

SEGMENT #4: Approx. 1600 LF. - Along Canton Street, between the intersections of Canton Street and Old Canton Street, Mayfield Road and Canton Street (Sta. 29 +75 – Sta. 45 + 68)

SEGMENT # 2: Proposed construction time will be during the day and/or night.

SEGMENT # 3: Proposed construction time will be during the night.

SEGMENT # 4: Proposed construction time will be during the day.

Each Bidder's, Bid items Unit Prices shall account for the applicable Segment, and proposed construction time, pro rata share of overhead and profit, so that the sum of their products obtained by multiplying the quantity, shown for each item by the unit price, represents its total Bid Item and the Subtotal Cost for each segment .

Each Bidder shall submit two sets of Bid Forms, to include all the Bid Items Unit Prices and Totals, to complete the proposed Segments activities, water pipe installation and construction.

The Bid Form for Set One (1) completion shall include all items, the proposed Total Cost for each segment, and the Sum Total Cost of all three segments (2 +3 + 4).

Set # One (1) Work Time: Segment # 2. Work is to be performed in the night; Segment # 3. Work is to be performed in the night; and Segment # 4. Work is to be performed in the day.

The Bid Form for Set Two (2) completion shall include all items, the proposed Total Cost for each segment, and the Sum Total Cost of all three segments (2 + 3 + 4).

Set Two (2) Work Time: Segment # 2. Work is to be performed in the day; Segment # 3. Work is to be performed in the night; and Segment # 4. Work is to be performed in the day.

The approved payments for Project's Work, shall be based on the actual Work performed and will be calculated using the Unit Prices set forth in the Contract Document and the applicable Item field measured quantity .

STATEMENT OF BIDDER'S QUALIFICATIONS AND SAFETY RECORD FORM

STATEMENT OF BIDDER'S QUALIFICATIONS

This Statement shall be submitted and accompany This Bid Documents. All Bidders must meet the minimum qualification criteria set forth under items 5, 7, 8, 9 10, and 11 of this section and must provide the organization chart as set forth under item 6 of this section to be deemed a "Responsible and Responsive Bidder".

1. NAME OF BIDDER: _____

2. BUSINESS ADDRESS: _____

3. TELEPHONE NUMBER: _____

4. OFFICIAL REPRESENTATIVE AND TITLE: _____

5. Using the forms provided in this Section, list previously completed projects which are similar in scope and complexity to this project which were completed or assigned to your firm or joint venture, including: Name of project, location of project, owner's name, address and phone number, description of work performed, initial contract amount, final contract amount, start date, scheduled completion date and actual completion date. (If a joint venture, list separately for each joint venture partner.) Limit to 5.

a. Contractors must have successfully completed contracts involving the installation and construction of 36 –inch diameter water main, construction value of not less than \$1.5 million

6. Provide the following information for the organization for this project:

a. Organizational chart.

b. Indicate the participation by the various members in the organization, as shown on the organizational chart, in the management and in the division of work (If a joint venture, indicate percent of man hours and percent of project cost to be performed by each joint venture member).

7. Using the forms provided in this Section, provide information for the Project Manager and Project Superintendent.

a. Project Manager and Project Superintendent must have been the manager for duration of project and successfully completed contracts involving the installation and construction 36 – inch diameter Ductile Iron Pipe water mains

with a construction value of not less than \$1.5 million.

8. The Contractor must have an established Safety Program. Complete the included entitled "CONTRACTOR SAFETY RECORD FORM".
9. The Contractor's Workman's Compensation Ratings (EMR-Experience Modification Rate) must not exceed an average of 1.0 over the last three (3) years.

Year	Experience Modification Rate (EMR)
Average:	

10. The Contractor's OSHA Incidence Rates **must not** exceed the Industry Standard for Construction, published by the U.S. Department of Labor (2012) for Heavy and Civil Engineering Construction, all industries, (i.e.-Recordable Incidence Rates of 3.2 and Days Away from Work Incidence Rates of 1.7 per OSHA definition and calculation) for the last three (3) years.

Year	Total Recordable Incidents	Total Hours Worked	OSHA Incidence Rate*
Average			

Year	Total Days Away from Work Incidents	Total Hours Worked	OSHA Incidence Rate*
Average			

* Use your OSHA Form No. 200 and the formula:

$$(\text{Total Incidents} \times 200,000 \text{ hours}) \div (\text{Number of hours worked}) = \text{Incidence Rate}$$

11. If there have been any fatalities during the last five (5) years on any projects performed by the Contractor or on any work performed under the direct supervision of a proposed Project Manager and the Contractor or proposed Project Manager was cited by OSHA for "Willful", in performing the work in which the fatality occurred, the Contractor will be disqualified based on the County's review. The Contractor may also be disqualified in the event that a Recordable Incident occurred due to the same condition that existed when a previous fatality occurred and resulted in an OSHA citation for failure to implement a corrective action plan.

- a. Fatalities during the last five years where Contractor was cited by OSHA for "Willful" Violation _____
- b. Fatalities during the last five years where the proposed Project Manager was cited by OSHA for "Willful" Violation.

a. the direct supervision of the proposed Project Manager:

The previous statements and attachments are true, correct, and complete to the best of my knowledge.

Date: _____

Firm Name: _____

By: _____

Title: _____

Sworn to and subscribed before me

this ____ day of _____, 2014

Notary Public

CONTRACTOR SAFETY RECORD FORM

A. General Information

Name of Firm:	
Business Address:	
Telephone:	Fax:
Prepared by/Title:	Date prepared:

II. Experience Modification Rates

List your firm's Workers Compensation Experience Modification Rates (EMR) for the last three years.

Year	Experience Modification Rate (EMR)

III. OSHA Incidence Rates

A. List your firm's Occupational Safety Health Administration (OSHA) incidence rates for the last three years.

Year	Total Recordable Incidents	Total Hours Worked	OSHA Incidence Rate*

* Use your OSHA Form No. 200 and the formula:

$$(\text{Total Incidents} \times 200,000 \text{ hours}) \div (\text{Number of hours worked}) = \text{Incidence Rate}$$

B. Provide your incidence rates over the last three years for the following categories:

Category	Incidence Rate by Year*		
	Year	Year	Year
Fatalities			
Injuries and Illnesses with Lost Work Days			
Injuries and Illnesses with Restricted Work Days			

* Use your OSHA Form No. 200 and the formula:

$$(\text{Total Incidents} \times 200,000 \text{ hours}) \div (\text{Number of hours worked}) = \text{Incidence Rate}$$

C. Does your firm have any upheld OSHA citations in the past five years?

Yes No (If yes, attach explanation)

IV. Safety Program Information

A. Do you have a written safety program?

Yes No (If yes, attach outline)

B. Which of the following does your safety program contain?

1. Does your company require health and safety training of its subcontractors?

Yes No

2. Is documentation of health and safety training required?

Yes No

3. Do you have a Hazard Communication Program (29 CFR 1910.1200, CCR Title 8 Section 5194)?

Yes No

4. Do you have a Confined Space Entry and Rescue Program (29 CFR 1910.146, CCR Title 8 Section 5156-5159)?

Yes No (If yes, attach explanation)

5. Do you have a "Hot Work" permit program (29 CFR 1910.146, CCR Title 8 5156-5159)?

Yes No (If yes, attach explanation)

IV. Safety Program Information (cont'd)

B. Which of the following does your safety program contain (cont'd):

6. Do you have a "Lock-Out/Tag-Out" program (29 CFR 1910.417)?

Yes No (If yes, attach explanation)

C. Do you have an Equipment Maintenance Program for the following:

1. Miscellaneous construction tools and equipment? Yes No

2. Ladders? Yes No

3. Scaffolds? Yes No

4. Heavy Equipment? Yes No

5. Vehicles? Yes No

D. Do you have a new employee safety orientation program?

Yes No

1. If yes, does it include instruction in the following:

(a) Company Safety Policy Yes No

(b) Company Safety Rules Yes No

(c) Safety Meeting Attendance Yes No

(d) Company Safety Record Yes No

(e) Hazard Recognition Yes No

(f) Hazard Reporting Yes No

(g) Injury Reporting Yes No

(h) Non-Injury Accident Reporting Yes No

(i) Personal Protective Equipment Yes No

(j) Respiratory Protection Yes No

(k) Fire Protection Yes No

(l) Housekeeping Yes No

(m) Toxic Substance Yes No

(n) Electrical Safety Yes No

(o) Fall Protection Yes No

(p) First-Aid/CPR Yes No

(q) Driving Safety Yes No

(r) Hearing Conservation Yes No

(s) Lock-Out/Tag-Out Yes No

(t) Blood borne Pathogens Yes No

(u) Asbestos Yes No

(v) Confined Spaces Yes No

(w) Hazard Communication Yes No

IV. Safety Program Information (cont'd)

E. Do you conduct safety meetings for your employees? Yes No

1. If yes, how often:

Daily Weekly Bi-weekly Monthly As Needed

F. Do you conduct health and safety audits of work in progress?

Yes No

1. If yes, who conducts the audits?

2. How often are the audits conducted?

G. Do you notify all employees of accidents and precautions related to accidents and near misses?

Yes No

1. If yes, how is this notification accomplished?

- | | | |
|---|------------------------------|-----------------------------|
| (a) Safety meetings | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (b) Post notification in office | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (c) Post notification at the site where the incident occurred | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (d) Other _____ | | |

H. Is safety a criterion in evaluating the performance of:

- | | | |
|----------------|------------------------------|-----------------------------|
| 1. Employees | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 2. Supervisors | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| 3. Management | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

I. Does your firm hold "tailgate" safety meetings? Yes No

1. If yes, how often:

Daily Weekly Bi-weekly Monthly As Needed

J. Does your company have a drug and alcohol testing policy?

Yes No

K. Does your company require that subcontractors participate in a drug surveillance/testing program?

Yes No

L. Does your company have a method of disseminating safety information?

Yes No

STATEMENT OF BIDDER'S QUALIFICATIONS
COMPANY PROJECT EXPERIENCE FORM
(Complete Form Only For Projects That Meet Minimum Criteria)

Project Name	
Project Location	
Contractor's Project Manager	
Contractor's Project Superintendent	
Owners Representative & Phone Number	
Design Engineer Representative Name & Phone Number	
Water Line (30 inch dia. and greater)	
Initial Contract Amount	\$
Final Contract Amount	\$
Project Duration	Date Started: Date Completed: Time Extensions:
Was Project Completed on Time?	
List Any NPDES Permit Violations Due to Contractors Failure to Complete Project on Schedule or Due to Contractor's Failure to Properly Coordinate its Work.	
Description of Major Project Components:	

STATEMENT OF BIDDER'S QUALIFICATIONS
PROJECT MANAGER'S / SUPERINTENDENTS EXPERIENCE FORM
(Complete Form Only For Projects That Meet Minimum Criteria)

Project Name	
Project Location	
Contractor's Safety Engineer	
Owners Representative & Phone Number	
Design Engineer Representative Name & Phone Number	
Water Main Size	
Initial Contract Amount	\$
Final Contract Amount	\$
Description of Major Project Components:	

END OF SECTION

A**Part 1 General****1.01 Description**

- A. The work will consist of providing all labor, equipment and materials and permits necessary for the construction, and installation of approximately **3400** Linear Feet (LF) of new **30 – inch diameter Ductile Iron Pipe (D. I. P.)** water transmission main, and appurtenances, as shown on the Project Drawings, starting near the intersection of Haynes Bridge Road and Academy Street to Mayfield Road and Canton Street intersection. The total proposed construction and installation of water main work activities is divided into **three (3) SEGMENTS. SEGMENT # 2: The project activities along Academy Street (between the intersections of Haynes Bridge Road and Academy Street, State Road (SR) 9 and Academy Street); and the tie- in of existing 30 inch diameter DIP installed previously by others, near Haynes Bridge Road and Academy Street intersection and across SR 9. SEGMENT # 3: The project activities along section of Milton Avenue, through Milton Avenue and Old Canton Street intersection, and along Old Canton Street (between the intersections of State Road 9 and Milton Avenue, Old Canton Street and Canton Street), and the tie-in of the existing 30 inch diameter DIP previously installed by others across State Road 9. SEGMENT # 4: The project activities along Canton Street (between the intersections of Canton Street and Old Canton Street, Mayfield Road and Canton Street.**
- B. All work shall be in conformance with the Contract Documents, Drawings, and Fulton County Standards and Specifications, and the relevant government standards and specifications.

1.02 Project Location

The project will be located in downtown area of the City of Alpharetta, Fulton County, Ga. The project begins near the Intersection of Haynes Bridge Road/Academy Street to State Road 9/Academy Street Intersection, and along Academy Street; near the Intersection of State Road 9/Milton Avenue, along a Section of Milton Avenue, through the Intersection of Milton Avenue/Old Canton Street, along Old Canton Street to Canton Street/Old Canton Street Intersection, and along Canton Street to Mayfield Road/Canton Street Intersection.

All work will be performed within the existing right – of – way and/or permanent easements, as shown on the Drawings. All required temporary easements or construction easements are the responsibility of the Contractor.

1.03 Working Hours

The Contractor day time standard working hours will be from 8:30 A.M. to 5:00 P.M. or as required by the City of Alpharetta, in order to comply with their Traffic Control Regulations and Noise Ordinance.

The Contractor night time standard working hours will be from 8:00 P.M. to 6:00 A.M., or as required by the City of Alpharetta, in order to comply with their Traffic Control Regulations and Noise Ordinance.

1.04 Quantities

The Owner reserves the right to alter the quantities of work to be performed, or to extend or shorten the improvements at any time, when and as found necessary, and the Contractor shall perform the work as altered, increased or decreased. Payment for such increased or decreased quantity will be made in accordance with the Instructions to Bidders. No allowance will be made for any change in anticipated profits nor shall such changes be considered as waiving or invalidating any conditions or provisions of the Contract and Bond.

1.05 Partial Owner Occupancy

The existing facilities to which these improvements are being made will continue operation during the period of construction.

1.06 Coordination of Work

- A. The Contractor shall coordinate the work with third parties (such as power, natural gas, or telephone companies, and etc.) in areas where such parties may have rights to underground property or facilities.
- B. The Contractor shall request from involved third parties maps or other descriptive information, as to the nature and location of such underground facilities or property. The Contractor shall make all necessary investigations to determine the existence and location of all underground utilities.
- C. The Contractor will be held responsible for any damage to and/or for maintenance and protection of existing utilities and structures.
- D. The Contractor shall coordinate the work with owners of private and public property, where access is required for the performance of the work. Legal access will be acquired and provided by the Owner.

END OF SECTION

Unique Requirements

Part 1 General

1.01 Scope

The scope of this Section is to convey to the Contractor unique and unusual stipulations and requirements which have established for this Project. Some of the stipulations and requirements are as a result of negotiations with various entities and organizations which have an interest in this Project. Some requirements are based on technical aspects of the Project, which are not otherwise conveyed to the Contractor. The provisions of this Section may supersede the provisions of the Specifications, but shall not supersede the bidding Requirements, Contract Forms or Conditions of the Contract.

1.02 Standards

Existing pavement, sidewalks and curb and gutter, drive ways or storm sewer, if affected by the construction, shall be replaced, in accordance with the City of Alpharetta and/or the Georgia Department of Transportation specifications and standards to match existing conditions at a minimum.

1.03 Submittals

A. Sequence Submittal

1. Submit a proposed sequence for construction in accordance with Section 01340, with appropriate times of starting and completion of tasks to the Construction Manager for review.
2. The Contractor may propose alternatives to the sequencing constraints to that shown in this Section in an attempt to reduce the disruption to the community or streamline the tasks associated with this Contract. The Owner is not obligated to accept any of these alternatives.

B. All requested submittals must be approved by the Owner or Construction Manager, prior to any on site work. This includes, but is not limited to the construction sequencing schedule, Erosion and Sedimentation Control Plan, Tree Protection Plan, Traffic Management Plan, product shop drawings, and health and safety and loss prevention programs.

1.04 Existing Service Operations

- A. All existing services and continuity of water service must be maintained during the time construction activities are in progress.

- B. The Contractor shall coordinate all work with the Owner or Construction Manager, so that the construction will not be restrain or hinder the operation of the existing services. If, at any time, any portion of the existing service will be interrupted, the Contractor must obtain approval from the Owner or Construction Manager, five days in advance, as to the date, time and length of time that portion of the services will be interrupted, until the services are restored.
- C. After having coordinate all work with the Owner or Construction Manager , the Constructor shall prepare a submittal, in accordance with Section 01340 to include the time, time limits and methods of each connection or alteration and have the approval of the Construction Manage, before any work is undertaken on the connections or alterations.
- D. The Contractor shall comply with the stipulations contained in permits obtained from the city of Alpharetta, and any other applicable government entity, pertaining to work hours, lane closures, noise pollution, traffic detours, and road closures.
- E. Before driveways are interrupted, the Contractor is responsible to coordinate their work activities with the property residence, so that construction will not hinder excess to the property.

1.05 Sequencing and Constraints

- A. General
 - 1. The Contractor shall be solely responsible for all construction sequencing.
 - 2. The completion of specific preliminary sequencing tasks be required, prior to any construction activities.
 - 3. The Contractor is responsible verify the project's existing topography, prior to the procurement and delivery of pipe materials.
 - 4. The Contractor is responsible to keep the road fully operational and functional, during the execution of the Project.
- B. The Contractor shall notify the Construction Manager in writing at least 72 hours, prior to starting work that will require taking existing facilities out of service.
- C. The Contractor may utilize multiple crews to construct the pipeline concurrently at various locations with the approval of the Construction Manager.
- D. The Contractor is responsible to make their own assessment and determination of requirements that affect or may affect the work progress and sequencing.

- E. Prior to the procurement of the proposed water line materials, the Contractor is responsible to field locate the starting and ending, tie-in points and connections locations of existing water line. Field stake the horizontal center line of the proposed water line, in order to better procure the total amount of proposed water line linear footage.
- F. The Contractor is responsible to provide, as an attachment to their Progress Payment Request Submittals, the applicable to date As-Built progress drawing of the installed water line that will support linear footage water line, to be approved for payment.

1.06 Site Physical Conditions

- A. The Contractor shall field verify the locations of existing subsurface structures, utilities, services, and underground facilities, prior to the start of excavation and construction.
- B. The Contractor is responsible to identify, locate, and make the necessary exploratory excavations where existing underground utilities, services, and structures may potentially conflict with propose construction. All exploratory excavations shall be conducted sufficiently ahead to avoid possible delays to the Contractor's proposed water line installation schedule, and project's Contract Time.
- C. The Contractor is responsible to field locate accurately and document, prior to start of work, the existing site condition of all landscaping features, walls, sidewalk, and curb and gutter alignment, including any existing features that may be impacted by the proposed construction.

1.07 Traffic Control

- A. The Contractor is responsible to furnish the necessary traffic flagmen and/or escorts to direct traffic in the roadway areas affected by their construction operations, whenever and wherever, in the opinion of the Construction Manager traffic is sufficiently congested or public safety is endangered.
- B. Under the Contract Terms, the employment or presence of traffic flagmen or escort, shall not in way relieve the Contractor of their responsible and/or liability.

END OF SECTION

Part 1 General**1.01 Partial Occupancy by Owner**

Whenever, in the opinion of the Construction Manager, any section or portion of the Work or any structure is in suitable condition, it may be put into use upon the written order of the Construction Manager, and such usage will not be held in any way as an acceptance of said Work or structure, or any part thereof, or as a waiver of any of the provisions of the Specifications and Contract. Pending final completion and acceptance of the Work, all necessary repairs and replacements, due to defective materials or workmanship or operations of the Contractor, for any section of the Work so put into use, shall be performed by the Contractor at Contractor's own expense.

END OF SECTION

Part 1 General

1.01 Scope

- A. The Bid list shall include each item of the Project for which payment will be made. **No payment will be made for any items other than those listed in the Bid. Final Payment shall be based on the actual work or service performed and calculated, using the unit prices set forth in the Contract Document.**
- B. Required items of work and incidentals necessary for the satisfactory completion of the work which are not specifically listed in the Bid, and which are not specified in this Section to be measured or to be included in one of the items listed in the Bid, shall be considered as incidental to the work. All costs thereof, including Contractor's overhead costs and profit, shall be considered as included in the unit prices bid for the various Bid Items. The Contractor shall prepare the Bid accordingly.
- C. Work includes furnishing all labor, equipment, tools and materials, which are not furnished by the Owner and performing all operations required to complete the work satisfactorily, in place, as specified and as indicated on the Drawings.

1.02 Descriptions

- A. Measurement of an item of work will be by the unit price indicated in the Bid.
- B. Final payment quantities shall be determined from actual quantities installed and measured in the field. The final quantities to be paid for items not shown on the drawings, for example silt fencing, shall be based on the quantity approved by the Owner or Construction Manager, based on the field measurements.
- C. Payment will include all necessary and incidental related work not specified to be included in any other item of work listed in the Bid.
- D. Unless otherwise stated in individual sections of the Specifications or in the Bid, or as approved in writing by the Construction Manager, prior to beginning the work, no separate payment will be made for any item of work, materials, parts, equipment, supplies, or related items required to perform and complete the work. The costs for all such items required shall be included in the Unit Price Bid for Item of which it is a part.
- E. Payment will be made by extending Unit Prices multiplied by quantities provided and then summing the extended prices to reflect actual work. Such price and payment shall constitute full compensation to the Contractor for furnishing all labor, equipment, tools, services, and materials not furnished by the Owner and for performing all operations required to provide to the Owner the entire Project, complete in place, as specified and as indicated on the Drawings and Specifications.
- F. "Products" shall mean materials or equipment permanently incorporated into the work.
- G. "Provide" shall mean furnish and install.

1.03 Non Payments

- A. No separate payment shall be made for property restoration, and the repair of damaged properties, due to the Contractor work execution. The cost shall be included in the Bid Unit Price for each particular Item of work.
- B. No separate payment shall be made for excavation, disposal of rubbish and debris, pipe bedding, backfill, and dewatering of trench. All testing required for the execution of the work shall be included as part of the Bid Item Unit Price for each particular item of work.
- C. No separate payment shall be made for any traffic control, work area protection, recording, safety measures, set-up of equipment and set-up of staging areas. Payment for these items shall be part of the Bid Item Unit Price for item involved.
- D. No separate payment shall be made for providing the detail field survey needed for construction, survey work performed by or for the Contractor in the establishment of reference points, construction staking to establish or confirm the location reference points, temporary and permanent bench marks, proposed water line center line or baseline, right – of way and easements limits. The Contractor shall carefully preserve the established points, and in case of willful or careless destruction, the Contractor shall be responsible for the costs of re-establishing the bench marks, reference points and stakes.
- E. No separate payment shall be made for any delay or extra cost encountered by the Contractor, due to protection, avoidance or relocation of existing utilities, mains or services shown or not shown on the Project's Drawings.
- F. No separate payment shall be made for retainer glands, lock ring or harnessing. The cost shall be included in the Bid Unit Price for each particular Item of work.
- G. No separate payment shall be made for thrust collars. All cost associated with providing thrust collars, as shown on the Drawings or as specified, shall be included in the Unit Price Bid for the Item to which it pertains.
- H. No separate payment shall be made for abandoning existing piping or salvaging valve markers, fire hydrants, or other materials shown or not shown on the Drawings or specified, including delivery of salvaged Items to the Owner's storage yard. The cost of such work and materials shall be included in the Unit price Bid for which it pertains.
- I. No separate payment shall be made for pavement removal and replacement associated with water line abandonment of existing water line, salvaging of materials, or installation of services. The cost of such work and materials shall be included in the Unit Price Bid for which it pertains.
- J. No separate payment shall be made for cutting and beveling pipe.
- K. No separate payment shall be made for electronic markers.
- L. No separate payment shall be made for temporary and/ or permanent Erosion and Sedimentation Controls, except as noted on the Drawings or as directed and approved by the Owner.

- M. No separate payment shall be made for any portion of the Project for which temporary Erosion and Sedimentation Controls are not properly maintained.
- N. No separate or additional payment shall be made for those length of pipeline where the Contractor must reseed, due to inadequate watering and maintenance; loss of seeds caused by site erosion, e.g., wind and rain; inadequate germination of seeds; inadequate coverage/density; providing permanent species at the appropriate season after temporary grassing has been performed.
- O. No separate or additional payment shall be made for providing temporary species of grass, where the seasonal limitations do not allow for the proper germination of a permanent species of grass. The cost for sowing temporary species shall be included in the Unit Price Bid for the Item to which it pertains.
- P. No separate or additional payment shall be made for any length of water main, where the clean- up and grassing operation is not maintained.
- Q. No separate payment shall be made for maintaining traffic flow, highways, streets, roadways, driveways, and detouring, and for the segment to which it pertains.
- R. No separate or additional payment shall be made for existing rock or soil excavation through pipe casing or tunnel with penetration pressure less than 6,000psi.
- S. No separate or additional payment shall be made for removing and replacing damaged adjacent pavement.
- T. No separate or additional payment shall be made for pavement removal and replacement, associated with abandonment of existing water mains or installation of water services.
- U. No separate or additional payment shall be made for removing and replacing damaged adjacent: curb and gutter; driveway areas and pavement, caused by the Contractor.
- V. No separate or additional payment shall be made for sections of pipe not installed, replacement of defective materials, sections of pipe which have not passed the required tests, or if the area has not been cleaned up to the satisfaction of the Owner's representative.

1.04 Contractor Mobilization/Demobilization

All costs associated with mobilization and demobilization of all required resources shall be included in the one - time Unit Price Bid for CONTRACTOR MOBILIZATION/DEMOBILIZATION.

1.05 Water Mains and Accessories

- A. Existing Utilities and Obstructions
 - 1. Horizontal Conflict: No separate payments shall be made for changing the horizontal alignment of the water main to avoid a horizontal conflict, except where authorized for additional fittings and/or lengths of pipe, as approved by the Construction Manager. The said payment shall be

made at the unit prices in the Bid. No other payment will be made for any delay or extra cost encountered by the Contractor due to protection, avoidance or relocation of existing utilities, or mains or services.

2. Vertical Conflict: No separate payment shall be made for lowering the water main alignment to avoid vertical conflict, except where authorized for additional fittings, concrete encasement or steel casing, as required and is approved by the Construction Manager. The said payment shall be made at the Bid Unit Price.
3. No separate payment will be for any delay or extra cost encountered by the Contractor, due to protection, or relocation of existing utilities, mains or services shown or not shown on the drawings.

B. Location and Grade:

1. The Construction Verification Surveying cash allowance is solely for the use of the Owner or Construction Manager, for the verification of Contractor's reference points, centerlines, and work performed. This cash allowance, in no way relieves the Contractor of the responsibility of, including, but not limited to installing reference points, centerlines, temporary and permanent bench marks or verifying that the work has been performed accurately. No payment shall be made for easements restoration, or locating and grading water main.
2. No separate payment shall be made for any surveying performed by the Contractor for construction staking to establish or confirm the location of reference points, right – of – way, or easements or location and grade of water main or field staking the horizontal alignment of water main.

C. Construction along Highways, Streets and Roadways:

1. No separate payment shall be made for traffic control or maintaining highways, streets, roadways and driveways, except as authorized by the Contractor Manager.
2. The Bid Unit Price shall include the cost of erecting and maintaining barriers, signs, lights, traffic control measures and channelization devices, flagmen and what is necessary to provide a safe work zone, and to protect the public safety, in accordance with the protect Traffic Control Plan, and the current Manual on Uniform Traffic Control Devices for Streets and Highways.

D. Ductile Iron Pipe (D I P) Water Main

1. Payment for water main installation shall be made at the Unit Price Bid for WATER MAIN, for the quantity and type provided.
2. Measurement for payment at the Unit Price for WATER MAIN shall be made along the centerline of the pipe, through valves and fittings.
3. The Unit Price Bid for WATER MAIN shall include all costs for installation of the water line as required including, but not limited to, materials, labor, excavation, dewatering, shoring, bedding, haunching, backfill and using the excavated material as backfill material, compaction, clean-up, testing, and all other related items not listed as separate items in the Bid.
4. Thrust Restraint: Payment for concrete thrust collars shall be made at the Unit Price Bid for CONCRETE THRUST COLLARS.

E. Fittings

1. The Unit Price Bid for FITTINGS shall include the costs of fittings and all joint accessories and the cost of all related blocking. Weight of fittings used for payment shall be AWWA C110 standard weight for all mechanical joint ends and shall not include the weight of bolts, glands, or cement lining.
2. Weight of fittings for payment for diameters 54 inches and larger shall be manufacturer's standard weight and shall not include weight of bolts, glands or cement lining.
3. Anchor couplings, not included fire hydrant assembly, will be paid for at the unit price bid for FITTINGS and shall not be included in the quantities measured for Water Main. Weight for payment of anchor couplings will be determined from the manufacturer's standard weight, including the coupling and rotating split gland.
4. Hydrant tees not included in a fire hydrant assembly will be paid for at the unit price bid for FITTINGS. Weight for payment of anchor couplings will be determined from the manufacturer's standard weight.

F. Fire Hydrants

1. Payment for fire hydrants shall be made for the actual quantity installed at the unit price bid for FIRE HYDRANT ASSEMBLY - COMPLETE. The Unit Price Bid for fire hydrant assembly shall include all costs for associated valve, valve box, and hydrant lead piping, and anchor couplings a complete fire hydrant assembly, related blocking, gravel drain, grade-lock fitting, anchor couplings, hydrant tee, and all associated labor and materials. Fittings will be paid for separately at the Unit Price Bid for FITTINGS.
2. Payment for hydrant lead piping and blow off piping will be made at the unit price bid for 6-inch WATER MAIN, except when anchor couplings are used.
3. Fittings for blow off and air release hydrant leads will be paid for at the unit price bid for FITTINGS.
4. Payment for hydrant extension sections where the depth of bury of fire hydrants is greater than 4.5 feet shall be made to the nearest half foot at the unit price Bid for HYDRANT EXTENSION. No distinction shall be made between the additional barrel lengths provided by measuring and ordering the proper depth of bury for the hydrants and the additional barrel length provided by adding extension kits after the hydrant is ordered. The unit price bid for HYDRANT EXTENSION shall include the cost of valve extension stems.
5. Salvage Existing Hydrant: Measurement for payment for removal and salvaging or disposal of existing fire hydrants shall be based on the actual quantity at the unit price bid per each hydrant removed. The unit price bid shall include all costs associated with removal of the hydrant assembly, plugging the existing main, restoration of the area, transportation of the salvaged hydrant assembly to the County's facility

located at 11575 Maxwell Road, Alpharetta, GA, or disposal of the assembly if directed by the Engineer.

- G. Valves: The Unit Price Bid for VALVES shall include the cost of providing the valve, extension stem, valve box, valve marker, all joint accessories, and all other related items. For valves in a vault, the vault and associated piping, equipment, structures, etc. will be included in the VALVE VAULT Bid Item.
- H. Valve Adjustments in Pavement (0'-5') - The Unit Price Bid for VALVE ADJUSTMENTS IN PAVEMENT (0'-5') shall include the cost of providing the new valve box and lid or 6 inch ductile iron pipe, excavation, backfill, concrete pad, pavement repair and all other related items.
- I. Solid Sleeves: Payment for solid sleeves or restrained sleeves shown on the Drawings and specifications, shall be made at the Unit Price Bid for FITTINGS. No payment shall be made for fittings provided due to the Contractor's sequence of construction, layout problems or repairs, except for those shown on the Drawings or specified.

1.06 Connections to Existing Water Lines

- A. The Unit Price Bid for TAPPING SLEEVES AND VALVES shall include the cost of locating the existing line, providing the sleeve, valve, extension stem, valve box, valve marker, all joint accessories, related support blocking and accessories, and all labor, materials, and tools required for a complete installation, including tapping the existing line. Payment for required thrust blocking will be paid for at the unit price bid for CONCRETE THRUST BLOCKING.
- B. The cost of all materials and labor necessary for making a connection to existing pipelines with solid sleeves or a manner other than tapping sleeves and valves shall be included in the Unit price Bid for CONNECT TO EXISTING WATER MAIN for the item to which it pertains.
- C. The cost for connection to existing pipe lines with couplings, including furnishing the coupling, shall be included in the Unit Price Bid for CONNECTION TO EXISTING WATER MAIN, for the item to which it pertains.

1.07 Removal/Addition of Plug or Cap or tie - in for Existing Water Main

- A. Cut and Plug / Dead man Restraint: The Unit Price Bid for CUT AND/OR PLUG, DEADMAN RESTRAINT, shall include all costs associated with cutting and/or plugging or capping of the existing water line, including field locating the existing line beginning and ends, excavation, dewatering, and as necessary to remove or plug or cap and connect to existing pipe, as directed by the Construction Manager, providing all anchors, rods, straps, and all other related items. Payment will be made for the quantity installed at the unit price bid for the appropriate size water line.
- B. Payments for plugs, caps and water main tie - in activities shall be included in the Unit Price Bid for Plugs and/or Caps.
- C. Payment for concrete thrust blocking or thrust collars will be made at the Unit Price Bid for THRUST BLOCKING. Quantities shall be determined from the

dimensions shown on the Drawings for each size and type of fitting for which the blocking is installed. The Contractor shall bear all costs for quantities in excess of the scheduled amount, as may be require due to over excavation or other reasons.

1.08 Clean-Up, Testing, and Disinfection

- A. No separate payment will be made for clean-up, pressure testing, and disinfection. All costs associated with clean up, pressure testing and disinfection of water main shall be included in the Unit Price Bid for WATER MAIN. Laboratory fees and will be paid for through the TESTING cash allowance. No payment shall be made for tests that fail to verify required results.

1.09 Valve Vault

- A. Measurement for VALVE VAULT shall be at the Unit Price Bid. All the cost to provide and construct a VALVE VAULT shall be included in the Unit Price Bid.
- B. Payment shall be for the construction of the VALVE VAULT at the station indicated. Payment shall include the concrete vault, hatch or manhole cover, sump, ladder, miscellaneous fittings, and other work necessary to complete the valve vault, as specified, and shown on the Drawings. The actual valve will be paid for under the associated VALVE Item.

1.10 Air Release Valve

- A. Measurement for AIR RELEASE VALVE shall be the Item Unit Price Bid. All the cost to provide and construct the air release valve, at the station indicated shall be included in the Unit Price Bid.
- B. Payment for AIR RELAESE VALVE shall be at the Unit Price named for the construction of the air release valve at the station indicated. The Unit Price shall constitute full payment for the air valve, piping, tee, tapping, fittings, manhole, frame and cover, stone and all related items, as called for on the Drawings and in the Specifications.

1.11 Bore and Jack Casings

- A. The Unit Price Bid for JACK and BORE shall include all costs associated with installation of the casing and carrier pipe, including but not limited to excavation, shoring, dewatering, backfilling, compaction, steel casing pipe, ductile iron carrier pipe, spacers, end seals, grout, and other accessories, for installing the pipe complete in place.
- B. Payment for casing shall be made only at the completion of all work specified for the casing installation. No partial payment shall be made for the construction of the casing without carrier pipe.
- C. Measurement for payment shall be made along the centerline of the pipe line to the limits of JACK and BOORE.
- D. Casing pipe may be included in Partial Payment Requests as stored materials, if the casing pipe is stored at the Project site. Casing pipe which has been

properly installed, but has not yet been paid for as installed casing, may also be included as stored materials.

- E. Payment for pipe in casing shall be made only at the completion of all work specified for the pipe installation. Payment for pipe in the casing and carrier pipe shall be made only at the Unit Price Bid for JACK and BORE CASING.
- F. In the event that rock or soil encountered during the installation of the pipe casing installation penetration pressure exceed 6,000 psi, which, in the opinion of the Construction Manager cannot be removed through the casing, then the Construction Manager may authorize the Contractor to complete the crossing by another method. Payment rock and/or soil shall be compensated for under the applicable Cash Allowance.
- G. No additional payment shall be made for rock and/or soil excavation through the casing.

1.13 Asphalt Pavement Replacement

- A. Payment for removing and replacing pavement will be made based on the measured quantity replaced at the Unit Price Bid for ASPHALT PAVEMENT REPLACING. The Unit Price Bid shall include all the costs associated with removing and replacing pavement, including providing sub-base material and selected backfill, if necessary, as required by Fulton County, and/or the City of Alpharetta specification.
- B. Payment shall be made only for the installation, placement and construction of the actual field verifiable items, as approved by the Construction Manager or Owner.
- C. Payment for soils testing shall be made from the SIOLS, CONCRETE, ASPHALT, AND MATERIALS TESTING cash allowance. No payment shall be made for tests that fail to verify the required results.
- D. Payment for road resurfacing shall be made at the Unit Price Bid for ASPHALT PAVEMENT REPLACEMENT. Limits eligible for payment shall be based on widths and lengths, shown on the Drawings or as approved by Construction Manager. Measurement shall be made based on the actual field measured dimensions, as approved by the Construction Manager. The Unit Price Bid shall include all cost associated with road resurfacing, labor, materials, tools, equipment, bituminous tack coat, replacing existing stripping and traffic devices, raising existing water valves or manholes, pothole repair, replacing items affected by the resurfacing activity, and restoring the road to its pre-construction condition.
- E. Payment for Utility Cut shall be made at the Unit Price Bid for ASPHALT PAVEMENT REPLACEMENT. The Unit Price Bid shall include all costs associated with trench cutting, labor, materials, tools, equipment, removing and disposing existing materials, placement of temporary GAB, temporary measures installation to make its surface drivable and passable, including ten inch thick concrete cap, and/or as required the applicable Municipality Standard Detail and Specification or as approve by the Construction Manager. Payment shall be made for the pipeline length and width for which is constructed underneath the roadway.

- F. All payments for road surface milling shall be made at Unit Price Bid for ASPHALT PAVEMENT REPLACEMENT. The Unit Price Bid shall include all costs related to items associated and affected by the milling activity, such as the lowering of existing water valves or manholes, and/or as required by the applicable Municipality Standard Detail and Specification, or approved by the Construction Manager. Measurement shall be made based on the actual area milled, as approved by the Construction Manager.
- G. No separate or additional payment shall be made for temporary measures required or necessary to make the road passable and drivable, including backing to the top of the trench temporarily with crusher run or granular material or placing a temporary asphalt topping surface.

1.14 Erosion and Sedimentation Control

- A. General
 - 1. No separate payment shall be made for erosion and sedimentation controls, except as noted below. All other erosion and sedimentation control costs shall be included in the unit price bid for the item to which it pertains.
 - 2. No payment will be made for any portion of the Project for which temporary erosion and sedimentation controls are not properly maintained.
 - 3. Quantities for payment shall be based upon actual quantity constructed by the Contractor.
- B. Construction Exits: All costs for construction exits, including installation, maintenance, repair, and removal, shall be included in the Unit Price Bid for CONSTRUCTION EXITS. The unit price bid shall include geotextile under liner, stone, and all incidental costs associated with maintaining a construction exit to Fulton County standards.
 - 1. If the action of the construction vehicles traveling over the gravel pad does not sufficiently remove mud and debris, the vehicle tires shall be washed prior to allowing vehicles to enter public right-of-way. No additional payment will be made for the cost of washing tires.
 - 2. No payment will be made for construction exits that are improperly constructed or use materials that are not approved.
- C. Reinforced Silt Fence: All costs for Type C silt fence, where ordered by the Construction Manager, including installation, maintenance, repair, replacement, and removal, shall be included in the unit price bid for REINFORCED SILT FENCE.
- D. Hay Bale Check Dams: All costs for hay bale check dams, including hay bales, necessary earthwork, staking, periodic maintenance and repair, and removal of sediment and hay bales following establishment of permanent erosion control measures shall be included in the unit price bid for HAY BALE CHECK DAMS.

- E. Curb Inlet Filter: All costs for fabric, blocks, wires and the furnishing of all labor, materials, equipment and tools necessary for installation, maintenance, repair and removal shall be included in the Unit Price Bid for CURB INLET FILTER. Payment shall be measured based on the actual quantity installed.
- F. Inlet Sediment Traps: All costs for temporary inlet sediment traps (silt box), including installation, maintenance, repair and removal, shall be included in the unit price bid for INLET SEDIMENT TRAPS.
- G. Rip Rap with Filter Fabric Underlay: All costs for rip rap, including filter fabric; installation, maintenance, repair and removal, as required by the Standard Details and Specifications, or as directed by the Construction Manager, shall be included in the unit price bid for RIP RAP.
- H. Tree Protection Fence: All costs for either passive or active tree protection fence, also known as orange mesh safety fence, including installation, maintenance, repair and removal, shall be included in the unit price bid for TREE PROTECTION FENCE.

1.15 **Vegetation Restoration**

- A. Temporary Seeding: Temporary seeding and mulching shall be applied to all disturbed area to be left exposed for a period greater than 14 days, or as ordered by the Construction Manager. The Unit Price Bid for TEMPORARY SEEDING shall include all costs associated with spreading fast growing seed, mulching, watering, maintenance and repair until permanent grassing is established.
- B. Permanent Seeding: All costs for permanent seeding, including fine grading, raking, soil preparation (removal of rocks and other objectionable materials), sowing the appropriate type of grass seed, fertilizing, mulching, watering, temporary protective measures, maintenance and repair until permanent grassing is established, shall be included in the Unit Price Bid for PERMANENT SEEDING. Permanent seed will be applied only after final grading and dress-up of disturbed area have been completed to the satisfaction of the Construction Manager.
- C. Sod Grassing: Where ordered by the Construction Manager, sod shall be provided at the Unit Price Bid for SOD GRASSING for any type. All costs for proper installation, including preparation of surface, installation, rolling, compacting, watering, maintenance, repair, and any temporary measures required to protect the sod until establishment, shall be included in the Unit Price Bid for SOD GRASSING.
- D. In no case shall any one area be paid more than once for temporary grassing or for permanent grassing.
- E. If an area is temporarily grassed, and as directed by the Construction Manager, the area will be left that way permanently. No additional payment will be made for permanent grassing.
- F. Measurement for payment will be made by square yard, along the water line centerline, to the widths allowed by the Standard Details and Specifications.

1.16 Remove and Replace Curb and Gutter

- A. Payment for removing and replacing curb and gutter shall be made based on the measured quantity at the Unit Price Bid for REMOVE AND REPLACE CURB AND GUTTER or for GRANTTE CURB, as appropriate. The quantity shall be defined by the limits indicated in the Standard Details. Measurement shall be made based on the record drawing dimensions.
- B. Payment for Soil, Asphalt, and materials testing shall be made from the SIOLS, CONCRETE, ASPHALT, AND MATERIALS TESTING cash allowance. No payment shall be made for tests that fail to verify the required results.
- C. It is anticipated that existing Curb Inlets and storm drain Catch Basins can be avoided during construction. If the Contractor encounters a situation where the proposed pipeline cannot be installed without the removal of an existing Curb Inlet or Catch Basin, or their affected parts, then then Construction Manager shall be notified. If approved by the Construction Manager, the removal and replacement of the Curb Inlet and/or Catch basin or the affected parts, shall be paid for from the Utility Relocation or Utility Conflict Resolution cash allowance.

1.17 Remove and Replace Sidewalk

- A. Payment for removing and replacing sidewalk will be made based on the measured quantity replaced at the Unit Price Bid for REMOVE AND REPLACE SIDEWALK. Measurement shall be made based on the record drawings or field measurement dimensions.
- B. The Unit Price for removing and replacing sidewalk shall include removal and Disposal of existing sidewalk, base, bricks, concrete, forms, curing and the furnishing of all labor, materials, tools, and appliances, and all related items necessary to complete the work, and/or per the applicable jurisdiction specification.
- C. Payment for the Soil, Asphalt and Concrete testing shall be made from SOIL, CONCRETE, ASPHALT, AND MATERIALS TESTING cash allowance. No payment shall be made for tests which fail to verify required results.

1.18 Remove and Replace Driveway

- A. Payment for removing and replacing al driveways shall be made based on the measured quantity replaced, for the type of pavement at the Unity Price Bid for REMOVE AND REPLACE PAVEMENT. The Unit Price Bid shall include all costs associated with cutting, removing and disposing of removed existing materials, compacting and replacing materials, including all traffic control and temporary measures for maintaining access, in accordance with the applicable Standard Details and Specifications.
- B. No additional payment shall be made for saw cutting driveways.
- C. Payment for removing and replacing gravel driveways will be made based on the measured quantity replaced, at the Unit Price Bid for RESIDENTAL ASPHALT DRIVEWAY
- D. Payment for removing and replacing concrete driveways will be made on the

measured quantity replaced, at the Unit Price Bid for RESIDENTAL CONCRETE DRIVEWAY.

- E. Payment for removing and replacing commercial driveways will be made on the Measured quantity replaced at the Unit Price Bid for COMMERCIAL CONCRETE DRIVEWAY.
- F. Payment for removing and replacing gravel driveway will be made on the Measured quantity replaced, at the Unit Price Bid for GRAVEL DRIVEWAY.

1.19 Trench Excavation, Backfill and Stabilization

- A. No separate or additional payment will be made for any special or unique method, means, techniques or equipment necessary for the Contractor's compliance with the Specifications, regulatory requirements, permits, laws or regulations which govern this Project.
- B. Trench Excavation: No separate payment will be made for trench excavation. All costs shall be included in the unit price bid for the item to which it pertains at the appropriate depth.
- C. Sheeting, Bracing and Shoring: No separate payment will be made for providing any sheeting, bracing and shoring. All costs shall be included in the unit price bid for the item to which it pertains at the appropriate depth.
- D. Dewatering Excavations: All costs of equipment, labor and materials required for dewatering shall be included in the price bid for the item to which it pertains.
- E. Trench Foundation and Stabilization
 - 1. No payment for trench stabilization shall be authorized until after the trench has been dewatered. If the pipe is installed in an inadequately prepared trench bottom, the Construction Manager shall notify the Contractor in writing of the deficiency and will not authorize payment for that portion of that length of pipe which was improperly installed.
 - 2. Payment for trench stabilization shall be made on the basis of the amount authorized and the unit price bid for TRENCH STABILIZATION. Payment shall include all costs for the removal and disposal of the unsuitable material and replacement with the materials listed in the Bid including filter fabric. No additional payment will be made for material required for specified bedding.
- F. Bedding and Haunching
 - 1. The unit price bid for pipe for WATER MAIN shall include excavation of the trench to the depth below the pipe necessary to provide specified bedding and to lay the water line to grade. Measurements for payment will be made only to the pipe invert.

2. No separate payment will be made for material used to provide specified bedding. The cost of all bedding materials shall be included in the unit price bid for the item to which it relates, except for trench stabilization.
3. No additional payment will be made for improved bedding required to compensate for over excavation of the trench.

G. Trench Rock Excavation

1. Rock excavation shall be paid for in addition to payment for normal pipe excavation accounted for in the Unit Price Bid for WATER MAIN. Payment will be made for the measured quantity of rock excavated, at the sum of the unit prices for Trench Rock Base Cost and Trench Rock Premium Cost if applicable.
2. The unit price for Trench Rock Base Cost is for the normally anticipated cost of rock excavation, the cost of additional bedding and backfill material as specified and all costs incidental thereto.
3. The unit price bid for Trench Rock Premium Cost shall be for all additional costs for rock excavation which, in the opinion of the Contractor, are in excess of the Base Cost, including but not limited to extra blasting protection, closer grouping of blasting holes, more detonator caps, more caution, etc. The Contractor shall not bid less than zero (bid a deduct) for the Trench Rock Premium Cost. Any Bids containing a deduct will be declared non-responsive and rejected by the Owner.
4. The maximum allowable volume of rock excavation for payment shall be based on a trench width equal to the outside diameter of the pipe barrel plus 18 inches, but not less than 36 inches, and depth of rock on the pipe centerline, from the top of the rock to the bottom of the rock or the specified bottom of the trench, whichever has the higher elevation.
5. The Construction Manager must be given reasonable notice to measure all rock. Payment will not be made for excavated rock that was not measured and approved by the Construction manager, prior to removal.
6. No allowance shall be made for excavating to extra widths for construction of manholes or other appurtenances, for excavating to sloping sides, or for excavations made necessary by the physical limitations of the Contractor's equipment. Cost of such additional rock excavation shall be included in the unit price bid for the item to which it pertains.
7. Payment for blasting monitoring shall be made from the BLASTING MONITORING cash allowance. A fee must be agreed upon by the Construction Manager, prior to the Contractor employing an independent, qualified specialty subcontractor to monitor the blasting. If the Contractor employs the specialty subcontractor prior to the Construction Manager's approval of the fee, all such costs are subject to non reimbursement.

H. Initial Backfill

1. No separate payment shall be made for initial backfill.
 2. No separate payment shall be made for drying out the initial backfill material in order to meet the compaction requirements.
 3. No separate payment shall be made for the adding of moisture to the initial backfill materials in order to meet the compaction requirements.
 4. No separate payment shall be made for providing select material if the insitu material cannot meet the compaction requirements.
- I. Concrete Encasement: Payment for concrete encasement shall be at the unit price bid for CONCRETE ENCASEMENT.
- J. Final Trench Backfilling
1. No additional payment will be made for additional material when excavated materials are used.
 2. No separate payment shall be made for drying out the final backfill material in order to meet the compaction requirements.
 3. No separate payment shall be made for the adding of moisture to the final backfill materials in order to meet the compaction requirements.
 4. No additional payment will be made for providing select material if the insitu material cannot meet the compaction requirements.
 5. Backfill material cost for none excavated trench material shall be included the Unit Price Bid for TRENCH BACKFILL with #57 stone and/or as specify by the Drawings. The Unit Price shall include removing and disposing of existing excavated trench materials, traffic control, placing temporary measures to make surface passable and drivable, including backfilling to the top of the trench temporarily with crushing run or granular material, or placing a temporary asphalt topping, or as approved by the Construction Manager. Payment and measurement shall be made base on the actual material placed, from the bottom of concrete top, as specify in Drawing Asphalt Pavement Replacement Detail, and for the trench length and width of which the pipeline is installed.
- K. Additional Material: No separate payment will be made for additional earth or fill materials imported to the Project site.

1.20 Clearing and Grubbing

- A. No separate payment shall be made for clearing and grubbing. All costs shall Be included in the Unity Price Bid for CLEARING AND GRUBBING.
- B. HEAVY CLEARING shall be defined by an easement that is dense with shrubs, brush, and trees averaging over two feet in diameter, including specimen trees.

- C. The cost of moving and reestablishing landscape features, including labor and materials, shall be included in the unit price bid for the item to which it pertains.
- E. No payment will be made for clearing and grubbing in grassed areas and in areas with non-established vegetation. The costs associated with such clearing shall be included in the Unit Price Bid for the item to which it pertains.

1.21 Pavement Marking and Striping

The Unit Price Bid for PAVEMENT MARKING AND STRIPING shall include all costs associated with applying standard DOT striping and paint as listed in the Bid and/or the relevant governmental authority, and as ordered by the Construction Manager. All required materials, labor, tools, equipment, and traffic control shall be included in the Unit Price Bid.

1.22 Traffic Control

- A. All costs for providing traffic control in compliance with the Manual on Uniform Traffic Control Devices (MUTCD) and Georgia Department of Transportation (GDOT) specifications shall be included in the unit price bid for the item to which it pertains. No additional payment will be made for complying with MUTCD or GDOT requirements.
- B. Payment for TRAFFIC CONTROL as indicated in the Bid will be made only for additional traffic control devices as ordered by the Construction Manager.
- C. The Unit Price Bid for STANDARD DOT CONCRETE BARRIER shall include all costs for providing, installing and removing a standard DOT concrete barrier, as directed by the Construction Manager.
 - 1. No excavation in or near roadways will be left open over night. Therefore, all concrete barriers will be required to be removed from the roadway and moved to a location where vehicular and pedestrian traffic are not obstructed. The cost of moving the barriers as such shall be included in the Unit Price Bid.
 - 2. Measurement for payment shall be made based on the actual linear footage of barrier installed, per day, approved by the Construction Manager and serving the purpose for which it was intended. Payment will not be made for excess barriers stored by the Contractor in any location.
- D. The Unit Price Bid for MUTCD STANDARD SAFETY BARREL shall include all costs for providing, installing and removing a standard MUTCD safety barrel, as directed by the Construction Manager. Only safety barrels directed by the Construction Manager, in addition to those required by the MUTCD and GDOT, shall be paid for separately.
- E. The Unit Price Bid for POLICE CRUISER shall include all costs for providing a police cruiser for additional traffic control. Payment will be made for hours spent on site, which may be a portion of a standard work day. Payment will be made only for hours documented and approved by the Construction Manager.

- F. The Unit Price Bid for CERTIFIED FLAGMAN shall include all costs for providing a flagman for additional traffic control, as directed by the Construction Manager, in addition to the requirements of MUTCD and GDOT.
1. The flagman shall be certified and dedicated to maintaining and directing traffic flow. An individual who works part time as a flagman and part time as a laborer or acts in dual capacity will not be approved for payment under this item. Proof of certification may be required by the Construction Manager prior to acceptance for payment.
 2. Payment will be made for hours spent on site performing dedicated flagman duties, which may be a portion of a standard work day. Payment will be made only for hours documented and approved by the Construction Manager.
- G. The Unit Price Bid for LIGHT PLANT shall include all costs for providing a light plant, including generator and lighting system, for night work, as directed by the Construction Manager.
- H. The Unit Price Bid for ELECTRONIC MESSAGE BOARD shall include all costs for providing an electronic message board, as directed by the Construction Manager.

1.23 Remove and Replace Existing Fence

The Unit Price Bid for REMOVE AND REPLACE EXISTING FENCE shall include all costs associated with removing and replacing an existing fence of the type and material listed in the Bid, including disposing of waste materials, restoration of site to original condition, and all other associated work for a complete installation.

1.24 Cast in Place Concrete

- A. Structural Concrete: The Unit Price Bid for STRUCTURAL CONCRETE shall include all costs associated with placing concrete as directed by the Construction Manager, including excavation, dewatering, formwork, placing of concrete, and all associated labor, tools, and materials. This item will not be utilized for concrete piers for stream crossings.
- B. Reinforcing Steel: The Unit Price Bid for REINFORCING STEEL shall include all costs associated with providing reinforcing steel for structural concrete, including providing steel as directed by the Construction Manager and all labor, tools, and materials required.
- C. Concrete Thrust Collars: The Unit Price Bid for CONCRETE THRUST COLLARS shall include all associated costs including high early strength concrete, reinforcing, forming and weld on collar or split retainer gland as directed by the Construction Manager. Measurement for payment shall be made at the unit price in the Bid for the quantity of installed concrete for the appropriate size pipe.
- D. Payment for CONCRETE THRUST BLOCKING AND ENCASEMENT shall be made at the Unit Price Bid for the measured quantity installed. The Unit Price Bid shall include all associated costs including high early strength concrete, reinforcing, forming, and all related items. Limits shall be determined from

dimensions shown on the Drawings for each size and type of fitting for which blocking is installed, or as directed by the Construction Manager. The Contractor shall bear all costs for quantities in excess of the scheduled amount, as may be required due to over excavation or other reasons.

1.25 Programmable Electronic Marking Devices

The Unit Price Bid for PROGRAMMABLE ELECTRONIC MARKING DEVICES shall include the cost of providing the marking devices including programmer/locator as specified, including programming the devices and placing them along the water line. The cost of excavation shall be included in the Unit Price Bid for WATER MAIN or UTILITY LOCATION. Measurement for payment will be based on the quantity installed, as directed by the Construction Manager.

1.26 Utility Location – Excavation and Backfill

- A. Soft Dig Hydro Excavation: The Unit Price Bid for SOFT DIG HYDRO EXCAVATION shall include all costs associated with locating the assigned existing utility, excavating to directly above the pipe, measuring the depth, diameter and type of the pipe, backfilling and compacting the hole up to two feet from existing grade with soil, encoding a 3M ID marker device, installing the marker above the pipe at a depth of two feet, and backfilling with soil and dressing the disturbed area with like surrounding materials.
- B. Where utility location is performed in roadways or sidewalks, other materials may be required for backfill. Select materials will be paid for at the Unit Prices Bid for TRENCH STABILIZATION. Measurement for payment will be made on the actual quantity of material used for backfill of the hole where the marker ball is installed.
- C. Exploratory Excavation: The Unit Price Bid for EXPLORATORY EXCAVATION shall include all costs associated with excavation of an area by machine and by hand where necessary with the intent of locating a Fulton County utility as ordered by the Construction Manager, including all equipment, tools, and labor. The costs associated with removal and replacement of roadway, driveway, sidewalk, or curb and gutter shall be included under the appropriate pay item. Measurement for payment will be based on the actual amount of excavation required to locate a Fulton County utility, only when ordered by the Construction Manager, prior to any excavation. This item shall not be used for standard locating of utilities, as required to perform the work.
- D. No payment will be made for excavation that does not locate the assigned utility, or where the marker ball is not installed directly above the pipe.
- E. No separate or additional payment will be made for any special or unique method, means, techniques or equipment necessary for the Contractor's compliance with these Specifications, regulatory requirements, permits, laws or regulations which govern this Project.

1.27 Cash Allowances

- A. General

1. The Contractor shall include in the Bid Total all allowances stated in the Contract Documents. These allowances shall cover the net cost of the services provided by a firm selected by the Owner. The Contractor's handling costs, labor, overhead, profit and other expenses contemplated for the original allowance shall be included in the items to which they pertain and not in allowances.
 2. No payment will be made for nonproductive time on the part of testing personnel due to the Contractor's failure to properly coordinate testing activities with the work schedule or the Contractor's problems with maintaining equipment in good working condition. The Contractor shall make all necessary excavations and shall supply any samples of materials necessary for conducting compaction and density tests.
 3. No payment shall be provided for services that fail to verify required results.
- B. Should the net cost be more or less than the specified amount of the allowance, the Contract will be adjusted accordingly by change order. The amount of change order will not recognize any changes in handling costs at the site, labor, overhead, profit and other expenses caused by the adjustment to the allowance.
- C. Documentation
1. Submit copies of the invoices with each periodic payment request from the firm providing the services.
 2. Submit results of services provided which verify required results.
- D. Schedule of Cash Allowances
1. Soils, Concrete, Asphalt, Materials, and Water Quality Testing: Allow the amount provided in the Bid for the services of a geotechnical engineering firm or testing laboratory to verify soils conditions including trench excavation and backfill, asphalt coring and density tests, testing of concrete cylinders for poured in place concrete, pipe materials, water quality and similar issues as directed and approved by the Construction Manager.
 2. Utility Conflict Resolution: Allow the amount specified in the Bid to resolve any unforeseen utility conflicts which may accrue during the water line installation, including relocating and/or replacement, as directed and approved by the Construction Manager.
 3. Large Tree Removal: Allow the amount specified in the Bid for the services of a **tree removal specialist** to remove individual trees as directed by the Construction Manager. Services will be reimbursed at direct cost plus 10%. The Contractor must provide invoices for Owner approval, prior to the start of work.
 4. Survey/Inspection and Blasting Monitoring: Allow the amount provided in the Bid for the services of an independent, qualified specialty subcontractor to monitor the blasting, when directed by the Engineer.

Services will be reimbursed at direct cost with no mark-up, Contractor must provide invoices for Owner approval.

5. Unforeseen Conditions: Allow the amount specified in the Bid to resolve any project unforeseen situation or condition, as approved by the Construction Manager.
6. Additional Landscaping Not Shown on the Drawings: Allow for the amount specified in the Bid for the provision of landscaping in addition to that not shown on the Drawings or specified, as directed and approved by the Construction Manager.
7. Construction Verification Surveying:
 - a. Allow the amount provided in the Bid for construction surveying by an independent surveying firm, selected by the OWNER, to perform horizontal and/or vertical checks at the discretion of the OWNER.
 - b. This allowance is solely to be used by the OWNER for verification of the Contractor's reference point, centerlines and work performed. The cash allowance in on way relieves the Contractor of the responsibility of installing reference points, the proposed water line centerline, temporary and permanent bench marks, and verifying that the Contractor's work has been performed accurately.
8. Utility Relocation: Allow the amount specified in the Bid, as directed and approved by the Construction Manager.
 - a. Known or field located utility which is not shown on the Drawings, but is necessary to be relocated for the water line relocation.
 - b. Unknown utility which require significant relocation work, prior to the start of the water line installation.
9. Exploratory Excavation: Allow the amount provided in Bid for subsurface investigation to identify existing water lines locations, sizes, depth, pipe type in the project area, where there is no as-built or record Drawings.

END OF SECTION

Part 1 General

1.01 Scope

- A. Permits and Responsibilities: The Contractor shall, without additional expense to the Owner, be responsible for obtaining all necessary licenses and permits, including building permits, and for complying with any applicable federal, state, county and municipal laws, codes and regulations, in connection with the prosecution of the Work.
 - 1. In addition, City Work Permits, Right of Way Encroachment permits, plumbing permits and similar type permits, and all appropriate licenses are the responsibility of the Contractor.
 - 2. If land disturbance permits, DOT permits, or easements are required, they will be obtained by the County as part of the design process.
- B. The Contractor shall take proper safety and health precautions to protect the Work, the workers, the public and the property of others.
- C. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the Work, except for any completed unit of construction thereof which may heretofore have been accepted.

END OF SECTION

Part 1 General

1.01 Scope

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END OF SECTION

Part 1 General**1.01 Description**

- A. Whenever reference is made to conforming to the standards of any technical society, organization, body, code or standard, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the time of advertisement for Bids. This shall include the furnishing of materials, testing of materials, fabrication and installation practices. In those cases where the Contractor's quality standards establish more stringent quality requirements, the more stringent requirement shall prevail. Such standards are made a part hereof to the extent which is indicated or intended.
- B. The inclusion of an organization under one category does not preclude that organizations' standards from applying to another category.
- C. In addition, all work shall comply with the applicable requirements of local codes, utilities and other authorities having jurisdiction.
- D. All material and equipment, for which a UL Standard, an AGA or NSF approval or an ASME requirement is established, shall be so approved and labeled or stamped. The label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.
- E. The standards which apply to this Project are not necessarily restricted to those organizations which are listed in Article 1.02.

1.02 Standard Organizations

- A. Piping and Valves

ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
API	American Petroleum Institute
ASME	American Society of Mechanical Engineers
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
DIPRA	Ductile Iron Pipe Research Association
FCI	Fluid Controls Institute
MSS	Manufacturers Standardization Society
NCPI	National Clay Pipe Institute
NSF	National Sanitation Foundation
PPI	Plastic Pipe Institute
Uni Bell PVC Pipe Association	
- B. Materials

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
- C. Painting and Surface Preparation

NACE	National Association of Corrosion Engineers
SSPC	Steel Structures Painting Council

D. Electrical and Instrumentation

AEIC	Association of Edison Illuminating Companies
AIEE	American Institute of Electrical Engineers
EIA	Electronic Industries Association
ICEA	Insulated Cable Engineers Association
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IPC	Institute of Printed Circuits
IPCEA	Insulated Power Cable Engineers Association
ISA	ISA – The Instrumentation, Systems, and Automation Society
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
REA	Rural Electrification Administration
TIA	Telecommunications Industries Association
UL	Underwriter's Laboratories
VRCI	Variable Resistive Components Institute

E. Aluminum

AA	Aluminum Association
AAMA	American Architectural Manufacturers Association

F. Steel and Concrete

ACI	American Concrete Institute
AISC	American Institute of Steel Construction, Inc.
AISI	American Iron and Steel Institute
CRSI	Concrete Reinforcing Steel Institute
NRMA	National Ready Mix Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute

G. Welding

ASME	American Society of Mechanical Engineers
AWS	American Welding Society

H. Government and Technical Organizations

AIA	American Institute of Architects
APHA	American Public Health Association
APWA	American Public Works Association
ASA	American Standards Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASQC	American Society of Quality Control
ASSE	American Society of Sanitary Engineers
CFR	Code of Federal Regulations
CSI	Construction Specifications Institute
EDA	Economic Development Administration
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FmHA	Farmers Home Administration

FS	Federal Specifications
IAI	International Association of Identification
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ITE	Institute of Traffic Engineers
NBFU	National Board of Fire Underwriters
(NFPA)	National Fluid Power Association
NBS	National Bureau of Standards
NISO	National Information Standards Organization
OSHA	Occupational Safety and Health Administration
SI	Salt Institute
SPI	The Society of the Plastics Industry, Inc.
USDC	United States Department of Commerce
WEF	Water Environment Federation

I. General Building Construction

AHA	American Hardboard Association
AHAM	Association of Home Appliance Manufacturers
AITC	American Institute of Timber Construction
APA	American Parquet Association, Inc.
APA	American Plywood Association
BHMA	Builders Hardware Manufacturers Association
BIFMA	Business and Institutional Furniture Manufacturers Association
DHI	Door and Hardware Institute
FM	Factory Mutual Fire Insurance Company
HPMA	Hardwood Plywood Manufacturers Association
HTI	Hand Tools Institute
IME	Institute of Makers of Explosives
ISANTA	International Staple, Nail and Tool Association
ISDSI	Insulated Steel Door Systems Institute
IWS	Insect Screening Weavers Association
MBMA	Metal Building Manufacturers Association
NAAMM	National Association of Architectural Metal Manufacturers
NAGDM	National Association of Garage Door Manufacturers
NCCLS	National Committee for Clinical Laboratory Standards
NFPA	National Fire Protection Association
NFSA	National Fertilizer Solutions Association
NKCA	National Kitchen Cabinet Association
NWMA	National Woodwork Manufacturers Association
NWWDA	National Wood Window and Door Association
RMA	Rubber Manufacturers Association
SBC	SBCC Standard Building Code
SDI	Steel Door Institute
SIA	Scaffold Industry Association
SMA	Screen Manufacturers Association
SPRI	Single Ply Roofing Institute
TCA	Tile Council of America
UBC	Uniform Building Code

J. Roadways

AREA	American Railway Engineering Association
DOT	Department of Transportation
SSRBC	Standard Specifications for Construction of Transportation Systems, Georgia Department of Transportation

- K. Plumbing
 - AGA American Gas Association
 - NSF National Sanitation Foundation
 - PDI Plumbing Drainage Institute
 - SPC SBCC Standard Plumbing Code

- L. Refrigeration, Heating, and Air Conditioning
 - AMCA Air Movement and Control Association
 - ARI American Refrigeration Institute
 - ASHRAE American Society of Heating, Refrigeration, and Air Conditioning Engineers
 - ASME American Society of Mechanical Engineers
 - CGA Compressed Gas Association
 - CTI Cooling Tower Institute
 - HEI Heat Exchange Institute
 - IIAR International Institute of Ammonia Refrigeration
 - NB National Board of Boilers and Pressure Vessel Inspectors
 - PFMA Power Fan Manufacturers Association
 - SAE Society of Automotive Engineers
 - SMACNA Sheet Metal and Air Conditioning Contractors National Association
 - SMC SBCC Standard Mechanical Code
 - TEMA Tubular Exchangers Manufacturers Association

- M. Equipment
 - AFBMA Anti Friction Bearing Manufacturers Association, Inc.
 - AGMA American Gear Manufacturers Association
 - ALI Automotive Lift Institute
 - CEMA Conveyor Equipment Manufacturers Association
 - CMAA Crane Manufacturers Association of America
 - DEMA Diesel Engine Manufacturers Association
 - MMA Monorail Manufacturers Association
 - OPEI Outdoor Power Equipment Institute, Inc.
 - PTI Power Tool Institute, Inc.
 - RIA Robotic Industries Association
 - SAMA Scientific Apparatus Makers Association

1.03 Symbols

Symbols and material legends shall be as scheduled on the Drawings.

END OF SECTION

Part 1 General

1.01 Scope

- A. The work covered by this Section includes the Construction Manager's and Contractor's responsibilities and obligations regarding inspection of the Work performed.

1.02 Construction Manager Inspection

- A. The Construction Manager shall have the right of access to inspect the work at all times. All materials, equipment, and products shall be subject to the Construction Manager review, as specified herein.
- B. The Construction Manager and/or assign inspector is responsible for general surveillance of the work on behalf of the Owner. The Construction Manager and/inspector is not responsible for construction means, methods, sequences, or procedures or for safety precautions and programs in connection with the work. The Construction Manager and /or inspector is not for supervision of the work and shall not give instruction to the Contractor's failure to carry out the work in accordance with the Contract Documents.

1.03 Contractor's Duties

- A. The Contractor is responsible for all materials, equipment, methods, and procedures in execution of the work.
- B. The Contractor shall correct to the satisfaction of the Construction Manager and/or Owner Inspector any work or material found to be defective or of deficient quality. Such corrections shall be made by the Contractor at no additional expense to the Owner.

1.04 Right of Entry

- A. Representative of the County, the City of Alpharetta, the Environmental Protection Division of the Georgia Department of Natural Resources, and others may be identified by the Owner shall have access to the work, wherever it is in preparation or progress. The Contractor shall provide proper facilities for such access and inspection.

END OF SECTION

Part 1 General

1.01 Scope

- A. The work under this Section includes preparing, furnishing, distributing, and periodic updating of the construction schedules, as specified herein.
- B. The purpose of the schedule is to demonstrate that the Contractor can complete the overall Project within the Contract Time and meet all required interim milestones.

1.02 Submittals

- A. Overall Project Schedule (OPS)
 - 1. The Contractor shall submit the OPS schedule within ten (10) days after date of the Notice of Proceed.
 - 2. The OPS schedule shall identify various critical project milestones, in order to address the public and activities within the project's area.
 - 3. The Construction Manager will review the schedule and return it within 10 work days after receipt.
 - 4. If required, resubmit within 10 work days after receipt of a returned copy.
- B. Near Term Schedule (NTS)
 - 1. The Contractor shall submit the first thirty (30) project work days Near Term Schedule, within ten (10) days of the Notice to Proceed (NTP).
 - 2. The Construction Manager will review the schedule and return it within ten (10) project work days after receipt.
- C. The contractor shall submit an updated OPS and NTS with each Progress Payment Request.
- D. The Contractor shall submit the number of copies required, plus four copies to be retained by the Owner.

1.03 Approval

The approval of the Constructor's detail construction program, Overall Project Schedule, Near Term Schedule and revisions thereto, shall no way relieve the Contractor of any Contractor's duties and obligations, under the Contract. Approval is not limited to the format of the schedule and does not in any way indicate approval of, or concurrence with the Contractor's means, methods and ability to carry out the Work.

1.03 Overall Project Schedule (OPS)

- A. The Contractor shall submit to the Construction Manager or Owner for approval detailed Overall Project Schedule of the Contractor's proposed operations for the duration of the Project or Contract Time. The OPS may be in the form of a Gantt Chart or Bar Chart, or as approved by the Construction Manager.
- B. Gantt Chart or Bar Chart Schedule:
 - 1. Each activity of five days or more days shall be identified by a separate bar. Activities with duration of more than twenty (20) days shall be sub-divided into separate activities.
 - 2. The schedule shall show the proposed start and completion date for each activity. A separate listing of activity start and stop dates and working day requirements shall be provided unless the information is shown in text form on the Gantt/Bar Chart.
 - 3. The schedule shall include activities drawing review; fabrication delivery and installation of materials and equipment on site.
 - 4. The schedule shall identify the Notice to Proceed date, the Contract Completion Date, major milestone dates, and project's critical path.
 - 5. The schedule shall show the precedence relationship for each activity.
 - 6. The schedule shall have a horizontal time scale based on calendar days and shall identify the Monday of each week.
 - 7. The schedule shall be printed on a minimum 11 x17 inch size paper.

1.04 Near Term Schedule (NTS)

- A. The Contractor shall develop and refine a detailed Near Term Schedule, showing the day to day activities with committed dates, which must be performed during the upcoming thirty (30) day period. The detailed schedule shall represent the Contractor's best approach to the Work, which must be accomplished to maintain progress consistent with the Overall Project Schedule.
- B. The Near Tern Schedule can be in the form of Gantt Chart or Bar Chart and shall include a written narrative description of all activities to be performed, and describe corrective action to be taken for activities that are behind schedule.

1.06 Updating Schedule

- A. Show all the changes occurring since previous submission of the updated schedule.
- B. Indicate progress of each activity and show the actual completion dates for each activity.
- C. The Contractor shall provide a written narrative project report at each Project's Coordination Meeting. The report shall include the following:
 - 1. A description of the overall project status and comparison to the Overall Project Schedule.

2. Identify the activities which are behind schedule and describe corrective action to be taken.
3. Describe any changes or revisions to the Project and their effect on the Overall Project Schedule.
4. Describe all the Near Term Schedule activities that are to be completed during the next thirty (30) days. The report shall include a description of all activities requiring participation by the Contractor and Owner.

END OF SECTION

Part 1 General

1.01 Scope

- A. The Contractor shall furnish all equipment and labor materials required to provide the Owner with digital construction photographs of the Project. Photographs shall be provided on a compact disk.
- B. Photo and video files shall become the property of the Owner and none of the photographs herein shall be published without express permission of the Owner.

1.02 Pre and Post Construction Photographs

- A. Prior to the beginning of any work, the Contractor shall take project Videos, and photographs depicting all of the project area, existing conditions. The videos and photographs shall serve as the pre – construction documentation of the project's site or areas or the work areas recorded existing conditions.
- B. Following completion of the work, another project video recording and photos shall be made by the Contractor, showing the same areas, and features as in the pre - construction videos and photographs. The videos and photographs shall serve as the Post – construction documentation of the project's site or areas
- C. All conditions which might later be subject to disagreement shall be shown in sufficient detail to provide a basis for decisions.
- D. The pre - construction videos and photographs shall be submitted to the Construction Manager or Owner, within 25 calendar days after the Notice to Proceed, by the Contractor. Post – construction videos and photographs shall be provided, prior to the project's retainage payment approval.

1.03 Progress Photographs and Submittals

- A. Progress photograph files shall be provided, by the Contractor on compact discs, as well as hard copies.
- B. The file name of each photograph shall at a minimum contain the date the photograph was taken. All photographs shall be labeled to indicate date, time taken, and description of work shown.
- C. A minimum of 10 photographs depicting the installed work to date shall be submitted with each Request for Payment or Payment Request. The view selection shall be as agreed to with the Construction Manager. One copy of each photograph shall be submitted. Failure to include photographs can be cause for rejection of the Payment Request.
- D. Videos shall be submitted with a log of the items recorded, referenced to stations and property identification numbers.

END OF SECTION

Part 1 General**1.01 Scope**

- A. The work under this Section includes submittal to the Engineer of shop drawings, product data and samples required by the various sections of these Specifications.
- B. Submittal Contents: The submittal contents required are specified in each section.
- C. Definitions: Submittals are categorized as follows:
 - 1. Shop Drawings
 - a. Shop drawings shall include technical data, drawings, diagrams, procedure and methodology, performance curves, schedules, templates, patterns, test reports, calculations, instructions, measurements and similar information as applicable to the specific item for which the shop drawing is prepared.
 - b. Provide newly prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated) or appropriate number of prints hereof, with name or preparer (firm name) indicated. The Contract Drawings shall not be traced or reproduced by any method for use as or in lieu of detail shop drawings. Show dimensions and note dimensions that are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements. Do not allow shop drawings to be used in connection with the Work without appropriate final "Action" markings by the Engineer.
 - c. Drawings shall be presented in a clear and thorough manner. Details shall be identified by reference to sheet and detail, specification section, schedule or room numbers shown on the Contract Drawings.
 - d. Minimum assembly drawings sheet size shall be 24 x 36 inches.
 - e. Minimum detail sheet size shall be 8 1/2 x 11 inches.
 - f. Minimum Scale:
 - i. Assembly Drawings Sheet, Scale: 1 inch = 30 feet.
 - ii. Detail Sheet, Scale: 1/4 inch = 1 foot.
 - 2. Product Data
 - a. Product data includes standard printed information on materials, products and systems, not specially prepared for this Project, other than the designation of selections from among available choices printed therein.
 - b. Collect required data into one submittal for each unit of work or system, and mark each copy to show which choices and options

are applicable to the Project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked and special coordination requirements.

3. Samples
 - a. Samples include both fabricated and un fabricated physical examples of materials, products and units of work, both as complete units and as smaller portions of units of work, either for limited visual inspection or, where indicated, for more detailed testing and analysis.
 - b. Provide units identical with final condition of proposed materials or products for the work. Include "range" samples, not less than three units, where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples where the Engineer's selection is required. Prepare samples to match the Engineer's sample where indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture and "kind" by the Engineer. Engineer will note "test" samples, except as otherwise indicated, for other requirements, which are the exclusive responsibility of the Contractor.
4. Miscellaneous submittals related directly to the Work (non administrative) warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, statements of applicability, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, security/protection/safety keys and similar information, devices and materials applicable to the Work but not processed as shop drawings, product data or samples.

1.02 Specific Category Requirements

- A. General: Except as otherwise indicated in the individual work sections, comply with general requirements specified herein for each indicated category of submittal. Submittals shall contain:
 1. The date of submittal and the dates of any previous submittals.
 2. The Project title.
 3. Numerical submittal numbers, starting with 1.0, 2.0, etc. Revisions to be numbered 1.1, 1.2, etc.
 4. The Names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer

5. Identification of the product, with the Specification section number, permanent equipment tag numbers and applicable Drawing No.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the Work or materials.
8. Applicable standards, such as ASTM or Federal Specification numbers.
9. Notification to the Engineer in writing, at time of submissions, of any deviations on the submittals from requirements of the Contract Documents.
10. Identification of revisions on resubmittals.
11. An 8 x 3 inch blank space for Contractor and Engineer stamps.
12. Contractor's stamp, initialed or signed, certifying to review of submittal, verification of products, field measurements and field construction criteria and coordination of the information within the submittal with requirements of the Work and of Contract Documents.
13. Submittal sheets or drawings showing more than the particular item under consideration shall have all but the pertinent description of the item for which review is requested crossed out.

1.03 Routing of Submittals

- A. Submittals and routine correspondence shall be routed as follows:
 1. Supplier to Contractor (through representative if applicable)
 2. Contractor to Engineer
 3. Engineer to Contractor and Owner
 4. Contractor to Supplier

Part 2 Products

2.01 Shop Drawings

- A. Unless otherwise specifically directed by the Engineer, make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the Work.
- B. Submit all shop drawings in the form of six hard copies and one pdf file.
- C. One reproducible for all submittals larger than 11 x 17 inches and no more than three prints of other submittals will be returned to the Contractor.

2.02 Manufacturer's Literature

- A. Where content of submitted literature from manufacturers includes data not pertinent to this submittal, clearly indicate which portion of the contents is being submitted for the Engineer's review.

- B. Submit the number of copies which are required to be returned (not to exceed three) plus three copies which will be retained by the Engineer.

2.03 Samples

- A. Samples shall illustrate materials, equipment or workmanship and established standards by which completed work is judged.
- B. Unless otherwise specifically directed by the Engineer, all samples shall be of the precise article proposed to be furnished.
- C. Submit all samples in the quantity which is required to be returned plus one sample which will be retained by the Engineer.

2.04 Colors

- A. Unless the precise color and pattern is specifically described in the Contract Documents, wherever a choice of color or pattern is available in a specified product, submit accurate color charts and pattern charts to the Engineer for review and selection.
- B. Unless all available colors and patterns have identical costs and identical wearing capabilities, and are identically suited to the installation, completely describe the relative costs and capabilities of each.

Part 3 Execution

3.01 Contractor's Coordination of Submittals

- A. Prior to submittal for the Engineer's review, the Contractor shall use all means necessary to fully coordinate all material, including the following procedures:
 - 1. Determine and verify all field dimensions and conditions, catalog numbers and similar data.
 - 2. Coordinate as required with all trades and all public agencies involved.
 - 3. Submit a written statement of review and compliance with the requirements of all applicable technical Specifications as well as the requirements of this Section.
 - 4. Clearly indicate in a letter or memorandum on the manufacturer's or fabricator's letterhead, all deviations from the Contract Documents.
- B. Each and every copy of the shop drawings and data shall bear the Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement.
- C. The Owner may back charge the Contractor for costs associated with having to review a particular shop drawing, product data or sample more than two times to receive a "No Exceptions Taken" mark.
- D. Grouping of Submittals

1. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items.
2. No review will be given to partial submittals of shop drawings for items which interconnect and/or are interdependent. It is the Contractor's responsibility to assemble the shop drawings for all such interconnecting and/or interdependent items, check them and then make one submittal to the Engineer along with Contractor's comments as to compliance, non compliance or features requiring special attention.

E. Schedule of Submittals

1. Within 30 days of Contract award and prior to any shop drawing submittal, the Contractor shall submit a schedule showing the estimated date of submittal and the desired approval date for each shop drawing anticipated. A reasonable period shall be scheduled for review and comments. Time lost due to unacceptable submittals shall be the Contractor's responsibility and some time allowance for resubmittal shall be provided. The schedule shall provide for submittal of items which relate to one another to be submitted concurrently.

3.02 Timing of Submittals

- A. Make all submittals far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.
- B. In scheduling, allow sufficient time for the Engineer's review following the receipt of the submittal.

3.03 Reviewed Shop Drawings

A. Engineer Review

1. Allow a minimum of 30 days for the Engineer's initial processing of each submittal requiring review and response, except allow longer periods where processing must be delayed for coordination with subsequent submittals. The Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination. Allow a minimum of two weeks for reprocessing each submittal. Advise the Engineer on each submittal as to whether processing time is critical to progress of the Work, and therefore the Work would be expedited if processing time could be foreshortened.
2. Acceptable submittals will be marked "No Exceptions Taken". A minimum of three copies will be retained by the Engineer for Engineer's and the Owner's use and the remaining copies will be returned to the Contractor.
3. Submittals requiring minor corrections before the product is acceptable will be marked "Make Corrections Noted". The Contractor may order, fabricate and ship the items included in the submittals, provided the indicated corrections are made. Drawings must be resubmitted for review and marked "No Exceptions Taken" prior to installation or use of products.

4. Submittals marked "Amend and Resubmit" must be revised to reflect required changes and the initial review procedure repeated.
 5. The "Rejected See Remarks" notation is used to indicate products which are not acceptable. Upon return of a submittal so marked, the Contractor shall repeat the initial review procedure utilizing acceptable products.
 6. Only two copies of items marked "Amend and Resubmit" and "Rejected See Remarks" will be reviewed and marked. One copy will be retained by the Engineer and the other copy with all remaining unmarked copies will be returned to the Contractor for resubmittal.
- B. No work or products shall be installed without a drawing or submittal bearing the "No Exceptions Taken" notation. The Contractor shall maintain at the job site a complete set of shop drawings bearing the Engineer's stamp.
- C. Substitutions: In the event the Contractor obtains the Engineer's approval for the use of products other than those which are listed first in the Contract Documents, the Contractor shall, at the Contractor's own expense and using methods approved by the Engineer, make any changes to structures, piping and electrical work that may be necessary to accommodate these products.
- D. Use of the "No Exceptions Taken" notation on shop drawings or other submittals is general and shall not relieve the Contractor of the responsibility of furnishing products of the proper dimension, size, quality, quantity, materials and all performance characteristics, to efficiently perform the requirements and intent of the Contract Documents. The Engineer's review shall not relieve the Contractor of responsibility for errors of any kind on the shop drawings. Review is intended only to assure conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site. The Contractor is also responsible for information that pertains solely to the fabrication processes or to the technique of construction and for the coordination of the work of all trades.

3.04 Resubmission Requirements

- A. Shop Drawings
1. Revise initial drawings as required and resubmit as specified for initial submittal, with the resubmittal number shown.
 2. Indicate on drawings all changes which have been made other than those requested by the Engineer.
- B. Project Data and Samples: Resubmit new data and samples as specified for initial submittal, with the resubmittal number shown.

END OF SECTION

Part 1 General**1.01 Scope**

- A. This Section includes testing which the Owner may require, beyond that testing required of the manufacturer, to determine if materials provided for the Project meet the requirements of these Specifications.
- B. This work also includes all testing required by the Owner to verify work performed by the Contractor is in accordance with the requirements of these Specifications, i.e., concrete strength and slump testing, soil compaction, etc.
- C. This work does not include materials testing required in various sections of these Specifications to be performed by the manufacturer, e.g., testing of pipe.
- D. The testing laboratory or laboratories will be selected by the Owner. The testing laboratory or laboratories will work for the Owner.

1.02 Payment for Testing Services

- A. The cost of testing services required by the Contract to be provided by the Contractor shall be paid for by the Owner through the CASH ALLOWANCE, i.e., concrete testing, soil compaction, and asphalt testing.
- B. The cost of additional testing services not specifically required in the Specifications, but requested by the Owner or Engineer, shall be paid for by the Owner through the CASH ALLOWANCE.
- C. The cost of material testing described in various sections of these Specifications or as required in referenced standards to be provided by a material manufacturer, shall be included in the price bid for that item and shall not be paid for by the Owner.
- D. The cost of retesting any item that fails to meet the requirements of these Specifications shall be paid for by the Contractor. Retesting shall be performed by the testing laboratory working for the Owner.

1.03 Laboratory Duties

- A. Cooperate with the Owner, Engineer and Contractor.
- B. Provide qualified personnel promptly on notice.
- C. Perform specified inspections, sampling and testing of materials.
 - 1. Comply with specified standards, ASTM, other recognized authorities, and as specified.
 - 2. Ascertain compliance with requirements of the Contract Documents.
- D. Promptly notify the Engineer and Contractor of irregularity or deficiency of work which are observed during performance of services.

- E. Promptly submit three copies (two copies to the Engineer and one copy to the Contractor) of report of inspections and tests in addition to those additional copies required by the Contractor with the following information included:
1. Date issued
 2. Project title and number
 3. Testing laboratory name and address
 4. Name and signature of inspector
 5. Date of inspection or sampling
 6. Record of temperature and weather
 7. Date of test
 8. Identification of product and Specification section
 9. Location of Project
 10. Type of inspection or test
 11. Results of test
 12. Observations regarding compliance with the Contract Documents
- F. Perform additional services as required.
- G. The laboratory is not authorized to release, revoke, alter or enlarge on requirements of the Contract Documents, or approve or accept any portion of the Work.

1.04 Contractor Responsibilities

- A. Cooperate with laboratory personnel, provide access to Work and/or manufacturer's requirements.
- B. Provide to the laboratory, representative samples, in required quantities, of materials to be tested.
- C. Furnish copies of mill test reports.
- D. Furnish required labor and facilities to:
1. Provide access to Work to be tested;
 2. Obtain and handle samples at the site;
 3. Facilitate inspections and tests;
 4. Build or furnish a holding box for concrete cylinders or other samples as required by the laboratory.

- E. Notify the laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.
- F. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample(s) shall be selected by such laboratory or agency, or the Engineer, and shipped to the laboratory by the Contractor at Contractor's expense.
- G. Copies of all correspondence between the Contractor and testing agencies shall be provided to the Engineer.

1.05 Quality Assurance

Testing shall be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).

1.06 Product Handling

Promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in the progress of the Work.

1.07 Furnishing Materials

The Contractor shall be responsible for furnishing all materials necessary for testing.

1.08 Code Compliance Testing

Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of, and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents.

1.09 Contractor's Convenience Testing

Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor.

1.10 Schedules for Testing

- A. Establishing Schedule
 - 1. The Contractor shall, by advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be on site to provide the required testing.
 - 2. Provide all required time within the construction schedule.
- B. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory as required.

- C. When the testing laboratory is ready to test according to the determined schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributable to the delay will be back charged to the Contractor and shall not be borne by the Owner.

1.11 Taking Specimens

Unless otherwise provided in the Contract Documents, all specimens and samples for tests will be taken by the testing laboratory or the Engineer.

1.12 Transporting Samples

The Contractor shall be responsible for transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.

END OF SECTION

Part 1 General**1.01 Scope**

- A. Temporary facilities required for this work include, but are not necessarily limited to:
 - 1. Temporary utilities such as water and electricity.
 - 2. First aid facilities.
 - 3. Sanitary facilities.
 - 4. Potable water.
 - 5. Temporary enclosures and construction facilities.

1.02 General

- A. First aid facilities, sanitary facilities and potable water shall be available on the Project site on the first day that any activities are conducted on site. The other facilities shall be provided as the schedule of the Project warrants.
- B. Maintenance: Use all means necessary to maintain temporary facilities in proper and safe condition throughout progress of the Work. In the event of loss or damage, immediately make all repairs and replacements necessary, at no additional cost to the Owner.
- C. Removal: Remove all such temporary facilities and controls as rapidly as progress of the Work will permit.

1.03 Temporary Utilities

- A. General
 - 1. Provide and pay all costs for all water, electricity and other utilities required for the performance of the Work.
 - 2. Pay all costs for temporary utilities until Project completion.
 - 3. Costs for temporary utilities shall include all power, water and the like necessary for testing equipment as required by the Contract Documents.
- B. Temporary Water: Provide all necessary temporary piping, and upon completion of the Work, remove all such temporary piping. Provide and remove water meters.
- C. Temporary Electricity
 - 1. Provide all necessary wiring for the Contractor's use.
 - 2. Furnish, locate and install area distribution boxes such that the individual trades may use, their own construction type extension cords to obtain adequate power, and artificial lighting at all points where required by inspectors and for safety.

1.04 First Aid Facilities

The Contractor shall provide a suitable first aid station, equipped with all facilities and medical supplies necessary to administer emergency first aid treatment. The Contractor shall have standing arrangements for the removal and hospital treatment of any injured person. All first aid facilities and emergency ambulance service shall be made available by the Contractor to the Owner and the Engineer's personnel.

1.05 Sanitary Facilities

Prior to starting the Work, the Contractor shall furnish, for use of Contractor's personnel on the job, all necessary toilet facilities which shall be secluded from public observation. These facilities shall be either chemical toilets or shall be connected to the Owner's sanitary sewer system. All facilities, regardless of type, shall be kept in a clean and sanitary condition and shall comply with the requirements and regulations of the area in which the Work is performed. Adequacy of these facilities will be subject to the Engineer's review and maintenance of same must be satisfactory to the Engineer at all times.

1.06 Potable Water

The Contractor shall be responsible for furnishing a supply of potable drinking water for employees, subcontractors, inspectors, engineers and the Owner who are associated with the Work.

1.07 Enclosures and Construction Facilities

Furnish, install and maintain for the duration of construction, all required storage, scaffolds, tarpaulins, canopies, steps, bridges, platforms and other temporary construction necessary for proper completion of the Work in compliance with all pertinent safety and other regulations.

1.08 Parking Facilities

Parking facilities for the Contractor's and Contractor's subcontractors' personnel shall be the Contractor's responsibility. The storage and work facilities provided by the Owner will not be used for parking by the Contractor's or subcontractor's personnel.

END OF SECTION

Part 1 General

1.01 Barricades, Lights and Signals

- A. The Contractor shall furnish and erect such barricades, fences, lights and danger signals and shall provide such other precautionary measures for the protection of persons or property and of the Work as necessary. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise, the Contractor shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any Work under construction.

- B. The Contractor will be held responsible for all damage to the Work due to failure of barricades, signs and lights and whenever evidence is found of such damage, the Contractor shall immediately remove the damaged portion and replace it at Contractor's cost and expense. The Contractor's responsibility for the maintenance of barricades, signs and lights shall not cease until the Project has been accepted by the Owner.

END OF SECTION

Part 1 General

1.01 Scope

Limit blowing dust caused by construction operations by applying water or employing other appropriate means or methods to maintain dust control, subject to the approval of the Owner. As a minimum, this may require the use of a water wagon twice a day to suppress dusty conditions.

1.02 Protection of Adjacent Property

- A. The Contractor shall visit the site and note the buildings, landscaping, roads, parking areas and other facilities near the Work site that may be damaged by their operations. The Contractor shall make adequate provision to fully protect the surrounding area and will be held fully responsible for all damages resulting from Contractor's operations.
- B. Protect all existing facilities (indoors or out) from damage by dust, fumes, spray or spills (indoors or out). Protect motors, bearings, electrical gear, instrumentation and building or other surfaces from dirt, dust, welding fumes, paint spray, spills or droppings causing wear, corrosion, malfunction, failure or defacement by enclosure, sprinkling or other dust palliatives, masking and covering, exhausting or containment.

END OF SECTION

Part 1 General

1.01 Scope

- A. The work under this Section shall include maintaining all Project signs for the duration of the project or as approved by the Construction Manager. Maintenance of the signs shall include:
 - 1. Setting up the signs in the Project's current work area.
 - 2. Moving all signs, as the work area shifts, or directed by the Construction Manager.
- B. The Project signs will be approximately 36 – inches by 48 – inches, metal, GDOT type or as required by the relevant Municipality specification.
- C. The Contractor shall provide steel mounting posts and bolts appropriate for supporting the project signs or as required by the applicable Municipality specification, for the duration of the project.

END OF SECTION

Part 1 General

1.01 Scope

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END OF SECTION

Part 1 General

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- B. The Contractor will be held responsible for all damage to the Work due to failure of barricades, signs and lights and whenever evidence is found of such damage, the Contractor shall immediately remove the damaged portion and replace it at Contractor's cost and expense. The Contractor's responsibility for the maintenance of barricades, signs and lights shall not cease until the Project has been accepted by the Owner.

END OF SECTION

Part 1 General

1.01 Scope

This Section outlines the restrictions and requirements for substitutions, product and manufacturer options, and construction method options.

1.02 Definitions

- A. For the purposes of these Contract Documents, a "substitute item" shall be defined as one of the following:
 - 1. A product or manufacturer offered as a replacement to a specified product or manufacturer.
 - 2. A product or manufacturer offered in addition to a specified product or manufacturer.
- B. For the purposes of these Contract Documents, a "substitute construction method" shall be defined as one of the following:
 - 1. A mean, method, technique, sequence or procedure of construction offered as a replacement for a specified mean, method, technique, sequence or procedure of construction.
 - 2. A mean, method, technique, sequence or procedure of construction offered in addition to a specified mean, method, technique, sequence or procedure of construction.

1.03 General

- A. An item or construction method, which is offered where no specific product, manufacturer, mean, method, technique, sequence or procedure of construction is specified or shown on the Drawings, shall not be considered a substitute and shall be at the option of the Contractor, subject to the provisions in the Contract Documents for that item or construction method.
- B. For products specified only by a referenced standard, the Contractor may select any product by any manufacturer, which meets the requirements of the Specifications, unless indicated otherwise in the Contract Documents.
- C. If the manufacturer is named on the Drawings or in the Specifications as an acceptable manufacturer, products of that manufacturer meeting all requirements of the Specifications and Drawings are acceptable.
- D. Whenever the Engineer's design is based on a specific product of a particular manufacturer, that manufacturer will be shown on the Drawings and/or listed first in the list of approved manufacturers in the Specifications. Any Bidder intending to furnish products of other than the first listed manufacturer, or furnish substitute items, shall
 - 1. Verify that the item being furnished will fit in the space allowed, perform the same functions and have the same capabilities as the item specified.

2. Include in its Bid the cost of all accessory items which may be required by the other listed substitute product,
 3. Include the cost of any architectural, structural, mechanical, piping, electrical or other modifications required, and
 4. Include the cost of required additional work by the Engineer, if any, to accommodate the item.
- E. Whenever a product is identified on the Drawings or in the Specifications by reference to manufacturers or vendors names, trade names, catalog numbers, etc., it is intended only to denote the quality standard of product desired and that they do not restrict Bidders to a specific brand, make, manufacturer or specific name. These listings and citations are used only to set forth and convey to Bidders the general style, type, character and quality of product desired. Equivalent products will be acceptable, subject to the substitution provisions of this Section.

1.04 Approvals

Approval, of a substitution as an acceptable manufacturer, of the Engineer is dependent on determination that the product offered is essentially equal in function, performance, quality of manufacture, ease of maintenance, reliability, service life and other criteria to that on which the design is based; and will require no major modifications to structures, electrical systems, control systems or piping systems.

1.05 Substitutions and Options

- A. No substitutions will be considered for the manufacturers listed in the Bid Form.
- B. After Notice to Proceed
1. Substitute items will be considered only if the term "equal to" precedes the names of acceptable manufacturers in the Specification.
 2. Where items are specified by referenced standard or specified as indicated in Article 1.03, Paragraph A. above, such items shall be submitted to the Engineer for review.
 3. The Contractor shall submit shop drawings on the substitute item for the Engineer's review in accordance with the Section 01340.
- C. Prior to Opening of Bids
1. No consideration or approvals will be made for products specified by a referenced standard, or specified as indicated in Article 1.02, Paragraph A. above. Such consideration may occur only after the Notice to Proceed.
 2. No consideration or approvals will be made for products being offered where the term "equal to" precedes the name of an approved product. Such substitution consideration may occur only after the Notice to Proceed.

3. If the term "or equal" follows the names of acceptable manufacturers, then other manufacturers desiring approval as an acceptable manufacturer may submit the product information to the Engineer for approval during the bidding phase, as indicated below. With the exception of where the phrase "no substitutions" is associated with a list of manufacturers, where a list of acceptable manufacturers is not preceded by the phrase "equal to", the list of acceptable manufacturers shall be considered as having the phrase "or equal" following the list, and the list being subject to the "or equal" provisions of this section.

4. The manufacturer shall include the following items in its "or equal" submittal:
 - a. Descriptive literature including information on materials used, minimum design standards, standard design features, manufacturing processes and facilities, and similar information which will indicate experience and expertise in the manufacture of the product being evaluated.
 - b. Performance specifications applicable to the manufacturer's standard design which indicates the level of performance to be expected from the product.
 - c. A complete set of submittal drawings of similar products which have been completed and placed into operation.
 - d. A list of existing installations of products similar in type and size, information required to satisfy specified experience requirements, or a copy of the bond to be submitted in lieu of experience.
 - e. Evidence of technical ability of the manufacturer to design and manufacture products meeting Project requirements.
 - f. Evidence submitted shall include, as a minimum, descriptions of engineering and manufacturing staff capabilities.
 - g. A copy of the manufacturer's most recent annual business report. Include a statement comparing the present net worth of the manufacturer in comparison to the total value of all products proposed to be furnished. Net worth must exceed the total value of all products proposed.
 - h. A complete description of field service capabilities, including the location of field service facilities which would serve the proposed facility and the number and qualifications of personnel working from that location.
 - i. A complete list of all requirements of the Drawings and Specifications with which the manufacturer cannot conform, including reasons why alternate features are considered equivalent.
 - j. If descriptive literature or drawings illustrate standard products with design features or materials not in compliance with Project

requirements then these exceptions must be specifically listed. Failure to do so will indicate intent by the manufacturer to modify design features and alter materials to meet Project requirements.

- k. Where additional information is submitted to supplement the submittal, all changes to the list of exceptions shall be specifically noted.
 - l. All other information necessary to fully evaluate the product for consideration.
5. This "or equal" submittal shall reach the Engineer no later than 14 days prior to the Bid date. Submittals which do not include a complete list of exceptions to Project requirements, or the statement "No exceptions to the Specifications will be taken", will automatically be rejected by the Engineer. Manufacturers will be advised of approval or rejection in writing no later than 10 days prior to the Bid date. Rejected submittals may be supplemented with additional information and resubmitted no later than five days prior to the Bid date. Manufacturers making supplementary submittals will be advised of approval or rejection in writing no later than one day prior to the Bid date.
6. Bids based on products which have not received the approval of the Engineer may be determined non-responsive by the Owner and rejected.

END OF SECTION

Part 1 General

1.01 Scope

This Section covers the general cleaning which the Contractor shall be required to perform both during construction and before final acceptance of the Project unless otherwise shown on the Drawings or specified elsewhere in these Specifications.

1.02 Quality Assurance

- A. Daily, and more often if necessary, conduct inspections verifying that requirements of cleanliness are being met.
- B. In addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.

1.03 Hazardous Material and Waste

- A. The Contractor shall handle hazardous waste and materials in accordance with applicable local, state, and federal regulations. Waste shall also be disposed of in approved landfills as applicable.
- B. The Contractor shall prevent accumulation of wastes which create hazardous conditions.
- C. Burning or burying rubbish and waste materials on the site shall not be allowed.
- D. Disposal of hazardous wastes or materials into sanitary or storm sewers shall not be allowed.

1.04 Disposal of Surplus Materials

Unless otherwise shown on the Drawings, specified or directed, the Contractor shall legally dispose off the site all surplus materials and equipment from demolition and shall provide suitable off site disposal site, or utilize a site designated by the Owner.

Part 2 Products

2.01 Cleaning Materials and Equipment

Provide all required personnel, equipment and materials needed to maintain the specified standard of cleanliness.

2.02 Compatibility

Use only the cleaning materials, methods and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Engineer.

Part 3 Execution

3.01 Progress Cleaning

A. General

1. Do not allow the accumulation of scrap, debris, waste material and other items not required for construction of this Work.
2. At least each week, and more often if necessary, completely remove all scrap, debris and waste material from the job site.
3. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the environment.

B. Site

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.
2. Restack materials stored on site weekly.
3. At all times maintain the site in a neat and orderly condition which meets the approval of the Engineer.

3.02 Final Cleaning

- A. Definitions: Unless otherwise specifically specified, "clean" for the purpose of this Article shall be interpreted as the level of cleanliness generally provided by commercial building maintenance subcontractors using commercial quality building maintenance equipment and materials.
- B. General: Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste. Conduct final progress cleaning as described in 3.01 above.
- C. Site: Unless otherwise specifically directed by the Engineer, hose down all paved areas on the site and all public sidewalks directly adjacent to the site; rake clean other surfaces of the grounds. Completely remove all resultant debris.
- E. Post Construction Cleanup: All evidence of temporary construction facilities, haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other evidence of construction, as directed by the Engineer.
- F. Restoration of Landscape Damage: Any landscape feature damaged by the Contractor shall be restored as nearly as possible to its original condition at the Contractor's expense. The Engineer will decide what method of restoration shall be used.
- G. Timing: Schedule final cleaning as approved by the Engineer to enable the Owner to accept the Project.

3.03 Cleaning During Owner's Occupancy

Should the Owner occupy the Work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner, responsibilities for interim and final cleaning of the occupied spaces shall be as determined by the Engineer in accordance with the Supplementary Conditions of the Contract Documents.

END OF SECTION

Part 1 General

1.01 Scope

- A. The work under this Section includes, but is not necessarily limited to, the compiling, maintaining, recording and submitting of project record documents as herein specified.
- B. Record and/or As-Built documents include, but are not limited to:
 - 1. Drawings;
 - 2. Specifications;
 - 3. Change orders and other modifications to the Contract;
 - 4. Construction Manager or Owner field orders or written instructions, including Requests for Information (RFI) and Clarification Memorandums;
 - 5. Reviewed shop drawings, product data and samples;
 - 6. Test records.
- C. The Contractor shall maintain on the Project site throughout the Contract Time an up to date set of Record/As-Built Drawings.

1.02 Maintenance of Documents and Samples

- A. Storage
 - 1. Store documents and samples in the Contractor's field office, apart from documents used for construction.
 - 2. Provide files and racks for storage of documents.
 - 3. Provide locked cabinet or secure storage space for storage of samples.
- B. File documents and samples in accordance with format of these Specifications.
- C. Maintenance
 - 1. Maintain documents in a clean, dry, legible condition and in good order.
 - 2. Do not use record documents for construction purposes.
 - 3. Maintain at the site for the Owner one copy of all record documents.
- D. Make documents and samples available at all times for inspection by Owner or Construction Manager.
- E. Failure to maintain the Record and/or As-Built Documents in a satisfactory manner may be cause for withholding of a certificate for payment.

1.03 Quality Assurance

- A. Unless noted otherwise, Record and/or As-Built Drawings shall provide dimensions, distances and coordinates to the nearest 0.1 foot.
- B. Unless noted otherwise, Record and /or As-Built Drawings shall provide elevations to the nearest 0.01 foot for all pertinent items constructed by the Contractor.

1.04 Recording

- A. Label each document "Project Record and/or As-Built" in neat, large printed letters.
- B. Recording
 - 1. Record and /or As-Built information concurrently with construction progress.
 - 2. Do not conceal or backfill any work until required information is recorded.

1.05 Record Drawings

- A. The Contractor shall provide one set of the Contract Drawings, with all changes recorded in that one set.
- B. Legibly mark drawings to record actual construction, including:
 - 1. All Construction
 - a. Changes of dimension and detail.
 - b. Changes made by Requests for Information (RFI), field order, clarification memorandums or by change order.
 - c. Details not on original Drawings.
 - 2. Site Improvements, Including Underground Utilities
 - a. Horizontal and vertical locations of all exposed and underground utilities and appurtenances, both new facilities constructed and those utilities encountered, referenced to permanent surface improvements.
 - b. Location of and dimensions of roadways and parking areas, providing dimensions to back of curb when present.
 - c. The locations shall be referenced to at least two easily identifiable, permanent landmarks (e.g., power poles, valve markers, etc.) or benchmarks.
 - d. The Record Drawings shall include the horizontal angle and distance between manhole covers.
 - 3. Structures

- a. Depths of various elements of foundation in relation to finish first floor datum or top of wall.
- b. Location of internal and buried utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

1.06 Specifications

- A. Legibly mark each section to record:
 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 2. Changes made by Requests for Information (RFI), field order, clarification memorandums, or by change order.

1.07 Submittal

- A. At contract closeout, deliver Record Documents to the Engineer for the Owner.
- B. Accompany submittal with transmittal letter, in duplicate, containing:
 1. Date
 2. Project title and number
 3. Contractor's name and address
 4. Title and number of each record document
 5. Signature of Contractor or Contractor's authorized representative

END OF SECTION

Part 1 General

1.01 Project Maintenance and Warranty

- A. Maintain and keep in good repair the Work covered by these Drawings and Specifications until acceptance by the Owner.
- B. The Contractor shall warrant for a period of one year from the date of Owner's written acceptance of certain segments of the Work and/or Owner's written final acceptance of the Project, as defined in the Contract Documents, that the completed Work is free from all defects due to faulty products or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect throughout the warranty period.
- C. The Contractor shall not be obligated to make replacements which become necessary because of ordinary wear and tear, or as a result of improper operation or maintenance, or as a result of improper work or damage by another Contractor or the Owner, or to perform any work which is normally performed by a maintenance crew during operation.
- D. In the event of multiple failures of major consequences prior to the expiration of the one year warranty described above, the affected unit shall be disassembled, inspected and modified or replaced as necessary to prevent further occurrences. All related components which may have been damaged or rendered non serviceable as a consequence of the failure shall be replaced. A new 12 month warranty against defective or deficient design, workmanship, and materials shall commence on the day that the item is reassembled and placed back into operation. As used herein, multiple failure shall be interpreted to mean two or more successive failures of the same kind in the same item or failures of the same kind in two or more items. Major failures may include, but are not limited to, cracked or broken housings, piping, or vessels, excessive deflections, bent or broken shafts, broken or chipped gear teeth, premature bearing failure, excessive wear or excessive leakage around seals. Failures which are directly and clearly traceable to operator abuse, such as operations in conflict with published operating procedures or improper maintenance, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over or under lubrication and using maintenance procedures not conforming with published maintenance instructions, shall be exempted from the scope of the one year warranty. Should multiple failures occur in a given item, all products of the same size and type shall be disassembled, inspected, modified or replaced as necessary and rewarranted for one year.
- F. The Contractor shall, at Contractor's own expense, furnish all labor, materials, tools and equipment required and shall make such repairs and removals and shall perform such work or reconstruction as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship or faulty materials, in any part of the Work performed by the Contractor. Such repair shall also include refilling of trenches, excavations or embankments which show settlement or erosion after backfilling or placement.

- G. Except as noted on the Drawings or as specified, all structures such as embankments and fences shall be returned to their original condition prior to the completion of the Contract. Any and all damage to any facility not designated for removal, resulting from the Contractor's operations, shall be promptly repaired by the Contractor at no cost to the Owner.

- H. The Contractor shall be responsible for all road and entrance reconstruction and repairs and maintenance of same for a period of one year from the date of final acceptance. In the event the repairs and maintenance are not made immediately and it becomes necessary for the owner of the road to make such repairs, the Contractor shall reimburse the owner of the road for the cost of such repairs.

- I. In the event the Contractor fails to proceed to remedy the defects upon notification within 15 days of the date of such notice, the Owner reserves the right to cause the required materials to be procured and the work to be done, as described in the Drawings and Specifications, and to hold the Contractor and the sureties on Contractor's bond liable for the cost and expense thereof.

- J. Notice to Contractor for repairs and reconstruction will be made in the form of a registered letter addressed to the Contractor at Contractor's home office.

- K. Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the Contractor's liability within the law of the place of construction.

END OF SECTION

Part 1 General

1.01 Scope

- A. Clearing and grubbing includes, but is not limited to, removing from the Project site, trees, stumps, roots, brush, structures, abandoned utilities, trash, debris and all other materials found on or near the surface of the ground in the construction area and understood by generally accepted engineering practice not to be suitable for construction of the type contemplated. Precautionary measures that prevent damage to existing features including trees, to remain is part of the Work.
- B. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion and sedimentation control procedures.

1.02 Quality Assurance

- A. The Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction over the Project. All required permits of a temporary nature shall be obtained for construction operations by the Contractor.
- B. Open burning, if allowed, shall first be permitted by the local authority having jurisdiction. The Contractor shall notify the local fire department and abide by fire department restrictions.

1.03 Job Conditions

Location of the Work: The area to be cleared and grubbed is shown schematically on the Drawings or specified below. It includes all areas designated for construction, which is limited to no more than 6-foot width along the water main alignment.

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, trucks, loaders and root rakes.

Part 3 Execution

3.01 Scheduling of Clearing

- A. The Contractor shall clear at each construction site only that length of the right-of-way, permanent or construction easement which would be the equivalent of two week's pipe laying. This length shall be determined from the Contractor's Progress Schedule.
- B. The Engineer may permit clearing for additional lengths of the pipe line provided that temporary erosion and sedimentation controls are in place and a satisfactory stand of temporary grass is established. Should a satisfactory stand of grass not be possible, no additional clearing shall be permitted beyond that specified above.

- C. A satisfactory stand of grass shall have no bare spots larger than one square yard. Bare spots shall be scattered and the bare area shall not comprise more than one percent of any given area.

3.02 Clearing and Grubbing

- A. Clear and grub no more than 3 feet on each side of the pipeline before excavating. Remove all trees, growth, debris, stumps and other objectionable matter. Clear the construction easement or road right-of-way only if necessary.
- B. Materials to be cleared, grubbed and removed from the Project site include, but are not limited to, all trees, stumps, roots, brush, trash, organic matter, paving, 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 stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and roadways or two feet below finish grade, whichever is lower.
- E. Landscaping features shall include, but are not necessarily limited to, fences, cultivated trees, cultivated shrubbery, property corners, man-made improvements, subdivision and other signs within the right-of-way and easement. 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. 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.
- H. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.
- I. 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.
- J. 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.
- K. The Contractor shall be responsible for repairs and/or replacement of all damages to existing improvements resulting from Contractor's operations.

3.03 Disposal of Debris

- A. The debris resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the Contractor and shall be 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 except with written consent of the property owner. In no case shall any material or debris be left on the Project, shoved onto abutting private properties or buried on the Project.

END OF SECTION

Part 1 General**1.01 Scope**

- A. The Work specified in this Section consists of providing and maintaining temporary and permanent erosion and sedimentation controls as shown on the Drawings. This Section also specifies the subsequent removal of temporary erosion and sedimentation controls.
- B. Temporary and permanent erosion and sedimentation controls include grassing and mulching of disturbed areas and structural barriers at those locations which will ensure that erosion during construction will be maintained within acceptable limits. Acceptable limits are as established by the Georgia Erosion and Sedimentation Control Act of 1975, as amended, Section 402 of the Federal Clean Water Act, and applicable codes, ordinances, rules, regulations, and laws of local, state, and municipal authorities having jurisdiction.
- C. Land disturbance activity shall not commence until the Land Disturbance Permit has been issued.

1.02 Submittals

Submit product data in accordance with the requirements of Section 01340 of these Specifications.

1.03 Quality Assurance

- A. The temporary and permanent erosion and sedimentation control measures shown on the Drawings are minimum suggested 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 no additional cost to the Owner.
- B. Perform all Work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated in these Specifications. Where provisions of pertinent rules and regulations conflict with these Specifications the more stringent provisions shall govern.
- C. Provide all materials and promptly take all actions necessary to achieve effective erosion and sedimentation control in accordance with the Georgia Erosion and Sedimentation Control Act of 1975 as amended (OCGA §12-7-1, et. seq.), local ordinances, other permits, local enforcing agency guidelines, and these Specifications.
- D. 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.

E. 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 and designated wetland areas. The Contractor shall maintain an undisturbed vegetative buffer a minimum of 25 feet from the top of the bank.
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 final acceptance of the Project. Maintenance shall include mulching, re-seeding, 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 Owner and Engineer.
6. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor.

Part 2 Products

2.01 Sediment Barrier

- A. Silt Fence:
1. Type C Silt Fence is a combination of Type A silt Fence with woven wire reinforcement. Type C Silt Fence reinforcement shall meet the requirements of Section 171 of Georgia D.O.T. Specifications.
 2. Silt fence fabric shall be an approved product on the Georgia DOT Qualified Product List No. 36, latest edition.
- B. Hay Bales: Hay bales shall be clean, seed-free cereal hay, rectangular in shape, and contain five cubic feet or more of material.
- C. Concrete Blocks: Concrete blocks shall be hollow, non-load-bearing type.

2.02 Construction Exit Stone

Use sound, tough, durable stone resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Aggregate size shall be in accordance with the National Stone Association Size R-2 (1.5 to 3.5-inch stone) or Type 3 rip rap stone conforming to Section 805.01 of the Georgia Department of Transportation Standard Specifications.

2.04 Rip Rap

- A. Stone Rip Rap: Use sound, tough, durable stones resistant to the action of air and unless noted otherwise, stone rip rap shall be Type 1.
 - 1. Type 1 Rip Rap: Rip rap size and gradation shall conform to Section 805.01 of the Georgia Department of Transportation Standard Specification for Type 1 Stone Dumped Rip Rap.
 - 2. Type 3 Rip Rap: Rip rap size and gradation shall conform to Section 805.01 of the Georgia Department of Transportation Standard Specifications for Type 3 Stone Dumped Rip Rap.
- B. Sand Cement Bag Rip Rap: Sand cement bag rip rap shall conform to the Georgia Department of Transportation Standard Specifications, Section 603.

2.05 Plastic Filter Fabric

- A. Plastic filter fabric shall conform to the Georgia Department of Transportation Standard Specifications, Section 881, for filter fabrics.
- B. Plastic filter fabric shall be an approved product on the Georgia Department of Transportation Qualified Product List No. 28, latest edition.

2.06 Grassing

- A. Grassing materials shall meet the requirements of the Georgia Department of Transportation Standard Specifications, latest edition; as shown in the table:

Material	Section No.
Topsoil	893.01
Seed and Sod	890
Fertilizer	891.01
Agricultural Lime	882.02
Mulch	893.02
Inoculants	893.04

- B. Seed species shall be provided as shown on the Drawings.
- C. Mulch Binder: Mulch on slopes exceeding 3 (horizontal) to 1 (vertical) shall be held in place by the use of a mulch binder, as approved by the Engineer. The mulch binder shall be non-toxic to plant and animal life and shall be approved by the Engineer.
- D. Water: Water shall be free of excess and harmful chemicals, organisms, and substances which may be harmful to plant growth or obnoxious to traffic. Salt or brackish water shall not be used. Water shall be furnished by the Contractor.

Part 3 Execution**3.01 General**

- A. Temporary and permanent erosion and sedimentation control measures shall prevent erosion and prevent sediment from exiting the site. If, in the opinion of the Owner, Engineer, or state inspector, the Contractor's temporary erosion and sedimentation control measures are inadequate, the Contractor shall provide additional maintenance for existing measures or additional devices to control erosion and sedimentation on the site at no additional cost to the Owner.
- 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 shall 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 Sediment Control

- 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 public right-of-way, street, alley, 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 ground elevations. The stone shall be dropped from no more than a three feet height 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 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, and any device which prevents sediment from exiting the disturbed area.
 - 2. Silt fences and hay bales shall not be used in any flowing stream, creek, or river.

3. Sediment barriers shall be installed as shown on the Drawings and as directed by the Owner or Engineer.
 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 or as directed by the Engineer. Torn, damaged, destroyed, or washed-out barriers shall be repaired, reinforced, or replaced with new material and installed as shown on the Drawings and as directed by the Owner or Engineer.
 5. Accumulated sediment shall be removed from the barrier and replaced and stabilized on-site as directed by the Owner or Engineer.
 6. 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 as directed by the Engineer.
 7. All non-biodegradable parts of the barrier shall be disposed of properly.
 8. The disturbed area created by barrier removal shall be permanently stabilized.
- C. Sediment Boxes: All inlet grates shall be covered with sediment boxes during grading operations and shall remain so covered until all open areas are permanently stabilized against erosion.

3.03**Erosion Control**

- A. 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 active streams. Compact backfill and place rip rap to prevent subsequent settlement and erosion. This requirement applies equally to construction alongside a stream as well as crossing a stream or drainage ditch.
 2. When trenching across a stream or drainage ditch, place rip rap over the entire disturbed area upstream and downstream of the trench excavation. Place rip rap across creek bottom, across creek banks, and extend rip rap placement five feet beyond the top of each creek bank.
 3. Preparation of Foundations: The ground surface upon which the rip rap is to be placed shall be brought to the correct lines and grades before placement is commenced. Where filling 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 around the toe of the fill or the cut slope. The toe ditch shall be two feet deep 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 spread neatly on the site.
 4. Placement of Plastic Filter Fabric:
 - a. Plastic filter fabric shall be placed under all rip rap unless shown or specified otherwise.

- b. Filter fabric shall not be placed under rip rap on stream or drainage ditch crossings.
 - c. 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 placed so that the upstream strip overlaps the downstream strip. 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 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 of rip rap shall be removed and replaced with uncontaminated and undamaged fabric at no additional cost to the Owner.
5. Placement of Rip Rap: Rip rap shall be placed on a 6-inch layer of soil, crushed stone or sand overlaying the filter fabric. Rip rap shall be placed with its top elevation conforming with the finished grade or the natural existing slope of the stream bank and stream bottom. The stone shall be dropped from no more than a three foot height during construction. Stone rip rap shall be placed to provide a uniform surface to the thickness shown on the Drawings. The thickness tolerance for the course shall be -3 inches and +6 inches.
- B. Grassing:
1. Temporary Stabilization: Temporary stabilization shall be provided as shown on the Drawings and conforming to these Specifications to control erosion on the site. Temporary stabilization shall be provided to any area that 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.
 2. Permanent Stabilization:
 - a. Permanent stabilization shall be provided as shown on the Drawings and conforming to these Specifications 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 any area greater than 0.25 acre.
 - 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.
 3. Grassing shall meet the requirements of Section 700 of the Georgia Department of Transportation Standard Specifications, latest edition, unless specified otherwise.

4. Seed rate, fertilization and other requirements shall be provided as shown on the Drawings.

3.04

Clean-Up

- A. Dispose of all excess erosion and sedimentation control materials in a manner satisfactory to the Owner and Engineer.
- B. Final clean-up shall be performed in accordance with the requirements of these Specifications and to the satisfaction of the Owner and Engineer.

END OF SECTION

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 water lines as shown on the Drawings and as specified.
- B. Excavation shall include the removal of any trees, 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 pipeline and appurtenances in conformance with the lines and grades shown on the Drawings and as specified.
- C. Backfill shall include the refilling and compaction of the fill in 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 18 inches above the top of the barrel of the pipe.
 - 5. Final Backfill: The area above a plane 18-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 Quality Assurance

- A. Density: All references to "maximum dry density" shall mean the maximum dry density defined by the "Maximum Density-Optimum Moisture Test", ASTM D 698, except that for non-cohesive materials "maximum dry density" shall mean the maximum index density as determined by the "Maximum Index Density of Soils Using a Vibratory Table", ASTM D 4253. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet with the requirements of ASTM D 1556, "Density 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)".

- B. Sources and Evaluation Testing: Testing of materials to certify conformance with the Specifications shall be performed by an independent testing laboratory in accordance with Section 01410 of these Specifications. All imported fill materials shall meet the requirements of on-site fill materials.

1.03 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 Trench Foundation Materials

- A. Crushed stone shall be utilized for trench foundation (trench stabilization) and shall meet the requirements of the Georgia Department of Transportation Specification 800.2.01, Group I (limestone, marble or dolomite) or Group II (quartzite, granite or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.

2.02 Bedding and Haunching Materials

- A. Unless specified otherwise, bedding and haunching materials shall be crushed stone as specified below.
- B. 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.
- C. Earth materials utilized for bedding and haunching 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, earth bedding and haunching materials shall be moistened to facilitate compaction by tamping. If materials excavated from the trench are not suitable for use as bedding or haunching material, provide select material conforming to the requirements of this Section at no additional cost to the Owner.
- D. Filter Fabric Woven Type
 - 1. Filter fabric associated with bedding shall be a polypropylene woven fabric. The fabric shall be a high modulus type with good separation capabilities.

The fabric shall be inert to biological degradation and naturally occurring chemicals, alkalies and acids.

2. The fabric shall have an equivalent opening size EOS of 20 to 45. The fabric shall also conform to the minimum property values listed in the following table:

Fabric Property	Unit	Test Method	Minimum Value
Grab Tensile Strength	lbs.	ASTM D 4632	200
Grab Tensile Elongation	%	ASTM D 4632	30 (max.)
Mullen Burst Strength	psi	ASTM D 3786	400
Trapezoid Tear Strength	lbs.	ASTM D 4533	75
Puncture Strength	lbs.	ASTM D 3787	75

3. 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.
4. Filter fabric shall be Mirafi 500X, Amoco 2002 or Exxon GTF-200.

2.03 Initial Backfill

- A. Initial backfill material shall be crushed stone or earth materials as specified for bedding and haunching materials.
- B. 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 at no additional cost to the owner.

2.04 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.

2.05 Select Backfill

Select backfill shall be materials which meet the requirements as specified for bedding, haunching or initial backfill materials, including compaction requirements.

2.06 Concrete

- A. 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.

Part 3 Execution

3.01 Trench Excavation

- A. Topsoil and grass shall be stripped a minimum of 6-inches over the trench excavation site and stockpiled separately for replacement over the finished grading areas.
- B. Trenches shall be excavated to the lines and grades shown on the Drawings with the centerlines of the trenches on the centerlines of the pipes and to the dimensions which provide the proper support and protection of the pipe and other structures and accessories.
- C. Trench Width for Pipelines
1. The sides of all trenches shall be vertical to a minimum of one foot above the top of the pipe. Unless otherwise indicated on the Drawings, the maximum trench width shall be equal to the sum of the outside diameter of the pipe plus two feet. The minimum trench width shall be that which allows the proper consolidation of the haunching and initial backfill material.
 2. Excavate the top portion of the trench to any width within the construction easement or right-of-way which will not cause unnecessary damage to adjoining structures, roadways, pavement, utilities, trees or private property. Where necessary to accomplish this, provide sheeting and shoring.
 3. Where rock is encountered in trenches, excavate to remove boulders and stones to provide a minimum of 9-inches clearance between the rock and any part of the pipe barrel or manhole.
 4. Wherever the prescribed maximum trench width is exceeded, the Contractor shall use the next higher Class or Type of bedding and haunching as shown on the Drawings for the full trench width as actually cut. The excessive trench width may be due to unstable trench walls, inadequate or improperly placed bracing and sheeting which caused sloughing, accidental over-excavation, intentional over-excavation necessitated by the size of the Contractor's tamping and compaction equipment, intentional over-excavation due to the size of the Contractor's excavation equipment, or other reasons beyond the control of the Engineer or Owner.
- D. Depth
1. The trenches shall be excavated to the required depth or elevation which allow for the placement of the pipe and bedding to the dimensions shown on the Drawings.

2. Where rock is encountered in trenches for pipelines, excavate to the minimum depth which will provide clearance below the pipe barrel of 8-inches for pipe 21-inches in diameter and smaller and 12-inches for larger pipe, valves and manholes.
- E. Excavated Materials
1. Excavated materials shall be placed adjacent to the work to be used for backfilling as required. Top soil shall be carefully separated and lastly placed in its original location.
 2. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause any drainage problems. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements.

3.02 Sheeting, Bracing and Shoring

- A. Sheeting, bracing and shoring shall be installed in the following instances:
1. Where sloping of the trench walls does not adequately protect persons within the trench from slides or cave-ins.
 2. In caving ground.
 3. In wet, saturated, flowing or otherwise unstable materials.
 4. Where necessary to prevent damage to adjoining buildings, structures, roadways, pavement, utilities, trees or private properties which are required to remain.
 5. Where necessary to maintain the top of the trench within the available construction easement or right-of-way.
- B. In all cases, excavation protection shall strictly conform to the requirements of the Occupational Safety and Health Act of 1970, as amended.
- C. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good, serviceable condition. Size and spacing shall be in accordance with OSHA regulations.
- D. Steel Sheeting and 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 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.
- E. 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.

- F. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe 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.
- G. Sheet piling within three feet of an existing structure or pipeline shall remain in place, unless otherwise directed by the Engineer.

3.03 Rock Excavation

- A. Definition of Rock: Any material which cannot be excavated with conventional excavating equipment, and is removed by drilling and blasting, and occupies an original volume of at least one-half cubic yard.
- B. Blasting: Provide licensed, experienced workmen to perform blasting. Conduct blasting operations in accordance with all existing ordinances and regulations. Protect all buildings and structures from the effects of the blast. Repair any resulting damage. If the Contractor repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the Engineer may direct the Contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.
- C. Removal of Rock: Dispose of rock off site that is surplus or not suitable for use as rip rap or backfill.
- D. The Contractor shall notify the Engineer prior to any blasting. Additionally, the Contractor shall notify the Engineer and local fire department before any charge is set.
- E. Following review by the Engineer regarding the proximity of permanent buildings and structures to the blasting site, the Engineer may direct the Contractor to employ an independent, qualified specialty sub-contractor, approved by the Engineer, to monitor the blasting by use of seismograph, identify the areas where light charges must be used, conduct pre-blast and post-blast inspections of structures, including photographs or videos, and maintain a detailed written log.

3.04 Dewatering Excavations

- A. Dewater excavation continuously to maintain a water level two feet below the bottom of the trench.
- B. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water running into the excavation.

- C. There shall be sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavations. Where the utility crosses natural drainage channels, the work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the work will be prevented. Provision shall be made for the satisfactory disposal of surface water to prevent damage to public or private property.
- D. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete or backfilling.
- E. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least two feet below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump two feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operation.
- F. Dewater by use of a well point system when pumping from sumps does not lower the water level two feet below the trench bottom. Where soil conditions dictate, the Contractor shall construct well points cased in sand wicks. The casing, 6 to 10-inches in diameter, shall be jetted into the ground, followed by the installation of the well point, filling casing with sand and withdrawing the casing.

3.05 Trench Foundation and Stabilization

- A. The bottom of the trench shall provide a foundation to support the pipe and its specified bedding. The trench bottom shall be graded to support the pipe 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 pipe, the trench will be determined to be unsuitable and the Engineer shall then authorize payment for trench stabilization.
- C. Should the undisturbed material encountered at the trench bottom constitute, in the opinion of the Engineer, an unstable foundation for the pipe, the Contractor shall be required to remove such unstable material and fill the trench to the proper subgrade with crushed stone as directed by the Engineer.
- D. Where the replacement of unsuitable material with crushed stone does not provide an adequate trench foundation, the trench bottom shall be excavated to a depth of at least two feet below the specified trench bottom. Place filter fabric in the bottom of the trench and support the fabric along the trench walls until the trench stabilization, bedding, haunching and pipe have been placed at the proper grade. The ends of the filter fabric shall be overlapped by one foot above the pipe.
- E. Where trench stabilization is provided, the trench stabilization material shall be compacted to at least 90 percent of the maximum dry density, unless shown or specified otherwise.

3.06 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 place and 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 immediately at the joint.
- 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. Water Mains
 - 1. Ductile Iron Pipe
 - a. Unless otherwise shown on the Drawings or specified, utilize earth materials for bedding and haunching. Type 2, 3, 4 and 5 bedding shall be as detailed on the Drawings.
 - b. Unless specified or shown otherwise, bedding shall meet the requirements for Type 2 Pipe Bedding. Unless specified or shown otherwise for restrained joint pipe and fittings, bedding shall meet the requirements for Type 4 Pipe Bedding.
 - c. Where the depth of cover over the piping exceeds 9 feet, the pipe bedding shall meet the requirements of Type 4 Pipe Bedding. Where the depth of cover over the piping exceeds 14 feet, the pipe bedding shall meet the requirements of Type 5 Pipe Bedding.
 - d. Type 4 or Type 5 Pipe Bedding called for on the Drawings, specified or ordered by the Engineer, shall meet requirements for Type 4 or Type 5 Pipe Bedding, utilizing crushed stone bedding and haunching material.

- F. 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 installing the manhole.

- G. Excessive Width and Depth
 - 1. Water Mains: If the trench is excavated to excess width, provide the next higher type or class of pipe bedding, but a minimum of Type 4, as detailed on the Drawings.
 - 2. If the trench is excavated to excessive depth, provide crushed stone to place the bedding at the proper elevation or grade.

- H. Compaction: Bedding and haunching materials under pipe, manholes and accessories shall be compacted to a minimum of 90 percent of the maximum dry density, unless shown or specified otherwise.

3.07 Initial Backfill

- A. Initial backfill shall be placed to anchor the pipe, protect the pipe from damage by subsequent backfill and ensure the uniform distribution of the loads over the top of the pipe.

- B. Place initial backfill material carefully around the pipe in uniform layers to a depth of at least 18-inches above the pipe barrel or duct bank. Layer depths shall be a maximum of 6-inches for pipe 18-inches in diameter and smaller and a maximum of 12-inches for pipe larger than 18-inches in diameter.

- C. Backfill on both sides of the pipe simultaneously to prevent side pressures.

- D. Compact each layer thoroughly with suitable hand tools or tamping equipment.

- E. Initial backfill shall be compacted to a minimum 90 percent of the maximum dry density, unless shown or specified otherwise.

- F. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.

3.08 Concrete Encasement for Pipelines

Where concrete encasement is shown on the Drawings for pipelines, 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 12-inches above the pipe bell. Do not backfill the trench for a period of at least 24 hours after concrete is placed.

3.09 Final Backfill

- A. Backfill carefully to restore the ground surface to its original condition.
- B. The top 6-inches shall be topsoil obtained as specified in "Trench Excavation" of this Section.
- C. Excavated material which is unsuitable for backfilling, and excess material, shall be disposed of, at no additional cost to the Owner, in a manner approved by the Engineer. Surplus soil may be neatly distributed and spread over the site, if approved by the Engineer. If such spreading is allowed, the site shall be left in a clean and sightly condition and shall not affect pre-construction drainage patterns. Surplus rock from the trenching operations shall be removed from the site.
- D. If materials excavated from the trench are not suitable for use as backfill materials, provide select backfill material conforming to the requirements of this Section.
- E. After initial backfill material has been placed and compacted, backfill with final backfill material. Place backfill material in uniform layers, compacting each layer thoroughly as follows:
 - 1. In 6-inch layers, if using light power tamping equipment, such as a "jumping jack".
 - 2. In 12-inch layers, if using heavy tamping equipment, such as hammer with tamping feet.
 - 3. In 24-inch layers, if using a hydra-hammer.
- F. Settlement: If trench settles, re-fill and grade the surface to conform to the adjacent surfaces.
- G. Final backfill shall be compacted to a minimum 90 percent of the maximum dry density, unless specified otherwise.

3.10 Additional Material

Where final grades above the pre-construction grades are required to maintain minimum cover, additional fill material will be as shown on the Drawings. Utilize excess material excavated from the trench, if the material is suitable. If excess excavated materials are not suitable, or if the quantity available is not sufficient, provide additional suitable fill material at no cost to the owner.

3.11 Backfill Under Roads

Compact backfill underlying pavement and sidewalks, and backfill under dirt and gravel roads to a minimum 95 percent of the maximum dry density. The top 12-inches shall be compacted to a minimum of 98 percent of the maximum dry density.

3.12 Backfill Within Georgia DOT Right-of-Way

Backfill within the Georgia DOT right-of-way shall meet the requirements stipulated in the "Utility Accommodation Policy and Standards", published by the Georgia Department of Transportation.

3.13 Backfill Along Restrained Joint Pipe

Backfill along restrained joint pipe shall be compacted to a minimum 90 percent of the maximum dry density.

3.14 Testing and Inspection

- A. The soils testing laboratory is responsible for the following:
 - 1. Compaction tests in accordance with Article 1.02 of this Section.
 - 2. Field density tests for each two feet of lift, one test for each 1,000 feet of pipe installed or more frequently if ordered by the Engineer.
 - 3. Inspecting and testing stripped site, subgrades and proposed fill materials.
- B. The Contractor's duties relative to testing include:
 - 1. Notifying laboratory of conditions requiring testing.
 - 2. Coordinating with laboratory for field testing.
 - 3. Paying costs for additional testing performed beyond the scope of that required and for re-testing where initial tests reveal non-conformance with specified requirements.
 - 4. Providing excavation as necessary for laboratory personnel to conduct tests.
- C. Inspection
 - 1. Earthwork operations, acceptability of excavated materials for bedding or backfill, and placing and compaction of bedding and backfill is subject to inspection by the Engineer.
- D. Comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction.

END OF SECTION

Part 1 General

1.01 Scope

- A. The work covered by this Section consists of furnishing all labor, equipment and material required to place topsoil, seed, commercial fertilizer, agricultural limestone and mulch material, including seedbed preparation, harrowing, compacting and other placement operations on graded earthen areas as described herein and/or shown on the Drawings. In general, seeding operations shall be conducted on all newly graded earthen areas not covered by structures, pavement or sidewalks; all cleared or grubbed areas which are to remain as finish grade surfaces; and on all existing turf areas which are disturbed by construction operations and which are to remain as finish grade surfaces. Areas disturbed by borrow activities shall also be seeded according to these Specifications.
- B. The work shall include temporary seeding operations to stabilize earthen surfaces during construction or inclement weather and to minimize stream siltation and erosion. Temporary seeding shall be performed at the times and locations as directed by the Engineer.

1.02 Quality Assurance

- A. Prior to seeding operations, the Contractor shall furnish to the Engineer labels or certified laboratory reports from an accredited commercial seed laboratory or a state seed laboratory showing the analysis and germination of the seed to be furnished. Acceptance of the seed test reports shall not relieve the Contractor of any responsibility or liability for furnishing seed meeting the requirements of this Section.
- B. Prior to topsoil operations, the Contractor shall obtain representative samples and furnish soil test certificates including textural, pH, and organic analysis from the State University Agricultural Extension Services or other certified testing laboratory.

Part 2 Products

2.01 Acceptable Manufacturers

All materials shall conform to the requirements and standards of this Section.

Wood-cellulose fiber mulch shall be manufactured by Weyerhaeuser Company or Conway Corporation.

2.02 Topsoil

- A. Utilizing designated stockpiles or borrow areas on site, the Contractor shall place a minimum of 4-inches of topsoil over all graded earthen areas and over any other areas to be seeded. Sources of topsoil shall be approved by the Engineer prior to disturbance. Importing topsoil from offsite sources shall be at the discretion of the Engineer and shall be justification for additional compensation to the Contractor. A change order properly authorized by the Owner shall be agreed upon prior to importing offsite topsoil. No additional compensation will be allowed for spreading of topsoil.

- B. Topsoil shall be a friable loam containing a large amount of humus and shall be original surface soil of good, rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than 1/2-inch in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips or other undesirable material harmful or unnecessary to plant growth. Topsoil shall be reasonably free from perennial weeds and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements or vegetable debris undesirable or harmful to plant life.
- C. Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classifiable as loam, silt loam, clay loam, sandy loam or a combination thereof. The pH shall range from 5.5 to 7.0. Topsoil shall contain not less than five percent nor more than 20 percent, by weight, of organic matter as determined by loss on ignition of oven-dried samples to 65 degrees C.

2.03**Seed**

- A. Seed shall be delivered in new bags or bags that are sound and labeled in accordance with the U.S. Department of Agriculture Federal Seed Act.
- B. All seed shall be from the last crop available at time of purchase and shall not be moldy, wet or otherwise damaged in transit or storage.
- C. Seed shall bear the growers analysis testing to 98 percent for purity and 90 percent for germination. At the discretion of the Engineer, samples of seed may be taken for verification against the grower's analysis.
- D. Species, rate of seeding, fertilization and other requirements are shown on Table 1.

2.04**Fertilizer and Liming Materials**

- A. Fertilizer and liming materials shall comply with applicable state, local and federal laws concerned with their production and use.
- B. Commercial fertilizer shall be a ready mixed material equivalent to the grade or grades specified in Table 1. Container bags shall have the name and address of the manufacturer, the brand name, net weight and chemical composition.
- C. Agricultural limestone shall be a pulverized dolomitic limestone having a calcium carbonate content of not less than 85 percent by weight. Agricultural limestone shall be crushed so that at least 85 percent of the material will pass a No. 10 mesh screen and 50 percent will pass a No. 40 mesh screen.

2.05**Mulch Material**

- A. All mulch materials shall be air dried and reasonably free of noxious weeds and weed seeds or other materials detrimental to plant growth.
- B. Mulch shall be composed of wood cellulose fiber, straw or stalks, as specified herein. Mulch shall be suitable for spreading with standard mulch blowing equipment.

- C. Straw mulch shall be partially decomposed stalks of wheat, rye, oats or other approved grain crops.
- D. Stalks shall be the partially decomposed, shredded residue of corn, cane, sorghum or other approved standing field crops.

2.06 Mulch Binder

- A. Mulch on slopes exceeding 3 to 1 ratio shall be held in place by the use of an approved mulch binder. The mulch binder shall be non-toxic to plant life and shall be acceptable to the Engineer.
- B. Emulsified asphalt binder shall be Grade SS-1, ASTM D 977. Cutback asphalt binder shall be Grade RC 70 or RC 250.

2.07 Legumes

All leguminous seed shall be inoculated prior to seeding with a standard culture of nitrogen-fixing bacteria that is adapted to the particular seed involved.

2.08 Water

Water shall be clean, clear water free from any objectionable or harmful chemical qualities or organisms and shall be furnished by the Contractor.

Part 3 Execution

3.01 Securing and Placing Topsoil

- A. Topsoil shall be secured from areas from which topsoil has not been previously removed, either by erosion or mechanical methods. Topsoil shall not be removed to a depth in excess of the depth approved by the Engineer.
- B. The area or areas from which topsoil is secured shall possess such uniformity of soil depth, color, texture, drainage and other characteristics as to offer assurance that, when removed the product will be homogeneous in nature and will conform to the requirements of these Specifications.
- C. All areas from which topsoil is to be secured, shall be cleaned of all sticks, boards, stones, cement, ashes, cinders, slag, concrete, bitumen or its residue and any other refuse which will hinder or prevent growth.
- D. In securing topsoil from a designated pit, or elsewhere, should strata or seams of material occur which do not come under the requirements for topsoil, such material shall be removed from the topsoil or if required by the Engineer, the pit shall be abandoned.
- E. Before placing or depositing topsoil upon any areas, all improvement within the area shall be completed, unless otherwise approved by the Engineer.
- F. The areas in which topsoil is to be placed or incorporated shall be prepared before securing topsoil for use.

3.02 Seedbed Preparation

- A. Before fertilizing and seeding, the topsoil surfaces shall be trimmed and worked to true line from unsightly variation, bumps, ridges and depressions and all detrimental material, roots and stones larger than 3-inches in any dimension shall be removed from the soil.
- B. Not earlier than 24 hours before the seed is to be sown, the soil surface to be seeded shall be thoroughly cultivated to a depth of not less than 4-inches with a weighted disc, tiller, pulvimixer or other equipment, until the surface is smooth and in a condition acceptable to the Engineer.
- C. If the prepared surface becomes eroded as a result of rain or for any other reason, or becomes crusted before the seed is sown, the surface shall again be placed in a condition suitable for seeding.
- D. Ground preparation operations shall be performed only when the ground is in a tillable and workable condition, as determined by the Engineer.

3.03 Fertilization and Liming

- A. Following seedbed preparation, fertilizer shall be applied to all areas to be seeded so as to achieve the application rates shown on Table 1.
- B. Fertilizer shall be spread evenly over the seedbed and shall be lightly harrowed, raked, or otherwise incorporated into the soil for a depth of 1-inch.
- C. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment. The seed shall not remain in water containing fertilizer for more than 30 minutes when a hydraulic seeder is used.
- D. Agricultural limestone shall be thoroughly mixed into the soil according to the rates shown on Drawings. The specified rate of application of limestone may be reduced by the Engineer if pH tests indicate this to be desirable. It is the responsibility of the Contractor to obtain such tests and submit the results to the Engineer for adjustment in rates.
- E. It is the responsibility of the Contractor to make one application of a maintenance fertilizer according to the recommendations listed in Table 1.

3.04 Seeding

- A. Seed of the specified group shall be sown as soon as preparation of the seedbed has been completed. No seed shall be sown during high winds, nor until the surface is suitable for working and is in a proper condition. Seeding shall be performed during the dates shown in Table 1 unless otherwise approved by the Engineer. Seed mixtures may be sown together provided they are kept in a thoroughly mixed condition during the seeding operation.
- B. Seed shall be uniformly sown by any approved mechanical method suitable for the slope and size of the areas to be seeded, preferably with a broadcast type

seeder, windmill hand seeder or approved mechanical power drawn seed drills. Hydro-seeding and hydro-mulching may be used on steep embankments, provided full coverage is obtained. Care shall be taken to adjust the seeder for seedings at the proper rate before seeding operations are started and to maintain their adjustment during seeding. Seed in hoppers shall be agitated to prevent segregation of the various seeds in a seeding mixture.

- C. Immediately after sowing, the seeds shall be covered and compacted to a depth of 1/8 to 3/8-inch by a cultipacker or suitable roller.
- D. Leguminous seeds shall be inoculated prior to seeding with an approved and compatible nitrogen-fixing inoculant in accordance with the manufacturer's mixing instructions.

3.05

Mulching

- A. All seeded areas shall be uniformly mulched in a continuous blanket immediately after seeding. The mulch shall be applied evenly so as to permit sunlight to penetrate and the air to circulate and at the same time shade the ground, reduce erosion and conserve soil moisture. Approximately 45 percent of the ground shall be visible through the mulch blanket.
- B. One of the following mulches shall be spread evenly over the seeded areas at the following application rates:
 - 1. Wood Cellulose Fiber: 1,400 pounds/acre.
 - 2. Straw: 4,000 pounds/acre.
 - 3. Stalks: 4,000 pounds/acre.
 - 4. These rates may be adjusted at the discretion of the Engineer at no additional cost to the Owner, depending on the texture and condition of the mulch material and the characteristics of the seeded area.
- C. Mulch on slopes greater than 3 to 1 ratio shall be held in place by the use of an approved mulch binder. Binder shall be thoroughly mixed and applied with the mulch. Emulsified asphalt or cutback asphalt shall be applied at the approximate rate of five gallons per 1,000 square feet as required to hold the mulch in place.
- D. The Contractor shall cover structures, poles, fences and appurtenances if the mulch binder is applied in such a way that it would come in contact with or discolor the structures.
- E. Mulch and binder shall be applied by suitable blowing equipment at closely controlled application rates in a manner acceptable to the Engineer.

3.06

Watering

- A. The Contractor shall be responsible for maintaining the proper moisture content of the soil to insure adequate plant growth until a satisfactory stand is obtained. If necessary, watering shall be performed to maintain an adequate water content in the soil.

- B. Watering shall be accomplished by hoses, tank truck or sprinklers in such a way to prevent erosion, excessive runoff and over-watered spots.

3.07 Maintenance

- A. Upon completion of seeding operations, the Contractor shall clear the area of all equipment, debris and excess material and the premises shall be left in a neat and orderly condition.
- B. The Contractor shall 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 Contractor's own expense. Seeding work shall be repeated on defective areas until a satisfactory uniform stand is accomplished. Damage resulting from erosion, gulleys, washouts or other causes shall be repaired by filling with topsoil, compacting and repeating the seeding work at Contractor's expense.

TABLE 1

SEEDING REQUIREMENTS

Sowing Season	Species	Rates per 1,000 Square Feet		
		Seed	Fertilizer	Lime
3/15 - 8/14	Common Bermuda (hulled) (Giant Bermuda Seed, including NK-37 is not acceptable)	2lbs.	35 lbs. 6-12-12	25 lbs.
	Annual Ryegrass	2 lbs.		
	Total	4 lbs.		
8/15 - 3/14	Common Bermuda (unhulled)	2lbs.	45 lbs. 6-12-12	25 lbs.
	Annual Ryegrass	2 lbs.		
	Total	4 lbs.		

END OF SECTION

Part 1 General**1.01 Scope**

- A. The extent of grassing consists of those areas which are disturbed by operations of the Contractor and are not covered over by improvements, except where specifically noted otherwise, together with any additional areas shown on the Drawings or authorized by the Construction Manager or Owner.
- B. Types of work required include following:
 - 1. Fine grading and preparing of lawn areas.
 - 2. Furnishing and applying new topsoil.
 - 3. Furnishing and applying soil amendments.
 - 4. Furnishing and applying fertilizers.
 - 5. Seeding lawn areas.
 - 6. Sodding lawn areas.
 - 7. Planting lawn areas with plugs.
 - 8. Reconditioning existing lawn areas.
 - 9. Replanting unsatisfactory or damaged lawns.
- C. Use stripped and saved top soil where available. For additional quantity required, furnish topsoil as specified in 2.01.

1.03 Submittals

- A. General: Submit the following in accordance with applicable Municipality specifications.
- B. Certification of Grass Seed: Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination rate (%), and weed seed for each grass seed species.
- C. Sod Analysis: Notify Construction Manager or Owner of sod source, including name and telephone number of supplier, and seed mix of sod.

1.04 Job Conditions

Planting Time: Sow lawn seed only during normal planting seasons for each type of lawn work required. Correlate planting with specified maintenance periods to provide required maintenance from date of substantial completion.

Specified work is minimum required, and any and all necessary materials and operations including reworking, must be performed to obtain specified results.

1.05 Warranty

Warrant grassing through specified maintenance period and until final acceptance.

Part 2 Products**2.01 New Topsoil**

- A. Provide topsoil that is fertile, friable, naturally loamy, surface soil; reasonably free of subsoil, clay lumps, brush, weeds, and other litter; and free of roots, stumps, stones larger than 1/2 inch in any dimension, and other extraneous or toxic matter harmful to plant growth.
- B. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at site of work. Obtain topsoil from naturally well-drained sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

2.02 Soil Amendments

- A. Lime: Natural limestone containing at least 85 percent of total carbonates, ground to such fineness that at least 90 percent passes a 10-mesh sieve and at least 50 percent passes a 100-mesh sieve.

Provide lime in form of dolomitic limestone.

- B. Fertilizer: Standard commercial grade fertilizer conforming to the standards of the Association of Official Agricultural Chemists. Provide either grade 4-12-12, 6-12-12 or 5-10-15 at Contractor's option.
- C. Nitrogen: Standard commercial grade nitrogen conforming to state fertilizer laws. Provide in either granular or liquid form at Contractor's option.
- D. Peat Humus: Finely divided or granular texture and with pH of 6.0 to 7.5 composed of moss peat (other than sphagnum), or peat humus, or reed-sedge peat.
- E. Sawdust or Ground Bark: Provide type that is nontoxic to plants, of uniform texture, and subject to slow decomposition when mixed with soil. Provide nitrogen-treated sawdust or ground bark, or provide untreated and mix at site with at least 0.15 lbs. of ammonium nitrate or 0.25 lbs. of ammonium sulfate per cu. ft. of loose sawdust or ground bark.

2.03 Grass Materials

- A. Seed, Sod, and Plugs will be the same species as the grass removed or damaged at any given location.
- B. Grass Seed: Provide fresh, clean, new-crop seed complying with the tolerance for purity and germination established by the Official Seed Analysts of North America. Provide seed of the grass species, proportions and minimum

percentages of purity, germination rate (%), and maximum percentage of weed seed, as detailed on the Drawings.

Seed shall bear the grower's analysis testing to 98 percent for purity and 90 percent for germination. At the discretion of the Engineer, samples of seed may be taken for verification against the grower's analysis.

- C. Sod: Provide machine-cut, strongly rooted, certified turfgrass sod, at least 2 years old and free of weeds and undesirable native grasses. Provide sod capable of vigorous growth and development when planted (viable, not dormant) and complying with the following requirements:
- Kentucky Bluegrass (*Poa pratensis*).
 - Bermuda grass (*Cynodon dactylon*).
 - St Augustinegrass (*Stenotaphrum secundatum*).
 - Centipede grass (*Eremochloa ophiuroides*).
1. Sod Pad Size: Uniform thickness of 5/8 inch, plus or minus 1/4 inch, measured at time of cutting and excluding top growth and thatch. Provide in supplier's standard size of uniform length and width with maximum 5 percent allowable deviation in either length or width. Broken or torn pads with uneven ends are not acceptable.
 2. Sod Strength: Provide sod pads capable of supporting their own weight and retaining size and shape when supplier's standard size pad is suspended vertically from a firm grasp on upper 10 percent of the pad.
- D. Sod Plugs: Provide strongly rooted certified sod at least 2 years old, free of weeds and undesirable native grasses and capable of growth and development when planted (viable, not dormant). Provide in form suitable for cutting into plugs at least 4 inches thick. Provide sod plugs composed principally of the following:
- Manilagrass (*Zoysia matrella*).
 - Carpetgrass (*Axonopus officinis*).
 - Centipede grass (*Eremochloa ophiuroides*).

2.04 Mulch and Water

- A. Antierosion Mulch: Provide clean, seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Seed Mulch: Provide peat moss in natural, shredded, or granulated form, of fine texture, with a pH of 4.0 to 6.0 and a water-absorbing capacity of 1,100 to 2,000 percent.
- C. Water used to produce grass is to be free of excess and harmful chemicals, acids, alkalies and all other substances which are harmful to plant growth.
- D. Asphalt: Homogeneous emulsified asphalt meeting ASTM D 977 which contains no agents harmful or toxic to plant growth.

Part 3 Execution

3.01 General

- A. Minimum Operations: These Specifications set forth minimum operations and material applications which are acceptable. However, a satisfactory stand of

grass must be obtained by using supplemental methods and/or materials as may be required.

- B. Grassing By Private Property: Where grassing is required between curbs and sidewalks or behind sidewalks in areas adjacent to private residential or commercial property, the Engineer may change the type of grassing specified to match any type of grass which may be planted and growing on the adjacent lawn. No modifications of the Contract Unit Price will be made for this substitution.

3.02 Soil Preparation

- A. Limit preparation to areas that will be planted in immediate future.

Loosen subgrade to a minimum depth of 4 inches. Remove stones bigger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter.

Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to toxic to plant growth.

Mix soil amendments and fertilizers with topsoil at rates specified. Delay mixing of fertilizer if planting will not follow placing of topsoil mixture within a few days. Either mix soil before spreading or apply soil amendments on surface of spread topsoil and mix thoroughly into top 4 inches of topsoil before planting.

Mix lime with dry soil before mixing in fertilizer.

Apply phosphoric acid fertilizer (other than that constituting a portion of complete fertilizers) directly to subgrade before tilling.

Place approximately 1/2 of total amount of topsoil mixture required. Work into top of loosened subgrade to create a transition layer, and then place remainder of topsoil mixture.

- B. Allow for sod thickness in areas to be sodded.
Lime and Fertilizer Application:

Spread lime uniformly over the ground surface at the rates detailed on the Drawings.

Spread fertilizer uniformly over the ground surface at the rates detailed on the Drawings.

3.03 Seeding Lawns

- A. Sow seed with a spreader or a seeding machine. Do not seed when wind velocity exceeds 5 miles per hour. Distribute seed evenly over entire area by sowing equal quantity in 2 directions at right angles to each other.

Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.

Sow no less than the quantity of seed specified.

- B. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.

- C. Protect seeded slopes against erosion with jute mesh erosion netting or other similar coverings acceptable to Construction Manager or Owner.
- D. Protect seeded areas against erosion by spreading specified lawn mulch after completion of seeding operations. Spread uniformly to form a continuous blanket at least 1-1/2 inches loose measurement over seeded areas. Spread by hand, blower, or other suitable equipment.

Anchor mulch by spraying with asphalt emulsion at the rate of 10 to 13 gallons per 1,000 sq. ft. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean such areas where damage occurs.
- E. Protect seeded areas against hot, dry weather or drying winds by applying specified mulch within 24 hours after completion of seeding operations. Presoak and scatter evenly to a depth of 1/8 inches to 3/16 inches thick and roll to a smooth surface. Do not mound.

3.04 Hydroseeding Lawns

- A. Mix specified seed, fertilizer, and pulverized mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
- B. Apply slurry uniformly to all areas to be seeded. Rate of application as required to obtain specified seed sowing rate.

3.05 Sodding Lawns

- A. Lay sod within 24 hours of stripping. Do not lay dormant sod or if ground is frozen.
- B. Lay sod to form solid mass with tightly fitting joints. Butt ends and sides of sod strips; do not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering adjacent grass.
- C. Anchor sod on slopes with wood pegs as required to prevent slippage.
- D. Water sod with fine spray immediately after planting. During first week, water daily or more frequently as necessary to maintain moist soil to depth of 4 inches.

3.06 Plug Sodding Lawns

- A. Cut plugs 2 inches to 4 inches square, retaining maximum amount of soil on roots. Do not tear or rip plug from sod mass. Keep roots moist and plant plugs immediately after cutting.
- B. Plant plugs in holes on furrows. On slopes (if any), contour furrows to near level to prevent washing in heavy rains. Space plugs 12 inches apart in both directions.

3.07 Reconditioning Lawns

- A. Recondition existing lawn areas damaged by Contractor's operations including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor regrading is required. Recondition other existing lawn areas where indicated.
- B. Provide fertilizer, seed or sod, and soil amendments as specified for new lawns and as required to provide satisfactorily reconditioned lawn. Provide new planting soil as required to fill low spots and meet new finish grades.
- C. Cultivate bare and compacted areas thoroughly to provide a good, deep planting bed.
- D. Remove diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations including oil drippings, stone, gravel, and other construction materials; replace with new topsoil.
- E. Where substantial lawn remains (but is thin), mow, rake, aerate if compacted, fill low spots, remove humps, cultivate soil, fertilize, and seed. Remove weeds before seeding. If weeds are extensive, apply selective chemical weed killers as required. Apply a seedbed mulch, if required, to maintain moist condition.
- F. Water newly planted areas and keep moist until new grass is established.

3.08 Application of Nitrogen

- A. Make two applications of nitrogen to all grassed areas using mechanical spreading equipment. Apply at a uniform rate of not less than 70 pounds per acre per application. Make both applications only when weather conditions will permit uniform and even distribution and when moisture conditions will not cause harm to grass.
- B. Place first application of nitrogen when young grass reaches a height of at least one inch. Make the second application of nitrogen between 30 and 45 days after the first application.

3.09 Protection

Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period until lawn is established.

3.10 Maintenance

- A. Begin maintenance of lawns immediately after each area is planted and continue for the periods required to establish acceptable lawns, but no less than the following:
 - 1. Seeded lawns, at least 60 days, after date of substantial completion.

If seeded in fall and not given full 60 days of maintenance, or if not considered acceptable at that time, continue maintenance during following spring until acceptable lawn is established.

2. Sodded lawns, at least 30 days after date of substantial completion.
 3. Sod plug lawns, at least 30 days after date of substantial completion.
- B. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.
- C. Remulch with new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.
- D. Replant bare areas with same materials specified for lawns.
- E. Watering: Provide and maintain temporary piping, hoses and lawn watering equipment to convey water from sources and to keep lawn areas uniformly moist as required for proper growth.
- F. Lay out temporary lawn-watering system and arrange watering schedule to prevent puddling, water erosion, and displacement of seed or mulch (if any). Lay out temporary watering system to avoid necessity of walking over muddy or newly seeded areas.
- G. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height. Remove no more than 40 percent of grass leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Time initial and subsequent mowings to maintain following grass height:
- Mow grass from 1-1/2 inches to 2 inches high. Do not mow to less than 1-1/2 inches.
- H. Apply second fertilizer application after first mowing and when grass is dry.
- Use fertilizer that will provide at least 1.0 lb. of actual nitrogen per 1,000 sq. ft. of lawn area.

3.11 Required Coverage

- A. Grassed areas will be considered acceptable when a viable stand of grass covers at least 98 percent of the total area with no bare spots exceeding one square foot and the ground surface is fully stabilized against erosion.

3.12 Acceptance

- A. When work is substantially completed, including maintenance, Construction Manager or Owner will, upon request, make an inspection to determine acceptability.

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- B. Lawn work may be inspected for acceptance in parts agreeable to Construction Manager or Owner , provided work offered for inspection is complete, including maintenance.
 - C. Replant rejected work and continue specified maintenance until re - inspected by Construction Manager or Owner and found to be acceptable.
 - D. Seeded lawns will be acceptable provided requirements, including maintenance and coverage, have been met and healthy, uniform close stand of specified grass is established free of weeds, bare spots, and surface irregularities.
 - E. Sodded lawns will be acceptable provided requirements, including maintenance and coverage, have been met and required number of plugs are established as well-rooted, viable patches of grass and areas between plugs are free of weeds and other undesirable vegetation.
 - F. Plugged lawns will be acceptable, provided requirements, including maintenance and coverage, have been met and required number of plugs are established as well-rooted, viable patches of grass and areas between plugs are free of weeds and other undesirable vegetation.

3.13 Clean Up

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of roads, side walks, or other paved areas.

END OF SECTION

Part 1 General**1.01 Scope**

- A. The work covered by this Section includes furnishing all materials and equipment, providing all required labor and installing water service connections and all appurtenant work according to these Specifications and/or to the Water Connection Detail as shown schematically on the Drawings.
- B. Water meters are not to be furnished nor installed. However, the water meter connection must be compatible with the water meters currently used by the Owner.

1.02 Locations

Locations shall be directed by the Engineer along the route of the water mains.

1.03 Service Compatibility

It is the intent of these Specifications that the water service connections shall duplicate those presently being provided by the County in order to be compatible with their service maintenance procedures.

1.04 Quality Control

All materials installed under this Section shall have the approval of the NSF for water services.

Part 2 Products**2.01 Materials and Construction**

- A. Service Line
 - 1. No galvanized or PVC pipe or fittings shall be used on water services.
 - 2. Copper Tubing: Tubing shall be ASTM B 88, Type K. Fittings shall be brass with flare connection inlets and outlets, ANSI B16.26. Where required, adapters shall be brass ANSI B16.18. Unions shall be cast bronze. Joints shall be flare type. All fittings shall be of bronze construction with flare type connection.
- B. Meter Box for Single Family Residential (where sewer service is not present)
 - 1. Meter boxes shall be the "Rome" type and shall be of cast iron, oval shape.
 - 2. Minimum inside dimensions shall be 19 inches x 10 inches and at least 11-1/2 inches deep.
 - 3. Lids shall be Fulton County standard and fit snugly on the box. Lids shall be banded together with a steel strapping and painted with black asphaltic paint before shipping. The combined weight of the box and lid shall not be less than 60 pounds.

C. Meter Box for Irrigation Meter

1. Where irrigation meters are necessary (where sewer service is present), meter boxes shall be cast iron painted black with a locking lid quad valve box. Boxes shall have nominal dimensions of 14-3/4 inches x 17 inches at bottom, 12 inches x 14 inches opening, and 12 inches tall. Meter box assemblies shall include one U-branch, four ball valves, two unions, two touch plugs with cotter pins, and two expansion connections. The entire assembly shall be configured to allow 7-1/2 inch meter and an ASSE 1024 dual check valve with a combined distance of 12-3/4 inches between inlet and outlet unions for the installation of the meter and ASSE 1024 dual check valve backflow preventer. The County will install the meter after property owner applies for it.
2. Meter boxes shall be equal to Ford Meter Box Company, Double Gulf Box Part #LDG12U-243FULTPNA.

D. Valves and Accessories

1. Curb Stops
 - a. Ball valves shall be full port bronze, heavy duty type. Valve ends shall be threaded. Valves shall have a minimum 200 psi working pressure for water. Valves shall have stainless steel nut and handle. Valves shall be made in the U.S.A.
 - b. Curb stops shall be equal to Ford B43-332W with padlock wings. The stops shall open left.
2. Corporation Cocks
 - a. Corporation cocks shall be ground key type, shall be made of bronze conforming to ASTM B61 or B62 and shall be suitable for the working pressure of the system. Ends shall be suitable for flare type joint. Coupling nut for connection to flared copper tubing shall conform to ANSI B16.26.
 - b. Corporation cocks shall be equal to Ford FB600-4. The cocks shall open left.

E. 1-1/2-inch water services are saddle tapped to the water main using the following brass material certified to ANSI/NSF Standard 61:

1. Brass Saddles/W (IPT) – Ford or equal:

Pipe Size	Part No.
6"	202B-750-IP6
8"	202B-962-IP6
10"	202B-1212-IP6
12"	202B-1438-IP6
16"	202B-1840-IP6
20"	202B-2220-IP6
24"	202B-2650-IP6

2. 1 ½" Ballcorp Corporation Stop: Ford #FB1100-6-G-K or equal
3. 1 ½" Rolled Type K soft copper tubing
4. 1 ½" Meter Setter- A.Y. McDonald #20R600WWFF 666X402 or equal
5. Water meter box & lid are of a composite material, box 24x36x24, and lid with one 1 ¼" hole on top.

F. 2-inch water services are saddle tapped to the water main using the following brass material certified to ANSI/NSF Standard 61:

1. Brass Saddles/W (IPT) – Ford or equal:

Pipe Size	Part No.
6"	202B-750-IP7
8"	202B-962-IP7
10"	202B-1212-IP7
12"	202B-1438-IP7
16"	202B-1840-IP7
20"	202B-2220-IP7
24"	202B-2650-IP7

2. 2" Ballcorp Corporation Stop: Ford #FB1100-7-G-K or equal
3. 2" Rolled Type K soft copper tubing
4. 2" Meter Setter: A.Y. McDonald #20R700WWFF 777X15.62 or equal
5. Water meter box & lid are of a composite material, box 24x36x24, and lid with two 1 ¼" holes on top.

G. Detection Tape: Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Water Systems, Safety Precaution Blue, "Caution Water Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of 2-inches when buried less than 10-inches below the surface. Tape width shall be a minimum of 3-inches when buried greater than 10-inches and less than 20-inches. Detection tape shall be equal to Lineguard Type III Detectable or Allen Systems Detectatape.

2.02 Double Detector Backflow Preventer Assembly

- A. Provide a double detector check (DDC) backflow preventer (BFP) assembly in a size to match that of the required fire line service piping. The DDC-BFP assembly shall be provided with a OS&Y gate valve near the inlet and outlet sides of the device.
- B. The DDC device shall be provided with three brass ball valve test cocks fitted with brass or plastic threaded plugs. A fourth test cock shall be provided on the upstream side of the inlet shut-off valve.
- C. The DDC device and shut-off valve bodies shall be cast iron, coated inside and outside with a NSF-approved, fused epoxy coating and assembled with bolts that are resistant to electrolysis. All DDC device interior/exterior components shall be of materials equal in corrosion resistance to bronze and/or stainless steel to resist electrolysis.

- D. Check valves shall have replaceable seats, and be accessible by top-entry only for maintenance and repair. The detector bypass line on the DDC-BFP assembly shall be of 3/4-inch copper pipe and have a bronze detector meter and a 3/4-inch DCV-BFP complete with unions and shut-off valves.
- E. The DDC-BFP assembly shall be classified or listed by the Underwriters Laboratories, Factory Mutual Insurance, and bear the ASSE seal (ASSE Standard 1049). The DDC-BFP assembly shall have approval of and conform to all current requirements of the University of Southern California, Foundation for Cross-Connection Control (USC-FCCC). The DDC-BFP assembly shall be individually factory tested, shipped and installed as a unit.
- F. The DDC-BFP assembly shall not be buried in earth but installed below ground in a concrete vault, and as close as practical to the property line of the premises.
- G. Under no condition will any connection be allowed on the system other than for fire fighting or fire protection purposes.
- H. All DDC-BFP assemblies shall be tested at the time of installation and at least annually thereafter. A copy of all test and maintenance reports must be submitted to the Fulton County Water Department, Dogwood Station.

Part 3 Execution

3.01 Installation

- A. Water Service Connections
 - 1. Immediately following completion of the water main system, water service connections and meter boxes shall be installed for the properties adjacent to the water transmission mains both to the same side of the roadway (Short Side Service) and to the opposite side of the roadway (Long Side Service) as directed by the Engineer.
 - 2. The Contractor shall be prepared to make emergency repairs to the water system, if necessary, due to damage by others working in the area. In conjunction with this requirement, the Contractor shall furnish and have available at all times, a tapping machine, for the purpose of making temporary water service taps or emergency repairs to damaged water services. The Contractor shall furnish the County a phone number of an individual with the authority to initiate emergency repair work. This number must be provided prior to starting work on the Project.
 - 3. All services connected to water main shall be through individual 1-inch direct taps regardless of service and meter size with the exception of 1 ½" and 2" inch services and above.
 - 4. The water main shall be tapped with a tapping machine specifically designed for that purpose. The tap shall be a direct tap into the water main through a 1-inch brass corporation cock. All taps shall be supervised by the County. All taps shall be made on the water main at a position so as not to be the top side of the pipe nor the bottom of the pipe. Distance between taps must be a minimum of 12 inches apart and not in line with

each other.

5. Installation shall conform to the details for water service connections appearing schematically on the Drawings. Contractor shall provide any and all appurtenant work required to provide the intended water service connections.

B. Service Lines

1. Copper tubing between tap and water meter shall be one continuous length of pipe with no intermediate joints or connections. The service line shall be placed without sharp turns or bends from the water main to the meter box.
2. When meters are located on the opposite side of the street from the water main, new copper service lines shall be extended through a common 6-inch bore, Schedule 40 PVC conduit to the service side. Replacement of existing services may be by free bore without a casing.
3. Provide detection tape over all service lines.
4. Service lines shall have a minimum 30-inch clear cover between main and meter, shallowing to a bury of 12-inches at the meter location.

C. Meter Boxes

1. The meter box shall be located one foot from back of right of way. The meter box lid shall be set at finished grade. The meter box shall be placed on two courses of brick on a bed of gravel or crushed stone. Brick shall not be placed on top of water service lines. The bed of gravel or crushed stone shall be 3-inches thick and extend 6-inches in all directions beyond the edge of the meter box. The box shall be carefully and uniformly backfilled to prevent distortion that would cause leaks. Meter boxes shall be located in pairs within two feet of the common property lines between the lots.
2. All water meters shall have fluorescent markings at curb. Markings shall not be the same color as markings denoting hydrants. In addition to fluorescent markings, a saw cut ½" deep "W" notch on top of curb at water service location is required.

D. Relocation of Service Lines

1. Relocate the existing meter to the new right-of-way limits as shown on the drawings or as ordered by the Engineer and reconnect to the house service. Existing meters already located at the new right-of-way limits will not need relocating.
2. Before disconnecting the existing meter, the existing corporation in the main shall be closed. All existing meters and meter boxes shall be removed if not already located at the right-of-way, reinstalled and reconnected as indicated on the Drawings.
3. Existing service lines shall be field-located by the Contractor. The Contractor shall be responsible for locating existing water meters, relocating the meters and meter boxes as necessary, and determining the

existing size service line to reconnect the meters to the new water mains. All service lines installed under existing pavement, including streets, driveways and sidewalks, shall be installed by boring.

- E. Transfer of Service: Immediately before connecting to the relocated or existing meter, all service lines shall be flushed to remove any foreign matter. Any special fittings required to reconnect the existing meter to the new copper service line, or the existing private service line, shall be provided by the Contractor. To minimize out of service time, the Contractor shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation stop shall be opened and all visible leaks shall be repaired.

- F. Maintenance and Repairs: The tap, service line and meter box shall remain under the Contractor's maintenance responsibility for the same warranty period as the water main. The Contractor shall promptly repair any damage to the water system during the warranty period.

END OF SECTION

Part 1 General

1.01 Scope

- A. This Section describes products to be incorporated into the water mains and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.
- B. Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable.

1.02 Qualifications

If requested by the Engineer, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.

1.03 Submittals

Complete shop drawings, product data and engineering data for all products shall be submitted to the Engineer in accordance with the requirements of Section 01340 of these Specifications.

1.04 Transportation and Handling

- A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. 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.

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 and hydrants 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.

1.06 Quality Assurance

The manufacturer shall provide written certification to the Engineer that all products furnished comply with all applicable requirements of these Specifications.

Part 2 Products

2.01 Ductile Iron Pipe (DIP)

- A. Ductile iron pipe shall be manufactured in accordance with AWWA C151 – latest revision. All pipes, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes will be as shown on the Drawings. All pipes shall have a minimum pressure rating as indicated in the following table and corresponding minimum wall thickness, unless otherwise specified or shown on the Drawings:

Pipe Sizes (inches)	Pressure Class (psi)
4 - 12	350
14 - 18	350
20	300
24	250
30 - 54	200
60 - 64	200

- B. Flanged pipe minimum wall thickness shall be equal to Special Class 53. Flanges shall be furnished by the pipe manufacturer.
- C. Pipe shall be cement lined in accordance with AWWA C104. Pipe shall be furnished with a bituminous outside coating.
- D. Certificates of conformance with the foregoing specifications shall be furnished with each lot of pipe supplied.
- E. Fittings shall be ductile iron and shall conform to AWWA C110 or AWWA C153 with a minimum rated working pressure of 250 psi. Fittings shall be cement lined in accordance with AWWA C104 and shall be furnished with a bituminous outside

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coating. In lieu of cement lining and bituminous coating, fittings may be provided with a fusion bonded coating and lining meeting the requirements of AWWA C116.

- F. Galvanized pipe fittings and PVC pipe fittings shall not be used as any part of the Fulton County Water Transmission and Distribution System, nor shall it be used to join any appurtenances to the System.
- G. Joints
1. Unless shown or specified otherwise, joints shall be push-on or restrained joint type for pipe and standard mechanical, push-on or restrained joints for fittings. Push-on and mechanical joints shall conform to AWWA C111.
 2. Restrained joints shall be American "FLEX-RING" or "LOK-RING", U.S. Pipe "TR FLEX" or "HP LOK", Clow "SUPER-LOCK", Griffin "SNAP-LOK" or equal.
 3. Restraining gasket joints shall be assembled with American Fast-Grip gaskets or US Pipe FIELD LOK gaskets and may be used for pipe 12-Inches in diameter or less.
 4. Retainer glands on a mechanical joint may be used as a restrained joint only where retainer glands are specifically shown on the drawings or where specifically specified.
 5. Where retainer glands are allowed, in lieu of retainer glands specified elsewhere, the joint may be assembled with US Pipe MJ FIELD LOK gasket.
 6. No field welding for manufactured restrained joint pipe assembly will be permitted. Where field cutting of restrained joint pipe is required, the joint shall be assembled with American Field Flex-Rings or US Pipe TR FLEX GRIPPER Rings.
 7. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.
- H. Provide the appropriate gaskets for mechanical and flange joints. Gaskets for flange joints shall be made of 1/8-inch thick, cloth reinforced rubber; gaskets and shall be full face type.
- I. Bolts and Nuts
1. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit. All bolts and nuts shall be made in the U.S.A.
 2. Bolts and nuts for mechanical joints shall be Tee Head Bolts and nuts of high strength low-alloy steel in accordance with ASTM A 242 to the dimensions shown in AWWA C111/ANSI A21.11.

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- 3. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.
- 4. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A 307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to ASTM B 633, Type II.
- 5. Bolts for submerged service shall be stainless steel machine bolts conforming to ASTM A 193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to ASTM A 194, Grade 8.

- J. Mechanical joint glands shall be ductile iron.
- K. Restrained joint pipe (RJP) on supports shall have bolted joints and shall be specifically designed for clear spans of at least 36 feet.
- L. Thrust collars shall be welded-on ductile iron body type or split retainer gland type, as shown on the Drawings or directed by the Engineer, designed to withstand thrust due to 250 psi internal pressure on a dead end.
- M. Tapping Saddles: Tapping saddles are not allowed.
- N. Pipe outlets shall be welded-on ductile iron pipe and shall be provided in lieu of tees or saddles on mains with a diameter greater than or equal to 24-inches. Outlets shall be plain end, push-on, mechanical, or flanged joint, and shall meet the joint requirements stated in this Specification. All welding, fabrication and outlet hole drilling shall be performed by the manufacturer of the parent pipe. Outlets shall be free of burrs. Sizes shall be as indicated on the Drawings. The outlets and parent pipe shall be minimum Class 53 ductile iron pipe for parent pipe 54-inches and smaller. For pipe larger than 54-inches, parent pipe shall be Pressure Class 350. Each welded outlet shall be rated for 250 psi working pressure and hydrostatically tested at 500 psi. The maximum outlet diameters shall not exceed those listed in the table below:

Parent Pipe Diameter, Inches	Maximum Outlet Diameter, Inches
24	16
30	20
36	24
42	30
48	30
54	30
60	30
64	30

- O. Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

2.02 Copper Pipe

- A. Pipe shall be rolled copper tubing, ASTM B 88, Type K. Fittings shall be sweat type wrought copper, ANSI B16.22.
- B. Where required, sweat to screw adapters shall be cast bronze ANSI B16.18, wrought solder joint ANSI B16.22. Unions shall be cast bronze or bronze with solder connections. Joints shall be made with 95/5 solder for Type K pipe.

2.03 Valves

- A. Gate Valves (GV): 6-Inches to 12-Inches in Diameter
 1. Gate valves shall be resilient wedge type conforming to the requirements of AWWA C509 or AWWA C515 rated for 250 psi working pressure.
 2. Valves shall be provided with two O-ring stem seals with one O-ring located above and one O-ring below the stem collar. The area between the O-rings shall be filled with lubricant to provide lubrication to the thrust collar bearing surfaces each time the valve is operated. At least one anti-friction washer shall be utilized to further minimize operating torque. All seals between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be flat gaskets or O-rings.
 3. The valve gate shall be made of cast or ductile iron having a vulcanized, synthetic rubber coating, or a seat ring attached to the disc with retaining screws. Sliding of the rubber on the seating surfaces to compress the rubber will not be allowed. The design shall be such that compression-set of the rubber shall not affect the ability of the valve to seal when pressure is applied to either side of the gate. The sealing mechanism shall provide zero leakage at the water working pressure when installed with the line flow in either direction.
 4. All internal ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall be non-toxic, impart no taste to the water and shall conform to AWWA C550.
 5. Valves shall be non-rising stem type with a 2-inch square wrench nut, except in meter vaults where hand wheels shall be installed, and shall open left. The manufacturer shall provide an affidavit of compliance with the applicable AWWA standards.
 6. Gate valves shall be manufactured by American Flow Control, Mueller or M & H Valve.
- B. Butterfly Valves (BV) 16-Inches to 24-Inches in Diameter

1. Butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with all requirements of AWWA C504 and as modified below. Valves shall be designed for a rated working pressure of 250 psi. Class B, AWWA C504 Section 5.2 testing requirements are modified as follows:
 - a. The leakage test shall be performed at a pressure of 250 psi;
 - b. The hydrostatic test shall be performed at a pressure of 500 psi; and
 - c. Proof of design tests shall be performed and certification of such proof of design test shall be provided to the Engineer.
2. Valve bodies shall be ductile iron conforming to ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. Shafts and shaft hardware shall be ASTM A 564, Type 630 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A 536, Grade 65-45-12. The resilient valve seat shall be located either on the valve disc or in the valve body and shall be fully field adjustable and field replaceable.
3. Valves shall be installed with the valve shafts horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.
4. Actuators
 - a. Valves shall be equipped with traveling nut, self-locking type actuators designed, manufactured and tested in accordance with AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc.
 - b. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable.
 - c. Valve actuators shall be capable of withstanding a minimum of 450 foot pounds of input torque in either the open or closed position without damage.
5. Operators: Valves for buried service shall have a 2-inch square wrench nut type operator and shall be equipped with a valve box and stem extension, as required and shall open left.
6. Valve ends shall be mechanical joint type, except where joint ends are shown. Flange joints shall meet the requirements of ANSI B16.1, Class 250, but drilled and faced to Class 125 dimensions.
7. Butterfly valves shall be manufactured by Mueller, M & H Valve, DeZurik, Val-Matic, or Pratt.

2.04 Fire Hydrants (FH)

- A. All fire hydrants shall conform to the requirements of AWWA C502 for 150 psi working pressure. Hydrants shall be the compression type, closing with line pressure. The valve opening shall not be less than 5-1/4-inches.
- B. In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and inexpensive restoration without digging or cutting off the water.
- C. The means for attaching the barrel to the standpipe shall permit facing the hydrant a minimum of eight different directions.
- D. Hydrants shall be fully bronze mounted with all working parts of bronze. Valve seat ring shall be bronze and shall screw into a bronze retainer.
- E. All working parts, including the seat ring shall be removable through the top without disturbing the barrel of the hydrant.
- F. The operating nut shall match those on the existing hydrants and shall open left. The operating threads shall be totally enclosed in an operating chamber, separated from the hydrant barrel by a rubber O-ring stem seal and lubricated by a grease or an oil reservoir.
- G. Hydrant shall be a non-freezing design and be provided with a simple, positive, and automatic drain which shall be fully closed whenever the main valve is opened.
- H. Hose and pumper connections shall be breech-locked, pinned, or threaded and pinned to seal them into the hydrant barrel. Each hydrant shall have two 2-1/2-inch hose connections and one 4-1/2-inch pumper connection, all with National Standard threads and each equipped with cap and non-kinking chain.
- I. Hydrants shall be furnished with a mechanical joint connection to the spigot of the 6-inch hydrant lead.
- J. Minimum depth of bury shall be 4.5 feet. Provide extension section where necessary for proper vertical installation and in accordance with manufacturer's recommendations.
- K. All outside surfaces of the barrel above grade shall be painted silver with Sherwin Williams KEM 400. The bonnet of hydrants installed on a 12 inch water main shall be painted Yellow; the bonnet of hydrants installed on water mains larger than 12 inch water mains shall be painted Green.
- L. Hydrants shall be traffic model and shall be American Flow Control B-84-B, Mueller Super Centurion, M & H Valve 929, or US Pipe Metropolitan 250 Model M94.

2.05 Valve Boxes (VB) and Extension Stems

- A. All valves shall be equipped with valve boxes. The valve boxes shall be cast iron two-piece screw type with drop covers. Valve boxes shall have a 5.25-inch inside diameter. Valve box covers shall weigh a minimum of 13 pounds. The valve boxes shall be adjustable to 6-inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "WATER VALVE" or "WATER" cast into them. Valve boxes shall be manufactured in the United States.
- B. All valve boxes shall have a concrete collar, minimum 9-inches thick. The collar shall be square or round and sized 24-inches square or 24-inches in diameter. Precast collars may be used, provided that they are grouted in place to the valve box. The box is to be flush with finished grade. The edge of the valve box is to be ½-inch above the edge of the concrete collar.
- C. All valves shall be furnished with Type 316 stainless steel extension stems, as necessary, to bring the operating nut to within 24-inches of the top of the valve box. Connection to the valve shall be with a wrench nut coupling and a set screw to secure the coupling to the valve's operating nut. The coupling and square wrench nut shall be welded or pinned to the extension stem and shall have a centering ring. Extension stems shall be minimum 1-inch diameter. Extension stems shall be equal to Trumbull Industries, M & H Valve, or Penn-Troy Manufacturing/Troy Valve.

2.06 Valve Markers (VM)

The Contractor shall provide a concrete valve marker as detailed on the Drawings for each valve installed outside paved areas. Valve markers shall be stamped "WATER". Valve markers shall be in accordance with County standards. In addition to concrete valve marker where street curbs are installed a saw cut ½" deep "V" notch on top of curb adjacent to water valve location is required.

2.07 Tapping Sleeves and Valves (TS&V)

Tapping sleeves shall be cast or ductile iron of the split-sleeve, mechanical joint type and shall be capable of withstanding a working pressure of 250 psi. The Contractor shall be responsible for determining the outside diameter of the pipe to be connected to prior to ordering the sleeve. Valves shall be gate valves furnished in accordance with the specifications shown above, with flanged connection to the tapping sleeve and mechanical joint connection to the branch pipe. The tapping sleeve shall be supplied by the valve manufacturer. Tapping sleeves shall be equal to American Flow Control, Mueller H-615 or M & H Valve.

2.08 Corporation Cocks and Curb Stops

Corporation cocks and curb stops shall be ball type, shall be made of bronze conforming to ASTM B 61 or B 62, and shall be suitable for the working pressure of the system. Ends shall be suitable for compression type joint. Threaded ends for inlet and outlet of corporation cocks shall conform to AWWA C800; coupling nut for connection to flared copper tubing shall conform to ANSI B16.26. Corporation cocks shall be manufactured by Ford (FB1000-4-G) or equivalent. Curb stops shall be manufactured by Ford (BA21-444W-Full Port) or equivalent.

2.09 Air Valves for Water Service

- A. The air release and vacuum break valve shall be of the compact single chamber design with solid cylindrical HDPE control floats housed in a tubular stainless steel body with epoxy powder coated cast iron or steel ends secured by means of stainless steel tie rods. The valve shall have an integral "anti-shock" orifice mechanism which shall operate automatically to limit transient pressure rise or shock induced by closure to two times valve rated working pressure. The intake orifice area shall be equal to the nominal size of the valve.
- B. Large orifice sealing shall be affected by the flat face of the control float seating against a nitrile rubber O-ring housed in a dovetail groove circumferentially surrounding the orifice. Discharge of pressurized air shall be controlled by the seating and unseating of a small orifice nozzle on a natural rubber seal affixed into the control float. The nozzle shall have a flat seating land surrounding the orifice so that the damage to the rubber seal is prevented.
- C. The valve construction shall be proportioned with regard to material strength characteristics, so that deformation, leaking or damage of any kind does not occur by submission to twice the designed working pressure. The valve design shall incorporate an over pressure safety feature that will fail without an explosive effect, such as is normally the case when highly compressed air is released suddenly. The feature shall consist of replaceable components such as gaskets or seals.
- D. Connection to the valve inlet shall be facilitated by a flanged end conforming to ANSI B16.1 Class 125. Flanged ends shall be supplied with the requisite number of stainless steel or mild steel screwed studs inserted for alignment to the specific standard.
- E. Valve orifice size shall be as shown on the Drawings.
- F. Provide a 1/4-inch NPT test/bleed cock.
- G. An isolation valve between the main and the air valve shall be installed in accordance with the Drawings.
- H. All air valves and accessories shall be equal to Vent-o-Mat.

2.10 Manholes and Precast Concrete Products

- A. Precast Concrete Sections
 - 1. Precast concrete sections shall meet the requirements of ASTM C 478 for round shaped and ASTM C 913 for rectangular shaped precast concrete products. The minimum compressive strength of the concrete in precast sections shall be 4,000 psi. The minimum wall thickness shall be one-twelfth of the inside diameter of the base, riser or the largest cone diameter.
 - 2. Transition slabs which convert bases larger than four feet in diameter to four foot diameter risers shall be designed by the precast concrete manufacturer to carry the live and dead loads exerted on the slab.

- 3. Seal joints between precast sections by means of rubber O-ring gaskets or flexible butyl rubber sealant. Butyl rubber sealants shall meet the requirements of AASHTO M-198. Sealant shall be pre-formed type with a minimum nominal diameter of 1-inch.
 - 4. Butyl rubber sealant shall be equal to Kent Seal No. 2 or Concrete Sealants CS 202.
- B. Brick and Mortar: Brick shall be whole and hardburned, conforming to ASTM C 32, Grade MS. Mortar shall be made of one part Portland cement and two parts clean sharp sand. Cement shall be Type 1 and shall conform to ASTM C 150. Sand shall meet ASTM C 144.
- C. Iron Castings
- 1. Cast iron manhole frames, covers and steps shall meet the requirements of ASTM A 48 for Class 30 gray iron and all applicable local standards. All castings shall be tough, close grained, smooth and free from blow holes, blisters, shrinkage, strains, cracks, cold shots and other imperfections. No casting will be accepted which weighs less than 95 percent of the design weight. Shop drawings must indicate the design weight and provide sufficient dimensions to permit checking. All castings shall be thoroughly cleaned in the shop and given two coats of approved bituminous paint before rusting begins.
 - 2. Manhole frames and covers shall be equal to the following:

Type	Design Weight	Manufacturer's Reference	
Bolt Down	400#	Neenah A-1916-F1	Vulcan V-2358
 - 3. All frames and covers shall have machined horizontal bearing surfaces.
 - 4. Bolt-down covers shall be equipped with four 1/2-inch stainless steel bolts and a 1/8-inch red rubber or rubber O-ring gasket. Covers shall be rotatable and interchangeable. Bolt holes shall be bored through so that debris entering the bolt hole will fall into the manhole. Bolt holes shall have the full 360 degree circle within the cover's radius when bored through the cover.
- D. Plastic Steps: Manhole steps of polypropylene, molded around a steel rod, equal to products of M.A. Industries may be used.
- E. Floor Door
- 1. Door shall be single or double leaf type as shown on the Drawings.

2. The frame shall be 1/4-inch extruded aluminum alloy 6063-T6, with built-in neoprene cushion and with strap anchors bolted to the exterior. Door leaf shall be 1/4-inch aluminum diamond plate, alloy 6061-T6, reinforced with aluminum stiffeners as required. Stainless steel hinges shall be bolted to the underside and pivot on torsion bars that counterbalance the door for easy operation. The door shall open to 90 degrees and lock automatically in that position. A vinyl grip handle shall be provided to release the cover for closing. The door shall be built to withstand a live load of 300 pounds per square foot, and shall be equipped with a snap lock and removable handle. Bituminous coating shall be applied to exterior of frame by the manufacturer. The door shall also be provided with a hasp in addition to the built-in locking mechanism.
3. The floor door shall be manufactured by The Bilco Company or Thompson Fabricating Company.

F. Vents

1. Where vent pipes are shown on the Drawings, vents shall be of one-piece, welded steel construction. Vent pipes shall equal air valve size, but no less than 4-inches. The vent pipe shall be grouted into a precast hole in the vault. The discharge of the vent pipe shall be provided with a 3/16-inch PVC coated mesh screen.
2. Where vent pipes are not shown on the Drawings, the frame and cover or floor door shall be provided with 1-inch holes to provide equivalent opening as in air valve, but not less than two. The quantity for each valve size is as follows: 2-inch, 4; 3-inch, 9; 4-inch, 16; 6-inch, 36; 8-inch, 64.

2.11 Retainer Glands

- A. Retainer glands for ductile iron pipe shall be Megalug Series 1100, as manufactured by EBAA Iron, Uni-Flange Series 1400, as manufactured by Ford Meter Box Company, Stargrip Series 3000, as manufactured by Star Pipe Products, or Sigma One LOK Series SLD as manufactured by Nappco-Sigma.
- B. Retainer glands shall be provided at all mechanical joints, including fittings, valves, hydrants and other locations as shown on the Drawings.

2.12 Hydrant Tees

Hydrant tees shall be equal to ACIPCO A10180 or U.S. Pipe U-592.

2.13 Anchor Couplings

Lengths and sizes shall be as shown on the Drawings. Anchor couplings shall be equal to ACIPCO A 10895 or U.S. Pipe U-591.

2.14 Hydrant Connector Pipe

The connector pipe shall be ductile iron meeting the requirements of AWWA C153 and shall be cement lined in accordance with AWWA C104. The pipe shall have a 24-inch offset design so the hydrant can be adjusted to ensure placement at the

proper grade and shall have an anchoring feature at both ends so that when used with mechanical joint split glands, a restrained joint is provided. The connector pipe shall be Gradelok as manufactured by Assured Flow Sales, Inc., Sarasota, Florida.

2.15 Concrete

Concrete 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. For job mixed concrete, submit the concrete mix design for approval by the Engineer. 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. Concrete for thrust blocking and thrust collars shall be high early strength concrete.

2.16 Electronic Markers

Electronic markers shall be buried with utilities to serve as a locating device. Electronic markers shall be the active, programmable type. Each marker shall be color coded in accordance with APWA standards and produce an industry specific frequency. Each marker shall contain a passive antenna that requires no internal power source. Markers shall be of water resistant polyethylene shells and impervious to minerals, chemicals, and underground temperature extremes. Electronic markers shall be compatible with 3M Dynatel 1420 EMS-ID Marker Locator. Contractor shall supply one Marker Locator for use during installation and shall turn over Locator to County upon project completion. Markers shall be 3M Dynatel 1423 XR/ID for water service.

Part 3 Execution

3.01 Existing Utilities and Obstructions

- A. The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the County. The Contractor shall call the Utilities Protection Center (UPC) (800-282-7411) as required by Georgia law (Code Section 25-9-1 through 25-9-13) and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site at least 72 hours (three business days) prior to construction to verify the location of the existing utilities.
- B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.
 - 1. Provide the required notice to the utility owners and allow them to locate their facilities according to Georgia law. Field utility locations are valid for only 10 days after original notice. The Contractor shall ensure at the time of any excavation that a valid utility location exists at the point of excavation.
 - 2. Expose the facility, for a distance of at least 200 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.

3. Avoid utility damage and interruption by protection with means or methods recommended by the utility owner.
 4. Maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The Contractor shall provide the Engineer an updated copy of the log bi-weekly, or more frequently if required.
- 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 water main does not permit safe installation of the water main 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 water main to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement, complies with regulatory agency requirements and after a written request to and subsequent approval by the Engineer. Where such relocation of the water main 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 water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The Contractor may change the proposed grade of the water main 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. Where such relocation of the water main is denied by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.
- 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 Sewer Separation
1. Water mains should maintain a minimum 10 foot edge-to-edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right-of-way and provide 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 water main shall be installed below the sewer with a minimum vertical separation of 18-inches.
 2. The water main, when installed below the sewer, shall be encased in concrete with a minimum 6-inch concrete depth to the first joint in each direction. 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. No water main shall pass through, or come in contact with, any part of a sanitary sewer manhole.

3.02 Construction Along Highways, Streets and Roadways

- A. Install pipe lines and appurtenances along highways, streets and roadways in accordance with the applicable regulations of, and permits issued by, the Department of Transportation and Fulton County with reference to construction operations, safety, traffic control, road maintenance and repair.
- B. Traffic Control
 1. The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights and other traffic control devices; provide qualified flagmen where necessary to direct traffic; take all necessary precautions for the protection of the work and the safety of the public. Flagmen shall be certified by a Georgia DOT approved training program.
 2. Construction traffic control devices and their installation shall be in accordance with the current Manual On Uniform Traffic Control Devices for Streets and Highways.
 3. Placement and removal of construction traffic control devices shall be coordinated with the Georgia Department of Transportation and Fulton County a minimum of 48 hours in advance of the activity.
 4. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right-of-way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as "Flagmen Ahead", shall be removed and replaced when needed.
 5. Existing traffic control devices within the construction work zone shall be protected from damage. Traffic control devices requiring temporary relocation shall be located as near as possible to their original vertical and horizontal locations. Original locations shall be measured from reference points and recorded in a log prior to relocation. Temporary locations shall provide the same visibility to affected traffic as the original location. Relocated traffic control devices shall be reinstalled in their original locations as soon as practical following construction.
 6. Construction traffic control devices shall be maintained in good repair and shall be clean and visible to affected traffic for daytime and nighttime operation. Traffic control devices affected by the construction work zone shall be inspected daily.
 7. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective

requirements of the Georgia Department of Transportation and Fulton County. Sign panels shall be of durable materials capable of maintaining their color, reflective character and legibility during the period of construction.

8. Channelization devices shall be positioned preceding an obstruction at a taper length as required by the current Manual On Uniform Traffic Control Devices for Streets and Highways, as appropriate for the speed limit at that location. Channelization devices shall be patrolled to insure that they are maintained in the proper position throughout their period of use.

C. Construction Operations

1. Perform all work along highways, streets and roadways to minimize interference with traffic.
2. Stripping: Where the pipe line is laid along road right-of-way, strip and stockpile all sod, topsoil and other material suitable for right-of-way restoration.
3. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.
4. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod and any other materials removed from shoulders.
5. Construction operations shall be limited to 400 feet along areas, including clean-up and utility exploration.

D. Excavated Materials: Do not place excavated material along highways, streets and roadways in a manner which obstructs traffic. Sweep all scattered excavated material off of the pavement in a timely manner.

E. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

F. Landscaping Features: Landscaping features shall include, but are not necessarily limited to: fences; property corners; cultivated trees and shrubbery; manmade improvements; subdivision and other signs within the right-of-way and easement. The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features.

G. Maintaining Highways, Streets, Roadways and Driveways

1. Maintain streets, highways, roadways and driveways in suitable condition for movement of traffic until completion and final acceptance of the Work.
2. During the time period between pavement removal and completing permanent pavement replacement, maintain highways, streets and

roadways by the use of steel running plates. Running plate edges shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted as specified elsewhere up to the existing pavement surface to provide support for the steel running plates.

3. Furnish a road grader or front-end loader for maintaining highways, streets, and roadways. The grader or front-end loader shall be available at all times.
4. Immediately repair all driveways that are cut or damaged. Maintain them in a suitable condition for use until completion and final acceptance of the Work.

3.03 Pipe Distribution

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- B. No pipe shall be strung further along the route than 1,000 feet beyond the area in which the Contractor is actually working without written permission from the County. The County reserves the right to reduce this distance to a maximum distance of 200 feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.
- C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.
- D. No distributed pipe shall be placed inside drainage ditches.
- E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge-to-edge.

3.04 Location and Grade

- A. The Drawings show the alignment and grade of the water main and the location of valves, hydrants and other appurtenances.
- B. Prior to clearing and grubbing, the Engineer will provide a temporary bench mark along the water main route and at all other locations where the alignment of the water main changes significantly.
- C. Construction Staking
 1. The base lines for locating the principal components of the work are shown on the Drawings. Base lines shall be defined as the line to which the location of the water main is referenced, i.e., edge of pavement, road centerline, property line, right-of-way or survey line. The Contractor shall be responsible for performing all survey work required for constructing the water main, including the establishment of base lines and any detail

surveys needed for construction. This work shall include the staking out of permanent and temporary easements to insure that the Contractor is not deviating from the designated easements.

2. The level of detail of survey required shall be that which the correct location of the water main can be established for construction and verified by the Engineer. Where the location of components of the water main, e.g. tunnels and fittings, are not dimensioned, the establishment on the location of these components shall be based upon scaling these locations from the Drawings with relation to readily identifiable land marks, e.g., survey reference points, power poles, manholes, etc.

D. Reference Points

1. The Contractor shall take all precautions necessary, which includes, but is not necessarily limited to, installing reference points, in order to protect and preserve the centerline or baseline established by the Engineer.
2. Reference points shall be placed, at or no more than three feet, from the outside of the construction easement or right-of-way. The location of the reference points shall be recorded in a log with a copy provided to the Engineer for use, prior to verifying reference point locations. Distances between reference points and the manhole centerlines shall be accurately measured to 0.01 foot.
3. The Contractor shall give the Engineer reasonable notice that reference points are set. The reference point locations must be verified by the Engineer prior to commencing clearing and grubbing operations.

E. After the Contractor locates and marks the water main centerline or baseline, the Contractor shall perform clearing and grubbing.

F. Construction shall begin at a connection location and proceed without interruption. Multiple construction sites shall not be permitted without written authorization from the Engineer for each site.

G. The Contractor shall be responsible for any damage done to reference points, base lines, center lines and temporary bench marks, and shall be responsible for the cost of re-establishment of reference points, base lines, center lines and temporary bench marks as a result of the operations.

H. Construction Verification Survey allowance: The Construction Verification Survey cash allowance is solely for the use of the Engineer for verification of the Contractor's reference points, centerlines and work performed. The presence of this cash allowance in no way relieves the Contractor of the responsibility of installing reference points, centerlines, temporary bench marks, providing as-built drawings, or verifying that the work has been performed accurately.

3.05 Laying and Jointing Pipe and Accessories

A. Water mains, valves, hydrants, and appurtenances shall be installed before the installation of the subbase course or paving or any other utilities except sanitary sewer lines.

- B. Lay all pipe and fittings to accurately conform to the lines and grades established by the Engineer.
- C. Pipe Installation
1. Proper implements, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings, valves and hydrants shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.
 2. All pipe, fittings, valves, hydrants and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.
 3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe containing dirt shall be laid.
 4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.
 5. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
 6. It is not mandatory to lay pipe with the bells facing the direction in which work is progressing.
 7. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade, shall not be permitted.
- D. Alignment and Gradient
1. Lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.
 2. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.
- E. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at

all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint or as approved by the Engineer.

F. Joint Assembly

1. Push-on, mechanical, flange and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.
2. The Contractor shall inspect each pipe joint within 1,000 feet on either side of main line valves to insure 100 percent seating of the pipe spigot, except as noted otherwise.
3. Each restrained joint shall be inspected by the Contractor to ensure that it has been "homed" 100 percent.
4. The Contractor shall internally inspect each pipe joint to insure proper assembly for pipe 24-inches in diameter and larger after the pipe has been brought to final alignment.

G. Cutting Pipe: Cut ductile iron pipe using an abrasive wheel saw. The Contractor shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories and closure pieces in the correct location. Only push-on or mechanical joint pipe shall be cut.

H. Lining Repair: Repair cement linings and recoat spigot ends of cut pipe with cement lining and bituminous coating as specified in Part 2 of this Section and as specified below:

1. Remove all burrs and areas of loose lining materials by sanding or scraping to bare metal.
2. Remove oil and lubricants used during field cutting.
3. Lining shall be stripped back a minimum of 1-inch from the spigot end into well adhered lined areas.
4. Roughen 1 to 2-inches of good lining with a rough grade (40 grit) emery paper, rasp or small chisel, to allow an overlap between new and existing lining.
5. Apply lining repair material in the number of coats required to match the thickness requirements as specified in Part 2 of this Section and in accordance with the manufacturer's recommendations.

J. Valve and Fitting Installation

1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be corrected or held for inspection by the Engineer. Valves shall be closed before being installed.

2. Valves, fittings, plugs and caps shall be set and joined to the pipe in the manner specified in this Section for cleaning, laying and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.
3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be installed where depth of bury places the operating nut in excess of 24-inches beneath finished grade so as to set the top of the operating nut 24-inches below finished grade. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the Engineer.
4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.
5. A valve marker shall be provided for each underground valve. Unless otherwise detailed on the Drawings or directed by the Engineer, valve markers shall be installed 6-inches inside the right-of-way or easement, and buried to a depth of 30-inches. In addition to a concrete valve marker where street curbs are installed, a saw cut ½" deep "V" notch on top of curb adjacent to the water valve location is required.
6. A precast concrete vault shall be installed for 24-inch valves and larger.

K. Hydrant Installation

1. Prior to installation, inspect all hydrants for direction of opening, nozzle threading, operating nut and cap nut dimensions, tightness of pressure-containing bolting, cleanliness of inlet elbow, handling damage and cracks. Defective hydrants shall be corrected or held for inspection by the Engineer.
2. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the roadway, with pumper nozzle facing the roadway, except that hydrants having two-hose nozzles 90 degrees apart shall be set with each nozzle facing the roadway at an angle of 45 degrees.
3. Hydrants shall be set to the established grade, with the centerline of the lowest nozzle at least 12-inches above the ground or as directed by the Engineer.
4. Each hydrant shall be connected to the main with a 6-inch branch controlled by an independent 6-inch valve.

5. When a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing coarse gravel or crushed stone mixed with coarse sand from the bottom of the trench to at least 6-inches above the drain port opening in the hydrant to a distance of 12-inches around the elbow.
6. When a hydrant is set in clay or other impervious soil, a drainage pit 2 x 2 x 2 feet shall be excavated below each hydrant and filled with coarse gravel or crushed stone mixed with coarse sand under and around the elbow of the hydrant and to a level of 6-inches above the drain port.
7. Hydrants shall be located as shown on the Drawings or as directed by the Engineer. In the case of hydrants that are intended to fail at the ground-line joint upon vehicle impact, specific care must be taken to provide adequate soil resistance to avoid transmitting shock moment to the lower barrel and inlet connection. In loose or poor load bearing soil, this may be accomplished by pouring a concrete collar approximately 6-inches thick to a diameter of 24-inches at or near the ground line around the hydrant barrel.
8. All hydrants shall have fluorescent markings at the curb. Markings shall not be the same color as markings denoting water meters.
9. FIRE HYDRANTS SHALL NOT BE OPERATED WITH ANY TOOL EXCEPT A SPECIFICALLY DESIGNED FIRE HYDRANT WRENCH. It is the Contractor's responsibility to ensure that all new facilities are maintained in new condition until final completion of the project and acceptance by the County. Fire hydrants with damaged operating nuts shall not be accepted.
10. New fire hydrants, not yet in service, shall be bagged or tagged with appropriate "out of service" materials. All hydrant openings shall be capped, except when hydrant is being worked on.

L. Air Valve Vaults

1. Construct the vault or manhole as detailed on the Drawings.
2. The frame and cover or floor door shall be cast into the top slab or cone. The floor door drain shall be piped to vault exterior.
3. Vaults and manholes shall be constructed such that their walls are plumb.

- M. Electronic markers will be provided for all water mains. Electronic markers shall be installed every 100 linear feet and as needed to establish a change in direction. Contractor shall program markers at the time of installation according to the information template specified by the County. Markers shall be programmed prior to installation, shall be locked to prevent further programming, and shall be buried 2.5 feet below finished grade, but no more than 4 feet below finished grade. The County shall verify programming and location of all electronic markers, and if

placement and/or programmed information is not satisfactory, Contractor shall be responsible for replacing and re-installing the marker.

3.06 Connections to Water Mains

- A. Make connections to existing pipe lines with tapping sleeves and valves, unless specifically shown otherwise on the Drawings.
- B. Tapping Sleeves
 - 1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted.
 - 2. Prior to attaching the sleeve, the pipe shall be thoroughly cleaned, utilizing a brush and rag, as required.
 - 3. Before performing field machine cut, the water tightness of the sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with water. An air compressor shall be attached, which will induce a test pressure of 250 psi. No leakage shall be permitted for a period of five minutes.
 - 4. After attaching the sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall be swabbed or sprayed with a one percent hypochlorite solution.
- C. Connections Using Solid Sleeves: Where connections are shown on the Drawings using solid sleeves, the Contractor shall furnish materials and labor necessary to make the connection to the existing pipe line.
- D. Connections Using Couplings: Where connections are shown on the Drawings using couplings, the Contractor shall furnish materials and labor necessary to make the connection to the existing pipe line, including all necessary cutting, plugging and backfill.
- E. Valve Operation: Existing valves may be operated by County personnel or with the specific authorization and/or direct supervision of the County. The only exception is an emergency situation affecting public health or safety. Any Contractor found violating this provision may be subject to prosecution under the Code of Fulton County for tampering with County property. When the Contractor requires existing valves to be operated in order to perform the work, the Contractor shall request such services from the Department of Public Works at least eight working days in advance.
- F. System Shutdowns and Interruption of Services
 - 1. Shutdowns shall be coordinated directly through the County. The Contractor shall notify the Engineer in writing at least eight working days in advance when scheduling the work. When more than eight working days notice is deemed necessary by the County, the length of such notice shall be as shown on the Drawings. Scheduling of shutdowns shall be approved at the discretion of the County. The County reserves the right

- to cancel the shutdown if conditions warrant (i.e. heavy rain, main break, etc.).
2. Contractor will provide "Water Line Maintenance" signs as directed by the County. Signs will be as specified in Figure 1 at the end of this Section.
 3. The County does not at any time guarantee the Contractor a 100 percent complete shutdown or dry shut. Dewatering shall be the responsibility of the Contractor.
 4. Shutdowns will be permitted Monday through Thursday, exclusive of County holidays. The Contractor shall perform connections to existing mains requiring shutdowns at night. Unless otherwise specified by the County, the hours of the shutdown shall be limited from 12:00 midnight to 6:00 A.M. In business districts and other areas of high water usage, circumstances may dictate limiting the hours of shutdown from 2:00 A.M. to 6:00 A.M. The excavation for the work shall be completed no later than 3:30 P.M. on the day prior to the shutdown to allow for inspection by the County.
 5. The materials to be installed and the tools to be used shall be assembled and ready for inspection no later than 3:30 P.M. on the day prior to the shutdown. The inside of all water system pipe and fittings to be installed shall be cleaned and swabbed with a chlorine solution of 50 mg/L, and ends of lines shall be capped until the time of installation. All visible dirt and foreign materials shall be removed from the interior of the pipe and fittings. Immediately prior to installation of the assembly, the pipe and fittings shall again be swabbed with 50 mg/L chlorine solution. The Contractor shall review in detail his plan of operation with the Engineer at the time the excavated pipe work is inspected for readiness.
 6. Excavation around the existing pipe shall be sufficient to allow the work to be performed without requiring additional excavation during the connection. Excavation shall be of sufficient depth to accommodate a minimum of 8-inches uniform depth of #57 stone which shall be placed by the Contractor over the entire bottom of the excavation. In addition, there shall be a minimum of 12-inches clearance between the bottom of the pipe and the top of the #57 stone.
 7. The Contractor shall clean and mark the locations on the existing pipe where the pipe cuts are to be made by 3:30 P.M. on the day prior to the shutdown. The Contractor shall measure the outside diameter of the pipe to be cut-in to be sure the proposed pipe and fittings are compatible with the existing pipe to be cut. All measurements shall be double-checked in the presence of the Engineer just prior to cutting the existing pipe.
 8. The Contractor shall have sufficient crews and equipment on hand to perform the work for each connection. All equipment to be used during the work, including, but not limited to, pump, backup pump, backhoe, at least two pipe saws, fuel, tools, generators, light towers, tanker truck, etc., shall be test run and determined to be in proper running order prior

to cutting of the existing pipe. If the Contractor fails to provide adequate equipment in proper running order, the Engineer has the option to cancel the work, and the Contractor shall request rescheduling when the deficiencies have been corrected.

9. The Contractor shall have available at the site of the work two full circle stainless steel repair clamps and two ductile iron mechanical joint plugs or caps as necessary for each size of pipe to be cut. If plugs or caps are used, appropriate thrust restraint shall be provided by the Contractor.
 10. After an existing main has been taken out of service for the work, the Contractor shall make continuous progress toward restoring the water main to full service. The Contractor shall maintain sufficient crews, equipment, and supplies and shall not leave the work site until the water main work has been completed and restored to complete operation.
 11. Any pump discharge shall be directed in such a manner as to ensure drainage away from the excavation to prevent flooding of streets or private property.
 12. Hydrant service signs shall be placed by the Contractor on existing hydrants temporarily taken out of service as directed by the Engineer. Such signs shall remain in place until removal is approved by the Engineer.
- G. The Contractor shall be responsible for any additional expense incurred by the Owner from his failure to comply with the aforementioned requirements. The Contractor shall anticipate the additional expense in performing the work at night and under partial shutdown conditions. No claims for additional compensation shall be made by the Contractor for performing these operations outside normal working hours and complete shutdown conditions.

3.07 Thrust Restraint

- A. Provide restraint at all points where hydraulic thrust may develop.
- B. Retainer Glands: Provide retainer glands where shown on the Drawings. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the set screws. The Contractor shall furnish a torque wrench to verify the torque on all set screws which do not have inherent torque indicators.
- C. Hydrants: Hydrants shall be attached to the water main by the following method:
 1. The isolation valve shall be attached to the main by connecting the valve to the hydrant tee.
 2. The isolation valve shall be attached to the hydrant by providing an anchor coupling between the valve and hydrant, if the hydrant and valve are less than two feet apart. Otherwise, provide ductile iron pipe with retainer glands on the hydrant and valve.
- D. Thrust Collars: Collars shall be constructed as shown on the Drawings. Concrete and reinforcing steel shall meet the requirements as specified in this

Section. The split gland mega lug or welded on collar shall be designed to meet the minimum allowable load shown on the Drawings. The welded-on collar shall be attached to the pipe by the pipe manufacturer.

E. Concrete Blocking

1. Provide concrete blocking for all bends, tees, valves, and other points where thrust may develop, except where other exclusive means of thrust restraint are specifically shown on the Drawings.
2. Concrete shall be as specified in this Section.
3. Form and pour concrete blocking at fittings as shown on the Drawings and as directed by the Engineer. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation. The Contractor shall allow the concrete to set up for a minimum of 4-hours before backfilling.

F. Harnessing

1. Provide harness rods only where specifically shown on the Drawings or directed by the Engineer.
2. Harness rods shall be manufactured in accordance with ASTM A 36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling.
3. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, provide 90 degree bend eye bolts or duc-lugs.
4. Eye bolts shall be of the same diameter as specified in AWWA C111 for that pipe size. The eye shall be welded closed. Where eye bolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eye bolts shall be of the same material and coating as the harness rods.

3.08 Inspection and Testing

- A. All sections of the water main subject to internal pressure shall be pressure tested in accordance with AWWA C600. A section of main will be considered ready for testing after completion of all thrust restraint and backfilling.
- B. Each segment of water main between main valves shall be tested individually.
- C. Test Preparation
 1. The Contractor shall supply the pumps, water, temporary support or reinforcement as necessary for testing purposes, gauges and meters

- calibrated within 90 days of the test, and all the necessary apparatus and labor. The Contractor shall notify the Engineer at least 24 hours in advance of the test date and perform tests in the presence of the Engineer.
2. For water mains less than 24-inches in diameter, flush sections thoroughly at flow velocities, greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats. For water mains 24-inches in diameter and larger, the main shall be carefully swept clean, and mopped if directed by the Engineer. Partially operate valves and hydrants to allow the water to flush the seats.
 3. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipe, valves, and appurtenances will be pressure tested. Pressure test shall not commence until after thrust restraint has been installed, the line has been backfilled, and at least seven days has passed since the last concrete thrust blocking was poured.
 4. Fill pipeline slowly with water at a velocity of approximately one foot per second. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Insert corporation cocks at highpoints to expel air as main is filled with water as necessary to supplement automatic air valves. Corporation stops shall be constructed as detailed on the Drawings with a meter box.
 5. Provide a suitable pump with an accurate gauge to pump the line to the specified pressure.
 6. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed, the rated working pressure. Where necessary, provide temporary backpressure to meet the differential pressure restrictions.
 7. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.
 8. Pressure shall be applied at intervals not to exceed 2000 feet.
- D. Test Pressure: Test the pipeline at 250 psi measured at the lowest point for at least two hours. Maintain the test pressure within 5 psi of the specified test pressure for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gauge with graduation not greater than 5 psi. Any exposed pipe, fittings, valves, and joints shall be examined carefully during the test. Any damaged or defective pipe, fittings, or valves following the hydrostatic pressure test or leakage test shall be repaired in a manner approved by the Engineer or replaced with sound material, and the test shall be repeated until it is satisfactory to the Engineer. Allow the system to stabilize at the test pressure before conducting the leakage test.
- E. Leakage
1. A leakage test shall be conducted concurrently with the hydrostatic pressure test. The leakage test shall be performed with a calibrated

water meter, calibrated pressure gauge, measure container, pump and water. The Contractor shall provide certification of calibration of testing devices indicating devices were calibrated within 90 days of actual tests. All equipment shall be approved by the Engineer prior to performance.

2. Leakage shall be defined as the sum of the quantity of water that must be pumped into the test section to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.
 3. The County assumes no responsibility for leakage occurring through existing valves.
- F. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:

$$L = \frac{SD(P)^{1/2}}{133,200}$$

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)

As determined under Section 4 of AWWA C600.

If the water main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. If any test of pipe laid discloses defects due to hydrostatic pressure test or leakage greater than that specified, the Contractor shall, at his own expense, locate and make repairs in a manner approved by the Engineer and perform tests again until results are within allowable limits. All visible leaks shall be repaired regardless of leakage test results.

- G. Completion: After a pipeline section has been accepted, relieve test pressure. Record type, size and location of all outlets on record drawings.

3.09 Disinfecting Pipeline

- A. After successfully pressure testing each pipeline section, disinfect in accordance with AWWA C651 for the continuous-feed method and these Specifications.
- B. Specialty Contractor: Disinfection shall be performed by an approved specialty contractor. Before disinfection is performed, the Contractor shall submit a written procedure for approval before being permitted to proceed with the disinfection. This plan shall also include the steps to be taken for the neutralization of the chlorinated water.
- C. Chlorination
 1. Apply chlorine solution to achieve a concentration of at least 25 milligrams per liter free chlorine in new line. Retain chlorinated water for 24 hours. Water shall be supplied from a temporary source protected by

- appropriate backflow prevention devices. Backflow preventer must be approved by the County prior to connection. Chlorine shall be injected no more than ten feet from the beginning of the new main.
2. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the 24 hour period.
 3. After 24 hours, all samples of water shall contain at least 10 milligrams per liter free chlorine. Re-chlorinate if required results are not obtained on all samples.
- D. Disposal of Chlorinated Water: Reduce chlorine residual of disinfection water to less than one milligram per liter if discharged directly to a body of water or to less than two milligrams per liter if discharged onto the ground prior to disposal. Treat water with sulfur dioxide or other reducing chemicals to neutralize chlorine residual. Flush all lines until residual is equal to existing system.
- E. Bacteriological Testing: After final flushing and before the water main is placed in service, the Contractor shall collect samples from the line and have tested for bacteriological quality in accordance with the rules of the Georgia Department of Natural Resources, Environmental Protection Division. One set of samples shall be collected from every 1,200 feet of water main, plus one set from each end of main and one set from each branch. Testing shall be performed by the County's water laboratory. Re-chlorinate lines until required results are obtained.

3.10 Protection and Restoration of Work Area

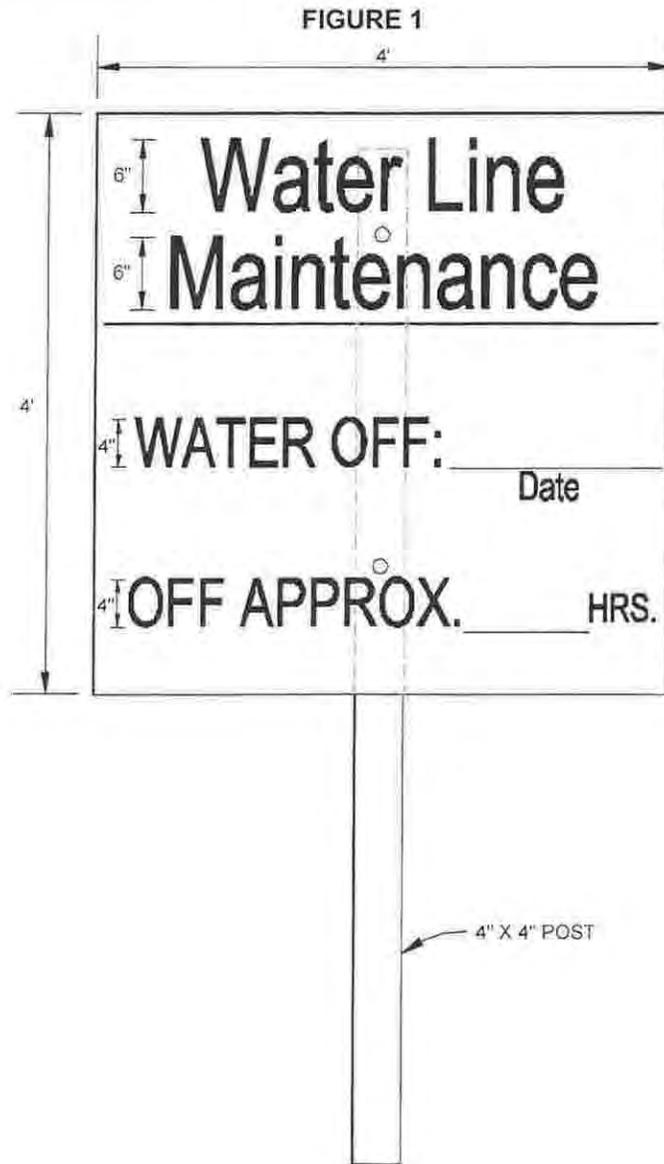
- A. General: Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is started.
1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.
 2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.
 3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.
 4. The Department of Transportation's engineer shall be authorized to stop all work by the Contractor when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.

- B. Man-Made Improvements: Protect, or remove and replace with the Engineer's approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins and other improvements that may be encountered in the Work.
- C. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by the Engineer. Any such trees or shrubbery which must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
- D. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. Repair any damaged tree over 3-inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the Contractor. No stumps, wood piles, or trash piles will be permitted on the work site.
- E. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate county, state and federal regulatory agencies.
- F. Swamps and Other Wetlands
 - 1. The Contractor shall not construct permanent roadbeds, berms, drainage structures or any other structures which alter the original topographic features within the easement.
 - 2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding swamp or wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the Contractor.
 - 3. The Contractor shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland or stream which may be temporarily divided by construction.
 - 4. The Contractor shall not spread, discharge or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent swamps or wetlands.

3.11 Abandoning Existing Water Mains

- A. General: Abandon in place all existing water main segments indicated on the Drawings to be abandoned. Perform abandonment after the new water main has been placed in service and all water main services have been changed over to the new main. Salvage for the County, existing fire hydrants, valve boxes, valve markers, and other materials indicated on the Drawings or located on water mains abandoned.

- B. Capping and Plugging
1. Where existing water mains are proposed for abandonment and where portions of the water distribution system must be shut down, the Contractor will only be permitted to perform cut and plug operations on Monday through Thursday between the hours of 12:00 midnight and 6:00 A.M. Furthermore, the County does not guarantee a complete shutdown of the distribution system should a shutdown be necessary. The Contractor shall anticipate cut and plug operations having to be carried out with the system under partial pressure and provide additional equipment as necessary for such an operation at no additional cost to the County.
 2. Disconnect by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is shown on the Drawings or directed by the Engineer. Provide a watertight pipe cap or plug and concrete blocking for restraint to seal off existing mains indicated to remain in service. Seal ends of existing mains to be abandoned with a pipe cap or plug or with a masonry plug and minimum 6-inch cover of concrete on all sides around the end of the pipe. The Contractor shall be responsible for uncovering and verifying the size and material of the existing main to be capped or plugged.
- C. Salvaging Materials: Salvage existing fire hydrants, valve boxes, valve markers and other materials as indicated on the Drawings and deliver salvaged items in good condition to the County's storage yard. Coordinate delivery and placement of salvaged materials in advance with the County.
- D. Blow-Off Piping: Remove existing blow-off piping, located on segments of water mains to be abandoned, to a minimum of two feet below finished grade. Seal the end of remaining piping as specified above in paragraph B. Blow-off piping removed becomes the property of the Contractor.
- E. Pavement Removal and Replacement: Perform any necessary pavement removal and replacement in accordance with the details on the Drawings and Section 02575 of these Specifications.



WATER LINE
MAINTENANCE
SIGN

END OF SECTION

Part 1 General

1.01 Scope

The work to be performed under this Section shall consist of removing and replacing existing pavement, sidewalks and curbs in paved areas where necessary for construction of sewers, manholes and all other sewer appurtenances and structures.

1.02 Submittals

- A. Certificates: Provide certificates stating that materials supplied comply with Specifications. Certificates shall be signed by the asphalt producer and the Contractor.
- B. Traffic paint manufacturer's application instructions and a description and other data relative to the Contractor's application equipment and methods shall be submitted to the Engineer for approval.

1.03 Conditions

- A. Weather Limitations
 - 1. Apply bituminous prime and tack coats only when the ambient temperature has been at least 55 degrees F for 12 hours immediately prior to application.
 - 2. Do not conduct paving operations when surface is wet or contains excess of moisture which would prevent uniform distribution and required penetration.
 - 3. Construct asphaltic courses only when atmospheric temperature in the shade is above 40 degrees F, when the underlying base is dry and when weather is not rainy.
 - 4. Place base course when air temperature is above 35 degrees F and rising.
- B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations.

Part 2 Products

2.01 Materials and Construction

- A. Graded Aggregate Base Course: Graded aggregate base course shall be of uniform quality throughout and shall meet the requirements of Section 815.01 of the Georgia Department of Transportation Standard Specifications.
- B. Black Base: Black base course shall be of uniform quality throughout and shall conform to the requirements of Section 828 of the Georgia Department of Transportation Standard Specifications.

- C. Binder Course: The binder course of all paved roadways shall conform to the requirements of Section 400, Type "B" of the Georgia Department of Transportation Standard Specifications.
- D. Surface Course: The surface course for all pavement, including prime or tack coat when required by the Engineer, shall conform to the requirements of Section 400, Type "E" of the Georgia Department of Transportation Standard Specifications.
- E. Concrete: Provide concrete and reinforcing for concrete pavement or base courses in accordance with the requirements of the Georgia Department of Transportation Standard Specifications, Section 430. Concrete shall be of the strength classifications shown on the Drawings.
- F. Special Surfaces: Where driveways or roadways are disturbed or damaged which are constructed of specialty type surfaces, e.g., brick or stone, these driveways and roadways shall be restored utilizing similar, if not original, materials. Where the nature of these surfaces dictate, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

2.02 Types of Pavements

- A. General: All existing pavement removed, destroyed or damaged by construction shall be replaced with the same type and thickness of pavement as that existing prior to construction, unless otherwise directed by the Engineer. Materials, equipment and construction methods used for paving work shall conform to the Georgia Department of Transportation specifications applicable to the particular type required for replacement, repair or new pavements.
- B. Aggregate Base: Aggregate base shall be constructed in accordance with the requirements of Section 310 of the Georgia Department of Transportation Standard Specifications. The maximum thickness to be laid in a single course shall be 6-inches compacted. If the design thickness of the base is more than 6-inches, it shall be constructed in two or more courses of approximate equal thickness. After the material placed has been shaped to line, grade and cross-section, it shall be rolled until the course has been uniformly compacted to at least 100 percent of the maximum dry density when Group 2 aggregate is used, or to at least 98 percent of maximum dry density when Group 1 aggregate is used.
- C. Concrete Pavement: Concrete pavement or base courses shall be replaced with concrete. The surface finish of the replaced concrete pavement shall conform to that of the existing pavement. The surface of the replaced concrete base course shall be left rough. The slab depth shall be equivalent to the existing concrete pavement or base course, but in no case less than 6-inches thick. Transverse and longitudinal joints removed from concrete pavement shall be replaced at the same locations and to the same types and dimensions as those removed. Concrete pavements or concrete base courses shall be reinforced.
- D. Asphaltic Concrete Base, Binder and Surface Course: Asphaltic concrete base, binder and surface course construction shall conform to Georgia Department of

Transportation Standard Specifications, Section 400. The pavement mixture shall not be spread until the designated surface has been previously cleaned and prepared, is intact, firm, properly cured, dry and the tack coat has been applied. Apply and compact the base in maximum layer thickness by asphalt spreader equipment of design and operation approved by the Engineer. After compaction, the black base shall be smooth and true to established profiles and sections. Apply and compact [binder and] the surface course in a manner approved by the Engineer. Immediately correct any high, low or defective areas by cutting out the course, replacing with fresh hot mix, and immediately compacting to conform and thoroughly bond to the surrounding area.

- E. Surface Treatment Pavement: Bituminous penetration surface treatment pavement shall be replaced with a minimum thickness of 1-inch conforming to Section 424, Georgia Department of Transportation Standard Specifications.
- F. Gravel Surfaces: Existing gravel road, drive and parking area replacement shall meet the requirements of graded aggregate base course. This surfacing may be authorized by the Engineer as a temporary surface for paved streets until replacement of hard surfaced pavement is authorized.
- G. Temporary Measures: During the time period between pavement removal and complete replacement of permanent pavement, maintain highways, streets and roadways by the use of steel running plates anchored to prevent movement. The backfill above the pipe shall be compacted, as specified in Section 02225 of these Specifications, up to the existing pavement surface to provide support for the steel running plates. All pavement shall be replaced within seven calendar days of its removal.

Part 3 Execution

3.01 Locations for Pavement Replacement

Pavement shall be removed and replaced with similar type and thickness as the original pavement, for the entire length of pipe laying and up to required trench width as per details shown on drawings.

3.02 Removing Pavement

- A. General: Remove existing pavement as necessary for installing the pipe line and appurtenances.
- B. Marking: Before removing any pavement, mark the pavement neatly paralleling pipe lines and existing street lines. Space the marks the width of the trench.
- C. Breaking: Break asphalt pavement along the marks using pavement shearing equipment, jack hammers or other suitable tools. Break concrete pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.
- D. Machine Pulling: Do not pull pavement with machines until the pavement is completely broken and separated from pavement to remain.

- E. Damage to Adjacent Pavement: Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.
- F. Sidewalk: Remove and replace any sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.
- G. Curbs: Tunnel under or remove and replace any curb disturbed by construction to the nearest undisturbed joint.

3.03 Replacing Pavement

- A. Preparation of Subgrade: Upon completion of backfilling and compaction of the backfill, arrange to have the compaction tested by an independent testing laboratory approved by the Engineer. After compaction testing has been satisfactorily completed, replace all pavements, sidewalks and curbs removed.
 - 1. The existing street pavement or surface shall be removed along the lines of the work for the allowable width specified for the trench or structure. After the installation of the sewerage or water works facilities and after the backfill has been compacted suitably, the additional width of pavement to be removed, as shown on the Drawings, shall be done immediately prior to replacing the pavement.
 - 2. Trench backfill shall be compacted for the full depth of the trench as specified in Section 02225 of these Specifications.
 - 3. Temporary trench backfill along streets and driveways shall include 6-inches of crushed stone or cherty clay as a temporary surfacing of the trenches. This temporary surface shall be maintained carefully at grade and dust-free by the Contractor until the backfill of the trench has thoroughly compacted in the opinion of the Engineer and permission is granted to replace the street pavement.
 - 4. When temporary crushed stone or chert surface is considered by the Engineer to be sufficient surface for gravel pavement, the surface shall be graded smooth and to an elevation that will make the final permanent surfacing level with the adjacent surfacing that was undisturbed.
- B. Pavement Replacement
 - 1. Prior to replacing pavement, make a final cut in concrete pavement 12-inches back from the edge of the damaged pavement with a concrete saw. Remove asphalt pavement 12-inches back from the edge of the damaged pavement using pavement shearing equipment, jack hammers or other suitable tools.
 - 2. Replace all street and roadway pavement as shown on the Drawings. Replace driveways, sidewalks and curbs with the same material, to nearest existing undisturbed construction joint and to the same dimensions as those existing.

3. If the temporary crushed stone or chert surface is to be replaced, the top 6-inches shall be removed and the crushed stone surfacing for unpaved streets or the base for the bituminous surface shall be placed.
 4. Following this preparation, the chert or crushed stone base shall be primed with a suitable bituminous material and surfaced with the proper type of bituminous surface treatment.
 5. Where the paved surface is to be replaced with asphaltic concrete pavement, concrete pavement or with a concrete base and a surface course, the temporary chert or crushed stone surface and any necessary backfill material, additional existing paving and new excavation shall be removed to the depth and width shown on the Drawings. All edges of the existing pavement shall be cut to a straight, vertical edge. Care shall be used to get a smooth joint between the old and new pavement and to produce an even surface on the completed street. Concrete base slabs and crushed stone bases, if required, shall be placed and allowed to cure for three days before bituminous concrete surface courses are applied. Expansion joints, where applicable, shall be replaced in a manner equal to the original joint.
 6. Where driveways or roadways, constructed of specialty type surfaces, e.g., brick or stone are disturbed or damaged, these driveways and roadways shall be restored utilizing similar materials. Where the nature of these surfaces dictate, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.
- C. Pavement Resurfacing: Certain areas to be resurfaced are specified or noted on the Drawings. After all pipe line installations are complete and existing pavement has been removed and the trench route has been repaired, mill entire area to be resurfaced 1-1/2 inches, then apply tack coat and 1-1/2 inches of Type E surface course as specified.. Where pavement to be resurfaced has been damaged with potholes, the Contractor shall remove all existing loose pavement material and fill the hole with black base, as specified, to the level of the existing pavement.
- D. Pavement Striping: Pavement striping removed or paved over shall be replaced with the same type, dimension and material as original unless directed otherwise by the Engineer.

3.04 Sidewalk and Curb Replacement

- A. Construction
1. All concrete sidewalks and curbs shall be replaced with concrete.
 2. Prefomed joints shall be 1/2-inch thick, conforming to the latest edition of AASHTO M59 for sidewalks and AASHTO M 123 for curbs.
 3. Forms for sidewalks shall be of wood or metal, shall be straight and free from warp, and shall be of sufficient strength, when in place, to hold the concrete true to line and grade without springing or distorting.

4. Forms for curbs shall be metal and of an approved section. They shall be straight and free from distortions, showing no vertical variation greater than 1/8-inch in 10 feet and no lateral variation greater than 1/4-inch in 10 feet from the true plain surface on the vertical face of the form. Forms shall be of the full depth of the structure and constructed such to permit the inside forms to be securely fastened to the outside forms.
 5. Securely hold forms in place true to the lines and grades indicated on the Drawings.
 6. Wood forms may be used on sharp turns and for special sections, as approved by the Engineer. Where wooden forms are used, they shall be free from warp and shall be the nominal depth of the structure.
 7. All mortar and dirt shall be removed from forms and all forms shall be thoroughly oiled or wetted before any concrete is deposited.
- B. When a section is removed, the existing sidewalk or curb shall be cut to a neat line, perpendicular to both the centerline and the surface of the concrete slab. Existing concrete shall be cut along the nearest existing construction joints; if such joints do not exist, the cut shall be made at minimum distances shown on the Drawings.
- C. Existing concrete sidewalks and curbs that have been cut and removed for construction purposes shall be replaced with the same width and surface as the portion removed. Sidewalks shall have a minimum uniform thickness of 4-inches. The new work shall be neatly jointed to the existing concrete so that the surface of the new work shall form an even, unbroken plane with the existing surfaces.
- D. The subgrade shall be formed by excavating to a depth equal to the thickness of the concrete, plus 2-inches. Subgrade shall be of such width as to permit the proper installation and bracing of the forms. Subgrades shall be compacted by hand tamping or rolling. Soft, yielding or unstable material shall be removed and backfilled with satisfactory material. Place 2-inches of porous crushed stone under all sidewalks and curbs and compacted thoroughly, then finish to a smooth, unyielding surface at proper line, grade and cross section.
- E. Joint for Curbs
1. Joints shall be constructed as indicated on the Drawings and as specified. Construct joints true to line with their faces perpendicular to the surface of the structure and within 1/4-inch of their designated position.
 2. Thoroughly spade and compact the concrete at the faces of all joints filling all voids.
 3. Install expansion joint materials at the point of curve at all street returns. Install expansion joint material behind the curb at abutment to sidewalks and adjacent structures.
 4. Place contraction joints every 10 feet along the length of the curbs and gutters. Form contraction joints using steel templates or division plates

which conform to the cross section of the structure. Leave the templates in place until the concrete has set sufficiently to hold its shape, but remove them while the forms are still in place. Contraction joint templates or plates shall not extend below the top of the steel reinforcement or they shall be notched to permit the reinforcement to be continuous through the joint. Contraction joints shall be a minimum of 1-1/2-inches deep.

- F. Expansion joints shall be required to replace any removed expansion joints or in new construction wherever shown on the Drawings. Expansion joints shall be true and even, shall present a satisfactory appearance, and shall extend to within 1/2-inch of the top of finished concrete surface.
- G. Finishing
 - 1. Strike off the surface with a template and finish the surface with a wood float using heavy pressure, after which, contraction joints shall be made and the surface finished with a wood float or steel trowel.
 - 2. Finish the face of the curbs at the top and bottom with an approved finishing tool of the radius indicated on the Drawings.
 - 3. Finish edges with an approved finishing tool having a 1/4-inch radius.
 - 4. Provide a final broom finish by lightly combing with a stiff broom after troweling is complete.
 - 5. The finished surface shall not vary more than 1/8-inch in 10 feet from the established grade.
- H. Driveway and Sidewalk Ramp Openings
 - 1. Provide driveway openings of the widths and at the locations indicated on the Drawings and as directed by the Engineer.
 - 2. Provide sidewalk ramp openings as indicated on the Drawings, in conformance with the applicable regulations and as directed by the Engineer.
- I. Concrete shall be suitably protected from freezing and excessive heat. It shall be kept covered with burlap or other suitable material and kept wet until cured. Provide necessary barricades to protect the work. All damage caused by people, vehicles, animals, rain, the Contractor's operations and the like shall be repaired by the Contractor, at no additional expense to the Owner.

3.05 Maintenance

The Contractor shall maintain the surfaces of roadways built and pavements replaced until the acceptance of the Project. Maintenance shall include replacement, scraping, reshaping, wetting and rerolling as necessary to prevent raveling of the road material, the preservation of reasonably smooth surfaces and the repair of damaged or unsatisfactory surfaces, to the satisfaction of the

Engineer. Maintenance shall include sprinkling as may be necessary to abate dust from the gravel surfaces.

3.06 Supervision and Approval

- A. Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. Obtain agency approval of pavement restorations before requesting final payment.
- B. Obtain the Engineer's approval of restoration of pavement, such as private roads and drives, that are not the responsibility of a regulatory agency.
- C. Complete pavement restoration as soon as possible after backfilling.
- D. Failure of Pavement: Should any pavement restoration or repairs fail or settle during the life of the Contract, including the bonded period, promptly restore or repair defects.

3.07 Cleaning

The Contractor shall remove all surplus excavation materials and debris from the street surfaces and rights-of-way and shall restore street, roadway or sidewalk surfacing to its original condition.

END OF SECTION

Part 1 General

1.01 Scope

- A. The extent of pavement patching consists of the repair of all pavement removed or damaged in the course of constructing the Project.
- B. Pavement patching includes repair of paved roads, streets, highways, walkways, driveways, patios, slabs on grade, and parking lots together with walls, curbing, gutters and headers, and other pavements and appurtenances. Pavement referred to under this Section, refers to asphaltic, cementious, brick, cobble or other large stone pavement materials together with underlying construction, irrespective of its composition.

1.02 Job Conditions

- A. Traffic Control: Schedule and conduct Work in a manner which will minimize inconvenience to vehicular and pedestrian traffic. Provide flaggers, barricades, warning signs, warning lights, and other warning means as appropriate.
- B. Weather Limitations: Conduct all operations during weather conditions appropriate to the Work being performed.
- C. Grade Control: Establish and maintain lines and elevations which will assure finished pavement patch having desirable appearance, function and strength.

1.03 Submittals

Submit detailed material descriptions when requested by the Engineer.

Part 2 Products

2.01 Materials

- A. General: For products not described below, use materials and gradations which have locally exhibited a satisfactory record of previous usage, and which for finished visible surfaces will permit obtaining appearance, color and texture reasonably matching remaining adjacent pavement of the same type.
- B. Asphalt Concrete: Bituminous plant mixture of asphalt cement and aggregates complying with Type E or F hot plant mix of Section 828 of the Georgia Department of Transportation "Standard Specifications for Road and Bridge Constructions".
- C. Graded Aggregate Base: Uniform graded aggregate material complying with Section 815 of the Georgia Department of Transportation "Standard Specifications for Road and Bridge Construction".
- D. Bituminous Prime: Cutback asphalt complying with Section 821 of the Georgia Department of Transportation "Standard Specifications for Road and Bridge Construction".
- E. Bituminous Tack Coat: Asphalt material complying with Section 413, topics 413.01 through 413.04 of the Georgia Department of Transportation "Standard Specifications for Road and Bridge Construction".

- F. Portland Cement Concrete: Concrete mix of Portland cement, aggregates, water, and air entraining admixture to produce the following properties: 3500 psi minimum compressive strength at 28 days per ASTM C39, 4 inches maximum slump per ASTM C143, and air content between 3% and 6%.
- G. Cold Mix: Uniform bituminous mixture of aggregate, asphaltic material and, if it is required, mineral filler complying with Type E or F cold mix of Section 401 of the Georgia Department of Transportation "Standard Specifications for Road and Bridge Construction".

Part 3 Execution

3.01 Pavement Cuts

Saw cut trench edges in paved areas to neat, straight lines before starting to break the pavement slab. Completely backfill the open half before opening the other half of pavement.

3.02 Backfill Placement

Place trench backfill materials in layers not more than six inches compacted thickness. Commence backfill immediately after utility is installed. Complete new replacement base construction immediately after trench backfill.

3.03 Inspection

Examine areas and conditions under which pavement patching will be conducted, giving special attention to stability of subbase. Do not proceed with pavement patching work until unsatisfactory conditions have been corrected.

3.04 Preparation

Saw cut any ragged edges of existing pavement, or in the case of concrete work, remove existing pavement to nearest joint. Remove all loose material from underlying and adjacent surfaces.

3.05 Strength and Stability

Use materials and construction techniques as necessary to obtain strength, stability and durability of pavement patch at least equal to that of remaining adjacent pavement of the same type. As a minimum, conform with pavement patch details, if any, required elsewhere by the Contract Documents; and where such details are not provided, accomplish pavement patching utilizing strengths, thicknesses, etc. not less than that of remaining adjacent pavement of the same type.

3.06 Placing

- A. Construct pavement using methods and equipment in general use for the type of work being performed.
- B. Immediately after new base construction, cover pavement cut with steel plates or similar devices of sufficient thickness to span the cut without noticeable deflection. Maintain plates in place for not less than 24 hours and not more than 7 days and until the concrete base (if used) has gained sufficient strength to withstand traffic loads. Traffic may resume after installation of metal plates.

- C. Upon removal of the metal plates or similar devices, provide new pavement surface in accordance with one of the following options:
1. Immediately apply new permanent pavement surface materials indicated or
 2. Immediately apply bituminous cold mixture over bond breaker paper over new base. Monitor performance and repair or replace materials regularly to maintain smooth traffic surface until placement of permanent pavement surface materials. At Contractor's time selection prior to substantial completion, remove cold mix and bond breaker paper and provide new permanent pavement surface materials. If performance or maintenance of cold mix patch is unsatisfactory in the opinion of the Owner or Engineer, remove materials and provide new permanent pavement surface materials within 72 hours of notice by the Owner or Engineer.
- D. Traffic control devices in lieu of cover plates are permitted for pavement patching longitudinal to the street centerline in excess of 20 feet. Use traffic barricades, warning signs and lights, flagmen, and other means as appropriate to continuously control traffic 24 hours per day. Use devices such that at least 12 feet wide, one-way through traffic access is provided at all times. Upon removal of traffic control devices, install permanent pavement surface.
- E. Contractor assumes all responsibility for maintaining repairing and or replacing concrete base that may be damaged during curing period.
- F. For existing surface of Portland cement concrete, furnish new Portland cement concrete structure thickness, including base and pavement surface, of not less than eight inches; except for driveways and sidewalks which shall be not less than four inches thick.
- G. Provide not less than eight inches thickness of new graded aggregate base for replacement of asphalt concrete pavement at driveways, sidewalks and parking lots.
- H. For repair of asphalt concrete pavement, clean base and adjacent surfaces and apply bituminous tack coat or bituminous prime (as appropriate) to such surfaces before placing new asphalt concrete surface.

3.07 Finish

- A. Accomplish pavement patching using materials and techniques which result in visible, finished surfaces having appearance, color, and texture reasonably matching remaining adjacent pavement of the same type. Do not permit the finished surface to have dips, objectionable roughness or discontinuity or non-draining areas. Do not create any unsafe pavement condition.

3.08 Repairs

- A. If pavement patch or adjacent pavement settles or shows evidence of other distress resulting from the Work, cut pavement out, repair subgrade, and reconstruct patch. Do not place additional pavement material on top of unsatisfactory previously repaired surfaces. At expense of Contractor, repair any pavement which he damages beyond that minimum amount necessary to construct the Work.

END OF SECTION

Part 1 General**1.01 Scope**

- A. The work covered by this Section includes furnishing all labor, materials and equipment required to bore and jack casings and to properly complete pipeline construction as described herein and/or shown on the Drawings.
- B. Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI) or other recognized standards. Latest revisions of all standards are applicable. If requested by the Engineer, submit evidence that manufacturer has consistently produced products of satisfactory quality and performance over a period of at least two years.

1.02 Submittals

- A. Submit shop drawings, product data, and experience in accordance with the requirements of Section 01340 of these Specifications.
- B. Material Submittals: The Contractor shall provide shop drawings and other pertinent specifications and product data as follows:
 - 1. Shop drawings for casing pipe showing sizes and connection details.
 - 2. Design mixes for concrete and grout.
 - 3. Casing Spacers.
- C. Experience Submittals
 - 1. Boring and jacking casings is deemed to be specialty contractor work. If the Contractor elects to perform the work, the Contractor shall provide evidence as required by the General Conditions. A minimum of five continuous years of experience in steel casing construction is required of the casing installer. Evidence of this experience must be provided with the shop drawings for review by the Engineer.

1.03 Storage and Protection

All materials shall be stored and protected in accordance with the manufacturer's recommendations and as approved by the Engineer.

Part 2 Products**2.01 Materials and Construction**

- A. Casing
 - 1. The casing shall be new and unused pipe. The casing shall be made from steel plate having a minimum yield strength of 35,000 psi. The steel plate shall also meet the chemical requirements of one of the following: ASTM A36; ASTM A139, Grade B, C, D or E; ASTM A53, Type S or Type E, Grade A or B.

2. The outside and inside of the casing pipe shall be coated with coal tar epoxy having a minimum dry film thickness of 16 mils. Surface preparation shall be SSPC-SP-10. Epoxy shall have a minimum solids content of 65 percent by volume and shall be air or airless spray applied; minimum drying time shall be seven days. Brushing shall be permitted in small areas only. All coating and recoating shall be done in strict accordance with the manufacturer's recommendations. Epoxy shall be Tnemec, Carboline or Valspar.
3. The thicknesses of casing shown in paragraph B. below are minimum thicknesses. Actual thicknesses shall be determined by the casing installer, based on an evaluation of the required forces to be exerted on the casing when jacking. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to the Owner.
4. The diameters of casing shown in paragraph B. below and shown on the Drawings are minimum. Larger casings, with the Engineer's approval, may be provided at no additional cost to the Owner, for whatever reasons the Contractor may decide, whether casing size availability, line and grade tolerances, soil conditions, etc.

B. Casing Sizes

UNDER ROADWAYS		
Pipe Diameter, inches	Casing Diameter, inches	Wall Thickness, inches
6	12	0.250
8	16	0.250
10	16	0.250
12	18	0.250
14	22	0.250
16	24	0.250
18	30	0.312
20	30	0.312
24	36	0.375

C. Casing Spacers: Casing spacers shall meet one of the following requirements:

1. Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch thick also having a hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The

- height of the runners and risers shall be manufactured such that the pipe does not float within the casing.
2. Casing spacers shall be a two-section, flanged, bolt on style constructed of heat fused PVC coated steel, minimum 14 gauge band and 10 gauge risers, with 2-inch wide glass reinforced polyester insulating skids, heavy duty PVC inner liner, minimum 0.09-inch thick having a hardness of 85-90 durometer, and all stainless steel or cadmium plated hardware.
 3. Casing spacers shall be equal to Cascade Waterworks Manufacturing Company, Pipeline Seal and Insulator, Inc., or Advance Products and Systems, Inc.
- D. Grout: Grout may be used for filling the void between the casing pipe and the carrier pipe. Cement shall conform to ASTM C 150, Type I or Type II. Grout shall have a minimum compressive strength of 100 psi attained within 24 hours.
- E. Carrier Pipe: Carrier pipes shall meet requirements as specified in Section 02665 of these Specifications.
- F. Surface Settlement Markers: Surface settlement markers within pavement areas shall be P.K. nails. Surface settlement markers within non-paved areas shall be wooden hubs.

2.02 Equipment

- A. A cutting head shall be attached to a continuous auger mounted inside the casing pipe.

Part 3 Execution

3.01 General

- A. Interpretation of soil investigation reports and data, investigating the site and determination of the site soil conditions prior to bidding is the sole responsibility of the Contractor. Any subsurface investigation by the Bidder or Contractor must be approved by the appropriate authority having jurisdiction over the site. Rock and/or water, if encountered, shall not entitle the Contractor to additional compensation.
- B. Casing construction shall be performed so as not to interfere with, interrupt or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The Contractor shall be responsible for all settlement resulting from casing operations and shall repair and restore damaged property to its original or better condition at no cost to the Owner.
- C. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing.
- D. Casing Design: Design of the bore pit and required bearing to resist jacking forces are the responsibility of the Contractor. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing

shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the Contractor, at no additional cost to the Owner. Due to restrictive right-of-way and construction easements, boring and jacking casing lengths less than the nominal 20 foot length may be necessary.

E. Roadway Crossings

1. The Contractor shall be held responsible and accountable for the coordinating and scheduling of all construction work within the roadway right-of-way.
2. Work along or across the roadway department rights-of-way shall be subject to inspection by such roadway department.
3. All installations shall be performed to leave free flows in drainage ditches, pipes, culverts or other surface drainage facilities of the roadway, street or its connections.
4. No excavated material or equipment shall be placed on the pavement or shoulders of the roadway without the express approval of the roadway department.
5. In no instance will the Contractor be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are placed on the right-of-way in advance of construction, shall be placed in such a manner as not to interfere with the safe operation of the roadway.
6. The Contractor shall be responsible for providing the Owner sufficient information to obtain a blasting permit in a timely manner.

3.02 Groundwater Control

- A. The Contractor shall control the groundwater throughout the construction of the casing.
- B. Methods of dewatering shall be at the option and responsibility of the Contractor. Maintain close observation to detect settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify the Engineer immediately and take such action as necessary to maintain safe conditions and prevent damage.
- C. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24 hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. Dewater into a sediment trap and comply with requirements specified in Section 02125 of these Specifications.

3.03 Safety

- A. Provide all necessary bracing, bulkheads and shields to ensure complete safety to all traffic, persons and property at all times during the work. Perform the work

in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it.

- B. Observe all applicable requirements of the regulations of the authorities having jurisdiction over this site. Conduct the operations in such a manner that all work will be performed below the level of the roadbed.
- C. Perform all activities in accordance with the Occupational Safety and Health Act of 1970 (PL-596), as amended, applicable regulations of the Federal Government, OSHA 29CFR 1926 and applicable criteria of ANSI A10.16-81, "Safety Requirements for Construction of Tunnel Shafts and Caissons".

3.04 Surface Settlement Monitoring

- A. Provide surface settlement markers, placed as specified and as directed by the Engineer. The Contractor shall place settlement markers outside of pavement area, along the centerline of the casing at 20 foot intervals and offset 10 feet each way from the centerline. Markers shall also be placed at each shoulder of the roadway, at each edge of pavement, at the centerline of the pavement and at 10 and 25 feet in each direction from the centerline of the casing. Tie settlement markers to bench marks and indices sufficiently removed as not to be affected by the casing operations.
- B. Make observations of surface settlement markers, placed as required herein, at regular time intervals acceptable to the Engineer. In the event settlement or heave on any marker exceeds 1-inch, the Contractor shall immediately cease work and using a method approved by the Engineer and the authority having jurisdiction over the project site, take immediate action to restore surface elevations to that existing prior to start of casing operations.
- C. Take readings and permanently record surface elevations prior to start of dewatering operations and/or shaft excavation. The following schedule shall be used for obtaining and recording elevation readings: all settlement markers, once a week; all settlement markers within 50 feet of the casing heading, at the beginning of each day; more frequently at the Engineer's direction if settlement is identified. Make all elevation measurements to the nearest 0.01 foot.
- D. The Contractor shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by, and at the expense of, the Contractor.
- E. Promptly report any settlement and horizontal movement immediately to the Engineer and take immediate remedial action.

3.05 Boring and Jacking

- A. Shaft
 - 1. Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.
 - 2. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever

nature due to site and soil conditions. Keep preparations dry during all operations. Perform pumping operations as necessary.

3. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base if directed by the Engineer due to soil conditions.

B. Jacking Rails and Frame

1. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.
2. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.
3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

C. Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing or wetboring.

D. Auger the hole and jack the casing through the soil simultaneously.

E. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.

F. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such as to require the use of a shield.

G. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation.

H. Any casing pipe damaged in jacking operations shall be repaired, if approved by the Engineer, or removed and replaced at Contractor's own expense.

I. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire joint circumference, in accordance with AWS recommended procedures. Prior to welding the joints, the Contractor shall ensure that both ends of the casing sections being welded are square.

J. The Contractor shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.

- K. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.
- L. Care shall be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.
- M. The Contractor shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.
- N. Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring and bracing shall be left in place, cut off or removed, as designated by the Engineer.
- O. Trench excavation, all classes and type of excavation, the removal of rock, muck, debris, the excavation of all working pits and backfill requirements of Section 02225 are included under this Section.
- P. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.
- Q. Grout backfill shall be used for unused holes or abandoned pipes.
- R. Any replacement of carrier pipe in an existing casing shall be considered a new installation, subject to the applicable requirements of these Specifications.

3.06 Free Boring

- A. Where ordered by the Engineer, the Contractor shall install the pipe by the free bore method. The allowed free bore method will be dry auger boring, without jetting, sluicing, or wet boring.
- B. The diameter of the free bore shall not exceed the pipe bell outside diameter or the pipe barrel outside diameter plus 1-inch, whichever is greater.
- C. The Contractor shall be responsible for any settlement of the surface (roadway, driveway, or otherwise) caused by the free bore construction activities.
- D. Where ordered to use the free bore method to install a segment of pipe, the Contractor may elect to install the pipe by the conventional bore and jack casing method instead.
- E. If the Contractor elects to free bore, and an acceptable installation does not result for any reason, the Contractor shall install a casing pipe by the bore and jack method at no additional cost to the Owner.
- F. The Contractor may elect to free bore other portions of the project in lieu of open cut installation. However, no additional payment for free bore will be made if the Contractor exercises this option.

3.07 Directional Drilling

- A. Where ordered by the Engineer, the Contractor shall install the pipe by directional drilling. The directional drilling construction method consists of drilling a small diameter pilot hole within the designated tolerances followed by enlargement of the hole to accommodate the ductile iron pipeline to be installed.
- B. The contractor shall provide all materials and equipment required, including but not limited to drilling equipment, water pumps, hoses, fittings, storage tanks, filters, hay bales, silt fences, drilling fluids including containment, collection, cleaning and disposal of, fuel and lubricants, bentonite and related mixing equipment, hydrostatic testing equipment and materials, sidebooms, cranes, backhoes, trucks, and other equipment or materials necessary to load and unload pipe, and to support and smoothly transition the pipe while being pulled into the reamed hole.
- C. The Contractor shall submit to the Engineer a detailed installation plan including operational sequences, details of the guidance or grade and alignment control system, and a plan and profile of the bore path. The bore path shall ensure that the pipe joints do not deflect more than 50 percent of the manufacturer's recommended maximum deflection for ductile iron pipe.
- D. The drilling operation shall be conducted in a manner to eliminate the discharge of water, drilling mud, and cuttings to areas not involved in the construction process. The Contractor shall immediately contain and clean-up any inadvertent returns. The Contractor shall also provide equipment and procedures to maximize the recirculation or reuse of drilling mud to minimize waste disposal. Proper disposal of water, drilling fluids, drilling mud, cuttings and muck is the Contractor's responsibility.
- E. Ductile iron pipe and fittings, inspection and testing shall be as specified in Section 02665.

3.08 Ventilation and Air Quality

Provide, operate and maintain for the duration of casing project a ventilation system to meet safety and OSHA requirements.

3.09 Rock Excavation

- A. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of the Engineer, cannot be removed through the casing, the Engineer may authorize the Contractor to complete the crossing by a method established in a change directive.
- B. At the Contractor's option, the Contractor may continue to install the casing and remove the rock through the casing at no additional cost to the Owner.

3.10 Installation of Pipe

- A. After construction of the casing is complete, and has been accepted by the Engineer, install the pipeline in accordance with the Drawings and Specifications.
- B. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper alignment, grade and elevation, without any sags or high spots.

- C. The carrier pipe shall be held in the casing pipe by one of the following methods:
1. The carrier pipe shall be held in the casing pipe by the use of hardwood blocks spaced radially around the pipe and secured together so that they remain firmly in place. The spacing of such blocks longitudinally in the casing pipe shall not be greater than 10 feet.
 2. The pipe shall be supported within the casing by use of casing spacers sized to limit radial movement to a maximum of 1-inch. Provide a minimum of two casing spacers per nominal length of pipe. Casing spacers shall be attached to the pipe at maximum 9 to 10 foot intervals.
- D. Fill the void between the carrier pipe and casing pipe with grout. Measures shall be taken by the Contractor to prevent floatation and other movement of the pipe as the grout is filling the void.
- E. Close the ends of the casing with 4-inch brick walls.

3.11 Sheeting Removal

Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring and bracing shall be done in such a manner as not to endanger or damage either new or existing structures, private or public properties and also to avoid cave-ins or sliding in the banks.

END OF SECTION

Part 1 General

1.01 Scope

- A. The work covered by this Section includes furnishing all labor, materials and equipment required to bore and jack casings and to properly complete pipeline construction as described herein and/or shown on the Drawings.
- B. Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI) or other recognized standards. Latest revisions of all standards are applicable. If requested by the Engineer, submit evidence that manufacturer has consistently produced products of satisfactory quality and performance over a period of at least two years.

1.02 Submittals

- A. Submit shop drawings, product data, and experience in accordance with the requirements of Section 01340 of these Specifications.
- B. Material Submittals: The Contractor shall provide shop drawings and other pertinent specifications and product data as follows:
 - 1. Shop drawings for casing pipe showing sizes and connection details.
 - 2. Design mixes for concrete and grout.
 - 3. Casing Spacers.
- C. Experience Submittals
 - 1. Boring and jacking casings is deemed to be specialty contractor work. If the Contractor elects to perform the work, the Contractor shall provide evidence as required by the General Conditions. A minimum of five continuous years of experience in steel casing construction is required of the casing installer. Evidence of this experience must be provided with the shop drawings for review by the Engineer.

1.03 Storage and Protection

All materials shall be stored and protected in accordance with the manufacturer's recommendations and as approved by the Engineer.

Part 2 Products

2.01 Materials and Construction

- A. Casing
 - 1. The casing shall be new and unused pipe. The casing shall be made from steel plate having a minimum yield strength of 35,000 psi. The steel plate shall also meet the chemical requirements of one of the following: ASTM A36; ASTM A139, Grade B, C, D or E; ASTM A53, Type S or Type E, Grade A or B.

2. The outside and inside of the casing pipe shall be coated with coal tar epoxy having a minimum dry film thickness of 16 mils. Surface preparation shall be SSPC-SP-10. Epoxy shall have a minimum solids content of 65 percent by volume and shall be air or airless spray applied; minimum drying time shall be seven days. Brushing shall be permitted in small areas only. All coating and recoating shall be done in strict accordance with the manufacturer's recommendations. Epoxy shall be Tnemec, Carboline or Valspar.
3. The thicknesses of casing shown in paragraph B. below are minimum thicknesses. Actual thicknesses shall be determined by the casing installer, based on an evaluation of the required forces to be exerted on the casing when jacking. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to the Owner.
4. The diameters of casing shown in paragraph B. below and shown on the Drawings are minimum. Larger casings, with the Engineer's approval, may be provided at no additional cost to the Owner, for whatever reasons the Contractor may decide, whether casing size availability, line and grade tolerances, soil conditions, etc.

B. Casing Sizes

UNDER ROADWAYS		
Pipe Diameter, inches	Casing Diameter, inches	Wall Thickness, inches
6	12	0.250
8	16	0.250
10	16	0.250
12	18	0.250
14	22	0.250
16	24	0.250
18	30	0.312
20	30	0.312
24	36	0.375

- C. Casing Spacers: Casing spacers shall meet one of the following requirements:
1. Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch thick also having a hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The

- height of the runners and risers shall be manufactured such that the pipe does not float within the casing.
2. Casing spacers shall be a two-section, flanged, bolt on style constructed of heat fused PVC coated steel, minimum 14 gauge band and 10 gauge risers, with 2-inch wide glass reinforced polyester insulating skirts, heavy duty PVC inner liner, minimum 0.09-inch thick having a hardness of 85-90 durometer, and all stainless steel or cadmium plated hardware.
 3. Casing spacers shall be equal to Cascade Waterworks Manufacturing Company, Pipeline Seal and Insulator, Inc., or Advance Products and Systems, Inc.
- D. Grout: Grout may be used for filling the void between the casing pipe and the carrier pipe. Cement shall conform to ASTM C 150, Type I or Type II. Grout shall have a minimum compressive strength of 100 psi attained within 24 hours.
- E. Carrier Pipe: Carrier pipes shall meet requirements as specified in Section 02665 of these Specifications.
- F. Surface Settlement Markers: Surface settlement markers within pavement areas shall be P.K. nails. Surface settlement markers within non-paved areas shall be wooden hubs.

2.02 Equipment

- A. A cutting head shall be attached to a continuous auger mounted inside the casing pipe.

Part 3 Execution

3.01 General

- A. Interpretation of soil investigation reports and data, investigating the site and determination of the site soil conditions prior to bidding is the sole responsibility of the Contractor. Any subsurface investigation by the Bidder or Contractor must be approved by the appropriate authority having jurisdiction over the site. Rock and/or water, if encountered, shall not entitle the Contractor to additional compensation.
- B. Casing construction shall be performed so as not to interfere with, interrupt or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The Contractor shall be responsible for all settlement resulting from casing operations and shall repair and restore damaged property to its original or better condition at no cost to the Owner.
- C. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing.
- D. Casing Design: Design of the bore pit and required bearing to resist jacking forces are the responsibility of the Contractor. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing

shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the Contractor, at no additional cost to the Owner. Due to restrictive right-of-way and construction easements, boring and jacking casing lengths less than the nominal 20 foot length may be necessary.

E. Roadway Crossings

1. The Contractor shall be held responsible and accountable for the coordinating and scheduling of all construction work within the roadway right-of-way.
2. Work along or across the roadway department rights-of-way shall be subject to inspection by such roadway department.
3. All installations shall be performed to leave free flows in drainage ditches, pipes, culverts or other surface drainage facilities of the roadway, street or its connections.
4. No excavated material or equipment shall be placed on the pavement or shoulders of the roadway without the express approval of the roadway department.
5. In no instance will the Contractor be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are placed on the right-of-way in advance of construction, shall be placed in such a manner as not to interfere with the safe operation of the roadway.
6. The Contractor shall be responsible for providing the Owner sufficient information to obtain a blasting permit in a timely manner.

3.02 Groundwater Control

- A. The Contractor shall control the groundwater throughout the construction of the casing.
- B. Methods of dewatering shall be at the option and responsibility of the Contractor. Maintain close observation to detect settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify the Engineer immediately and take such action as necessary to maintain safe conditions and prevent damage.
- C. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24 hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. Dewater into a sediment trap and comply with requirements specified in Section 02125 of these Specifications.

3.03 Safety

- A. Provide all necessary bracing, bulkheads and shields to ensure complete safety to all traffic, persons and property at all times during the work. Perform the work

in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it.

- B. Observe all applicable requirements of the regulations of the authorities having jurisdiction over this site. Conduct the operations in such a manner that all work will be performed below the level of the roadbed.
- C. Perform all activities in accordance with the Occupational Safety and Health Act of 1970 (PL-596), as amended, applicable regulations of the Federal Government, OSHA 29CFR 1926 and applicable criteria of ANSI A10.16-81, "Safety Requirements for Construction of Tunnel Shafts and Caissons".

3.04 Surface Settlement Monitoring

- A. Provide surface settlement markers, placed as specified and as directed by the Engineer. The Contractor shall place settlement markers outside of pavement area, along the centerline of the casing at 20 foot intervals and offset 10 feet each way from the centerline. Markers shall also be placed at each shoulder of the roadway, at each edge of pavement, at the centerline of the pavement and at 10 and 25 feet in each direction from the centerline of the casing. Tie settlement markers to bench marks and indices sufficiently removed as not to be affected by the casing operations.
- B. Make observations of surface settlement markers, placed as required herein, at regular time intervals acceptable to the Engineer. In the event settlement or heave on any marker exceeds 1-inch, the Contractor shall immediately cease work and using a method approved by the Engineer and the authority having jurisdiction over the project site, take immediate action to restore surface elevations to that existing prior to start of casing operations.
- C. Take readings and permanently record surface elevations prior to start of dewatering operations and/or shaft excavation. The following schedule shall be used for obtaining and recording elevation readings: all settlement markers, once a week; all settlement markers within 50 feet of the casing heading, at the beginning of each day; more frequently at the Engineer's direction if settlement is identified. Make all elevation measurements to the nearest 0.01 foot.
- D. The Contractor shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by, and at the expense of, the Contractor.
- E. Promptly report any settlement and horizontal movement immediately to the Engineer and take immediate remedial action.

3.05 Boring and Jacking

- A. Shaft
 - 1. Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.
 - 2. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever

nature due to site and soil conditions. Keep preparations dry during all operations. Perform pumping operations as necessary.

3. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base if directed by the Engineer due to soil conditions.

B. Jacking Rails and Frame

1. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.
2. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.
3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

- C. Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing or wetboring.
- D. Auger the hole and jack the casing through the soil simultaneously.
- E. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.
- F. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such as to require the use of a shield.
- G. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation.
- H. Any casing pipe damaged in jacking operations shall be repaired, if approved by the Engineer, or removed and replaced at Contractor's own expense.
- I. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire joint circumference, in accordance with AWS recommended procedures. Prior to welding the joints, the Contractor shall ensure that both ends of the casing sections being welded are square.
- J. The Contractor shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.

- K. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.
- L. Care shall be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.
- M. The Contractor shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.
- N. Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring and bracing shall be left in place, cut off or removed, as designated by the Engineer.
- O. Trench excavation, all classes and type of excavation, the removal of rock, muck, debris, the excavation of all working pits and backfill requirements of Section 02225 are included under this Section.
- P. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.
- Q. Grout backfill shall be used for unused holes or abandoned pipes.
- R. Any replacement of carrier pipe in an existing casing shall be considered a new installation, subject to the applicable requirements of these Specifications.

3.06 Free Boring

- A. Where ordered by the Engineer, the Contractor shall install the pipe by the free bore method. The allowed free bore method will be dry auger boring, without jetting, sluicing, or wet boring.
- B. The diameter of the free bore shall not exceed the pipe bell outside diameter or the pipe barrel outside diameter plus 1-inch, whichever is greater.
- C. The Contractor shall be responsible for any settlement of the surface (roadway, driveway, or otherwise) caused by the free bore construction activities.
- D. Where ordered to use the free bore method to install a segment of pipe, the Contractor may elect to install the pipe by the conventional bore and jack casing method instead.
- E. If the Contractor elects to free bore, and an acceptable installation does not result for any reason, the Contractor shall install a casing pipe by the bore and jack method at no additional cost to the Owner.
- F. The Contractor may elect to free bore other portions of the project in lieu of open cut installation. However, no additional payment for free bore will be made if the Contractor exercises this option.

3.07 Directional Drilling

- A. Where ordered by the Engineer, the Contractor shall install the pipe by directional drilling. The directional drilling construction method consists of drilling a small diameter pilot hole within the designated tolerances followed by enlargement of the hole to accommodate the ductile iron pipeline to be installed.
- B. The contractor shall provide all materials and equipment required, including but not limited to drilling equipment, water pumps, hoses, fittings, storage tanks, filters, hay bales, silt fences, drilling fluids including containment, collection, cleaning and disposal of, fuel and lubricants, bentonite and related mixing equipment, hydrostatic testing equipment and materials, sidebooms, cranes, backhoes, trucks, and other equipment or materials necessary to load and unload pipe, and to support and smoothly transition the pipe while being pulled into the reamed hole.
- C. The Contractor shall submit to the Engineer a detailed installation plan including operational sequences, details of the guidance or grade and alignment control system, and a plan and profile of the bore path. The bore path shall ensure that the pipe joints do not deflect more than 50 percent of the manufacturer's recommended maximum deflection for ductile iron pipe.
- D. The drilling operation shall be conducted in a manner to eliminate the discharge of water, drilling mud, and cuttings to areas not involved in the construction process. The Contractor shall immediately contain and clean-up any inadvertent returns. The Contractor shall also provide equipment and procedures to maximize the recirculation or reuse of drilling mud to minimize waste disposal. Proper disposal of water, drilling fluids, drilling mud, cuttings and muck is the Contractor's responsibility.
- E. Ductile iron pipe and fittings, inspection and testing shall be as specified in Section 02665.

3.08 Ventilation and Air Quality

Provide, operate and maintain for the duration of casing project a ventilation system to meet safety and OSHA requirements.

3.09 Rock Excavation

- A. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of the Engineer, cannot be removed through the casing, the Engineer may authorize the Contractor to complete the crossing by a method established in a change directive.
- B. At the Contractor's option, the Contractor may continue to install the casing and remove the rock through the casing at no additional cost to the Owner.

3.10 Installation of Pipe

- A. After construction of the casing is complete, and has been accepted by the Engineer, install the pipeline in accordance with the Drawings and Specifications.
- B. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper alignment, grade and elevation, without any sags or high spots.

- C. The carrier pipe shall be held in the casing pipe by one of the following methods:
 - 1. The carrier pipe shall be held in the casing pipe by the use of hardwood blocks spaced radially around the pipe and secured together so that they remain firmly in place. The spacing of such blocks longitudinally in the casing pipe shall not be greater than 10 feet.
 - 2. The pipe shall be supported within the casing by use of casing spacers sized to limit radial movement to a maximum of 1-inch. Provide a minimum of two casing spacers per nominal length of pipe. Casing spacers shall be attached to the pipe at maximum 9 to 10 foot intervals.
- D. Fill the void between the carrier pipe and casing pipe with grout. Measures shall be taken by the Contractor to prevent floatation and other movement of the pipe as the grout is filling the void.
- E. Close the ends of the casing with 4-inch brick walls.

3.11 Sheeting Removal

Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring and bracing shall be done in such a manner as not to endanger or damage either new or existing structures, private or public properties and also to avoid cave-ins or sliding in the banks.

END OF SECTION

Part 1 General**1.01 Scope**

Sodding shall consist of establishing certain critical areas with sod as designated on the Drawings.

Part 2 Products**2.01 Sod**

- A. Sod shall consist of a live, dense, well-rooted growth of turf grass species as noted on the Drawings. The sod shall be free from Johnson grass, nut grass and other obnoxious grasses and shall be of suitable character for the purpose intended and for the soil in which it is to be planted. It shall be un-injured at the time of planting.
- B. Sod shall be uniform in thickness, having not over 2-inches or less than 1-inch of soil.
- C. Sod strips shall have a consistent width of 12 or 18-inches.

2.02 Fertilizer

- A. Fertilizer (10-10-10) used in connection with sodding, shall contain 10 percent nitrogen, 10 percent phosphoric acid and 10 percent potash. The fertilizer shall be furnished in standard containers with the name, weight and guaranteed analysis of the contents clearly marked. The containers shall ensure proper protection in handling and transporting the fertilizer. All commercial fertilizer shall comply with local, state and federal fertilizer laws.
- B. Ammonium nitrate shall be a standard commercial product, shall conform to the requirements for other commercial fertilizers as specified above, and shall have a minimum of 32-1/2 percent nitrogen.

2.03 Lime

Agricultural limestone shall be dolomitic and contain not less than 85 percent of calcium carbonate and magnesium carbonate combined, and shall be crushed so that at least 85 percent will pass the No. 10 mesh sieve and 50 percent will pass a No. 40 mesh screen.

2.04 Weather Limitations

Sod shall be planted only when the soil is moist and favorable to growth. No planting shall be done between October 1 and April 1 unless weather and soil conditions are considered favorable and permission is granted by the Engineer.

Part 3 Execution**3.01 Sodding**

- A. The area to be sodded shall be constructed to the lines and grades indicated on the Drawings or as directed by the Engineer, and the surface loosened to a depth

of not less than 3-inches with a rake or other device. If necessary, it shall be sprinkled until saturated at least 1-inch in depth and kept moist until the sod is place thereon. Immediately before placing the sod, the fertilizer shall be uniformly applied at the rate of 12 pounds of Grade 10-10-10, or equivalent, per 1,000 square feet. Agricultural limestone shall be applied at the rate of 50 pounds per 1,000 square feet.

- B. The entire area shall be thoroughly covered with sod. The sod shall be placed on the prepared surface with the edges in close contact and, as far as possible, with staggered joints.
- C. The sod shall be maintained moist from time of removal until reset but shall be placed as soon as practicable after removal from place where growing. Immediately after placing it shall be rolled with a light- weight roller or hand tamped to the satisfaction of the Engineer.
- D. Sod on slopes steeper than 3 to 1 shall be held in place by wooden pins about 1-inch square and 6-inches long, driven through the sod into the soil until they are flush with the top of the sod.

3.02 Watering and Maintenance

- A. The sod shall be watered as directed by the Engineer for a period of two weeks after which ammonium nitrate shall be applied at the rate of three pounds per 1,000 square feet and the sod given a final watering.
- B. The Contractor shall not allow any equipment or material to be placed on any planted area and shall erect suitable barricades and guards to prevent Contractor's equipment, labor or the public from traveling on or over any area planted with sod.
- C. It shall be the obligation of the Contractor to secure a satisfactory growth of grass before final acceptance of the Project.

END OF SECTION

Part 1 General

1.01 Scope

- A. The work specified in this Section includes furnishing all labor, equipment and material required to locate, identify, verify condition and remove or protect existing trees as shown on the Drawings and/or as directed by the Construction manager or Owner.
- B. The contractor shall install orange tree protection fencing (barrier) around each tree to be protected, as shown on the Drawings and as ordered by the Construction Manager or Owner.
- C. No trees or vegetation shall be removed except as specifically exempted or approved by the Construction Manager or Owner.

1.02 Reference

"Trenching and Tunneling near Trees," by James R. Fazio. Published by the National Arbor Day Foundation.

"Tree Preservation Ordinance and Administrative Guide Lines," Fulton County (January 2000).

1.03 Qualifications

Contractor shall have on staff for the project at least one person with a minimum of 5 years experience as nurseryman in planting and protecting trees.

1.04 Submittals

- A. Contractor shall walk the site with City of Alpharetta's Arborist, to understand (in more detail than shown on the Drawings) the scope and requirements of tree protection for this project. Prepare a Tree Protection Work Plan describing how tree protection will be handled during installation of the water lines. The Work Plan shall include, but is not limited to:
 - 1. Confirmation of identification of specimen trees (shown on the Drawings) and other trees to be protected.
 - 2. Scope of general protection of trees within right-of-ways and along the water line trench alignment.
 - 3. Determination of drip line limits of protected trees and approximate free bore lengths.
 - 4. Scope of general protection of trees outside right-of-ways but in close proximity to work areas.
 - 5. Extent of approved or required tree limb cutting and trimming to make space for work area.
 - 6. Extent of approved or required tree root cutting, if necessary within trench area.
 - 7. Confirmation of the type of protective fencing, other protective measures as required, and installation details.

Contractor shall submit five copies of the Tree Protection Work Plan to the Construction Manager or Owner) for approval. Contractor shall not begin any field

activity prior to approval of this Work Plan by the Construction Manager or Owner and City Arborist.

Part 2 Products

2.01 Products

- A. Protective Fencing
 - 1. Orange Safety Fencing: Minimum 4 feet in width and shall be made of high density polyethylene resin, extruded and stretched to provide a highly visible bright orange, non-fading fence. The fabric shall remain flexible from -60° F to 200° F and shall be inert to most chemicals and acids. The fabric pattern may vary from diamond to circular with a minimum unit weight of 0.4 lbs. and a maximum opening size of 2 inches. The fabric shall have minimum tensile yield strength (horizontal) of 2000 psi and ultimate tensile strength of 2680 psi.
 - 2. The fencing material shall be supported by steel pipe tee posts or U posts, that are minimum 5 ½ feet in height and spaced no more than 8 feet on centers. The fabric shall be secured to post by bands or wire ties.
- B. Warning Signs: A weather proof warning sign shall be prominently displayed on each tree protection fence at 20-foot intervals. The sign shall be minimum 8.5-inches X 11-inches and clearly state in half inch tall letters: "Warning – Tree Protection Zone".
- C. Silt Fence (Type C): Silt fence shall be installed 2-feet from the outside of the tree protection fence where required or directed by the Construction Manager or Owner and City Arborist.
- D. Trunk Protection: When directed by the City Arborist, the tree trunk protection shall be provided using either 2x4-inch or 2x6-inch planking or plastic strapping.
- E. Tree Dressing: Dressing of any damaged areas shall be accomplished using any approved asphaltic tree wound paint immediately after damage occurs.

Part 3 Execution

3.01 Execution

- A. Protective Fencing: All trees and shrubs in the proximity of the construction site shall be carefully checked for damage prior to initiation of any construction activity. All individual trees, shrubs, and natural areas scheduled for preservation shall be protected during construction with temporary fencing as indicated on the Drawings or directed by the City Arborist. Protective fences shall be installed prior to the start of any site preparation work (clearing, grubbing, or grading), and shall be maintained in functioning condition throughout all phases of the construction project. Protective fence locations in close proximity to intersecting streets or drives shall adhere to the site distance requirements.
- B. Protective fences shall be constructed around trees to be protected, at the locations (typically the outer limits of the Critical Root Zone) and with materials indicated on the Drawings to prevent the following:
 - 1. Soil compaction in the root zone area resulting from vehicular traffic or storage of equipment or materials.

2. Root zone disturbances due to grade changes greater than 6-inch cut or fill or trenching not reviewed and authorized by the City Arborist or the Construction Manager or Owner.
 3. Damage to exposed roots, trunks or limbs by mechanical equipment.
 4. Other activities detrimental to trees such as chemical storage, concrete truck cleaning, and fires.
- C. Exceptions to the installation of protective fences at the tree drip lines may be permitted in the following cases:
1. Where there is to be an approved grade change, impermeable paving surface, tree well, or other such site development, the fence shall be erected approximately 2 to 4 feet beyond the areas of disturbance.
 2. When permeable paving is to be installed within a tree drip line, the fence shall be erected at the outer limits of the permeable paving area prior to any site grading so that this enclosed area is graded separately to minimize root damage.
 3. When trees are located close to a proposed building or other construction activity, the fence shall be erected to allow 6 to 10 feet work space between the fence and the structure and apply organic mulch to a depth of (4) to six (6) inches in the unprotected root zone area;
 4. When there are street-side pedestrian walkways, fences shall be constructed in a manner that does not obstruct safe passage;
 5. When there are severe space constraints due to tract size or other special requirements, the Contractor shall contact the Arborist or the Engineer to discuss alternatives.
 6. When any of the exceptions listed above will result in a fence being located closer than five (5) feet to a tree trunk, the Contractor shall also protect the trunk with strapped-on planking to a height of 8 feet or to the limits of lower branching in addition to the reduced fencing required.
- D. Repair of Damage: Tree roots scarred by equipment shall be cut cleanly and covered with topsoil. When tree roots are pruned, a comparable portion of selected branches shall be cut from the tree on the opposite side. Limb pruning shall be made at the branch collar. All limbs greater than 1-inch in diameter shall be precut in accordance with ANSI 300 pruning methods to prevent splitting. All cut limbs shall be treated with an approved tree dressing. Tools shall be disinfected with alcohol or 5 ppm chlorine solution between repairs to trees to prevent the transmission of diseases from one tree to another. All trees damaged during construction shall receive an application of fertilizer within the drip line at the rate of 4 pounds per caliper inch.
- E. Cutting and Filling around Trees: When the depth of an excavation or embankment exceeds 6 inches of any tree with a diameter greater than 8 inches, a tree well shall be constructed to protect the tree.
- F. Free Bore: Where a pipe is to be installed within critical root zone (CRZ) and inside drip line area, installation of the pipe by free bore method is required to protect trees. The length of tree bore shall extend a minimum of five feet beyond drip line on both sides or as recommended length in the table provided on the

Drawings, whichever is greater. The depth of free bore shall be such that there is a minimum of 4 feet of cover on top of pipe. The location and procedures shall be approved by the Construction Manager or Owner and City Arborist.

- G. Paying Around Trees: Where paving within the drip line of any tree greater than a 6 inch diameter is necessary, a permeable pavement and aeration system must be installed except for street construction.
- H. Tree Removal: Trees which directly interfere with construction may only be removed if approval of the Construction Manager and City Arborist has been obtained. When a tree or shrub is scheduled for removal, it shall be cut to a depth of 12 inches below the surrounding ground line. After removal, soil shall be placed in the hole to a depth matching the existing grade. The tree shall be cut into sections that can be managed, removed from the site and disposed of. All work shall be conducted in such a manner as to protect all facilities, improvements and vegetation in the work area. All damage resulting from tree removal or pruning shall be repaired at the Contractor's own expense.
- I. Final cleanup: All temporary tree and shrub preservation and protection measures shall be removed when the construction has been completed.
- J. Roots larger than 2-inch diameter shall not be cut without written permission from the City Arborist.

END OF SECTION

SECTION 03200

REINFORCING STEEL

PART 1 – GENERAL

1.01 THE REQUIREMENTS

- A. Provide all concrete reinforcing including all cutting, bending, fastening and any special work necessary to hold the reinforcing steel in place and protect it from injury and corrosion in accordance with the requirements of this section.
- B. Provide deformed reinforcing bars to be grouted into reinforced concrete masonry walls.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 03100 - Concrete Formwork
- B. Section 03250 - Concrete Accessories
- C. Section 03300 - Cast-in-Place Concrete
- D. Section 03400 - Precast Concrete

1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.
 - 1. Georgia State Minimum Standard Building Code
 - 2. CRSI - Concrete Reinforcing Institute Manual of Standard Practice
 - 3. ACI SP66 - ACI Detailing Manual
 - 4. ACI 315 - Details and Detailing of Concrete Reinforcing
 - 5. ACI 318 - Building Code Requirements for Structural Concrete
 - 6. WRI - Manual of Standard Practice for Welded Wire Fabric

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| 7. | ASTM A 185 - | Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcing |
| 8. | ASTM A 615 - | Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcing |

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.

1. Detailed placing and shop fabricating drawings, prepared in accordance with ACI 315 and ACI Detailing Manual - (SP66), shall be furnished for all concrete reinforcing. These drawings shall be made to such a scale as to clearly show joint locations, openings, and the arrangement, spacing and splicing of the bars.
2. Mill test certificates - 3 copies of each.
3. Description of the reinforcing steel manufacturer's marking pattern.
4. Requests to relocate any bars that cause interferences or that cause placing tolerances to be violated.
5. Proposed supports for each type of reinforcing.
6. Request to use splices not shown on the Drawings.
7. Request to use mechanical couplers along with manufacturer's literature on mechanical couplers with instructions for installation, and certified test reports on the couplers' capacity.
8. Request for placement of column dowels without the use of templates.
9. Request and procedure to field bend or straighten partially embedded reinforcing.

1.05 QUALITY ASSURANCE

- A. If requested by the Construction Manager or Owner, the Contractor shall provide samples from each load of reinforcing steel delivered in a quantity adequate for testing. Costs of initial tests will be paid by the Owner. Costs of additional tests due to material failing initial tests shall be paid by the Contractor.

PART 2 -- PRODUCTS

2.01 REINFORCING STEEL

- A. Bar reinforcing shall conform to the requirements of ASTM A 615 for Grade 60 Billet Steel reinforcing. All reinforcing steel shall be from domestic mills and shall have the

manufacturer's mill marking rolled into the bar which shall indicate the producer, size, type and grade.

- B. Welded wire fabric reinforcing shall conform to the requirements of ASTM A 185 and the details shown on the Drawings.
- C. A certified copy of the mill test on each load of reinforcing steel delivered showing physical and chemical analysis shall be provided, prior to shipment. The Owner reserves the right to require the Contractor to obtain separate test results from an independent testing laboratory in the event of any questionable steel. When such tests are necessary because of failure to comply with this Specification, such as improper identification, the cost of such tests shall be borne by the Contractor.
- D. Field welding of reinforcing steel will not be allowed.
- E. Use of coiled reinforcing steel will not be allowed.

2.02 ACCESSORIES

- A. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers and other devices to position reinforcing during concrete placement. Slab bolsters shall have gray plastic-coated legs.
- B. Concrete blocks (dobies), used to support and position bottom reinforcing steel, shall have the same or higher compressive strength as specified for the concrete in which it is located.

2.03 MECHANICAL COUPLERS

- A. Mechanical couplers shall develop a tensile strength which exceeds 125 percent of the yield strength of the reinforcing bars being spliced at each splice. The reinforcing steel and coupler used shall be compatible for obtaining the required strength of the connection.
- B. Where the type of coupler used is composed of more than one component, all components required for a complete splice shall be supplied.
- C. Hot-forged sleeve type couplers shall not be used. Acceptable mechanical couplers are Richmond Dowel Bar Splicer System by Richmond Screw Anchor Company, Fort Worth, Texas. Mechanical couplers shall only be used where shown on the Drawings or where specifically approved by the Construction Manager or Owner.

2.04 DOWEL ADHESIVE SYSTEM

- A. Where shown on the Drawings, reinforcing bars anchored into hardened concrete with a dowel adhesive system shall use a two-component adhesive mix which shall be injected with a static mixing nozzle following manufacturer's instructions. Thoroughly clean drill holes of all debris and drill dust with wire brush prior to installation of adhesive and reinforcing bar. The embedment depth of the bar shall be per manufacturer's recommendations, so as to provide a minimum allowable bond strength that is equal to 125 percent of the yield strength of the bar, unless noted otherwise on the Drawings. The adhesive system shall be "Epcon

System A7, C6 or G5" as manufactured by ITW Ramset/Redhead, or "HIT HY-150 or RE-500 Injection Adhesive Anchor System" as manufactured by Hilti, Inc. or "SET/ET Epoxy-Tie" or "AT Acrylic-Tie" as manufactured by Simpson Strong-Tie Co., or equal. Owner's approval is required for use of this system in locations other than those shown on the Drawings.

PART 3 – EXECUTION**3.01 TEMPERATURE REINFORCING**

- A. Unless otherwise shown on the Drawings or in the absence of the concrete reinforcing being shown, the minimum cross sectional area of horizontal and vertical concrete reinforcing in walls shall be 0.0033 times the gross concrete area and the minimum cross sectional area of reinforcing perpendicular to the principal reinforcing in slabs shall be 0.0020 times the gross concrete area. Temperature reinforcing shall not be spaced further apart than five times the slab or wall thickness, nor more than 18 inches.

3.02 FABRICATION

- A. Reinforcing steel shall be accurately formed to the dimensions and shapes shown on the Drawings and the fabricating details shall be prepared in accordance with ACI 315 and ACI 318, except as modified by the Drawings.
- B. The Contractor shall fabricate reinforcing bars for structures in accordance with the bending diagrams, placing lists and placing Drawings.
- C. No fabrication shall commence until approval of Shop Drawings has been obtained. All reinforcing bars shall be shop fabricated, unless approved by the Construction Manager or Owner to be bent in the field. Reinforcing bars shall not be straightened or rebent in a manner that will injure the material. Heating of bars will not be permitted.
- D. Welded wire fabric with longitudinal wire of W9.5 size or smaller shall be either furnished in flat sheets or in rolls with a core diameter of not less than 10 inches. Welded wire fabric with longitudinal wires larger than W9.5 size shall be furnished in flat sheets only.

3.03 DELIVERY, STORAGE AND HANDLING

- A. All reinforcing shall be neatly bundled and tagged for placement when delivered to the job site. Bundles shall be properly identified for coordination with mill test reports.
- B. Reinforcing steel shall be stored above ground on platforms or other supports and shall be protected from the weather at all times by suitable covering. It shall be stored in an orderly manner and plainly marked to facilitate identification.
- C. Reinforcing steel shall at all times be protected from conditions conducive to corrosion until concrete is placed around it.
- D. The surfaces of all reinforcing steel and other metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar and other foreign substances immediately before the concrete is placed. Where there is delay in depositing concrete, reinforcing shall be reinspected and if necessary recleaned.

3.04 PLACING

- A. Reinforcing steel shall be accurately positioned as shown on the Drawings and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcing steel shall be supported by concrete, plastic or metal supports, spacers or metal hangers which are strong and rigid enough to prevent any displacement of the reinforcing steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dobies) shall be used in sufficient numbers to support the reinforcing bars without settlement. In no case shall concrete block supports be continuous.
 - B. The portions of all accessories in contact with the formwork shall be made of plastic or steel coated with a 1/8 inch minimum thickness of plastic which extends at least 1/2 inch from the concrete surface. Plastic shall be gray in color.
 - C. Tie wires shall be bent away from the forms in order to provide the specified concrete coverage.
 - D. Reinforcing bars additional to those shown on the Drawings, which may be found necessary or desirable by the Contractor for the purpose of securing reinforcing in position, shall be provided by the Contractor at no additional cost to the Owner.
 - E. Reinforcing placing, spacing, and protection tolerances shall be within the limits specified in ACI 318 except where in conflict with the Building Code, unless otherwise specified.
 - F. Reinforcing bars may be moved within one bar diameter as necessary to avoid interference with other concrete reinforcing, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed placing tolerances, the resulting arrangement of bars shall be as acceptable to the Construction Manager.
 - G. Welded wire fabric shall be supported on slab bolsters spaced not less than 30 inches on centers, extending continuously across the entire width of the reinforcing mat and supporting the reinforcing mat in the plane shown on the Drawings.
 - H. Reinforcing shall not be straightened or rebent unless specifically shown on the drawings or authorized in writing by the Owner or Construction Manager. Bars with kinks or bends not shown on the Drawings shall not be used. Coiled reinforcement shall not be used.
- 3.05 SPLICING
- A. Reinforcing bar splices shall only be used at locations shown on the Drawings. When it is necessary to splice reinforcing at points other than where shown, the splice shall be as acceptable to the Construction Manager.
 - B. The length of lap for reinforcing bars, unless otherwise shown on the Drawings shall be in accordance with ACI 318 for a class B splice.
 - C. Laps of welded wire fabric shall be in accordance with ACI 318. Adjoining sheets shall be securely tied together with No. 14 tie wire, one tie for each 2 running feet. Wires shall be staggered and tied in such a manner that they cannot slip.

- D. Mechanical splices shall be used only where shown on the drawings or when approved by the Construction Manager.
- E. Couplers which are located at a joint face shall be a type which can be set either flush or recessed from the face as shown on the Drawings. The couplers shall be sealed during concrete placement to completely eliminate concrete or cement paste from entering. After the concrete is placed, couplers intended for future connections shall be plugged and sealed to prevent any contact with water or other corrosive materials. Threaded couplers shall be plugged with plastic plugs which have an O-ring seal.

3.06 INSPECTION

- A. The Contractor shall advise the Construction Manager of his intentions to place concrete and shall allow him adequate time to inspect all reinforcing steel before concrete is placed.
- B. The Contractor shall advise the Construction Manager of his intentions to place grout in masonry walls and shall allow him adequate time to inspect all reinforcing steel before grout is placed.

- END OF SECTION -

SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. See Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Shop Drawings: For steel reinforcement. Material certificates.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 7, "Lightweight Concrete."
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- C. Preinstallation Conference: Conduct conference at Project site.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I or II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, graded, 1-inch (25-mm) nominal maximum coarse-aggregate size.
 - 1. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Lightweight Aggregate: ASTM C 330, 3/8-inch (10-mm) nominal maximum aggregate size.
- D. Water: ASTM C 94/C 94M and potable.
- E. Air-Entraining Admixture: ASTM C 260.
- F. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding

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those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class C, or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick. Include manufacturer's recommended adhesive or pressure-sensitive joint tape.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
- F. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- G. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1752, cork or self-expanding cork.

2.7 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.
- C. Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: As indicated on drawings.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
 - 4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch (25-mm) nominal maximum aggregate size.
 - 5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
- D. Proportion structural lightweight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
 - 2. Calculated Equilibrium Unit Weight: 110 lb/cu. ft. (1762 kg/cu. m), plus or minus 3 lb/cu. ft. (48.1 kg/cu. m) as determined by ASTM C 567.
 - 3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
 - 4. Air Content: 7 percent, plus or minus 2 percent at point of delivery for nominal maximum aggregate size 3/8 inch (10 mm) or less.
 - 5. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.

2.8 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork according to ACI 301 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 - 1. At elevated slab, place joints no more than two feet from a beam or joist centerline. Continue reinforcement across construction joints, unless otherwise indicated.
 - 2. At slabs on grade, place joints at contraction joint locations.

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3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1.
- D. Hot-Weather Placement: Comply with ACI 301.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

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1. Apply to concrete surfaces exposed to public view.

- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch (6 mm) in 1 direction.
 1. Apply scratch finish to surfaces to receive concrete floor toppings.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces to receive trowel finish.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 2. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-foot- (3.05-m-) long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/4 inch (6 mm)
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

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3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer[unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project].
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
 - 1. Testing Services: Tests shall be performed according to ACI 301.

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- B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173/C 173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).
 10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete

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placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 03 3000