.
3. Galvanized after fabrication.

C. POSTS

Type I round post shall be hot dipped galvanized with a minimum average zinc coating of 1.8 oz./sq. ft. meeting ASTM F-1083 for standard weight (Schedule 40) galvanized pipe.

1. Line Posts: 2.50" O.D. – 5.10 lbs./LF, Type 1.
2. Corner/Terminal Posts: 4.00" O.D. – 8.65 lbs./LF, Type 1.
3. Gate Posts: 4.00" O.D. – 8.65 lbs./LF, Type 1.
4. Finish: Hot dipped galvanized.

D. TOP RAIL AND BRACE RAIL

1. Size: 1.625" O.D. - 2.27 lbs./LF, Type 1.
2. Finish: Hot dipped galvanized.

E. BARBED WIRE

1. Three (3) lines 12-1/2 gauge mounted on extension arms.
2. Four point barbs, 14 gauge spaced approximately 5” on center.
3. Zinc-coated barbed wire shall conform to ASTM A 121.

F. EXTENSION ARMS

1. Pressed steel extension arms shall withstand 250 lb. downward pull at outermost end of arm without failure.
2. Forty-five degree angle.
3. Twelve inches (12") out from and above fence line.
4. Finish: Hot dipped galvanized.

G. GATES

1. HEIGHT: The fabric shall be seven (7) feet in height with an overall height of eight (8) feet above grade when erected including extension arms

for barbed wire or as shown on the plans. Width as shown on plans with offset hinges capable of opening 180 degrees. Conform to ASTM F900.

2. Frame: 2" O.D. - 2.72 lbs./LF, Type 1.
3. Provide double gate latch with two gate catches. The locking device
4. Provide stops and keepers for all double gates. Latches shall have a plunger-bar arranged to engage the center stop. Arrange latches for locking. Center stops shall consist of a device arranged to be set in concrete and to engage a plunger bar. The latching device shall be constructed so that the plunger bar cannot be raised when the gate is locked. Keepers shall consist of a mechanical device arranged to be set in concrete for securing the free end of the gate when in full open position. Latching device shall have a padlock and key provided per Owners choice.
5. Finish: Hot dipped galvanized.

H. ADJUSTABLE TRUSS ROD

1. Truss rods & tightener: Minimum rod diameter shall be 3/8".
2. Truss rod adjusting unit shall be located per detail on plans.
3. Finish: Hot dipped galvanized.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install fence by properly trained crew, on previously prepared surfaces, to line and grade as shown. Install fence in accordance with ASTM F567 and with the manufacturer's printed installation instructions, except as modified herein or as shown. Maintain all equipment, tools, and machinery while on the project in sufficient quantities and capacities for proper installation of posts, chain links and accessories. Installation shall be in a neat, tight, plumb and true manner. It shall conform to the manufacturer's recommendations.

B. Excavation for concrete-embedded posts shall be of the dimensions shown, except in rock. If rock is encountered before reaching the required depth, continue the excavation to the depth shown or 18 inches into the rock, whichever is less, and provide a minimum of 2 inches larger diameter than the outside diameter of the post. Clear loose material from post holes. Grade area around finished concrete footings as shown and dispose of excess earth as directed.

C. Posts shall be a maximum of ten (10) feet on center. Line posts shall be set in twelve (12) inch diameter by forty (40) inch deep excavation with 3000 psi concrete footings. Corner/Terminal and gateposts shall be set in sixteen (16) inch diameter by forty (40) inch deep excavation with 3000 psi concrete footings. Set posts plumb and in alignment, in 3000 psi concrete footings with top of footing 2 inches above finished grade and crowned to shed water.

D. Fit all exposed ends of post with caps. Provide caps that fit snugly and are weathertight. Where top rail is used, provide caps to accommodate the top rail. Install post caps as recommended by the manufacturer and as shown.

E. Do not stretch fabric until concrete foundation has cured 7 days.

F. Position bottom of fabric 1-1/2 inches maximum above finished grade and on a straight grade between posts. Excavate if necessary, fill only with approval of Engineer.

G. Fasten fabric to top rail, line posts, braces, and bottom tension wire with nine (9) gauge tie wire at maximum 15 inches on centers.

F. Attach fabric to end, corner, and gateposts with tension bars and tension bar clips.

G. Tension bars shall be a minimum of 3/16" x 3/4" and be provided for each end and gate post, and two for each corner and pull post.

H. Tension wire shall be #7 gage, hot-dipped galvanized and be provided within 6 inches of the bottom of the fabric.

I. Install gates plumb, level, and secure for full opening without interference. Set keepers, stops and other accessories into concrete as required by the manufacturer and as shown. Adjust hardware for smooth operation and lubricate where necessary.

J. Use galvanized repair compound, stick form, or other method, where galvanized surfaces need field or shop repair. Repair surfaces in accordance with the manufacturer's printed directions.

END OF SECTION

SECTION 02920
LAWNS AND GRASSING

PART 1 GENERAL

1.01 SCOPE

This section pertains to seeding work, including preparing the seedbed, furnishing and placing of topsoil, seed and other required materials for a complete installation to the limits of construction and specified herein. Seeding operations shall be performed on all newly graded earth areas not otherwise specified covered by structures, pavements and/or surfacings, riprap, sod, sprigging, walkways, and other items of a similar nature; on all cleared and/or grubbed areas which are to remain as finish grade surfaces and not to be excavated or embankments constructed thereon; on all existing off site and on site turfed earth surfaces which are disturbed by construction operations and which are to remain as finish grade surfaces; and at all other locations which may be designated on the drawings or specified herein. The contractor shall follow the GA DOT Standard Specifications Construction of Roads and Bridges Section 700, 882, 890 and 891 latest edition and/or pages 6-35 thru 6-60 of the Manual for Erosion and Sediment Control in Georgia (1975 and as amended in the latest edition).

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Erosion and Sedimentation Control - Section 02370

B. Sodding – Section 02921 (If Indicated on the Drawings)

PART 2 PRODUCTS

2.01 TOPSOIL

Topsoil for planting shall be a rich friable loam containing a large amount of humus and shall be original surface sandy loam, topsoil of good rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than 1/2-inch in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips, or other undesirable material harmful or unnecessary to plant growth. Topsoil shall be reasonably free from perennial weeds and perennial weed seeds, and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements or vegetable debris undesirable or harmful to plant life. Bermuda grass roots in topsoil will not be accepted, unless otherwise approved by the Engineer.

Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classifiable as loam, silt loam, clay loam, or a combination thereof.

2.02 GRASS SEED

All seeds shall be labeled in accordance with U.S.D.A. Rules and Regulations. Seeds shall be packaged in suitable containers in accordance with the Georgia Seed Laws, Rules and Regulations currently in effect. No seed shall be used which has become molded, wet or otherwise damaged. Seed shall be tested by the Georgia Department of Agriculture for the purity and germination within six months prior to the date of sowing.

1. Grass seed on level or slightly sloping ground shall consist of the following for the planting dates specified:

(a)	March 1 to June 30	
	Common Bermuda (hulled)	10 lbs./acre
	Tall Fescue	50 lbs./acre
(b)	August 1 to November 1	
	Tall Fescue	50 lbs./acre
	Common Bermuda (unhulled)	10 lbs./acre
(c)	November 1 to March 1	
	Common Bermuda (unhulled)	10 lbs./acre

2. Grass seed on slopes 3:1 or steeper and infrequently mowed areas shall consist of the following for the planting dates specified:

(a)	March 1 to June 15	
	Weeping Lovegrass	5 lbs./acre
	Sericea Lespedeza (scarified)	60 lbs./acre
(b)	August 1 to November 1	
	Tall Fescue	50 lbs./acre
	Sericea Lespedeza (unscarified)	75 lbs./acre
(c)	November 1 to March 1	
	Common Bermuda (unhulled)	10 lbs./acre
	Sericea Lespedeza (unscarified)	75 lbs./acre

When as directed by the Engineer, an approved quick growing species of grass seed such as rye, Italian rye, millet or other cereal grass, shall be applied at a rate of 30 lbs./acre in conjunction with and in addition to the seed mixture specified above.

2.03 SPRIGS

Bermuda, common, healthy living stolons native to locality of project. Plant on day of removal from growing location. Plant sprigs from March 15 to July 15.

2.04 MULCH

A. Dry Mulch: Dry mulch shall be straw or hay, consisting of oat, rye or wheat straw, or of pangola, peanut, coastal Bermuda or Bahia grass hay. Only undeteriorated mulch which can be readily cut into the soil shall be used. Application rate shall be 2 ½ tons per acre.

B. Mulch for hydroseeding: This material shall consist of wood cellulose fiber applied at 500 lbs./acre with dye color equal to Weyerhauser Company, or Conway Corporation material used for "hydroseeding" and suitable for this purpose.

2.05 FERTILIZER

Fertilizer shall be of an accepted and approved commercial brand. Fertilizer shall be a ready mixed material containing the soil nutrients as specified and in a suitable form compatible with the equipment used to achieve uniform distribution of the fertilizer. The fertilizer mixture shall contain the following nutrients expressed in per cent of the total weight: 6% nitrogen, 12% available phosphoric acid, and 12% water soluble potash (6-12-12) analysis. Container tags shall have the name and address of the manufacturer, the brand name, net weight, and chemical composition of analysis. Fertilizer shall be applied at 1500 lbs./acre.

2.06 LIME

Agricultural lime shall be within the specifications of the Georgia Department of Agriculture. Ground limestone is calcitic or dolomitic limestone ground so that 90 percent of the material shall pass a 10-mesh sieve, not less that 50 percent will pass through a 50-mesh sieve and at least 25% shall pass a 100-mesh sieve. Lime shall be applied as indicated by soil test, or the rate of 1 to 2 tons per acre.

2.07 WATER

The water used in the grassing operations may be obtained from any approved spring, pond, lake, stream or municipal water system. The water shall be free of excess and harmful chemicals, acids, alkalies, or any substance which might be harmful to plant growth or obnoxious to traffic.

2.08 SOD

Shall be healthy living, disease and weed free grass that has been freshly cut.

PART 3 EXECUTION

3.01 HYDROSEEDING

A. The materials for grassing shall consist of a thoroughly mixed slurry of grass seed, fertilizer, lime and mulch as specified. The application rate for wood fiber mulch shall be approximately 500 lbs./acre. All materials shall be discharged within one hour after being combined in the hydroseeder.

B. Each kind of leguminous seed shall be inoculated separately with the appropriate commercial culture according to instructions of the manufacturer of the material. All inoculated seed shall be protected from the sun and shall be planted the same day it is inoculated.

C. Equipment for mixing and applying the slurry shall be especially designed for this purpose. It shall be capable of applying a uniform mixture over the entire area to be seeded. The slurry mixture shall be agitated during application to keep the ingredients thoroughly mixed. A suitable metering device to determine the rate of application and assist in obtaining uniform coverage of the grassed areas shall be incorporated as part of the equipment.

D. Ground preparation for hydroseeding shall be the same as for conventional seeding.

E. Hydroseeding shall not be performed when windy weather prevents even distribution; when the prepared surface is crusted; or when the ground is frozen, wet or otherwise in a non-tillable condition.

3.02 CONVENTIONAL SEEDING

A. Grading and Shaping

Grade and shape to finish contours and to allow practical use of equipment.

B. Seedbed Preparation

1. Broadcast plantings:
   a. Tillage as a minimum shall: adequately loosen the soil to a depth of 4 to 6 inches; alleviate compaction; incorporate lime and fertilizer; smooth and firm the soil; allow for the proper placement of seed, sprigs, or plants; and allow for the anchoring of straw or hay mulch if a disk is to be used.
   b. Tillage may be done with any suitable equipment.
   c. Tillage may be done on the contour where feasible.
   d. On slopes too steep for the safe operation of tillage equipment, the soil surface will be pitted or trenched across the slope with appropriate hand tools to provide a place 6 to 8 inches apart in which seed may lodge and germinate.

2. Individual plants:
   a. Where individual plants are to be set, the soil will be well prepared by excavating holes, opening furrows, or dibble planting.
   b. For nursery stock plants, holes shall be large enough to accommodate roots without crowding.

3.03 SPRIGS

Separate or shred and broadcast over area prepared for planting at 40 cu. ft. per acre. Harrow into ground with disc turned straight.

3.04 LIME/FERTILIZER APPLICATION

Lime and fertilizer will be applied uniformly during land preparation so that it will be mixed with the soil during seedbed preparation. On steep surfaces, scarify slope prior to broadcasting lime and fertilizer.

3.05 PLANTING

A. Seeding will be done on a freshly prepared and firmed seedbed. For broadcast planting, use a cultipacker-seeder, drill, rotary seeder, other mechanical seeder, or hand seeding to distribute the seed uniformly over the area to be treated. Cover the seed lightly with a cultipacker or other suitable equipment.

B. No-till seeding is permissible into annual cover crops when planting is done following maturity of the cover crop or if the temporary cover stand is sparse enough to allow adequate growth of the permanent species.

C. No-till seeding must be done with appropriate no-till seeding equipment. The seed must be uniformly distributed and planted at the proper depth.

3.06 MULCHING

All seeded areas shall be mulched. Soil retention blankets, erosion control netting, and other manufactured materials may be required in addition to mulch on unstable soils and concentrated flow areas. Mulch shall be spread uniformly within 24 hours after seeding.

3.07 WATER, MAINTENANCE AND RESEEDING

A. Contractor shall be responsible for maintaining the proper moisture content of the soil to insure adequate plant growth until a satisfactory stand of grass is obtained. Watering shall be performed to maintain an adequate water content in the soil.

B. **The Contractor shall mow and maintain all seeded areas without additional payment until final acceptance of the work by the Owner, and any regrading, refertilizing, reliming, reseeding or remulching shall be done at his own expense.** Seeding work shall be repeated on defective areas until a satisfactory uniform stand of grass is accomplished. A satisfactory stand of grass is defined as

grass that covers at least 98% of the total area with no bare spots larger than one square foot and bare spots shall be scattered such that bare areas do not comprise more than 1/100 of any given area. **Damage resulting from erosion, gulleys, washouts, or other causes shall be repaired by filling with topsoil, compacting, and repeating the seeding work at the Contractor's expense.**

3.08 SODDING

See Section 02921 Sodding for additional sod requirements. Smooth the grade for the specified area to be planted. Apply amendments and fertilizer requirements as determined in soil test. Planting area shall be free of stumps, roots, large stone over 4" diameter, and any other debris. Apply fertilizer and rake into the soil surface. Lightly wet soil surface if dry. Lay the sod at right angles to any major water flow. Sod shall be pinned and secured on slopes greater than 6:1. Sod joints shall be staggered between rows. Sod shall be watered after installation each day.

END OF SECTION

SECTION 03395
TESTING OF HYDRAULIC STRUCTURES

PART 1 GENERAL

1.01 SCOPE

Furnish all labor, materials, tools, equipment and related items required to perform integrity and leakage tests of hydraulic structures. This includes all water/wastewater retaining structures. This does not include manholes, which are tested according to specification section 02532 Sanitary Sewers.

1.02 SUBMITTALS

Submittals shall include a description of the testing procedures to be employed and the report form to be furnished. Testing procedure shall follow ACI 350.1 R-93

PART 2 PRODUCTS

2.01 TEST MEDIUMS

The Owner will provide the necessary potable water required for testing the Work. The Contractor shall furnish all other test mediums. The Contractor shall furnish all equipment, pumping, necessary piping and required labor to transport water from its source to the test location for use in testing and to empty any tankage at conclusion of test.

2.02 TEST EQUIPMENT

The Contractor shall furnish all labor and equipment, including required pumps with regulated bypass meters and gauges, for conducting tests

PART 3 EXECUTION

3.01 GENERAL

A. The timing and sequence of testing shall be scheduled by the Contractor, subject to the approval of the Engineer. The Contractor shall coordinate the timing and sequence of testing with the Owner's operating schedule. The Contractor shall provide the Engineer with a minimum of 48 hours notice prior to the start of any test. All tests must be observed by the Engineer.

B. The Contractor shall repair any leaks discovered during the testing sequence. All known and visible leaks shall be repaired, whether or not the leakage rate is within

allowable limits. Concrete tanks shall not be backfilled prior to testing. A visible leak shall be defined as water flow from cracks, joints, fittings, etc. Isolated surface dampness shall not be considered a leak.

3.02 NON-POROUS STRUCTURES

Non-porous structures, such as steel and fiberglass, shall be tested for 24 hours. Accurate and precise measurements shall be made at the beginning and end of the test period. The structure shall be filled with water to its maximum depth. No leakage is allowed during the 24 hour test period.

3.03 CONCRETE STRUCTURES

A. Test Preparation - Concrete structures shall be tested prior to any backfill (provided design of structure allows for it) and prior to application of any coatings. Structures shall be pilled to the highest allowable point and water shall remain in structure a minimum of three days prior to commencement of testing.

B. Allowable leaking Rate = 0.1% of the tank volume over a 24-hr period. Example: 1,000,000 gallon tank x 0.1% = 1000 gallons allowable leakage; Assume tank has a 100 ft diameter; 1000 gal x 0.1337 = 133.7 ft3; $\prod (50)^2$ h= 133.7 ft3; h=0.2 inches allowable water level drop in 24 hours.

C. Compensation for temperature, evaporation, and precipitation shall be made by using a filled calibrated container. The container shall be floating in the water containment structure. This container will allow for corrections due to the above.

D. Test Procedure. Concrete structures shall be tested for 24 hours. Accurate and precise measurements of the water level in the containment structure and the compensating vessel shall be made at the beginning and end of test. Leakage shall no exceed allowable in item B above.

3.04 REPAIRS

If the leakage exceeds the specified allowable limits or is visible, the point or points of leakage shall be sought out and remedied by the Contractor at no additional cost to the Owner. Repairs shall be accomplished in a method submitted by the contractor and approved by the engineer.

3.05 ACCEPTANCE

A. No hydraulic structure shall be accepted until all known and visible leaks have been repaired, whether or not the leakage is within the maximum allowable limits. Repairs must be made prior to backfill for concrete tanks.

B. The Contractor will certify that all required tests have been successfully completed before the work is accepted.

END OF SECTION

SECTION 03400
PRECAST CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Columns and bearing saddles.

B. Beams, spandrels, girders, purlins.

C. Floor double tees and channel slabs.

D. Grout packing.

E. Connection and supporting devices.

F. Lintels and bond beams.

G. Wetwells

H. Utility Vaults

I. Headwalls

1.02 RELATED SECTIONS

A. 03300 or 03305 - Cast-In Place Concrete

1.03 REFERENCES

A. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International; 1999.

B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1997a.

C. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1998.

D. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement; 1997.

E. ASTM A 416/A 416M - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete; 1998.

F. ASTM A 497 - Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement; 1997.

G. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.

H. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 1999.

I. ASTM A 767/A 767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 1997.

J. ASTM A 775/A 775M - Standard Specification for Epoxy-Coated Reinforcing Steel Bars; 1997.

K. ASTM C 150 - Standard Specification for Portland Cement; 1999a.

L. ASTM D 3963/D 3963M - Standard Specification for Fabrication and Job-Site Handling of Epoxy Coated Reinforcing Steel Bars; 1999.

M. AWS D1.1 - Structural Welding Code - Steel; American Welding Society; 2000.

N. AWS D1.4 - Structural Welding Code - Reinforcing Steel; American Welding Society; 1998.

O. PCI MNL-116S - Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products; Precast/Prestressed Concrete Institute; 1985, Third Edition.

P. PCI MNL-120 - PCI Design Handbook - Precast and Prestressed Concrete; Precast/Prestressed Concrete Institute; 1999.

Q. PCI MNL-123 - Design and Typical Details of Connections for Precast and Prestressed Concrete; Precast/Prestressed Concrete Institute; 1988, Second Edition.

R. PCI MNL-124 - Design for Fire Resistance of Precast Prestressed Concrete; Precast/Prestressed Concrete Institute; 1989, Second Edition.

S. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 DESIGN REQUIREMENTS

A. Size components to withstand design loads in a restrained condition as follows:

1. Horizontal Assembly: 150 psf live and dead loads.
2. Vertical Assembly: 20 psf wind load.
3. As shown on the drawings.

B. Maximum Allowable Deflection: 1/180 span.

C. Design members exposed to the weather to provide for movement of components without damage, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to seasonal or cyclic day/night temperature ranges.

D. Design system to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.

E. Calculate structural properties of framing members in accordance with ACI 318.

F. Shall be manufactured in accordance with Prestress Concrete Institute's Manual 116 Manual for quality control for plans and production of Precast, prestressed concrete products and GA D.O.T. Standard Specifications Construction of Roads and Bridges Section 866 where located in D.O.T. right-of-way.

1.05 SUBMITTALS

A. Product Data: Indicate standard component configurations, design loads, deflections, cambers, and bearing requirements.

B. Shop Drawings: Indicate layout, unit locations, fabrication details, unit identification marks, reinforcement, connection details, support items, dimensions, openings, and relationship to adjacent materials. Indicate design loads, deflections, cambers, bearing requirements, and special conditions.

C. Samples: Submit two panels, 24 x 24 inch (610 x 610 mm) in size, illustrating surface finish treatment.

D. Design Data: Submit design data reports indicating calculations for loadings and stresses of fabricated, designed framing.

1.06 QUALITY ASSURANCE

A. Perform work of this section in accordance with requirements of PCI MNL-116S, PCI MNL-120, and PCI MNL-123.

B. Fabricator Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

C. Erector Qualifications: Company specializing in erecting products of this section with minimum five (5) years of documented experience.

D. Design precast concrete members under direct supervision of a Professional Structural Engineer experienced in design of precast concrete and licensed in the State of Georgia.

E. Welder: Qualified within previous 12 months in accordance with AWS D1.1 and

AWS D1.4.

1.07 REGULATORY REQUIREMENTS

Conform to ACI 318 for design load and construction requirements applicable to work of this section.

1.08 PRE-INSTALLATION MEETING

A. Convene a pre-installation conference one week prior to commencing work of this section.

B. Instruct others when field cutting of required openings are 10 inches (254 mm) and smaller.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Handle precast members in position consistent with their shape and design. Lift and support only from support points.

B. Lifting or Handling Devices: Capable of supporting member in positions anticipated during manufacture, storage, transportation, and erection.

C. Protect members to prevent staining, chipping, or spalling of concrete.

D. Mark each member with date of production and final position in structure.

1.10 PROJECT/SITE CONDITIONS

Coordinate the work of framing components not pre-tensioned but associated with the work of this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Precast Concrete:

1. Foley Precast.
2. Tindall Concrete Products.
3. Oldcastle.

2.02 MATERIALS

A. Cement: White Portland, conforming to ASTM C 150, Type I.

B. Aggregate, Sand, Water, Admixtures: Determined by precast fabricator as

appropriate to design requirements and PCI MNL-116S.

2.03 REINFORCEMENT

A. Tensioning Steel Tendons: ASTM A 416/A 416M, Grade 250 (1725); seven-wire stranded steel cable; low-relaxation type; full length without splices; uncoated.

B. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).

1. Plain billet-steel bars.
2. Unfinished.
3. Shop fabricated and bent cold.

C. Welded Steel Wire Fabric: ASTM A 185 plain type; in flat sheets; unfinished.

2.04 ACCESSORIES

A. Connecting and Supporting Devices: Plates, angles, items cast into concrete, and inserts conforming to PCI MNL-123, and as follows:

1. Material: Carbon steel conforming to ASTM A 36/A 36M.
2. Finish: Prime painted, except where device surfaces will be in contact with concrete or will require field welding.

B. Grout:

1. Non-shrink, non-metallic, minimum yield strength of 10,000 psi (69 MPa) at 28 days.
2. Epoxy.

C. Bearing Pads: High density plastic, Vulcanized elastomeric compound molded to size, Neoprene (Chloroprene), or Tetrafluoroethylene(TFE); Shore A Durometer; 1/8 inch (3 mm) thick, smooth both sides.

D. Bolts, Nuts and Washers: High strength steel type recommended for structural steel joints.

E. Prime Paint: Zinc rich alkyd type.

2.05 FABRICATION

A. Fabrication procedure to conform to PCI MNL-116S.

B. Fabricate and handle epoxy-coated reinforcing bars in accordance with ASTM D 3963/D 3963M.

C. Maintain plant records and quality control program during production of precast members. Make records available upon request.

D. Ensure reinforcing steel, anchors, inserts, plates, angles, and other cast-in items are embedded and located as indicated on shop drawings.

E. Tension reinforcement tendons as required to achieve design load criteria.

F. Provide required openings with a dimension larger than 10 inches (250 mm) and embed accessories provided under other sections of the specifications, at indicated locations.

G. Exposed Ends at Stressing Tendons: Fill recess with non-shrink grout, trowel flush.

2.06 FINISHES

A. Ensure exposed-to-view finish surfaces of precast concrete members are uniform in color and appearance.

B. Cure members under identical conditions to develop required concrete quality, and minimize appearance blemishes such as non-uniformity, staining, or surface cracking.

C. Architectural Finish: Surface holes or bubbles over 1/4 inch (6 mm) filled with matching cementitious paste, fins or protrusions removed and surface ground smooth.

D. Precast manufacturer shall coat inside of all wet well structures and receiving manholes (manhole force main discharges into) as outlined in Section 02542 – Protective Coating for Wetwell and Receiving Manhole.

2.07 FABRICATION TOLERANCES

A. Conform to PCI MNL-116S.

B. Maximum Variation From Nominal Dimension: 1 inch (25 mm).

C. Maximum Variation From Intended Camber: 5/8 inch (15 mm).

D. Maximum Out of Square: 1/8 inch/10 feet (3 mm/3 m), non-cumulative.

E. Maximum Misalignment of Anchors, Inserts, Openings: 1/8 inch (3 mm).

F. Maximum Bowing of Members: Length of Bow/ 360.

2.08 SOURCE QUALITY CONTROL AND TESTS

A. Test samples in accordance with applicable ASTM standard.

PART 3 EXECUTION

3.01 EXAMINATION

Verify that site conditions are ready to receive work and field measurements are as shown on shop drawings.

3.02 PREPARATION

Prepare support equipment for the erection procedure, temporary bracing, and induced loads during erection.

3.03 WETWELLS AND UTILITY VAULTS

A. Concrete bases may be precast or cast-in-place. The concrete base of precast and cast-in-place structures shall be placed on an (eight) 8-inch No. 57 stone mat or as shown on the drawings. Each precast section shall have not more than two holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with rubber stoppers or mortar installation. Brick or concrete ring to support cover shall be a minimum of 3 inches high but not more than 18 inches high.

B. Openings larger than 1 1/2 inches in diameter shall be precast into the appropriate section.

C. Any openings added during construction shall be approved by the precast manufacturer and be formed by coring. No other method for adding holes will be considered.

D. Joints of the precast sections shall be tongue and groove type. Sections shall be joined using O-ring rubber gaskets conforming to ASTM C443 or preformed mastic sealer. In addition, the joint shall be sealed inside and out with cement mortar using one part Portland cement to two parts clean sand meeting ASTM C144. The joints shall be watertight.

E. Shaped bottoms shall be as shown on the drawings. They shall be constructed of one monolithic pour using 3000-psi concrete.

F. Brickwork required to complete the precast concrete structures shall be constructed using mortar of one part Portland cement to two parts clean sand, meeting ASTM C144 and thoroughly mixed to a workable plastic consistency.

G. Any damage to the coating during storage, handling, transportation or installation of the section shall be repaired immediately to provide complete coverage and protection per manufacturer's recommendations. Mortar joints shall receive two (2) coats of waterproofing after the section is installed and the mortar has set and dried.

3.04 ERECTION

A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.

B. Align and maintain uniform horizontal and vertical joints, as erection progresses.

C. Maintain temporary bracing in place until final support is provided. Protect members from staining.

D. Provide temporary lateral support to prevent bowing, twisting, or warping of members.

E. Adjust differential camber between precast members to tolerance before final attachment.

F. Install bearing pads.

G. Level differential elevation of adjoining horizontal members with grout to maximum slope of 1:12.

H. Set vertical units dry, without grout, attaining joint dimension with lead or plastic spacers.

I. Grout underside of column bearing plates.

J. Secure units in place. Perform welding in accordance with AWS D1.1.

3.05 ERECTION TOLERANCES

A. Erect members level and plumb within allowable tolerances.

B. Conform to PCI MNL-116S.

C. Design and erect to the following tolerances:

1. Maximum Variation from Plane or Location Indicated on Drawings: 1/4 inch/10 feet and 3/8 inch in 100 feet (6 mm/3 m and 9 mm in 30 mm), non-cumulative.
2. Maximum Offset from True Alignment Between Members: 1/4 inch (6 mm).
3. Maximum Variation From Dimensions Indicated on Reviewed Shop Drawings: Plus or minus 1/8 inch (3 mm).

D. Exposed Joint Dimension: 3/8 inch (9 mm) plus or minus 1/4 inch (6 mm).

E. When members cannot be adjusted to conform to design or tolerance criteria, cease work and advise. Execute modifications as directed.

3.06 PROTECTION

A. Protect members from damage caused by field welding or erection operations.

B. Provide non-combustible shields during welding operations.

3.07 CLEANING

Clean weld marks, dirt, or blemishes from surface of exposed members.

END OF SECTION

SECTION 03900
CONCRETE REPAIR AND REHABILITATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of deteriorated concrete and replacement.

B. Repair of floor joints.

C. Crack repair with injected epoxy.

D. Repair of concrete reinforcement.

E. Resurfacing concrete.

F. Placement of anchors.

1.02 RELATED SECTIONS

A. Section 03100 - Concrete Forms and Accessories

B. Section 03200 - Concrete Reinforcement.

C. Section 03300 - Cast-In-Place Concrete.

D. Section 03931 – Concrete Crack Injection.

E. Section 03932 – Concrete Bonding.

F. Section 03933 – Concrete Patching.

1.03 UNIT PRICES - MEASUREMENT AND PAYMENT

A. Unit prices include the cost of required field testing for quality control.

B. Repair Surfaces: Paid for by the square foot, including surface preparation, repair, and finishing.

C. Repair Volumes: Paid for by the cubic foot, including removal of deteriorated concrete, preparation, installation and bonding of new concrete and reinforcement, and surface finishing; measured orthogonally to the nearest whole cubic unit.

D. Repair Cracks: Paid for by the linear foot of crack, measured on surface used for injection.

1.04 REFERENCES

A. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel; 1997a.

B. ASTM A 82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement; 1997a.

C. ASTM A 153/A 153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 1998.

D. ASTM A 307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength; 1997.

E. ASTM A 615/A 615M – Standard for Deformed and Plain billet-Steel Bars for Concrete Reinforcement; 1996a.

F. ASTM A 767/A 767M – Standard Specification for Zinc-Coated (Galvanized) Steel Bas for Concrete Reinforcement; 1997.

G. ASTM A 775/A 775M – Standard Specification for Epoxy-Coated Reinforcing Steel Bars; 1997.

H. ASTM A 996/A 996M – Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement; 2000.

I. ASTM C 33 – Standard Specification for Concrete Aggregates; 1999a.

J. ASTM C 150 – Standard Specification for Portland Cement; 1999a.

K. ASTM C 321 - Standard Test Method for Bond Strength of Chemical-Resistant Mortars; 1994.

L. ASTM C 404 – Standard Specification for Aggregates for Masonry Grout; 1997.

M. ASTM C 881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 1999.

N. ASTM C 882 – Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear; 1999.

O. ASTM D 570 - Standard Test Method for Water Absorption of Plastics; 1998.

P. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics; 1999.

Q. ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics; 1996.

R. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 1999.

S. AWS D1.4 - Structural Welding Code - Reinforcing Steel; American Welding Society; 1998.

1.05 SUBMITTALS

A. Product Data: Include manufacturer's printed data sheets specifying chemical and physical properties, uses and limitations of use, installation and maintenance instructions, and general recommendations.

B. Shop Drawings: Provide drawings of formwork and temporary shoring prepared and stamped by a qualified professional engineer retained by the Contractor.

C. Test Reports: Test results and interpretations prepared by a qualified testing agency.

D. Project Record Documents: Accurately record locations and types of repairs to structural reinforcement.

1.06 QUALITY ASSURANCE

A. Perform welding work in accordance with AWS D1.4.

B. Manufacturer: Provide all bonding, patching, anchoring, and injecting materials by a single manufacturer and provided through a single source.

C. Installer: Company specializing in operations of the types required for this project, with not less than 5 years of documented experience and approved by the manufacturer.

D. Design reinforcement splices under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State of Georgia.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver all concrete repair materials to project site in manufacturer's original, unopened containers, clearly labeled.

B. Comply with manufacturer's instructions for storage and handling, including maximum shelf life limitations.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Comply with requirements of Section 03300 - Cast-In-Place Concrete, for precautions related to placement of concrete in hot and cold weather.

B. Comply with temperature limitations and precautions for use recommended by manufacturer of rehabilitation products.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide concrete rehabilitation products as manufactured by Polytite Manufacturing Company; 324 Rindge Avenue, Cambridge, MA 02140-3144. ASD. Telephone: 617-864-0930; fax 617-864-9006; www.polytite.com, or approved equal.

1. Substitutions: See Section 01600 - Product Requirements.

2.02 EPOXY REPAIR PRODUCTS

A. Anchoring Materials:

1. Fast-Set Anchoring Epoxy: Anchor-Loc fast setting, high modulus, high strength, pumpable gel adhesive; complying with ASTM C 881, Type IV, Grade 3, Class B and C; and with properties as follows:
   a. Pot life: 5 to 8 minutes at 77 degrees F (25 degrees C).
   b. Tensile strength: Minimum 8,000 psi (55 MPa), per ASTM D 638.
   c. Flexural strength: Minimum 12,000 psi (83 MPa), per ASTM D 790.
   d. Compressive strength: Minimum 14,000 psi (96.5 MPa), per ASTM D 695.
   e. Bond strength: Minimum 600 psi (4.1 MPa) after 24 hours, per ASTM C 321.
   f. Elongation: 3 percent, per ASTM D 638.
2. Medium/Slow Set, Anchoring Epoxy: Dowel-Loc high modulus, high strength epoxy paste; complying with ASTM C 881, Type IV, Grade 3, Class B and C; and with properties as follows:
   a. Pot life: 16 minutes at 77 degrees F (25 degrees C).
   b. Tensile strength: Minimum 6,000 psi (41.3 MPa), per ASTM D 638.
   c. Flexural strength: Minimum 8,000 psi (55 MPa), per ASTM D 790.
   d. Compressive strength: Minimum 10,000 psi (69 MPa), per ASTM D 695.
   e. Bond strength: Minimum 525 psi (3.6 MPa) after 24 hours, per ASTM C 321.
   f. Elongation: 2-3 percent, per ASTM D 638.

3. Custom-Packaged, Multi-Use Epoxy: Quick-Kit 1, high modulus, high strength epoxy; complying with ASTM C 881, Type IV, Grade 2, Class B

and C; and with properties as follows:

a. Pot life: 40 minutes at 77 degrees F (25 degrees C).
b. Tensile strength: Minimum 8,900 psi (61 MPa), per ASTM D 638.
c. Flexural strength: Minimum 16,000 psi (110 MPa), per ASTM D 790.
d. Compressive strength: Minimum 14,000 psi (96.5 MPa), per ASTM D 695.
e. Bond strength: Minimum 2,200 psi (15.2 MPa) after 48 hours, per ASTM C 321.
f. Elongation: 2.4 percent, per ASTM D 638.

4. Low Modulus Epoxy Mortar: Mortar-Loc 2, low modulus, moisture insensitive, epoxy adhesive and binder system; complying with ASTM C 881, Type III, Grade 1, Class B and C; and with properties as follows:
   a. Pot life: 38 minutes at 77 degrees F (25 degrees F).
   b. Tensile strength: Minimum 5,000 psi (34.5 MPa), per ASTM D 638.
   c. Flexural strength: Minimum 4,500 psi (31 MPa), per ASTM D 790.
   d. Compressive strength: Minimum 6,500 psi (45 MPa), per ASTM D 695.
   e. Bond strength: Minimum 1,600 psi (11 MPa) after 48 hours, per ASTM C 321.
   f. Elongation: 35 percent, per ASTM D 638.

B. Bonding Agents:

1. Slow Set Bonding Agent: Bond 2 high strength, two-component epoxy bonding agent with long pot life; complying with ASTM C 881, Type IV, Grade 2, Class B and C; and with properties as follows:
   a. Pot life: 4 hours at 77 degrees F (25 degrees C).
   b. Gel time: 12-16 hours at 77 degrees F (25 degrees C).
   c. Tensile strength: Minimum 5,000 psi (34.5 MPa), per ASTM D 638.
   d. Flexural strength: Minimum 7,000 psi (48 MPa), per ASTM D 790.
   e. Compressive strength: Minimum 10,000 psi (69 MPa), per ASTM D 695.
   f. Bond strength: Minimum 550 psi (4 MPa) after 24 hours, per ASTM C 321.
   g. Elongation: 8 percent, per ASTM D 638.
2. High Modulus, Clear Binding Epoxy: Pebble-Bond high modulus, medium viscosity, moisture insensitive epoxy binder/bonding system; complying with ASTM C 881, Type II, Grade 2, Class B and C; and with properties as follows:
   a. Pot life: 21 minutes at 77 degrees F (25 degrees C).
   b. Gel time: 6-8 hours at 77 degrees F (25 degrees C).
   c. Tensile strength: Minimum 6,000 psi (41.3 MPa), per ASTM D 638.
   d. Flexural strength: Minimum 7,000 psi (48 MPa), per ASTM D 790.

e. Compressive strength: Minimum 6,500 psi (45 MPa), per ASTM D 695.
f. Bond strength: Minimum 600 psi (4.1 MPa) after 24 hours, per ASTM C 321.
g. Elongation: 22 percent, per ASTM D 638.

3. Underwater, Chemical-Resistant Epoxy Gel: Sewer-Loc sand-filled epoxy gel system for underwater or above water cure; complying with ASTM C 881, Type II, Grade 3, Class B and C; and with properties as follows:
   a. Pot life: 10-15 minutes at 77 degrees F (25 degrees C).
   b. Gel time: 6-8 hours at 77 degrees F (25 degrees C).
   c. Tensile strength: Minimum 5,000 psi (34.5 MPa), per ASTM D 638.
   d. Flexural strength: Minimum 3,000 psi (20.8 MPa), per ASTM D 790.
   e. Compressive strength: Minimum 6,000 psi (41.3 MPa), per ASTM D 695.
   f. Bond strength: Minimum 625 psi (4.3 MPa) after 24 hours, per ASTM C 321.
   g. Water absorption: Maximum 0.45 percent, per ASTM D 570.
4. Hydrophilic, Impact-Resistant Epoxy Gel: Underwater-Gel, complying with ASTM C 881, Type II, Grade 3, Class B and C; and with properties as follows:
   a. Pot life: 40 minutes at 77 degrees F (25 degrees C).
   b. Bond time: 6-8 hours.
   c. Tensile strength: Minimum 5,000 psi (34.5 MPa), per ASTM D 638.
   d. Flexural strength: Minimum 3,000 psi (20.8 MPa), per ASTM D 790.
   e. Compressive strength: Minimum 5,000 psi (34.5 MPa), per ASTM D 695.
   f. Bond strength: Minimum 500 psi (3.5 MPa) after 24 hours, per ASTM C 321.
   g. Elongation: Maximum 25 percent.
   h. Water absorption: Maximum 0.25 percent after 24 hours.
5. Underwater Injection Epoxy: Underwater-Inject waterproof epoxy resin system; complying with ASTM C 881, Type II, Grade 1, Class B and C; and with properties as follows:
   a. Pot life: 25 minutes at 77 degrees F (25 degrees C).
   b. Gel time: 6-8 hours.
   c. Tensile strength: Minimum 3,000 psi (20.8 MPa), per ASTM D 638.
   d. Flexural strength: Minimum 1,500 psi (10.4 MPa), per ASTM D 790.
   e. Compressive strength: Minimum 5,500 psi (38 MPa), per ASTM D 695.
   f. Bond strength: Minimum 500 psi (3.5 MPa) after 24 hours, per ASTM C 321.
   g. Elongation: 45 percent.
   h. Water absorption: Maximum 0.25 percent after 24 hours.
6. Injection Epoxy for Voids and Large Cracks: Void-Loc low exothermic,

moisture-insensitive epoxy resin system; complying with ASTM C 881, Type IV, Grade 1, Class B and C; and with properties as follows:

a. Pot life: ½ hour to 4 hours at 77 degrees F (25 degrees C), depending on volume mixed and mix ratio.
b. Compressive strength: Minimum 1,200 psi (8.3 MPa) at 1:1 mix ratio; 4,000 psi (27.5 MPa) at 3:2 mix ratio; and 16,000 psi (110 MPa) at 2:1 mix ratio, per ASTM D 695.
c. Bond strength: Minimum 500 psi (3.5 MPa) after 24 hours, per ASTM C 321.
d. Elongation: 80 percent at 1:1 mix ratio; 30 percent at 3:2 mix ratio; and 6 percent at 2:1 mix ratio.
e. Water absorption: Maximum 0.45 percent at 1:1 mix ratio; 0.30 percent at 3:2 mix ratio; and 0.23 percent at 2:1 mix ratio.

7. High Modulus, Medium Set, Wet Bonding Agent: Wet-Loc 2 high strength, moisture insensitive, fast curing epoxy system; complying with ASTM C 881, Type V, Grade 2, Class B and C; and with properties as follows:
   a. Pot life: 30 minutes at 77 degrees F (25 degrees C).
   b. Gel time: 3-4 hours.
   c. Tensile strength: Minimum 8,000 psi (55 MPa), per ASTM D 638.
   d. Flexural strength: Minimum 13,000 psi (89.6 MPa), per ASTM D 790.
   e. Compressive strength: Minimum 12,000 psi (83 MPa), per ASTM D 695.
   f. Bond strength: Minimum 600 psi (4.1 MPa) after 24 hours, per ASTM C 321.
   g. Elongation: 8-10 percent.
   h. Water absorption: Maximum 0.2 percent after 24 hours.
8. High Modulus, Slow Set, Wet Bonding Agent: Wet-Loc 3 medium viscosity, moisture insensitive epoxy; complying with ASTM C 881, Type II, Grade 2, Class B and C; and with properties as follows:
   a. Pot life: 4-5 hours at 77 degrees F (25 degrees C).
   b. Gel time: 8-10 hours.
   c. Tensile strength: Minimum 8,000 psi (55 MPa), per ASTM D 638.
   d. Flexural strength: Minimum 13,000 psi (89.6 MPa), per ASTM D 790.
   e. Compressive strength: Minimum 12,000 psi (83 MPa), per ASTM D 695.
   f. Bond strength: Minimum 600 psi (4.1 MPa) after 24 hours, per ASTM C 321.
   g. Elongation: 8-10 percent.
   h. Water absorption: Maximum 0.2 percent after 24 hours.

C. Epoxy Gels:
1. Pre-Injection Concrete Sealant: Gel-Loc R high modulus, high strength, moisture insensitive epoxy system; complying with ASTM C 881, Type IV, Grade 3, Class B and C; and with properties as follows:
   a. Pot life: 15 minutes at 77 degrees F (25 degrees C).
   b. Gel time: 2-3 hours.
   c. Tensile strength: Minimum 10,000 psi (69 MPa), per ASTM D

638.

d. Flexural strength: Minimum 12,000 psi (83 MPa), per ASTM D 790.

e. Compressive strength: Minimum 14,000 psi (96.5 MPa), per ASTM D 695.

f. Bond strength: Minimum 600 psi (4.1 MPa) after 24 hours, per ASTM C 321.

g. Elongation: 2 percent.

h. Water absorption: Maximum 0.1 percent after 24 hours.

2. Semi-Flexible Bonding Gel: Gel-Loc 25 moisture insensitive epoxy bonding agent; complying with ASTM C 881, Type I, Grade 3, Class A, B, and C; and with properties as follows:

a. Pot life: 40 minutes at 77 degrees F (25 degrees C), with gel time of 6-8 hours.

b. Pot life: 11 minutes at 77 degrees F (25 degrees C), with gel time of 2-3 hours.

c. Pot life: 7 minutes at 77 degrees F (25 degrees C), with gel time of 1-2 hours.

d. Tensile strength: Minimum 5,000 psi (34.5 MPa), per ASTM D 638.

e. Flexural strength: Minimum 3,000 psi (20.8 MPa), per ASTM D 790.

f. Compressive strength: Minimum 5,000 psi (34.5 MPa), per ASTM D 695.

g. Bond strength: Minimum 500 psi (3.4 MPa) after 48 hours, per ASTM C 321.

h. Elongation: 25 percent, per ASTM D 638.

i. Water absorption: Maximum 0.35 percent after 24 hours.

3. Low Modulus, General Purpose Gel: Gel-Loc 50 moisture insensitive epoxy bonding gel; complying with ASTM C 881, Type III, Grade 3, Class B and C; and with properties as follows:

a. Pot life: 30 minutes at 77 degrees F (25 degrees C), with gel time of 8-10 hours.

b. Pot life: 10 minutes at 77 degrees F (25 degrees C), with gel time of 2-3 hours.

c. Tensile strength: Minimum 2,400 psi (16.5 MPa), per ASTM D 638.

d. Flexural strength: Minimum 500 psi (3.4 MPa), per ASTM D 790.

e. Compressive strength: Minimum 2,500 psi (17.2 MPa), per ASTM D 695.

f. Bond strength: Minimum 575 psi (4.0 MPa) after 48 hours, per ASTM C 321.

g. Elongation: 50 percent, per ASTM D 638.

h. Water absorption: Maximum 0.3 percent after 24 hours.

4. Fast Set, High Modulus Epoxy Gel: Quik-Gel odorless, non-sag epoxy system; complying with ASTM C 881, Type II, Grade 3, Class A, B, and C; and with properties as follows:

a. Pot life: 4-5 minutes at 77 degrees F (25 degrees C).

b. Bond time: Less than 1 hour.

c. Tensile strength: Minimum 6,000 psi (41.3 MPa), per ASTM D 638.
d. Flexural strength: Minimum 4,000 psi (27.5 MPa), per ASTM D 790.
e. Compressive strength: Minimum 6,000 psi (41.3 MPa), per ASTM D 695.
f. Bond strength: Minimum 475 psi (3.3 MPa) after 48 hours, per ASTM C 321.
g. Elongation: 15 percent, per ASTM D 638.
h. Water absorption: Maximum 0.35 percent after 24 hours.

D. Injection Resins:

1. High Modulus, General Purpose Injection Epoxy: Injection-Loc rigid, high strength, low viscosity epoxy; complying with ASTM C 881, Type IV, Grade 1, Class B and C; and with properties as follows:
   a. Pot life: 12-15 minutes at 77 degrees F (25 degrees C).
   b. Gel time: 3 hours.
   c. Tensile strength: Minimum 10,000 psi (69 MPa), per ASTM D 638.
   d. Flexural strength: Minimum 13,500 psi (93 MPa), per ASTM D 790.
   e. Compressive strength: Minimum 12,000 psi (83 MPa), per ASTM D 695.
   f. Bond strength: Minimum 500 psi (3.5 MPa) after 24 hours, per ASTM C 321.
   g. Elongation: 2 percent, per ASTM D 638.
   h. Water absorption: Maximum 0.1 percent after 24 hours.
2. High Modulus, Low Viscosity Injection Epoxy: Injection-Loc XLV high strength epoxy crack injection system; complying with ASTM C 881, Type IV, Grade 1, Class B and C; and with properties as follows:
   a. Pot life: 18-20 minutes at 77 degrees F (25 degrees C).
   b. Gel time: 6-7 hours.
   c. Tensile strength: Minimum 10,000 psi (69 MPa), per ASTM D 638.
   d. Flexural strength: Minimum 12,000 psi (83 MPa), per ASTM D 790.
   e. Compressive strength: Minimum 12,000 psi (83 MPa), per ASTM D 695.
   f. Bond strength: Minimum 600 psi (4.1 MPa) after 24 hours, per ASTM C 321.
   g. Elongation: 2-5 percent, per ASTM D 638.
   h. Water absorption: Maximum 0.15 percent after 24 hours.
3. Low Modulus, Low Viscosity Injection Epoxy: Injection-Loc XLV-35 epoxy crack injection system for use where concrete is exposed to movement; complying with ASTM C 881, Type III, Grade 1, Class B and C; and with properties as follows:
   a. Viscosity: 80 cps, per Brookfield method.
   b. Pot life: 25 minutes at 77 degrees F (25 degrees C).

c. Gel time: 10-12 hours.
d. Tensile strength: Minimum 4,500 psi (31 MPa), per ASTM D 638.
e. Flexural strength: Minimum 3,000 psi (20.8 MPa), per ASTM D 790.
f. Compressive strength: Minimum 5,000 psi (34.5 MPa), per ASTM D 695.
g. Bond strength: Minimum 500 psi (3.5 MPa) after 24 hours, per ASTM C 321.
h. Elongation: 35 percent, per ASTM D 638.
i. Water absorption: Maximum 0.3 percent after 24 hours.

4. Super Low Viscosity, High Modulus Injection Epoxy: Injection-Loc XXLV high strength epoxy system for repairing hairline cracks; complying with ASTM C 881, Type IV, Grade 1, Class B and C; and with properties as follows:
   a. Viscosity: 60 cps, per Brookfield method.
   b. Pot life: 60 minutes at 77 degrees F (25 degrees C).
   c. Gel time: 6-7 hours.
   d. Tensile strength: Minimum 10,000 psi (69 MPa), per ASTM D 638.
   e. Flexural strength: Minimum 12,000 psi (83 MPa), per ASTM D 790.
   f. Compressive strength: Minimum 12,000 psi (83 MPa), per ASTM D 695.
   g. Bond strength: Minimum 600 psi (4.1 MPa) after 24 hours, per ASTM C 321.
   h. Elongation: 2-5 percent, per ASTM D 638.
   i. Water absorption: Maximum 0.15 percent after 24 hours.

E. Joint Fillers:

1. Fast Setting, Chemical Resistant Epoxy: Flex-Seal fast curing, flexible joint sealer; complying with ASTM C 881, Type III, Grade 3, Class B and C; and with properties as follows:
   a. Color: Gray gel.
   b. Viscosity: Flowable gel.
   c. Pot life: 9 minutes at 77 degrees F (25 degrees C).
   d. Gel time: 1-2 hours.
   e. Tensile strength: Minimum 1,600 psi (11 MPa), per ASTM D 638.
   f. Flexural strength: Minimum 100 psi (689 kPa), per ASTM D 790.
   g. Compressive strength: Minimum 1,000 psi (6.9 MPa), per ASTM D 695.
   h. Bond strength: Minimum 250 psi (1.7 MPa) after 24 hours, per ASTM C 321.
   i. Elongation: 70 percent, per ASTM D 638.
   j. Water absorption: Maximum 0.35 percent after 24 hours.

2.03 CONCRETE MATERIALS

A. Concrete: Comply with requirements of Section 03300 - Cast-In-Place Concrete.

B. Reinforcement Materials: Comply with requirements of Section 03200 - Concrete Reinforcement.

C. Concrete Formwork: Comply with requirements of Section 03100 - Concrete Form Work.

D. Miscellaneous Materials:

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Carbon Steel Bolts and Nuts: ASTM A 307, Grade A, galvanized to ASTM A 153/A 153M, Class C, for galvanized structural members.

2.04 MIXES

A. Epoxy Repair Products:

1. Mix epoxy products in accordance with manufacturer's instructions for intended application and project conditions.
2. Mix components in clean equipment or containers, conforming to pot life and workability limitations as recommended by manufacturer.

B. Concrete Mixes: Comply with requirements of Section 03300 - Cast-In-Place Concrete.

PART 3 EXECUTION

3.01 EXAMINATION

A. Locate areas to be repaired and mark boundaries using straight lines.

B. Verify that concrete surfaces are ready to receive work.

3.02 PREPARATION

A. Protect adjacent areas from damage due to concrete repair and rehabilitation work.

B. Install temporary supports before beginning concrete removal.

C. Saw-cut perimeter of areas marked for removal, using perpendicular cuts that go no deeper than cover on reinforcing. Remove loose and deteriorated concrete by breaking up and dislodging from reinforcement.

D. Remove heavily rusted reinforcement altogether. Remove loose and flaking rust from sound reinforcement by wire brushing or abrasive blast cleaning.

E. Clean sound concrete surfaces to be repaired using water and wire brush.

3.03 CONCRETE REPLACEMENT

A. Repair deteriorated reinforcement by welding new bar reinforcement to sound portions of existing reinforcement or by using sleeve splices to obtain stress values not less than originally required.

B. Apply epoxy bonding agent to clean concrete surfaces that will receive new concrete, complying with manufacturer's instructions. Pour replacement concrete within limitations of bonding agent, using concrete with properties not less than those required for original work.

3.04 CRACK REPAIR

A. Flush out cracks and voids with chemical agent or chemical solvent to remove dirt and laitance prior to epoxy injection.

B. Provide temporary entry ports spaced to accomplish movement of fluids between ports, complying with manufacturer's recommendations. Provide temporary seal at concrete surface to prevent adhesive leakage.

C. Inject epoxy adhesive into prepared ports under pressure, using equipment appropriate for the particular application. Begin injection at lower entry port and continue until adhesive appears at adjacent entry port; continue from port to port until each crack is filled.

D. After epoxy adhesive has set, remove temporary seal and excess adhesive. Grind surfaces smooth.

3.05 JOINT FILLER

A. Install in nonmoving floor joints where indicated.

B. Install epoxy joint filler to depth recommended by manufacturer, bringing flush to level of adjacent concrete. If necessary, overfill joint and grind off excess when epoxy has cured.

3.06 MORTAR INSTALLATION

A. Trowel apply epoxy mortar mix to required thickness, tamping into place to fill voids at spalled areas.

B. For patching honeycomb, trowel mortar onto surface and work into voids, bringing mortar surface flush with surrounding areas. Trowel finish to match.

3.07 FIELD QUALITY CONTROL

An independent testing agency, as specified in Section 01400, will perform field inspection and testing.

END OF SECTION

SECTION 16000
ELECTRICAL POWER AND SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. The electrical work commences with the point of electrical service where shown on the Drawings and includes furnishing all material and labor for a complete electrical installation.

B. The requirements of Division I apply to all work hereunder. The General and Special Conditions are a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

1.02 DEFINITIONS

A. Provide: Furnish, install, and connect.

B. Product Data: Catalog cuts and descriptive literature.

C. Shop Drawings: Factory prepared specific to the installation.

D. Indicated: Shown on the Drawings.

E. Noted: Indicated or specified elsewhere.

1.03 SYSTEM DESCRIPTION

See One Line Diagrams.

1.04 SUBMITTALS

A. Approved drawings consist of shop drawings, product data and other information as noted in the individual equipment sections. Except as noted, submittal information is for approval and equipment may not be installed until submittals have been returned with stamped approval.

B. Information required "for reference" such as product samples, similar unit test reports and time current curves is for the purpose of determining the suitability of a product, selecting breaker settings, etc. This information is to be submitted at the same time as approval data; however, this information will not be returned and stamped approval is not required prior to installation.

C. Except as noted, installation instructions are not required to be submitted. However, it is the Contractor's responsibility to obtain installation information from the manufacturer for all equipment prior to installing the equipment.

1.05 QUALITY ASSURANCE

A. Provide the complete electrical installation in accordance with the National Electrical Code (NFPA 70), Life Safety Code (NFPA 101), and in accordance with applicable local codes. Obtain all necessary permits and have all work inspected by appropriate authorities.

B. All products shall be designed, manufactured, and tested in accordance with industry standards. Where applicable, date for industry standards is that in effect on the date of Advertisement of the Project.
   1. American National Standards Institute (ANSI)
   2. American Society for Testing and Materials (ASTM)
   3. Federal Specifications (FS)
   4. Institute of Electrical and Electronics Engineers (IEEE)
   5. insulated Cable Engineers Association (ICEA)
   6. National Electrical Manufacturers Association (NEMA)
   7. National Fire Protection Association (NFPA)
   8. Underwriters Laboratories, Inc. (UL)

1.06 DELIVERY, STORAGE, AND HANDLING

A. Ship products to the job site in their original packaging. Receive and store Products in a suitable manner to prevent damage or deterioration. Keep equipment upright at all times.

B. Investigate the spaces through which equipment must pass to reach its final destination. Coordinate with the manufacturer to arrange delivery at the proper stage of construction and to provide shipping splits where necessary.

1.07 PROJECT/SITE CONDITIONS

A. Power will be supplied by the utility company overhead distribution system. Verify and comply with all power company requirements. Make necessary arrangements with the power company for temporary service requirements.

B. Telephone, security, energy management and fire alarm will be tied into the Owner’s existing system. Refer to the Drawings for conductors and interface requirements.

PART 2 PRODUCTS

2.01 MATERIALS (NOT FURNISHED)

A. Unless otherwise noted, the following are furnished and installed under other Divisions:
   1. Motors
   2. Electric heating and air conditioning equipment
   3. Building energy management systems

4. Electrical heat tracing
5. Pilot and control devices for the above equipment

B. Power wiring and equipment connections for the above items are included in this Division. Also included in this Division is control wiring to the extent shown on the Electrical Drawings: other control wiring is furnished under the applicable Mechanical Division.

2.02 MANUFACTURED UNITS

A. Provide only new products of the manufacturer's latest design.

2.03 EQUIPMENT

A. Where the words "equal to" follow or precede the listed acceptable manufacturers, equal products of other manufacturers are acceptable and request for substitution may be made during submittal stage.

B. Where the words "or equal" follow the listed acceptable manufacturers, products of other manufacturers must be submitted and approved prior to the Bid, in accordance with the Instructions to Bidders of the Contract Documents.

2.04 SOURCE QUALITY CONTROL

A. Furnish record drawings. Record drawings consist of submittal data as listed above, operation and maintenance data, and as-built drawings. Record drawings are to reflect the final installation, including any changes during approval, manufacturing tests, and installation.

B. In addition to other required sets, furnish one set of operation and maintenance data for all apparatus requiring service. This set is to be bound in hardback, 3-ring binder(s) located in a hinged metal cabinet in the main electrical room and shall include:
1. Title page with project name; installing contractor's name, address and telephone number; date of installation and warranty period.
2. Index sheet.
3. Complete manufacturer's operation and maintenance data with tabs (corresponding to the index) separating each item or system. Include the name, address, and phone number of the nearest sales and service organization for each item.
4. Coordination Study.

C. As-Built Drawings: Furnish one set of prints maintained at the job site at all times with all changes during construction marked thereon. Include on the as-built drawings sufficient dimensions to permit location of underground conduits.

D. Submit the results of any tests required in the individual equipment sections.

PART 3 EXECUTION

3.01 INSTALLATION

A. The complete installation is to be accomplished by skilled electrical tradesmen, with certified or suitably qualified individuals performing all special systems installation and testing. All workmanship shall be of the highest quality, sub-standard work will be rejected.

B. Schedule the work and cooperate with all trades to avoid delays, interferences, and unnecessary work. If any conflicts occur necessitating departures from the Drawings and Specifications, details of departures and reasons therefore shall be submitted immediately for the Engineer's consideration.

C. Prior to final inspection, clean all dirt, mud and construction debris from all boxes, cabinets, manholes and equipment enclosures.

3.02 FIELD QUALITY CONTROL

A. Description: Submit a coordination study with recommended settings for all fault protective devices within the scope of the study. The study shall be prepared by a registered professional engineer, who is not an employee of the Contractor, equipment supplier, or other party having a financial interest in the results of the study. The preparer shall certify that the protective device settings recommended represent a reasonable engineering compromise between equipment protection and selective coordination.

B. Documentation: Provide tabulations of recommended settings and time current curves showing the degree of coordination obtained with the recommended settings. Also show equipment inrush characteristics and applicable protection limits such as motor stall times, transformer ANSI damage limits, cable heating limits and NEC overcurrent protection requirements. Include manufacturing tolerance and damage bands in plotted fuse characteristics. Terminate device characteristic curves at a point reflecting the maximum symmetrical or asymmetrical fault current seen by the device.

C. Scope: The study extends from the service entrance equipment down to, and including, the low voltage motor control centers. Panelboards and other equipment downstream from the low voltage motor control centers need not be included, except as required to obtain settings for equipment within the study scope.

D. Fault Currents: Maximum three phase symmetrical values for all major busses will be supplied by the Engineer. For high voltage busses, both momentary and interrupting network values will be supplied. Any other values needed are to be calculated as part of the study. Values supplied by the Engineer are to be used solely for determination of device settings - equipment ratings are as elsewhere noted.

E. Study Data: The Contractor is responsible for providing field data (conductor materials, existing device types, nameplate information, etc.) to the study preparor. The Contractor is also responsible for providing to the study preparer shop drawing data on new equipment. The study preparer is responsible for obtaining all other needed data (equipment data, time current curves, etc.).

F. Submittal Requirements: Submit the coordination study prior to, or concurrent with, distribution equipment within the study scope. This is to allow suggested improvements

(relay ranges, CT ratios, etc.) that may arise in performing the study to be incorporated prior to equipment fabrication. Review procedures are as specified in Article 1.04 above.

3.03 DEMONSTRATION

A. Prior to request for final review, test all systems and repair or replace all defective work. Submit, with request for final review, written certification that all electrical systems are complete and operational.

B. Unless otherwise specified, a 1,000 Volt megohmmeter shall be used for resistance measurements.

C. Insulation resistance measurements shall be made on conductors and energized parts of electrical equipment. Minimum acceptable values of insulation resistance shall be in accordance with the applicable ICEA, NEMA or ANSI standards for the equipment or material being tested, unless otherwise specified. The ambient temperature at which insulation resistance is measured shall be recorded on the test form.

D. Insulation resistance measurements shall format similar to Form 16000-A. Insulation with resistance of less than 10 megohms is not acceptable.

1. Conductor and Cable Tests: The phase-to-ground insulation resistance shall be measured for all circuits 120 volts and above except lighting circuits. Measurements may be made with motors and other equipment connected, except that solid state equipment shall be disconnected unless the equipment is normally tested by the manufacturer at voltages in excess of 1000 volts DC.

2. Motor Tests: The Installed Motor Test Form, 16000-B, contained in this section, shall be completed for each motor after installation. All motors shall have their insulation resistance measured before they are connected. Motors 50 HP and larger shall have their insulation resistance measured at the time of delivery as well as when they are connected. Insulation resistance values less than 10 megohms are not acceptable.

E. At the time of final review of electrical work, demonstrate the operation of electrical systems. Furnish labor, apparatus and equipment for systems' demonstration.

F. After final review and acceptance, turn over to the Owner all keys for electrical equipment locks. Present to the Owner or the Owner's designated representative, demonstrations and oral instructions for proper operation and maintenance of the electrical equipment and systems.

END OF SECTION