

SECTION FOUR

**COBB COUNTY WATER SYSTEM
SPECIFICATIONS**

MEASUREMENT AND PAYMENT

GENERAL

Only those pay items identified in the bid schedule, or added by Addendum or Supplemental Agreement, will be measured for payment by the units listed in the bid schedule and/or supplemental agreement and paid for at the Contract prices.

The cost of all Work not directly covered by the pay items shall be considered incidental to the construction and is to be included and distributed among the bid unit prices of the pay items listed in the Contract.

Contract unit prices represent the installed, complete-in-place, tested and accepted cost, including, but not limited to:

- * All required labor, tools, and equipment, unless otherwise noted.
- * All materials, unless specifically noted to be furnished by the Owner or by others, or specifically identified for payment under another pay item.
- * All required excavation, dewatering, thrust blocking, rodding, sheeting/shoring/bracing, backfill, compaction and restoration to grade, and testing.
- * All required normal traffic control.
- * Acceptable bedding as detailed, specified, or as required by conditions encountered.
- * Disposal of all surplus or waste materials, unsuitable materials, and debris.
- * Protection of existing utilities, including but not limited to locating, diligent care in handling and working around, relocating, and repairing.
- * Miscellaneous associated work necessary to complete the work in place.
- * Minor meter, meter box, and valve box adjustments.
- * All temporary taps necessary for sterilization and testing.
- * Minor manhole adjustments.
- * Preconstruction staking.
- * Coordination of additional project access as may be desired.
- * Project Record Drawings

ADJUST EXISTING MANHOLE TO GRADE

Unit price each is for all required labor, tools, equipment, and material to adjust an existing manhole ring and cover to grade.

WATER MAIN

Unit price per linear foot is for each size of water main installed at a nominal depth of cover of 48 inches or less. Water main will be measured for payment in linear feet along the horizontal centerline of the pipe. The length of fittings and valves in the line will be included in the measurement of the water main. Fittings for Copper Water Main/Service Lines are included in the unit price for pipe. Fittings for ductile iron mains are separately measured and paid under MISCELLANEOUS FITTINGS.

ADJUST EXISTING METER AND BOX TO GRADE

Unit price each is for the equipment, labor, and incidental materials to adjust existing meter and box to new elevations, up to 2 feet adjustment, using Owner furnished meter setter/resetter devices, or to new elevation greater than 2 feet using Contractor furnished materials. Any necessary pipe, fittings, etc., necessary for adjustments greater than 2 feet shall be paid under the corresponding payment item for NEW METER SERVICE PIPING – CONTRACTOR FURNISHED MATERIALS. Includes required excavation; No. 57 stone bedding; protection of meter assembly; piping connections/component assembly; backfill and compaction; restoration of disturbed area; and prior coordination/notification to affected customer(s).

REMOVE EXISTING FIRE HYDRANT

Unit price each is for all required labor, tools and equipment to remove the fire hydrant from bonnet to boot and return the hydrant to the Water System storage yard. Item includes the removal of the hydrant-locator reflector in roadway adjacent to hydrant.

ABANDON EXISTING WATER MAIN IN PLACE

Unit price each is for equipment and labor only to remove a five (5) foot section of pipe. Necessary plugs, valves, miscellaneous fittings, and concrete trench cap and/or asphalt pavement trench patch as may be required to complete the abandonment will be paid for under the corresponding bid items.

TAPPING ASSEMBLY

Unit price each is for materials only. Unit price includes tapping sleeve, tapping valve, rodding, thrust blocking, valve box and lid, and concrete collar. Labor will be paid under CONNECT TO EXISTING WATER MAIN - WET TAP.

VALVE ASSEMBLY

Unit price each is for each assembly, including rodding, thrust blocking, valve box and lid, and concrete collar.

ADJUST EXISTING VALVE BOX TO GRADE

Unit price each is for all required labor, tools, equipment, and material to adjust (and align for proper valve operation) an existing valve box to grade including replacement of concrete collar, if necessary.

MISCELLANEOUS FITTINGS

Unit price item includes, but is not limited to: bends, tees, crosses, plugs, solid sleeves, and reducers. Miscellaneous fittings will be measured for payment in tons for the manufacturer listed base weight of ductile iron compact fittings (without accessory kits) as shown in bid schedule.

FIRE HYDRANTS

CCWS Contract Documents

Interstate North Parkway at Interstate North Circle Realignment

Unit price each includes the fire hydrant with barrel height as necessary for proper standard setting at required nominal depth of Water Main. Anchor couplings, fittings, valve assembly and any necessary vertical or horizontal extension will be paid for under the corresponding bid items.

VERTICAL FIRE HYDRANT EXTENSIONS

Unit price per foot is for extensions of the fire hydrant barrel. Vertical fire hydrant extensions required by additional depth will be measured for payment in one-foot increments. Payment will be made for each foot, or part of a foot, in excess of the standard setting depth.

HORIZONTAL FIRE HYDRANT EXTENSIONS

Unit price each is for equipment and labor only to horizontally extend a fire hydrant lead to accommodate the repositioning of the hydrant or the water main. Water main, valves, fittings, and anchor couplings required to complete connection to the new water main will be paid for under the corresponding bid items.

ANCHOR COUPLINGS

Unit price each is for anchor coupling installed at fire hydrant.

CONNECT TO EXISTING WATER MAIN - CUT IN

Unit price each is for equipment and labor only to complete a connection to an in-service existing water main as shown on the plans including location of existing water main, temporary water shut down, and cutting in a tee and/or elbow as required on the plans. Water main, valves, and fittings required to complete connection to the new water main will be paid for under the corresponding bid items.

CONNECT TO EXISTING WATER MAIN - WET TAP

Unit price each is for equipment and labor only to complete a connection to an in-service existing water main as shown on the plans including location of existing water main, installing a manufactured tapping sleeve and valve, and tapping the existing main. Water main, tapping assembly, valves, and fittings required to complete connection to the new water main will be paid for under the corresponding bid items.

RELOCATE EXISTING WATER METER

Unit price each is for all required labor, tools, equipment, and materials to relocate an existing water meter and vault or meter box including extension of the service line, miscellaneous fittings, testing, and disinfection as required. Water meter size shall be as indicated in the Bid Schedule.

SERVICE LINE REPLACEMENT LONG/SHORT SIDE- 2 INCH AND UNDER

Unit price each is for all materials and labor required to replace the service line from the water main to the meter assembly including the service line, connections to the main and meter assembly, and boring with casing as necessary. Service line replacement for pipe sizes greater than 2-inches in diameter will be measured and paid for under the appropriate separate corresponding bid items.

The Cobb County Water System will furnish new meter boxes to replace damaged or unserviceable units found during construction, or the new meter boxes will be purchased by the Contractor and paid for from the utility allowance at the direction of the Project Engineer.

Where so indicated, existing water meters shall be replaced by the Contractor with new meters supplied by the Owner. A record of these meters change-outs shall be maintained and transmitted to the Owner on a weekly basis for updating of customer account information.

WEDGE ACTION RETAINER GLANDS

Unit price each includes the furnishing and proper installation of the appropriate size of wedge action retainer gland in conjunction with other conventional thrust restraint devices (rodding, thrust blocking, etc.) where so directed during the course of construction.

LANDSCAPE ALLOWANCE

Landscape allowance will only be utilized at the direction of the Project Engineer, and the scope and cost must be approved prior to performance of the work.

UTILITY ALLOWANCE

Utility allowance will only be utilized at the direction of the Project Engineer, and the scope and cost must be approved prior to performance of the work.

SODDING

Unit price per square foot includes ground surface preparation, application of fertilizer and lime appropriate for soil type and season, and placement of sod to successfully match in kind the preconstruction condition. The actual area of sodded surfaces will be measured for payment; however, the width of the disturbed area considered for payment shall not exceed the construction easement limits, unless directed by the Project Engineer.

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SPECIAL CONDITIONS

The following project specific Special Conditions take precedent over plans and specifications. Section numbers shown refer to the appropriate section of the Cobb County Water System Contract Documents. All other requirements remain in full effect.

1. If additional work is required and the bid unit prices are not applicable to the necessary additional work, the Contractor shall be compensated as follows. If the additional work is to be performed entirely by the Contractor, compensations for such extra work shall be based on the direct costs as listed in a detailed proposal, plus 15 percent of direct costs for overhead and profit, plus 1 percent of such direct costs for bond. When the extra work involves subcontractors, compensation for such work shall be based on direct costs as listed by the subcontractor plus 15 percent of such direct costs for the subcontractor's overhead and profit. The Contractor may add 5 percent to the subcontractor proposal for overhead and profit, and 1 percent for bond. The 5 percent subcontractor markup shall be applied only once regardless of the number of tiers of subcontractors. The above allowances for overhead and profit shall include full compensation for overhead, including superintendence, and additional overhead attributable to a time extension granted because of the change order. For extra work that is funded from contract allowances, the 1 percent additional cost for bonds shall not be applied.

END OF SPECIAL CONDITIONS

SECTION 01010 - PROJECT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

Section Includes:

1. Lands and Rights-of-Way
2. Access to and Contractor's use of the site.
3. Coordination requirements.
4. Construction procedures.

1.02 LANDS AND RIGHTS-OF-WAY

- A. Access to the work shall be limited to the right-of-way or easement area provided for execution of the work. The **Contractor** shall not enter any adjacent private property without prior written approval from the property owner. Proof of such approval shall be furnished to the **Owner** upon request.
- B. If the Contractor performs any work or service for any property owner outside the specified scope of the Contractor's agreement with the Owner or has any agreements with a private property owners for access to or for temporary use of property outside of the right-of-way or easement area, a written agreement shall be entered into, with the private property owner(s) prior to any work or service being performed or prior to any use by Contractor of the private property and such agreement shall be provided to Owner. The agreement shall contain the following language, in addition to the terms agreed to between the Contractor and the property owner.

"The Property Owner understands that Cobb County is not a party to this Agreement, exercises no control over the means, methods, and execution of this agreement, and that Cobb County assumes no responsibility for the Contractor's compliance with the terms of this agreement. The Contractor shall be solely liable for any and all claims, demands, and judgments related to loss or damage to property or person (including death) arising from or in any way related to the Contractor's acts or omissions related to the agreement".

1.03 ACCESS TO AND CONTRACTOR'S USE OF THE SITE

- A. The space available to the **Contractor** for the performance of the work, either exclusively or in conjunction with others performing other construction as part of the project, is shown on the drawings.
- B. The **Owner** will continue to occupy existing facilities during the construction period.
 1. The **Owner** will endeavor to cooperate with the **Contractor's** operations when the **Contractor** has notified the **Owner** in advance of need for changes in operations in order to accommodate construction operations.
 2. The **Contractor** shall conduct the Work so as to cause the least interference with the **Owner's** operations.

- C. Adequate signage will be provided by the **Contractor** as necessary.

1.04 COORDINATION REQUIREMENTS

- A. Coordination with Owner:
 - 1. Limit access through occupied areas to those days and times which the **Owner** approves. Occupied areas include all areas in which the **Owner's** regular operations will be going on or to which the **Owner** requires access during the construction period.
 - 2. When the following must be modified, provide alternate facilities acceptable to the **Owner**:
 - a. Emergency means of egress.
 - b. Utilities which must remain in operation.
 - c. Informational signage.
 - 3. The **Contractor** shall notify the **Owner** of any circumstances which may jeopardize or have interrupted utility service.
- B. Security Procedures:
 - 1. Limit access to the site to persons involved in the work.
 - 2. Provide secure storage for materials.
 - 3. Secure completed work as required to prevent loss.
- C. Coordination of Construction:
 - 1. Inform each party involved, in writing, of procedures required for coordination of the work; include requirements for giving notice, submitting reports, and attending meetings.
 - 2. Inform the **Owner** when coordination of his work is required.
 - 3. Furnish coordination drawings, as required, where limited space available may cause conflicts in the locations of installed products, and where required to coordinate installation of products.
- D. Coordination with the Cobb County-Marietta Water Authority (CCMWA)
 - 1. All work involving the isolation of and/or connection to a water main owned by the CCMWA must have the prior approval of the CCMWA.
 - 2. The **Contractor** shall notify CCMWA of any circumstances that may jeopardize or interrupt water service.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION PROCEDURES

- A. General Examination Requirements:
 - 1. Prior to performing work, examine the applicable substrates and the conditions under which the work is to be performed.
 - 2. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding.
 - 3. Notify the **Owner** promptly of any modifications required due to existing conditions or previous work.

4. Before starting work which might affect existing construction, verify the existence and location of:
 - a. Underground utilities.
 - b. Other underground construction.
 - c. Location and invert elevation of points of connection to piped utilities.
 5. Verify that utility requirements of operating equipment are compatible with building utilities.
 6. Verify space requirements of items which are shown diagrammatically on the drawings or any other items that might impact construction.
 7. Prepare preconstruction photographic documentation in conformance with the requirements of Section 01380 of these specifications.
- B. General Preparation Requirements:**
1. The **Contractor** shall obtain and pay for all required permits.
 2. Prior to starting work, the **Contractor** shall have the limits of construction field staked by, or under the supervision of, a Georgia Registered Land Surveyor. The staking shall include, but not be limited to, easement (permanent and construction) limits, construction entrances, and any other staking that is necessary to clearly define the limits of construction.
 3. Take field measurements as required to fit the work properly.
 4. Recheck measurements prior to installing each product.
- C. General Installation Procedures:**
1. Accurately install the work and components of the work.
 2. See sections describing specific parts of the work for additional requirements.
 3. Where space is limited, install components to maximize space available for maintenance and to maximize ease of removal for replacement.
 4. Install work in such manner to minimize cutting and patching.
- D. Cleaning and Protection**
1. Remove debris from concealed spaces prior to enclosing the space.
 2. Keep the site and the work free of waste materials and debris.
 3. Clean areas in which work is to be done to level of cleanliness necessary for proper execution of that work.
 4. Keep installed work clean, and clean again when soiled by other operations.
 5. Protect installed work from soiling and damage.
- E. Do not cut existing mechanical and electrical services which are to remain in use until provisions have been made to relocate or reconnect them promptly; obtain approval of the **Owner** of the time and duration of disconnection.**
- F. Installation of Components:**
1. Install products only at the time and in the sequence which will ensure the best possible results in conformance with project requirements.
 2. Install products only during environmental conditions which will ensure the best possible results.
 3. Install all products in accordance with manufacturer's instructions and recommendations, whether conveyed in writing or not.
 4. Separate incompatible materials with suitable materials or spacing.

5. Provide all anchors and fasteners required and use methods necessary to securely fasten work.
 6. After installation, adjust operating components to proper operation.
- G.** Instruction of the **Owner's** Personnel:
1. Instruct personnel designated by the **Owner** in the operation and maintenance of equipment and systems, prior to substantial completion.
 2. Arrange times and places of instruction with the **Owner**.
 3. Provide instruction by qualified manufacturer representatives.
 4. Allow videotaping of instruction sessions by **Owner**.
- H.** Final Cleaning:
1. Remove materials and equipment which are not part of the work and all debris from the site prior to substantial completion.
 2. Dispose of debris in a lawful manner.
 3. Perform final cleaning after substantial completion has been certified, but before final payment.
 4. Clean entire project site and grounds.
 5. In spaces to be occupied, remove dirt, stains, and other foreign substances from all accessible surfaces and remove nonpermanent labels.
 6. In spaces not normally occupied, remove debris and surface dust and wipe equipment clean, removing excess lubrication, paint, and other foreign substances.
 7. Remove paint and other coatings from permanent labels and from mechanical and electrical equipment nameplates.
 8. Leave the project clean and ready for occupancy.
- I.** Substantial Completion Procedures:
Reference Section 00700 6.05 of the General Conditions
- J.** Final Completion Procedures
Reference Section 00700 6.07 of the General Conditions

3.02 HEALTH AND SAFETY CONSIDERATIONS

- A.** Take precautions to prevent fires and to facilitate fire-fighting operations.
- B.** Take precautions to prevent accidents due to physical hazards.
- C.** Maintain working conditions in order to keep the site and adjacent public ways free of hazardous and unsanitary conditions and public nuisances.
- D.** Maintain working conditions in order to control rodents and other pests; prevent infestation of adjacent sites and buildings due to pests on this site.
- E.** Keep public streets free of debris due to this work.
- F.** Provide adequate traffic control by means of signs, signals, and flaggers, as necessary.

3.03 ENVIRONMENTAL CONSIDERATIONS

- A. Take care to prevent pollution of air, water, and soil.
- B. Prevent the entry of rainwater runoff into sanitary sewer system.
- C. Control windblown dust; prevent erosion to site and nuisance to neighbors.
- D. Conduct construction operations so that waste of power, water, and fuel is avoided.
- E. Noise from the **Contractor's** operations shall not exceed limits established by applicable laws or regulations and in no event shall exceed 86 dBA at a distance of 50 feet from the noise source between 7:30 p.m. and 7:00 a.m. and on the weekends.
- F. Any created or observed situation involving discharge / spill of raw sewage shall be immediately reported to the Cobb County Water System Emergency Dispatch at (770) 419-6201.

3.04 PROTECTION OF THE WORK

- A. Conduct construction operations so that no part of the work is subjected to damaging operations or influences which are in excess of those to be expected during normal occupancy conditions.
- B. Execute work and stockpile spoils and materials to prevent flooding of excavations, below-grade construction, and adjacent properties due to rainwater runoff.
- C. Protect existing property not indicated to be removed.
- D. Provide temporary supports as required to prevent movement and structural failure.
- E. All equipment and vehicles used on Water system projects shall be clearly marked with the **Contractor's** name and telephone number. The identifying markings may be in the form of magnetic signs, decals, or painted lettering and shall be located on both sides of the equipment/vehicle. The lettering shall be legible, of a contrasting color to the background surface, and at least two inches in height. All markings shall be in place upon initiation of the work on the project site.
- F. A copy of the project's Notice to Proceed letter issued by the Water System shall be available at all times on the job site as proof of the contractual relationship of the Contractor with the Water System. The letter shall be presented for review upon request by regulatory agencies or other County departments that visit the job site.
- G. If removal and replacement of a paved private driveway is required, the replacement shall be performed within two (2) weeks of removal. The permanent pavement replacement for public roadways shall be performed within thirty (30) days or within 7 days if the roadway is a state highway or major county arterial roadway. Temporary surface maintenance is the **Contractor's** responsibility and shall be adequate for the volume and type of traffic loads imposed. Temporary asphalt cold mix application, steel traffic plates, etc. shall be utilized as necessary.

H. The Contractor shall maintain copies of all permits on the project site at all times.

3.05 NOTIFICATION OF SERVICE INTERRUPTION

During progress of work under this Contract, it may be necessary to temporarily interrupt water, sewer or other utility service to a limited number of customers in the vicinity of the work. It shall be the **Contractor's** responsibility to coordinate the service outage with the utility owner and to provide proper advance notification (a minimum of 48 hours) to the affected customers.

The **Contractor** is alerted to the fact that due to the nature of businesses and traffic in certain projects' areas, water outages for connections, service changeovers, and other work may not be allowable during normal work hours. Considerations of this are to be factored into bid price submitted. Coordination, special lighting, traffic control, employee overtime, special customer notification, etc. shall be included in these considerations by the **Contractor**.

3.06 WATER DISTRIBUTION SYSTEM VALVE OPERATION

All water distribution system service interruptions or outages, such as through water distribution system valve operation, either through pre-approved scheduling or in response to emergency situations, shall require the **Contractor** to notify the appropriate inspector/project engineer of the Cobb County Water System and the Cobb County Water System Dispatch/Emergency office at (770) 419-6201. Specifics of the outage shall be provided, including but not limited to the following information: **Contractor**, **Contractor** authorized representative providing the notice, contact number(s) of the Contractor or representative, anticipated duration of the outage, geographical limits of the outage, and definitive identification of the valves to be operated. The Cobb County Water System shall log this information for reference in the event inquiries develop and to ensure valves are repositioned correctly.

Upon conclusion of the work or repair and after service has been restored, the **Contractor** shall again notify the appropriate project representative of the Cobb County Water System and the Cobb County Water System Dispatch/Emergency office to confirm and crosscheck, as appropriate, that all affected valves have been fully and correctly repositioned. Additional **Contractor** contact information shall be provided to maintain and ensure Contractor responsibility for 24 hours or the next work day, whichever is longer. Such action does not relieve the **Contractor** from overall contract warranty responsibility.

Unauthorized operation of the Cobb County Water System water distribution system valves, hydrants, or other appurtenances, or operation in which the proper notification is not provided, is expressly forbidden and subject to penalties.

3.07 TRAFFIC CONTROL

The **Contractor** shall be responsible for traffic control during the course of each phase of the work. A Cobb County Department of Transportation (CDOT) Utility Permit shall be required for all partial and full lane closures. Road closures and / or detours shall require a CDOT Road Closure Permit. **Contractor** shall submit a traffic control plan to the **Owner** a minimum of two weeks prior to partial or full lane closures and a minimum of four weeks prior to a road closure along with other pertinent information needed for the associated

permit application. The **Owner** will submit the permit application to CDOT. The traffic control plan shall conform to CDOT requirements and be in conformance with the Manual on Uniform Traffic Control Devices for Streets and Highways. In the event the road or lane closure is necessary within the limits of a municipality or on a State of Georgia highway, the **Contractor** shall make direct application to the municipality or the Georgia Department of Transportation for the necessary road or lane closure permits. The **Contractor** shall install and maintain traffic control compliant with the approved permit, including but not limited to, trained and properly equipped flagmen, to safely control all traffic through the work zone(s). It is the **Owner's** intent that this work be accomplished with as little disturbance to traffic, private property, and the public as is reasonably possible, consistent with timely completion thereof.

3.08 WEEKLY SITE REVIEW

On a regular weekly basis, or prior to an inclement weather event forecast, the Contractor's field superintendent shall perform a full review of the construction site with the Construction Manager or his designee. This review shall examine the condition of the erosion/sedimentation control facilities, adequacy of traffic control and work zone safety facilities and procedures, restoration of disturbed areas, housekeeping of project site, proposed works plans for the coming week, and other pertinent items. Deficiencies shall be recorded and a schedule for resolution shall be established.

3.09 WATER CONSERVATION

The **Contractor** is required to exercise water conservation efforts to the fullest extent possible. These efforts shall include compliance with the current Cobb County "Drought Response Plan Regulations". The **Contractor** shall otherwise stage and sequence operations to be as effective as possible in conserving water and to collect any flushing water for reuse as dust control, backfill or roadway base consolidation, watering of landscape restoration, etc. All direct use of water from fire hydrants shall be metered via fire hydrant meters obtained from the Cobb County Water System. Any observed use of non-metered water by the **Contractor** shall be immediately reported to the **Owner**. Any observed leaks from an existing water main or fire hydrant shall be immediately reported. Leaks on newly installed, but not in service water mains, shall promptly be isolated and repaired. Best practices for irrigation shall be followed.

END OF SECTION 01010

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Preparing and processing of submittals for review and action.
 - 2. Preparing and processing of informational submittals.
- B. Submit the following for the **Owner's** review and action:
 - 1. Shop drawings.
 - 2. Product data.
 - 3. Samples.
 - 4. Submittals indicated as "for approval."
- C. Submit the following as informational submittals:
 - 1. Structural design information required by the contract documents.
 - 2. Certificates.
 - 3. Coordination drawings.
 - 4. Reports.
 - 5. Qualification statements for manufacturers/installers.
 - 6. Submittals indicated as "for information only."
- D. Specific submittals are described in individual sections.
- E. Do not commence work which requires review of any submittals until receipt of returned submittals with an acceptable action.
- F. Do not allow submittals without an acceptable action marking to be used for the project.
- G. Submit all submittals to the **Owner**.
- H. Do not include requests for substitution (either direct or indirect) on submittals; comply with procedures for substitutions specified in Section 01600.

1.02 DEFINITIONS

- A. "Shop drawings" are drawings and other data prepared by the entity who is to do the work, specifically to show a portion of the work.
- B. "Product data submittals" are standard printed data which show or otherwise describe a product or system, or some other portion of the work.
- C. "Samples" are actual examples of the products or work to be installed.
- D. Informational Submittals: Submittals identified in the Contract Documents as for information only.

1.03 FORM OF SUBMITTALS

- A. Sheets Larger Than 8-1/2 by 14 Inches:
 - 1. Maximum sheet size: 24 by 36 inches (except for full size pattern or template drawings).
 - 2. Number of copies:
 - a. Submittals for review: Three blue or blackline prints.
 - b. Informational submittals: Three blue or blackline prints.
- B. Small Sheets or Pages:
 - 1. Minimum sheet size: 8-1/2 by 11 inches.
 - 2. Maximum sheet size for opaque copies: 11 by 17 inches.
 - 3. Number of copies will be the same as for larger sheets.
- C. Samples:
 - 1. 2 sets of each shall be submitted with the original submittal.
 - 2. 1 set will be returned.
 - 3. If additional sets are needed by other entities involved in work represented by the samples, submit with original submittal.

1.04 COORDINATION OF SUBMITTALS

Coordinate submittals and activities that must be performed in sequence or of different types for the same product or system so that the **Owner** has enough information to properly review each submittal.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TIMING OF SUBMITTALS

- A. Transmit each submittal at the time indicated on the approved construction schedule.
- B. Deliver each submittal requiring approval in time to allow for adequate review and processing time, including resubmittals if necessary; failure of the **Contractor** in this respect will not be considered as grounds for an extension of the contract time.
- C. Deliver each informational submittal prior to start of the work involved, unless the submittal is of a type which cannot be prepared until after completion of the work; submit promptly.
- D. If a submittal must be processed within a certain time in order to maintain the progress of the work, state so clearly on the submittal.
- E. If a submittal must be delayed for coordination with other submittals not yet submitted, the **Owner** may at his option either return the submittal with no action or notify the **Contractor** of the other submittals which must be received before the submittal can be reviewed.

3.02 SUBMITTAL PROCEDURES - GENERAL

- A. Contractor Review: Sign each copy of each submittal certifying compliance with the requirements of the contract documents.
- B. Notify the **Owner**, in writing and at time of submittal, of all points upon which the submittal does not conform to the requirements of the contract documents, if any.
- C. Preparation of Submittals:
 - 1. Label each copy of each submittal, with the following information:
 - a. Project name.
 - b. Date of submittal.
 - c. Contractor's name and address.
 - d. Supplier's name and address.
 - e. Manufacturer's name.
 - f. Specification section where the submittal is specified.
 - g. Numbers of applicable drawings and details.
 - h. Other necessary identifying information.
 - 2. Submittals to receive **Owner's** action marking: Provide blank space on the label or on the submittal itself for action marking; minimum 4 inches wide by 5 inches high.
- D. Transmittal of Submittals:
 - 1. Submittals will be accepted from the **Contractor** only.
 - 2. Submittals received without a transmittal form will be returned without review or action.
 - 3. Transmittal form: Use a form acceptable to the **Owner**; provide space on form for:
 - a. Project name.
 - b. Submittal date.
 - c. Transmittal number.
 - d. Specification section number.
 - e. To:
 - f. From:
 - g. Contractor's name.
 - h. Subcontractor's and supplier's names.
 - i. Manufacturer's name.
 - j. Submittal type (shop drawing, product data, sample, informational submittal).
 - k. Description of submittal.
 - l. Action marking.
 - m. Comments.
 - 4. Fill out a separate transmittal form for each submittal; also include the following:
 - a. Other relevant information.
 - b. Requests for additional information.

3.03 SHOP DRAWINGS

- A. Content: Include the following information:
 - 1. Dimensions, at accurate scale.
 - 2. All field measurements that have been taken, at accurate scale.

3. Names of specific products and materials used.
4. Details, identified by contract document sheet and detail numbers.
5. Show compliance with the specific standards referenced.
6. Coordination requirements; show relationship to adjacent or critical work.
7. Name of preparing firm.

B. Preparation:

1. Reproductions of contract documents are not acceptable as shop drawings.
2. Copies of standard printed documents are not acceptable as shop drawings.
3. Identify as indicated for all submittals.
4. Space for **Owner's** action marking shall be adjacent to the title block.

3.04 PRODUCT DATA

A. Submit all product data submittals for each system or unit of work as one submittal.

B. When product data submittals are prepared specifically for this project (in the absence of standard printed information) submit such information as shop drawings and not as product data submittals.

C. Content:

1. Submit manufacturer's standard printed data sheets.
2. Identify the particular product being submitted; submit only pertinent pages.
3. Show compliance with properties specified.
4. Identify which options and accessories are applicable.
5. Include recommendations for application and use.
6. Show compliance with the specific standards referenced.
7. Show compliance with specified testing agency listings; show the limitations of their labels or seals, if any.
8. Identify dimensions which have been verified by field measurement.
9. Show special coordination requirements for the product.

3.05 SAMPLES

A. Samples:

1. Provide samples that are the same as proposed product.
2. Where selection is required, provide full set of all options.

B. Preparation:

1. Attach a description to each sample.
2. Attach name of manufacturer or source to each sample.
3. Where compliance with specified properties is required, attach documentation showing compliance.
4. Where there are limitations in availability, delivery, or other similar characteristics, attach description of such limitations.
5. Where selection is required, the first submittal may be a single set of all options; after return of submittal with selection indicated, submit standard number of sets of selected item.

C. Keep final sample set(s) at the project site, available for use during progress of the work.

3.06 REVIEW OF SUBMITTALS

- A. Submittals for approval will be reviewed, marked with appropriate action, and returned. Submittals are reviewed for conformance with project design concept and for compliance with standard of quality established in the Contract Documents. This review shall not relieve the **Contractor** from responsibilities for correctness of detail and dimension, nor from deviation from Contract Document requirements, except as noted and accepted in writing by the **Owner** at the time of submittal.
- B. Informational submittals: Submittals will be reviewed.
- C. Action markings for submittals for approval will be as follows:
 - 1. NO EXCEPTIONS TAKEN and EXCEPTIONS TAKEN AS NOTED: Indicate that the submitted item is released for manufacture with consideration given to any comments noted.
 - 2. REVISE AND RESUBMIT: Revise the submittal or prepare a new submittal complying with the comments made.
 - 3. REJECTED: Indicates that the submitted item does not comply with contract requirements and that another selection must be made and the submittal process repeated.

3.07 RETURN, RESUBMITTAL, AND DISTRIBUTION

- A. Submittals will be returned to the **Contractor** by mail.
- B. Perform resubmittals in the same manner as original submittals; indicate all changes other than those requested by the **Owner**.
 - 1. Exception: Transmittal number for resubmittal shall be the number of the original submittal plus a letter suffix.
 - 2. Resubmittals shall be submitted within 14 days of **Contractor's** receipt of rejected submittal.
- C. Distribution:
 - 1. Make one copy for project record documents.

END OF SECTION 01300

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

Section Includes:

1. General product requirements, including:
 - a. General specification requirements for all products.
 - b. Product options.
 - c. Procedures for substitution requests.
2. General procedures for products including:
 - a. Procedures for transportation and handling.
 - b. Procedures for delivery and receiving.
 - c. Procedures for storage.

1.02 DEFINITIONS

Damage: Any sort of deterioration whether due to weather, normal wear and tear, accident, or abuse, resulting in soiling, marring, breakage, corrosion, rotting, or impairment of function.

1.03 SUBMITTALS

- A. Schedule of Products: Submit for approval.
- B. Final Schedule of Products: Submit for project record.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Components required to be supplied in quantity within a specification section shall be identical, interchangeable, and made by the same manufacturer.
- B. Do not use products removed from existing construction, unless specifically permitted by the contract documents or approved by the **Owner**.
- C. When material or equipment is specified by reference to two (2) or more brand names or catalog numbers, it shall be understood that these references are for the purpose of defining the performance, or other salient requirements, and that other materials or equipment, of equal capacities, quality and function, shall be considered by the **Owner** upon the **Contractor's** request for substitution.
- D. If material or equipment is specified by only one patent or proprietary name or by the name of only one manufacturer, it is for the purpose of standardization, or because the **Owner** knows of no equal.
- E. Any material, article or equipment of other manufacturers and vendors, which will perform adequately the duties imposed by the general design, will be considered equally acceptable provided the material, article or equipment so proposed, is in

the opinion of the **Owner**, of equal substance and function. It shall not be purchased or installed by the **Contractor** without the **Owner's** written approval.

PART 3 - EXECUTION

3.01 PRODUCT OPTIONS

- A.** It is the **Contractor's** responsibility to select products which comply with the contract documents and which are compatible with one another, with existing work, and with products selected by other contractors.
- B.** Do not use any substitute products which have not been approved in accordance with the requirements of the contract documents.
- C.** Definition of Substitute Product: Any product which does not meet the requirements of the contract documents, whether in product characteristics, performance, quality, or manufacturer or brand names, is considered a substitute.
- D.** Product Options: Where products are specified using more than one method, such as description with a manufacturer list, use a product meeting the requirements of both specification methods.
- E.** Products Specified by Reference Standard: Use any product meeting the specification.
- F.** Products Specified by Description: Use any product meeting the specification.
- G.** Products Specified by Performance Requirements: Use any product meeting the specification.
- H.** Products Specified by Listing a Brand Name Product as the "Basis of Design": Provide a product equivalent to the product specified within the limits of variation specified. Use of a product other than that specified constitutes a representation by the **Contractor** that he will comply with all the conditions specified for acceptance of substitutions.
- I.** Language indicating that substitutions are not allowed includes:
 - 1. "Provide one of the following products."
 - 2. "Provide products made by one of the manufacturers listed."
 - 3. "Provide products complying with the contract documents and made by one of the following."
 - 4. "No substitutions."
 - 5. Other similar language.
- J.** Language indicating that substitutions are allowed includes:
 - 1. Substitutions will be considered.
 - 2. "... will be among those considered acceptable."
 - 3. Other similar language.

3.02 PRODUCT SUBSTITUTION

- A.** Reference the General Conditions – Section 00700 4.05 (Requests for Substitution).

- B.** Submission of request for substitution shall constitute a representation that the **Contractor:**
1. Has investigated the proposed product and determined that it is equal to or better than the specified product.
 2. Will provide the same warranty for the proposed product as for the specified product.
 3. Will coordinate the installation and make other changes which may be required for the work to be complete in all respects, including:
 - a. Redesign.
 - b. Additional components and capacity required by other work affected by the change.
- C.** Substitutions will not be considered when:
1. Acceptance would require substantial revision of the contract documents.
 2. They are indicated or implied on shop drawing or product data submittals without separate written request.
- D.** Substitution Request Submission:
1. Submit 3 copies of each request and accompanying data.
 2. Submit all requests on a standard form.
 3. Only one request for substitution will be considered for each product.
- E.** Data Required with Substitution Request: Submit written request with complete data substantiating compliance of the proposed product with the requirements of the Contract Documents. Provide at least the following data:
1. Identify product by specification section and paragraph number.
 2. Manufacturer's name and address, trade name and model number of product (if applicable), and name of fabricator or supplier (if applicable).
 3. Complete product data.
 4. A list of other projects on which the proposed product has been used, with project name, the design professional's name, and owner contact.
 5. An itemized comparison of the proposed product to the specified product.
 6. Net amount of change to the contract sum.
 7. List of maintenance services and replacement materials available.
 8. Statement of the effect of the substitution on the construction schedule.
 9. Description of changes that will be required in other work or products if the substitute product is approved.

3.03 SCHEDULE OF PRODUCTS

- A.** Prepare a complete schedule of products used, including the following for each product:
1. Manufacturer's name.
 2. Brand or trade name.
 3. Model number, if applicable.
 4. Reference standard, if more than one is applicable.
 5. Arrange products in the schedule by specification sections; indicate paragraph where specified.
- B.** Schedule of products shall not be used to obtain approval of substitute products; make separate request for substitution.

3.04 TRANSPORTATION AND HANDLING

- A. Require supplier to package finished products in a manner which will protect from damage during shipping, handling, and storage.
- B. Transport products by methods which avoid damage.
- C. Deliver in dry, undamaged condition in manufacturer's unopened packaging.
- D. Provide equipment and personnel adequate to handle products by methods which prevent damage.
- E. Provide additional protection during handling where necessary to prevent damage to products and packaging.
- F. Lift large and heavy components at designated lift points only.

3.05 DELIVERY AND RECEIVING

- A. If storage area is not available on site, arrange deliveries so that storage is not required.
- B. Arrange deliveries of products to allow time for inspection prior to installation.
- C. Coordinate delivery to avoid conflict with the work and to take into account both the conditions at the site and the availability of personnel, handling equipment, and storage space.
- D. Clearly mark partial deliveries to identify contents, to permit easy accumulation of entire delivery, and to facilitate assembly.
- E. Promptly inspect shipments and remedy damage, incorrect quantity, incompleteness, improper or illegible labeling, and noncompliance with requirements of contract documents and approved submittals.

3.06 STORAGE

- A. If authorized by the **Owner**, partial payment may be made for off-site storage of products. The **Contractor** shall provide evidence of full coverage insurance for any products stored at a facility outside of the project site.
- B. General Storage Procedures:
 - 1. Store products immediately on delivery.
 - 2. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
 - 3. Store in a manner to prevent damage to the stored products and to the work.
 - 4. Store moisture-sensitive products in weathertight enclosures.
 - 5. Store indoors if necessary to keep temperature and humidity within ranges required by manufacturer.
 - 6. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
 - 7. Arrange storage to provide access for inspection and inventory.

8. Periodically inspect and remedy damage and noncompliance with required conditions.

END OF SECTION 01600

SECTION 01720 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

Record documents refer to those documents maintained and annotated by the **Contractor** during construction to provide a record of the Work as installed. The Record Drawings are defined as a neatly and legibly marked set of Contract Drawings showing the final location of piping, valves, fittings, and equipment. The Record Drawings shall show field changes, changes by change order, and details not shown on the original Contract Drawings.

1.02 SUBMITTALS

Submit one set of Record Drawings and one copy of the Record Survey (if required) in accordance with Substantial Completion Procedures (00700, 6.05). The **Owner** may withhold declaring the project substantially complete and shall withhold Final Payment until acceptable Record Drawings are submitted.

1.03 QUALITY ASSURANCE

- A. The Record Drawings shall be maintained continuously. Prior to each request for partial progress payment, the **Owner** may review the Record Drawings with the **Contractor**. Progress payments may be withheld or reduced if Record Drawings are not current.
- B. In addition to the annotated Contract Drawings, the **Contractor** shall provide a Record Survey of sanitary sewer lines installed as a part of the Work. This Record Survey shall be prepared under the supervision of, and be sealed by, a Land Surveyor registered in the State of Georgia.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

- A. Unless otherwise required, the Record Drawings shall be a full-size set of the Contract Drawings maintained in a clean, dry and legible condition. Each drawing shall be marked "RECORD DRAWING" in large, clear print. Annotations on the drawings should be made with red pencil or red ink. Record Drawings shall not be used for construction purposes.
- B. Marking of the drawings shall be kept current and shall be done at the time the material and equipment are installed. Do not conceal any work until required information is recorded.
- C. If the project consists of both water line work and sanitary sewer work, the Record Drawings for each shall be maintained separately. Additional sets of the Contract Documents will be furnished by the **Owner** for Record Drawing purposes.

- D.** The **Contractor's** name, address and telephone number shall be shown on each sheet. The date(s) of installation of the Work shall also be shown on each sheet of the plan set.

3.02 WATER LINE RECORD DRAWINGS

- A.** In addition to the information shown on the Contract Drawings, the Water Line Record Drawings must contain the following information:
1. Pipe size, material, and pressure class.
 2. Manufacturer's name and model number of fire hydrants and valves; date of manufacture.
 3. Horizontal location of water lines, valves, fire hydrants, service connections, meters, air release valves and all other appurtenances. Location to be referenced to horizontal control system shown on the Contract Drawings (e.g., station and offset). If the location is identical to that shown on the Contract Drawings, indicate with the annotation "As Installed".
 4. Vertical location of water lines at crossings of creeks, storm drains, sanitary sewers, and other utilities. Also indicate any other locations where the depth of the water lines are other than standard depth.
 5. Detailed sketches, with dimensions, of connections of water mains, including valves and fittings.
- B.** Field-measured tie-down dimensions shall be provided for all valves installed (except for those on fire hydrant leads). Each valve shall be referenced to no less than three permanent and well-defined physical objects located within 100 feet of the valve. Tie-down measurements shall be shown to the nearest one-hundredth of a foot. The tie-down dimensions and reference object descriptions shall be clearly presented on the Record Drawings in the form of tables or enlarged scale sketches.

3.03 SANITARY SEWER RECORD DRAWINGS

- A.** In addition to the information shown on the Contract Drawings, the Sanitary Sewer Record Drawings must contain, as a minimum, the following information:
1. Pipe material.
 2. Manhole type, if other than standard (i.e., drop, doghouse, etc.).
 3. Pipe size and slope and length between manholes. Slope shown as percent to the nearest hundredth; length to the nearest tenth of a foot.
 4. All pipe end inverts (ins and outs) to the nearest hundredth of a foot.
 5. Manhole rim elevation to the nearest hundredth of a foot.
 6. Ground elevation at each manhole to the nearest tenth of a foot.
 7. Stationing between manhole centers to the nearest tenth of a foot.
 8. Relative horizontal angle between all pipes entering and exiting manholes; to the nearest second.
 9. Horizontal location of service laterals, stationed along sewer centerline from manholes.
 10. Invert elevation of lateral at right-of-way or easement limit; required only if lateral depth is other than standard shallow service connection.

- B.** If the project includes a sewage pump station and force main, provide the following information:
1. Elevations to accuracy noted, using site bench mark as reference, including:
 - a. Wet well top slab, bottom slab, invert of incoming gravity sewers, and centerline of pump discharge lines exiting; hundredths of a foot.
 - b. Equipment building slab; hundredths of a foot.
 - c. Generator slab; hundredths of a foot.
 - d. Ground at wet well and at fence corners; tenths of a foot.
 - e. Centerline of access road, on 50 foot centers; tenths of a foot.
 2. Site, mechanical and electrical drawings, marked to show any changes.
 3. Equipment manufacturer names and model numbers; including pumps, valves, generator, etc.
 4. Force main pipe size and material.
 5. Horizontal location of force main, air release valves and all other appurtenances. Location to be referenced to horizontal control system shown on the Contract Drawings (e.g., station and offset). If the location is identical to that shown on the Contract Drawings, indicate with the annotation "As Installed".
 6. Vertical location of force main at crossings of creeks, storm drains, water lines, and other utilities. Also indicate any other locations where the depth of the force main is other than standard depth.

3.03 SANITARY SEWER RECORD SURVEY

- A.** As noted in Paragraph 1.03.B above, the **Contractor** shall provide a Record Survey of sanitary sewer lines installed as a part of the Work, in addition to the annotated Contract Drawings submitted as Record Drawings. The Record Survey must include, as a minimum, the following information:
1. Pipe size and slope and length between manholes. Slope shown as percent to the nearest hundredth; length to the nearest tenth of a foot.
 2. All pipe end inverts (ins and outs) to the nearest hundredth of a foot.
 3. Manhole rim elevation to the nearest hundredth of a foot.
 4. Ground elevation at each manhole to the nearest tenth of a foot.
 5. Ground profile along centerline of sewer between manholes; to the nearest tenth of a foot.
 6. Manhole stationing to the nearest tenth of a foot.
 7. Relative horizontal angle between all pipes entering and exiting manholes; to the nearest second.
- B.** The Record Survey must be referenced to the horizontal and vertical controls shown on the Contract Drawings. The coordinates of the manholes shall be presented in tabular form on each sheet of the set.
- C.** Each drawing shall indicate the Cobb County Water System project name and project number, the **Contractor's** name, address and telephone number, the surveyor's name, address and telephone number, and the surveyor's seal.

END OF SECTION 01720

SECTION 01740 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds.
- B. Co-execute submittals when so specified.
- C. Review submittals to verify compliance with Contract Documents.
- D. Submit to the **Owner** for review.

1.02 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Number of original signed copies required: Two each.

1.03 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8-1/2 inches x 11 inches, punch sheets for standard 3-post binder.
 - a. Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS." List:
 - a. Title of Project.
 - b. Name of Contractor.
- C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum width of 2 inches.

1.04 WARRANTY REQUIREMENTS

- A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the **Contractor's** for one (1) year commencing at the time of acceptance by the **Owner**.
- B. The **Contractor** shall be responsible for obtaining certificates for equipment warranty for all major equipment specified herein which lists for more than \$1,000. The **Owner** reserves the right to request warranties for equipment not classified as major. The **Contractor** shall still warrant equipment not considered to be "major" in the **Contractor's** one-year warranty period even though certificates of warranty may not be required.
- C. Equipment shall be warranted to be free from defects in workmanship, design, and materials. If any part of the equipment should fail during the warranty period, it

shall be replaced and the equipment restored to service at no expense to the **Owner**.

- D. The manufacturer's warranty period shall run concurrently with the **Contractor's** warranty or guarantee period. No exception to this provision shall be allowed.
- E. Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The **Contractor** is responsible for the cost of replacing or rebuilding defective work regardless of whether the **Owner** has benefited from use of the work through a portion of its anticipated useful service life.
- F. When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.
- G. When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- H. Written warranties made to the **Owner** are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- I. The **Owner** reserves the right to reject warranties and to limit selections to Products with warranties not in conflict with requirements of the Contract Documents.
- J. The **Owner** reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- K. Manufacturer's disclaimers and limitations on product warranties do not relieve the **Contractor** of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the **Contractor**.
- L. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the **Owner**.
- M. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the **Owner**.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01740

SECTION 02100 - SITE PREPARATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This Section covers clearing, grubbing and stripping along the construction site, complete as specified herein.
- B. The **Contractor** shall clear and grub all of the area within the limits of construction as required. The limits of construction are set forth in the Contract Documents; however, the **Contractor** shall endeavor, to the extent possible, to minimize the area disturbed for the execution of the Work. The clearing limits shall be field staked as specified in Section 00700, General Conditions, unless otherwise indicated in the Contract Documents.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CLEARING

The surface of the ground, for the area to be cleared and grubbed shall be completely cleared of all timber, brush, stumps, roots, grass, weeds, rubbish and all other objectionable obstructions resting on or protruding through the surface of the ground, with the exception of those trees or landscaped areas which are designated to be preserved.

3.02 GRUBBING

Grubbing shall consist of the complete removal of all stumps, roots, matted roots, brush, timber, logs and any other debris. All depressions excavated below the original ground surface for or by the removal of such objects, shall be refilled with suitable materials and compacted to a density conforming to the surrounding ground surface.

3.03 STRIPPING

In areas so designated, top soil shall be stockpiled at the direction of the **Owner** for reuse after backfilling operations are complete. Topsoil so stockpiled shall be protected until it is placed as specified. Any topsoil remaining after all work is in place shall be disposed of by the **Contractor**, unless otherwise requested by the **Owner**.

3.04 DISPOSAL OF CLEARED AND GRUBBED MATERIAL

The **Contractor** shall dispose of all excess material and debris from the clearing and grubbing operation. The **Contractor** shall dispose of material off-site. Burning and/or burying of debris on-site will not be allowed. The cost of disposal (including hauling) of cleared and grubbed material and debris shall be considered a subsidiary obligation of the **Contractor**, the cost of which shall be included in the price of the Work.

3.05 PRESERVATION OF TREES

Those trees which are designated or identified by the **Owner** or the County arborist for preservation shall be carefully protected from damage. The **Contractor** shall comply with all directives of the County arborist regarding tree protection. The cost for compliance shall be considered a subsidiary obligation of the **Contractor**, the cost of which is included in the cost of the Work.

3.06 PRESERVATION OF PROPERTY

- A.** The **Contractor** shall exercise extreme care to avoid unnecessary disturbance of developed property.
- B.** All soil preparation procedures and replanting operations shall be under the supervision of a nurseryman experienced in such operations.
- C.** Improvements to the land such as fences, walls, outbuildings, etc. which of necessity must be removed shall be replaced with equal quality materials and workmanship.
- D.** The **Contractor** shall clean up the construction site across developed property immediately after construction is completed.
- E.** Special property preservation measures may be included in the project as an Easement Stipulation. The **Contractor** shall be responsible for executing the Work in conformance with the stipulations noted in the Contract Documents. The cost of this work shall be included in the Contract Price.

END OF SECTION 02100

SECTION 02211 – ROCK EXCAVATION

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes the drilling, blasting, splitting, disposal, and replacement of Rock.
- B. The payment for Rock requires a field evaluation of the conditions encountered during the execution of the work, prior written approval of the **Owner**, and the use of surveying methods to determine quantities removed.

1.02 DEFINITIONS

- A. Rock (General): Removal and disposal of rock material occurring as boulders or in beds, ledges, unstratified masses, and conglomerate deposits and which, in the opinion of the **Owner**, cannot be removed without the aid of systematic drilling and blasting or splitting. Drilling and splitting of rock material by mechanical or chemical means will be required and/or permitted in areas where the use of explosives is not allowed or not recommended because of sensitive surroundings. Drilling and blasting or splitting of difficult material in order to increase productivity will not be cause for identification of material as Rock.
- B. Mass Rock: Any material occupying an original volume of more than one cubic yard which cannot be excavated with a single-toothed ripper drawn by a crawler tractor having a minimum draw bar pull rating of not less than 80,000 pounds usable pull (e.g., Caterpillar D-8 or larger).
- C. Trench Rock: Any material occupying an original volume of more than one cubic yard which cannot be excavated with a backhoe having a bucket curling force of not less than 40,000 pounds, using a rock bucket and rock teeth (e.g., John Deere 790 or larger).

1.03 SUBMITTALS

- A. The **Contractor** shall submit to the **Owner** a complete list of major equipment to be used in the execution of the work, to include manufacturer's name, model number and year of manufacture. For excavating equipment, the **Contractor** shall also submit a copy of the manufacturer's printed performance specifications for the equipment to be used. All information shall be submitted within seven days after the issuance of the Notice to Proceed.
- B. The **Contractor** shall submit, for approval by the **Owner**, a list of subcontractors to be used during any drilling and blasting or splitting operations.

- C. If splitting by chemical methods is required and/or anticipated, the **Contractor** shall submit to the **Owner** complete manufacturer's product data, including standard printed information concerning the proper use, storage and disposal of the material.

1.04 PROCEDURES

- A. Notification: If, during the execution of the work, the **Contractor** encounters material believed to be classified as Rock, he shall immediately notify the **Owner**, provided however that a reasonable attempt has already been made to remove the material with excavating equipment equal to, and outfitted as, that hereinbefore specified. The **Owner** shall promptly investigate the conditions.
- B. Classification: The **Contractor** shall demonstrate, in the presence of the **Owner** or the **Owner's** designated representative, that the material encountered cannot be removed with the properly outfitted specified equipment. Any claims for delay in the classification of the material that result from the **Contractor's** failure to have the proper equipment on site will not be considered.
- C. Inspections and Monitoring: The procedures outlined in Section 02201 of these Specifications will be followed before any explosives are introduced to the site or any blasting is performed.
- D. Measurement: The volume of material eligible for payment as Rock will be based on pre- and post-surveys of the excavation. All surveys will be performed by the **Owner**, or the **Owner's** representative. The following methods will be used to determine payment quantities. The measurement method, or methods, used will be selected by the **Owner** depending on the specific blasting program employed by the **Contractor**.
 - 1. Direct Measurement: This method involves the performance of a survey along the exposed top surface of the Rock after the removal of overburden material.
 - 2. Indirect Measurement: This method involves the determination of the unexposed top surface of the Rock by monitoring the drilling of test holes in the area to be excavated. The survey will be conducted along the ground surface and the depth to the Rock surface will be determined by the measurement of the drill shaft. The spacing of test holes will not exceed fifty feet. The implementation of this method will follow the classification of Rock in test pits excavated at reasonable intervals in the area of work. As an alternate to drilling test holes, the depth measurements and horizontal locations may be made during the drilling of holes for blasting. The depth measurements will be confirmed by the **Owner** by inspection of the exposed soil/rock interface following excavation of the trench.

3. Volume Calculations: The survey data obtained by either method will be used in conjunction with the certified record survey information of the line and grade of the finished work to determine the quantity of Rock removed. The limits of payment for trench excavation (trench width and bedding depth below pipe invert) will be based on the standard dimensions as detailed on the contract drawings and will not be measured. No allowances will be made for Rock beyond the specified payment limits for additional excavation for working space, pump sumps, drainage ditches or other like purposes.
- E. Restoration: The **Contractor** shall restore or replace utilities, equipment, buildings, or structures damaged by blasting operations at no cost to the **Owner**.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 BLASTING

All blasting operations shall be conducted in full compliance with all laws of the State, local ordinances, and with all possible care. The Contractor shall adhere to the requirements of Section 02201 of these specifications.

3.02 SPLITTING

- A. The splitting of Rock by either mechanical or chemical methods shall be allowed and/or required as an alternate to blasting in areas considered too sensitive for the use of explosives. These areas shall be identified by the **Owner** or the blasting consultant before the initiation of the blasting program.
- B. If chemical products are used for splitting of Rock, the **Contractor** shall perform the splitting operations in conformance with the manufacturer's printed instructions.
- C. No additional compensation shall be allowed for mechanical or chemical splitting of rock where required or allowed in lieu of blasting.

3.03 DISPOSAL AND REPLACEMENT OF ROCK

- A. Use excavated rock in backfilling trenches above the pipe envelope subject to the following limitations:
 1. Do not use pieces of rock larger than 6 inches.
 2. Do not allow rock quantities used in backfill in any location to result in the formation of voids.
 3. Do not place rock backfill within 16 inches of surface of finish grade or within two feet of the top of the pipe.
 4. Specified density of compacted backfill must be attainable.
 5. Do not use any rock in backfill under roadways and other paved areas.

- B.** Rock disposed of shall be replaced by available surplus excavation. Approved borrow to supply any deficiency of trench backfill shall be provided by the **Contractor** for no additional compensation. The material shall conform to the requirements "Satisfactory Soil Material" as described in Section 02221 of these specifications .
- C.** If rock below required grade elevation is shattered by blasting, the shattered rock shall be removed and the excavation refilled with appropriate material at the expense of the **Contractor**.
- D.** If the excavated rock is considered by the **Owner** as acceptable material for the stabilization of slopes, creek banks, channels, etc., the rock may be used in locations where rip-rap is called for on the Drawings. This use will be considered as disposal of the excavated rock and no payment will be made for rip-rap.

END OF SECTION 02211

SECTION 02221 - TRENCHING FOR UTILITIES

PART 1 - GENERAL

1.01 SUMMARY

Section Includes:

1. Preparation.
2. Utilities trenching.
3. Backfilling.
4. Compacting.

1.02 SUBMITTALS

- A. Test Reports: Testing laboratory will submit the reports directly to the **Owner** and shall copy the **Contractor**.
- B. The results of sheeting and shoring analysis and design shall be submitted to the **Owner** on request.

1.03 QUALITY ASSURANCE

- A. An independent geotechnical consultant will take samples and perform moisture content, gradation, compaction, and density tests during placement of backfill materials to check compliance with these specifications. The **Contractor** shall provide such assistance as necessary for sampling and testing. The cost of the services of the geotechnical consultant will be paid for by the **Owner** under a separate contract or from the Geotechnical Allowance in the Bid Schedule.
- B. All excavation and trenching activities must be performed in accordance with all applicable Federal, state and local safety requirements and all permits and certifications must be obtained by the **Contractor** prior to the execution of the work. Copies of obtained Trenching and Excavation Permits along with copies of specific jobsite key personnel "Competent Person" and "Excavation and Trenching" certifications shall be submitted to the Owner on request.

1.04 SITE CONDITIONS

- A. Traffic: Do not interfere with or close public or private roadways or driveways without permission of governing authorities. Work within the rights-of-way of public roadways shall be done in accordance with requirements and provisions of the permits issued by the agencies for the construction within their respective rights-of-way.
- B. Site Utilities:
 1. Advise utility companies of excavation activities before starting excavations. Locate and identify underground utilities passing through work area before

- starting work. Contact The Utilities Protection Center at 800-282-7411 and comply with "Call before you dig" requirements.
2. If underground utilities are encountered in locations other than indicated, immediately advise utility owners before proceeding. Amend project record documents to show actual locations of all existing utilities encountered, regardless of whether or not shown on contract drawings.
 3. Protect existing utilities.
 4. Do not interrupt existing utilities without advance notice to and written approval from the utility owner.
- C. If materials are encountered that are suspected of being hazardous or toxic, the **Contractor** shall follow the procedures specified in Section 01010.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Obtain approval of each soil material from the Owner's geotechnical consultant prior to use.
- B. Satisfactory Topsoil: Fertile agricultural soil, typical for locality, capable of sustaining vigorous plant growth; free of subsoil, rocks, clay, toxic matter, plants, weeds, and roots.
- C. Satisfactory Backfill Material: Fine, sound, loose, low plasticity soil (Plasticity Index less than 30) free from all wood, vegetable matter, debris, and other objectionable material, and having scattered clods, stones, or broken concrete less than 6 inches in maximum dimension except that maximum particle size shall be less than 2 inches in backfill under roadways or other paved areas and less than $\frac{3}{4}$ inch when used with PVC or other flexible thermoplastic pipe.
- D. Bedding Material and Stabilization Stone: Gravel, air-cooled blast furnace slag, crushed stone or synthetic aggregate meeting the requirements of Section 800 of the State of Georgia Department of Transportation Standard Specifications for the Construction of Roads and Bridges, latest edition. Gradation shall be Size No. 57.
- E. Where existing excavated materials are deemed unsuitable for backfill, obtain satisfactory borrow materials from other acceptable sources. Contractor shall be compensated for this replacement material in accordance with the Contract's Unsuitable Trench Backfill Allowance.
- F. If compromise of otherwise suitable excavated material is caused by the Contractor's failure to provide proper dewatering measures, to prevent surface water run-off into the excavated area, or to protect stockpiles of stored material, the removal of the compromised material and replacement with satisfactory borrow material will be accomplished by the Contractor at no cost to the Owner.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protection: Provide markers indicating limits of work and clear identification of items and areas requiring protection.
- B. Provide barricades, warning signs, and warning lights around open excavations as necessary to prevent injury to persons.
- C. The **Contractor** is solely responsible for determining the potential for injury to persons and damage to property and for executing the work to prevent injury and damage.
- D. Do not allow excavation subgrades and soil to be subjected to freezing temperatures, frost or excessive water.

3.02 EROSION CONTROL

Provide erosion control during the entire project in accordance with the drawings and with the requirements of Section 02270 and 02275 (as applicable) of these Specifications.

3.03 PROTECTION OF TREES

- A. Provide temporary guards to protect the tops, trunks and roots of trees and vegetation to remain. Protective guards or fencing shall be installed before work is started and shall be removed when directed by the **Owner**. Heavy equipment or the stockpiling of material will not be permitted within the branch spread drip line of protected trees.
- B. Promptly repair any damaged trees to prevent death or loss of vigor. Repairs shall be performed in conformance with accepted horticultural practices suited to the nature and extent of damage done.
- C. The Cobb County arborist will determine if additional measures are required to protect specific trees. The **Contractor** shall comply with all of the arborist's directions, at no additional cost to the **Owner**.

3.04 DEWATERING

- A. Do not allow surface or ground water to flow into or accumulate in excavations. All excavation shall be done "in-the-dry", defined as no more than $\pm 3\%$ of soils' optimum moisture content.
- B. Do not allow water to flow in an uncontrolled fashion across the project site or to erode slopes or to undermine excavations.
- C. Provide and maintain temporary diversion ditches, dikes, and grading as necessary. When required by surface or subsurface water conditions, provide

sumps, wellpoints, french drains, pumps, and other control measures necessary to keep excavations free of water.

- D. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the affected areas shall be excavated and replaced with stabilization stone at no cost to the Owner.
- E. Water shall be disposed of in such a manner as not to be a menace to the public health and in accordance with applicable local regulations and State Environmental Protection Division standards and permits.

3.05 EXCAVATION

- A. Explosives: The **Contractor** shall assume sole responsibility for the effects of explosives. Comply with the requirements of Section 02201 of these Specifications.
- B. General: Excavation includes the removal of any materials necessary to achieve the required subgrade elevations and includes the reuse or disposal of such materials.
- C. Unnecessary Excavation: The expense of excavation of materials outside of limits indicated shall be borne by the **Contractor**.
- D. Approval of Subgrade: The adequacy of the subgrade shall be subject to the inspection and approval of the **Owner** before the installation of the pipeline.
- E. Excavation Stabilization: Design, provide, maintain, and remove shoring and bracing in compliance with requirements of governing authorities. The **Owner** has the right (but not the duty) to require additional stabilization measures if the **Contractor** fails to comply with applicable requirements. The **Contractor** shall immediately comply with the **Owner's** directives, at no additional cost to the **Owner**.
- F. Excavation for Utilities Structures: Excavate to allow proper construction and inspection of concrete formwork and other materials.
- G. Excavation for Footings and Foundations: Delay excavation to final grade and final compaction until just before concrete will be placed. Remove any loose or sloughed material and adjust excavations to form a suitable bearing surface.
- H. Excavation for Trenches:
 - 1. Dig trenches to uniform widths and depths as indicated.
 - 2. Trench walls for piping shall be vertical from trench bottom to one foot above top of pipe or to top elevation of initial backfill, whichever is higher.
 - 3. Should hard, unyielding material be encountered when excavating for utilities bearing directly on trench bottom remove such material to at least 6 inches below required grade and replace with approved bedding material.

- I. Unsuitable Excavated Soils and Subgrade: Where unsuitable materials are encountered within or below the excavation limits, they shall be removed and disposed of to the level or limits of suitable material. Areas so excavated shall be backfilled with satisfactory soil material and/or stabilization stone. Payment for this additional material will be from the corresponding allowance items listed in the bid form and with proper authorization and approval of the Owner representative(s).
- J. Progress of Work: The length of trench to be opened or the areas of the surface to be disturbed or un-restored at any one time shall be limited by the **Owner** with regard both to expeditious construction and to the convenience and comfort of the persons residing in the neighborhood or frequenting the project area. New trenching will not be permitted when earlier trenches need backfilling or labor is needed to restore the surfaces to a safe and proper condition. Pipe trenches shall not be excavated more than 100 feet in advance of pipe laying and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic. All trenches must be closed at the end of each work day.

3.06 STORAGE

- A. Stockpile materials to be used for filling and backfilling in a manner to protect from contamination. Erosion and sedimentation control measures shall be provided as required by the field conditions encountered at no additional cost to the **Owner**.
- B. In the storing of excavated material which is to be used for backfill, the **Contractor** shall exercise care so as to avoid inconveniencing the public. If, in the opinion of the **Owner** it is necessary to remove or relocate this excavated material, the **Contractor** will be required to do so at no cost to the **Owner**.

3.07 BACKFILLING

- A. Preparation: Backfill excavations as soon as practicable. Complete the following operations before backfilling:
 - 1. Remove temporary shoring and bracing as the work progresses and when its use is no longer necessary.
 - 2. Request the performance of any inspections or testing required in the open ditch.
- B. Installation:
 - 1. Place bedding material and install pipe in conformance with the applicable sections of these specifications and with the details on the drawings.
 - 2. Place approved soil materials in layers to required elevations.

3.08 COMPACTION

- A. Place backfill in layers not exceeding loose depths as follows:
 - 1. Heavy equipment compaction: 8 inches.

2. Hand operated tampers: 4 inches.
- B.** In-Place Density Requirements: Compact soil to not less than the standard proctor values given below.
1. Unpaved areas outside of roadway right-of-ways: 90 percent for all lifts.
 2. Unpaved areas of roadway right-of-way: 98 percent for all lifts.
 3. Paved areas: 98 percent for all lifts up to the top 12-inches, 100 percent for the top 12-inches.
- C.** Moisture Control: During compaction, control moisture of subgrades and subsequent lifts to within $\pm 3\%$ of optimum moisture content.

3.09 GRADING

- A.** Slope grades to prevent ponding. Finish subgrades to following tolerance:
1. Unpaved areas: Plus or minus 0.10 foot.
 2. Sidewalk areas: Plus or minus 0.05 foot.
 3. All other paved areas: Plus or minus 0.05 foot.
- B.** Restore disturbed wetlands areas to original pre-construction configuration. Dispose of excess soil in upland areas.

3.10 FIELD QUALITY CONTROL

- A.** Testing Laboratory Services: Provide timely notice to testing laboratory. Do not proceed with construction until testing, inspection and approval have been obtained.
- B.** Maximum Density at Optimum Moisture Content: Determined in accordance with ASTM D 1557, Method D.
- C.** In-Place Density Tests: ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2922 (nuclear method), as applicable.
- D.** If testing indicates that subgrade or fills are below specified density, scarify or remove and replace to the required depth, re-compact, and retest at no additional cost to the **Owner**.
- E.** The cost of the initial tests will be borne by **Owner**. The cost of any retests or additional tests will be borne by **Contractor**.

3.11 MAINTENANCE

- A.** Completed Areas: Protect from damage by pedestrian or vehicular traffic, freezing, erosion, and contamination with foreign materials.
- B.** Damaged Areas: Where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction and whether due to subsequent construction operations or weather conditions, restore materials to required

condition. Scarify or remove and replace to the required depth, return to optimum moisture content, and compact materials to the required density before continuing construction. The restoration of damaged areas will be accomplished at no additional cost to the **Owner**.

3.12 DISPOSAL OF EXCESS AND WASTE MATERIALS

- A.** Evenly spread any excess satisfactory topsoil in locations on site as directed by the **Owner**. Properly dispose of unsatisfactory topsoil off site.
- B.** Remove any trash, debris, and other materials not required for use on the project and legally dispose of it off site.
- C.** On-site burning or burying of any material is prohibited.

END OF SECTION 02221

SECTION 02235 - BORING AND JACKING

PART 1 - GENERAL

1.01 WORK INCLUDED

The work included in this Section consists of furnishing and installing bored and jacked pipeline casings, and installation of pipelines within the casings, through whatever material is encountered where cased pipelines are required.

1.02 METHOD OF CONSTRUCTION

- A. All roadway crossings must conform to the requirements of the state or local Department of Transportation having jurisdiction in the project area.
- B. All railroad crossings shall conform to the requirements of the American Railway Engineering Association Manual for Railway Engineering, Part 5. The **Contractor** shall secure permission from the railroads to schedule the work so as not to interfere with the operation of the railroads. The **Contractor** shall be held responsible for any delays or damages occurring to the railroads. The **Contractor** will furnish the railroad with such additional insurance as may be required, cost of same to be included in the Contract Price, together with the costs for flagmen, watchmen, temporary work of any nature, safety devices and any other items that may be imposed by the railroad.
- C. Any change in the construction method during the work or increase in length of bore beyond that specified due to a selected construction method shall not result in additional payments to the **Contractor**.
- D. No payment will be made for incomplete or unacceptable casings and no extra payment will be made for realignment of casings.

1.03 SUBMITTALS

If requested, submit casing pipe manufacturer's certification stating the casing complies with the requirements of this Specification and submit product data for casing carrier spacers.

1.04 JOB CONDITIONS

- A. Protect and preserve benchmarks, monuments, and reference points provided.
- B. Conduct all work on Georgia DOT right-of-way in strict conformance to Georgia DOT rules and regulations. Coordinate and schedule the work with the Cobb County DOT and/or Georgia DOT, as appropriate. Provide traffic protection as required by the governing authority.

- C. Protect existing underground and overhead utility pipes, poles, lines, services, structures, etc., from damage or interruption of service by the conduct of construction operations. Location and protection of all underground utilities and structures in the path of construction is the responsibility of the **Contractor**.

PART 2 - PRODUCTS

2.01 CASING PIPE

- A. Casing pipe shall be welded steel, smooth wall pipe conforming to ASTM A139, except that the hydrostatic test is not required. The casing shall be fully coated on the exterior with a coal tar epoxy. Field connections between sections of pipe shall be continuous circumferential welded joints.
- B. The diameter of the casing pipe shall be as indicated on the Drawings. The wall thickness of the casing pipe shall be as follows:

<u>Nominal Diameter (Inches)</u>	<u>Wall Thickness (Inches)</u>
Under 14	0.188
14	0.219
16	0.219
18	0.250
20	0.281
22	0.312
24	0.344
26	0.375
28	0.406
30	0.406
32	0.438
34	0.469
36	0.469
42	0.500
48	0.625
54	0.700

2.02 CARRIER PIPE

- A. The product transporting pipeline that is inserted through the casing pipe is referred to hereinafter as "carrier pipe". The pipe size, material and application (water supply, gravity sewer, sewage force main) shall be as indicated on the drawings.
- B. For installations involving water lines or sewage force mains, blocking or skids shall be placed under the carrier pipe prior to inserting pipe into the casing. Skids shall be formed with pressure treated lumber and be attached to the pipe with metal bands. Skid spacing shall not exceed ten feet on center.

- C. For installations involving gravity sewer lines, manufactured casing spacers shall be used to maintain proper line and grade of the carrier pipe. Spacer spacing shall not exceed ten feet on center. Spacers shall be equal to Model 4810 stainless steel Casing Chocks as manufactured by Power Seal.

PART 3 - EXECUTION

3.01 CLEARING

Clearing shall be done as required for completion of the Work within the limits indicated in the Contract Documents.

3.02 PROTECTION OF UTILITIES

Locate and protect all existing overhead and underground utilities.

3.03 EXCAVATION

Excavate suitable pits or trenches. Provide suitable sheeting and bracing where necessary. Keep the work dewatered at all times.

3.04 ALIGNMENT AND GRADE

Install casing pipe at the location and grade shown on the Drawings. Variation in the final position of the pipe from the line and grade shown on the Drawings will be permitted only if approved by the **Owner**. The **Contractor** shall be responsible for all costs of realignment which result from unacceptable casings.

3.05 INSTALLATION OF CASING PIPE

The diameter of the bored excavation shall conform to the outside diameter and circumference of the casing pipe as closely as practicable. Any voids which develop during the installation operation and which are determined by the **Owner** to be detrimental to the work, shall be pressure grouted with an approved mix.

3.06 INSTALLATION OF CARRIER PIPE

- A. Install carrier pipe in casing utilizing adequate blocking, bracing and skids or casing spacers per the manufacturer's recommendations.
- B. When indicated in the Contract Documents, the annular space between the casing pipe and the carrier pipe shall be completely filled with an approved grout mix. Proper precautions shall be taken to prevent floating and misalignment of the carrier pipe during grouting operations.
- C. Seal casing ends against entrance of foreign material by means of casing seals, grout, brick and mortar or steel plate.

- D.** Backfilling: Backfill pits and trenches immediately after installation of the casing pipe and carrier pipe and approval by the **Owner**. Compaction of backfill shall follow appropriate provisions of Section 02221.

END OF SECTION 02235

SECTION 02650 - MANHOLE FRAME AND COVER ADJUSTMENTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This Section addresses the adjustment to grade and/or replacement of manhole frames and covers for both in-pavement and out-of-pavement structures
- B. The Contractor shall be responsible for the following:
 - 1. Furnishing all labor, equipment, and materials necessary to complete the work.
 - 2. Compliance with Cobb County Department of Transportation and/or Georgia Department of Transportation guidelines for work zone establishment, traffic control, authorization to perform work within roadways and right-of-ways, material specifications, etc.
 - 3. Compliance with Cobb County Community Development regulations in regards to erosion and sedimentation control.
 - 4. Negotiations and obtaining (in writing) any necessary permission to enter private property to access work areas.
 - 5. Protect or re-establish existing drainage ways or easements which may be impacted during work activities.
 - 6. Repair of any manholes damaged as a result of work activities
- C. The Owner will provide maps of the sewer collection systems' (via electronic PDF format) and other location details based on the best information currently and readily available for the Contractor's use in establishing the general location of a manhole. The Contractor is responsible for further location efforts (electromagnetic devices, survey measurement/alignment, etc.) to properly identify the work order location.
- D. Water supply for concrete mix preparation shall be from an authorized, metered source. Fire hydrant meter(s) are available for rental from the Cobb County Water System

1.02 WARRANTY

- A. A written two year warranty covering all workmanship and materials shall be provided by the Contractor for each adjustment from the date of the completion of the work order.

1.03 SUBMITTALS

- A.** Submit shop drawings for materials furnished under this section to the Owner in conformance with the requirements of Section 01300 (Submittals) of these Specifications.
- B.** Submit to owner the detailed mix design information (compressive strength, curing time, availability to introduce traffic loads, etc.) for the concrete
- C.** Submit a letter from the rapid-set cement manufacturer certifying that all products proposed for use in conjunction with the cement have been reviewed (including the dye/ staining agent, curing and sealing compound, and crack sealant) and have been determined to be compatible with the cement material when used as intended in this project.

PART 2 - PRODUCTS

2.01 GENERAL

- A.** All materials and products utilized in the execution of the work shall be in accordance with these Specifications and the subject to the inspection, testing, and approval of the Owner.

2.02 MATERIALS

- A.** Manhole Frames and Covers
 - 1. Standard manhole frames and covers shall be furnished and installed on manholes in roadways and in maintained right-of-ways (unless located in direct drainage ways). Standard manhole frames and covers shall be East Jordan Iron Works Model V-1480, U.S. Foundry Model USF 360-E, or approved equal.
 - 2. Bolt-down, watertight frames and covers shall be furnished and installed on manholes along easements for outfall collector and interceptor sewers, in drainage ways, and elsewhere as directed. Bolt-down, watertight frames and covers shall be East Jordan Iron Works Model V2480, U.S. Foundry USF 360-E / ORS, or approved equal with rubber gasket. Two (2), 5/8-inch diameter, stainless steel, machine bolts shall be furnished and installed along with two (2) Owner-furnished, 5/8-inch stainless steel, "tamper-proof" bolts.
- B.** Concrete and Grout
 - 1. Concrete for manhole frame and cover adjustments in roadways shall be a rapid-setting, early strength mix meeting the requirements of Section 934-Rapid Setting Patching Materials for Portland Cement Concrete of the Georgia Department of Transportation's Standard Specifications and utilizing a product from the Georgia Department of Transportation's Qualified Products List 27, "Rapid Setting Patching Materials" (latest edition) such as CTS Manufacturing Company's Rapid Set D.O.T. Cement or approved equal. Sand, coarse

aggregate, water, and other special additives shall be furnished and accurately proportioned in accordance with the patching material manufacturer's specifications.

2. Sand-cement grout for setting precast concrete adjustment rings shall consist of 1 part Type III Portland cement, 2 parts sand, with a maximum of 4.5 gallons of water per sack (cubic foot) of cement.
 3. Hydraulic cement for use in sealing manhole joints, lift holes, around pipe connections, inverts, complete interior grouting of brick manholes, etc. shall be Thoro Waterplug (Masterseal 590), Quikrete Hydraulic Water-Stop Cement (No. 1126) or approved equal.
- C.** An acrylic curing and sealing compound shall be applied to the concrete surface in accordance with the manufacturer's instruction. The compound shall be Rez-Seal by Euclid Chemical Company or approved equal.
- D.** The perimeter joint shall have a cold-pour, liquid, crack sealant applied to inhibit the effects of water penetration between the newly placed concrete and the surrounding pavement. This application shall be in accordance with the manufacturer's instruction. The sealant shall be Brewer Cote of the Brewer Company, or approved equal.
- E.** Reinforcing steel shall be deformed, billet-steel bars conforming to ASTM A615, Grade 60. Bars shall be shop fabricated and bent cold.
- F.** Precast Concrete manhole sections shall conform to Specification for Precast Concrete Manhole Sections, ASTM designation C478, except as otherwise specified below. The method of construction shall conform to the drawings and details and the following additional requirements:
1. Barrel sections shall have tongue and groove joints. Joints shall have a round rubber gasket set in specially provided indentations. The round rubber "O"-ring gasket shall conform to ASTM C443 standard specifications SS-S-210A "Sealing Compound, Preformed Plastic for Pipe Joints", Type I, Rope Form and AASHTO Designation M-198 75 1, Type B, Flexible Plastic Gasket (Bitumen) are also acceptable.
 2. Type I cement shall be used except as otherwise approved.
 3. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section. Each section of the manhole must be inspected and stamped by an accredited testing laboratory.
 4. Sections shall be cured by an approved method for at least 28 days.

5. Top sections shall be eccentric except that precast concrete slabs shall be used where cover over the top of the pipe is less than 4 feet for all manholes.
 6. Precast concrete slabs over top sections, where required, shall be capable of supporting the overburden plus live load equivalent to AASHTO H-20 loading.
 7. Manhole steps shall be cast into precast sections and shall conform to ASTM Specification C478. Steps shall be Plastic Step by M.A. Industries, Inc. or equal.
 8. Lift holes for handling the precast sections shall not penetrate completely through the wall.
- G.** Precast concrete adjustment rings shall conform to ASTM C478, except as otherwise specified below. The method of construction shall conform to the drawings and detail and the following additional requirements:
1. The precast concrete adjustment ring shall only be used for minor vertical adjustments (12-inches or less) to a manhole frame and cover out of pavement and where directed by the Owner.
 2. The precast concrete adjustment ring shall be free from cracks, voids, and other defects.
 3. The inside diameter of the precast concrete adjustment ring shall have a diameter to match the manhole frame and cover.

PART 3 - EXECUTION

3.01 GENERAL

- A.** Care shall be taken in all aspects of the work, including, but not limited to the following:
1. Protection of existing sanitary sewer mains and manholes.
 2. Protection of existing adjacent utilities.
 3. Protection of existing adjacent trees, shrubs, landscape, etc.
 4. Protection of existing adjacent roadway surfaces.
 5. Protection of existing adjacent drainage ways, creeks, streams, ponds, and lakes.
 6. Handling of materials.

7. Providing traffic control.
- B.** The Contractor shall be effectively equipped with machinery, tools, materials, traffic control devices, etc. to perform the necessary tasks for completing work in accordance with these specifications and detail drawings.
 - C.** The Contractor shall be effectively staffed with knowledgeable, capable personnel. Experienced, trained supervisory personnel shall be present at all times to ensure the best quality work in accordance with these specifications and detail drawings.
 - D.** The Contractor shall legally dispose of all waste, surplus, or unsuitable materials or debris on a daily basis. Debris allowed to drop into sewer manholes shall immediately be removed to avoid the potential of sewer blockages. Contractor will be held responsible for any fine levied by Federal, State, or Local authorities having jurisdiction, which may be the direct or indirect result of work performed under this Contract.
 - E.** In the event the Contractor encounters a manhole which has not previously been adjusted in accordance with the Specifications of this Contract, the Contractor shall inform the Owner. At the Owner's direction, the Contractor will correct the existing condition to bring the manhole to the current standards set forth by this Contract.

3.02 ADJUSTMENT AND/ OR REPLACEMENT IN ROADWAYS AND PAVEMENT

- A.** The adjustment to grade and/ or replacement of manhole frames and covers in roadways shall be performed with the following guidelines:
 - 1. Accurately locate the Manhole (if not currently visible) and its center.
 - 2. Mechanically core or saw-cut the full depth of existing roadway pavement around the manhole. A circular core/cut with a diameter sufficient for adjustment needs is required.
 - a. Exceptions to this include situations in which existing, square concrete pad/patch, exposed at roadway surface is being replaced. In these instances the replacement pad/patch is to match the existing square dimensions.
 - 3. All existing adjustment rings, bricks, shims, etc. shall be removed and the surrounding sub-base and base shall be excavated to the clean lines and dimension of the pavement core/cut.
 - a. For Manhole adjustments less than 24-inches- Excavation shall be to a depth of 3-inches (minimum) below the resulting top of the intact manhole structure. The existing structure shall be exposed and be cleaned of residual dirt, mud, cement, gravel, etc. Care shall be employed to prevent the entry of dirt, debris, and foreign materials into the manhole, and if such occurs, shall immediately be removed by the Contractor at no additional cost to the Owner.

- b. For manhole adjustments greater than 24-inches- Excavation shall be to a depth of 3-inches (minimum) below existing cone section, the existing cone section removed, 1-foot concrete riser section(s) installed, the existing cone section reinstalled (if suitable for reuse), and all joints sealed & grouted. Care shall be employed to prevent the entry of dirt, debris, and foreign materials into the manhole, and if such occurs, shall immediately be removed by the Contractor at no additional cost to the Owner.
 4. The cast iron manhole frame shall be supported in place, centered accurately over the manhole throat/chimney, and set to the elevation and slope of the adjacent roadway surface. This support and the formwork for subsequent concrete placement around the installation shall be by a proven method deemed acceptable by the owner. The manhole throat/chimney diameter shall not be permanently compromised or constricted in any way. The use of manhole adjusting rings (of any type of material) or brick is not acceptable. Any supporting interior form/liner to remain in place shall be of a corrosion-resistant material, such as Vylon, PVC, HDPE, etc. and shall be secured and sealed in place with a proven, compatible adhesive/ sealant.
 5. Accurately proportion the rapid-setting, high-early strength concrete mix in accordance to manufacturer's specifications. Place the concrete along with the required reinforcing steel to the detailed clearances. Mechanically vibrate the concrete to achieve proper consolidation and the elimination of voids. The concrete collar shall be a monolithic placement, completely filling the core/cut opening and encapsulating the top of the manhole structure and manhole cast iron frame. Screed concrete surface flush with the adjacent roadway surface. Float and/or trowel to a consistent finish. Tool a perimeter joint to a depth of 1-1/2-inch and apply a light broom finish. Following the finishing, apply a curing and sealing compound to the concrete and a crack sealant to the perimeter joint in accordance with manufacturer's instructions.
 6. Maintain full traffic control around the freshly placed concrete until the concrete has achieved a minimum compressive strength of 1200 psi based upon manufacturer's mix design guidelines. Curing duration will be validated by the Owner by random sampling and testing during the course of the contract.
 7. Place concrete only if ambient and adjoining surface temperatures are 45 degrees and rising or if sufficient thermal protection is provided to maintain proper curing conditions. Appropriate curing precautions shall be taken to protect the concrete during hot weather conditions.
- B.** As specifically directed for coordination with select Department of Transportation roadway resurfacing projects, the Contractor shall lower existing manholes prior to major road surface milling operations. The following general guidelines shall apply:
1. Accurately locate the manhole (if not currently visible) and its center. Reference and record location for subsequent adjustment.

2. Mechanically core or saw cut the full depth of existing roadway around the manhole, or completely remove the concrete pad/patch if such exists.
3. Dependent upon the anticipated depth of proposed road surface milling
 - a. Remove the manhole frame and cover.
 - b. Remove any existing manhole adjustments, i.e. adjustment rings, bricks, shims, etc.
 - c. For manhole adjustments greater than 24-inches- The existing cone section is to be removed, 1-foot precast concrete riser section(s) shall be installed, the existing cone section (if suitable) shall be reinstalled, and all joints sealed and grouted. Care shall be employed to prevent the entry of dirt, debris, and foreign materials into the manhole, and if such occurs, it shall be immediately removed by the Contractor at no additional cost to the Owner.
 - d. If the proposed milling depth allows, the manhole frame and cover may be reset. If not, the manhole frame and cover shall be removed and an adequate sized steel traffic plate placed over the manhole structure. Either method is temporary until roadway milling and resurfacing has been completed, and shall be sufficient to support traffic loads as well as to protect the sanitary sewer facility.
 - e. All debris, including the manhole frame and cover (if removed) shall be removed from the site.
4. Backfill with select granular material and compact to a level of 3-inches below the anticipated road surface milling depth.
5. Accurately proportion the rapid-setting, high-early strength concrete mix in accordance to manufacturer's specifications. Place concrete and screed to a level flush with the existing roadway surface. Neither concrete curing compound nor joint sealant will be required for this temporary pad/patch.
6. Maintain full traffic control around the freshly placed concrete until the concrete has achieved a minimum compressive strength of 1200 psi based upon manufacturer's mix design guidelines, curing duration will be validated by the Owner by random sampling and testing during the course of the contract.
7. Place concrete only if ambient and adjoining surface temperatures are 45 degrees and rising or if sufficient thermal protection is provided to maintain proper curing conditions. Appropriate curing precautions shall be taken to protect the concrete during hot weather conditions.
8. Following completion of the Department of Transportation's resurfacing of the roadway, permanent adjustment to grade of the manhole frame and cover shall be performed in accordance with these specifications.

3.03 ADJUSTMENT AND/OR REPLACEMENT OUT OF PAVEMENT

- A. The adjustment to grade and/or replacement of manhole frames and covers out of pavement within right-of ways and/or easements shall be performed in accordance with the following guidelines:
1. Accurately locate the Manhole (if not currently visible) and its center.
 2. Excavate to fully expose the top of the manhole structure at a depth to effectively and safely perform the manhole adjustment work.
 3. All existing adjustment rings, bricks, shims, etc. shall be removed. Care shall be employed to prevent the entry of dirt, debris, and foreign materials into the manhole, and if such occurs, shall immediately be removed by the Contractor at no additional cost to the Owner.
 4. Perform manhole adjustments using all new materials and components in accordance with manufacturer instructions, industry guidelines, and these specifications and detail drawings.
 - a. Manhole adjustments involving only frame and cover replacement will be accomplished by attaching the new frame to the manhole structure with 4 each, ½-inch diameter, stainless steel anchor bolts (or threaded rods), installed in drilled holes with epoxy adhesive. Install a butyl rubber flexible sealant (Ram-Nek, Kent Seal, or equal) to provide a mastic seal between frame and structure.
 - b. Manhole height adjustments involving the removal of the existing precast cone or flat-top section, installation of a new precast concrete riser section of the proper diameter and height, and resetting the existing cone or flat-top section (if acceptable for reuse). Anchor Straps shall be installed per the standard details
 - c. If the existing manhole is of brick and mortar construction, the brick cone and walls shall be demolished/ removed to an adequate and structurally sound level (as determined by the Owner). A new precast concrete riser and cone or flat-top sections of the proper diameter and height shall be installed on the brick structure. An external concrete collar shall be placed to secure the precast concrete to the brick structure as indicated by contract standard details.
 - d. For locations specifically authorized by the Owner for minor vertical adjustments (12-inches or less), precast concrete adjustment rings may be used to elevate the frame and cover. Adjustment rings, along with the frame, shall be secured to the manhole structure with 4 each, ½-inch stainless steel anchor bolts (or threaded rods) installed in drilled holes with epoxy adhesive. Grout shall be used to bond adjustment rings as well as to provide an exterior seal.

5. Place concrete only if ambient and adjoining surface temperatures are 45 degrees and rising or if sufficient thermal protection is provided to maintain proper curing conditions. Appropriate curing precautions shall be taken to protect the concrete during hot weather conditions.

3.04 FIELD QUALITY ASSURANCES

- A. Owner shall field inspect all work performed before final acceptance and payment.
- B. A written two-year warranty shall be provided for the replacement work.
- C. Failures considered to be warranty repairs include concrete surface spalling, cracking of the concrete, separation of the manhole frame from the concrete, or other obvious defects. The Owner may require the concrete mix manufacturer's involvement in examination of failures and determination of modifications necessary to avoid future defective work.
- D. Warranty repair consists of complete removal and replacement of the manhole frame in accordance with these adjustment specifications at no cost to the Owner. Critical failures that create a potential traffic hazard shall be rectified within 24 hours of notice, while less serious failures shall be addressed within 30 days of notice. The failure type shall be determined by the Owner.

END OF SECTION 02650

SECTION 02660 - VALVE BOX ADJUSTMENTS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This Section addresses the adjustment to grade and/or replacement of valve box for both in-pavement and out-of-pavement situations
- B. The Contractor shall be responsible for the following:
 - 1. Furnishing all labor, equipment, and materials necessary to complete the work.
 - 2. Compliance with Cobb County Department of Transportation and/or Georgia Department of Transportation guidelines for work zone establishment, traffic control, authorization to perform work within roadways and right-of-ways, material specifications, etc.
 - 3. Compliance with Cobb County Community Development regulations in regards to erosion and sedimentation control.
 - 4. Negotiations and obtaining (in writing) any necessary permission to enter private property to access work areas.
 - 5. Protect or re-establish existing drainage ways or easements which may be impacted during work activities.
 - 6. Repair of any valve boxes damaged as a result of work activities.
- C. The Owner will provide maps of the water distribution systems (via electronic PDF format) and other location details based on the best information currently and readily available for the Contractor's use in establishing the general location of a valve box. The Contractor is responsible for further location efforts (electromagnetic devices, survey measurement/alignment, etc.) to properly identify the work order location.
- D. Water supply for concrete mix preparation shall be from an authorized, metered source. Fire hydrant meter(s) are available for rental from the Cobb County Water System

1.02 WARRANTY

- A. A written two-year warranty covering all workmanship and materials shall be provided by the Contractor for each adjustment from the date of the completion of the work order.

1.03 SUBMITTALS

- A.** Submit shop drawings for materials furnished under this section to the Owner in conformance with the requirements of Section 01300 (Submittals) of these Specifications.
- B.** Submit to owner the detailed mix design information (compressive strength, curing time, availability to introduce traffic loads, etc.) for the concrete
- C.** Submit a letter from the rapid-set cement manufacturer certifying that all products proposed for use in conjunction with the cement have been reviewed (including the dye/ staining agent, curing and sealing compound, and crack sealant) and have been determined to be compatible with the cement material when used as intended in this project.

PART 2 - PRODUCTS

2.01 GENERAL

- A.** All materials and products utilized in the execution of the work shall be in accordance with these Specifications and the subject to the inspection, testing, and approval of the Owner.

2.02 MATERIALS

- A.** Valve Box
 - 1. Valve Box shall be approved standard cast iron adjustable with a minimum diameter of 5-1/4-inches. The casting shall be coated with coal-tar pitch varnish. The lid shall bear the word "WATER", the letter "W", or other applicable designation for sewer, reuse water, etc. The valve box shall be East Jordan Iron Works model 8550 or approved equal.
- B.** Concrete and Grout
 - 1. Concrete for valve box adjustments in roadways shall be a rapid-setting, early strength mix meeting the requirements of section 934 - Rapid Setting Patching Materials for Portland Cement Concrete of the Georgia Department of Transportation Standard Specification and utilizing a product from the Georgia Department of Transportation's Qualified Products List 27, "Rapid Setting Patching Materials" (latest edition) such as CTS Manufacturing Company's Rapid Set D.O.T. Cement or approved equal. Sand, coarse aggregate, water, and other special additives shall be furnished and accurately proportioned in accordance with the patching material manufacturer's specifications.
 - 2. Sand-cement grout for filling of annular space between valve box and precast collar shall consist of 1 part Type III Portland cement, 2 parts sand, with a maximum of 4.5 gallons of water per sack (cubic foot) of cement.

- C. An acrylic curing and sealing compound shall be applied to the concrete surface in accordance with the manufacturer's instruction. The compound shall be Rez-Seal by Euclid Chemical Company or approved equal.
- D. The perimeter joint shall have a cold-pour liquid, crack sealant applied to inhibit the effects of water penetration between the newly placed concrete and the surrounding pavement. This application shall be in accordance with the manufacturer's instruction. The sealant shall be Brewer Cote of the Brewer Company, or approved equal.
- E. Mesh reinforcement shall be electrically welded, cold-drawn, mild-steel, plain wire fabric conforming to ASTM A185. Wires shall be cold-drawn steel conforming to ASTM A82. Mesh reinforcement shall be supplied as flat sheets or mats.
- F. Precast concrete valve collars may be used in unpaved areas instead of casting valve collar in place upon approval of the precast valve collar shop drawings. The precast collar can be square or circular in shape. The concrete shall be a minimum of 3000 psi design and a have minimum thickness of 4". The precast collar shall be a minimum 18-inch square or have a minimum diameter of 18".

PART 3 - EXECUTION

3.01 GENERAL

- A. Care shall be taken in all aspects of the work, including, but not limited to the following:
 - 1. Protection of existing water main and valves.
 - 2. Protection of existing adjacent utilities.
 - 3. Protection of existing adjacent trees, shrubs, landscape, etc.
 - 4. Protection of existing adjacent roadway surfaces.
 - 5. Protection of existing adjacent drainage ways, creeks, streams, ponds, and lakes.
 - 6. Handling of materials.
 - 7. Providing traffic control.
- B. The Contractor shall be effectively equipped with machinery, tools, materials, traffic control devices, etc. to perform the necessary tasks for completing work in accordance with these specifications and detail drawings.

- C. The Contractor shall be effectively staffed with knowledgeable, capable personnel. Experienced, trained supervisory personnel shall be present at all times to ensure the best quality work in accordance with these specifications and detail drawings.
- D. In the event the Contractor encounters a valve box which has not previously been adjusted in accordance with the Specifications of this Contract, the Contractor shall inform the Owner. At the Owner's direction, the Contractor will correct the existing condition to bring the valve box to the current standards set forth by this Contract.
- E. All water distribution system valves shall be exercised through their full range upon completion of valve box adjustment work. An accurate "count" of full turns to fully open and close the valve shall be recorded along with the original position (open, closed, partial) and provided to the Owner. The valve shall be returned to its original position.
- F. The Contractor shall avoid allowing any debris from the work activities to enter the valve box. If such occurs, the Contractor shall immediately take action to remove debris.

3.02 ADJUSTMENT AND/ OR REPLACEMENT IN ROADWAYS AND PAVEMENT

- A. The adjustment to grade and/ or replacement of valve boxes in roadways shall be performed with the following guidelines:
 - 1. Accurately locate the valve box (if not currently visible) and its center.
 - 2. Mechanically core or saw-cut the full depth of existing roadway pavement around the valve box. A circular core/cut with a diameter sufficient for adjustment (but not to exceed 20-inches) is required.
 - a. Exceptions to this include situations in which existing, square concrete pad/patch, exposed at roadway surface is being replaced. In these instances the replacement pad/patch is to match the existing square dimensions.
 - 3. Excavate as necessary around the existing valve box including removing it to clean debris from the box and valve nut and to center the box on the valve nut. No existing valve box shall be reused if cracked, otherwise damaged, or if found inappropriate for the location. The area of excavation shall be to the clean lines and dimensions of the pavement core/cut. Excavation below the nominal depth of the concrete collar shall be backfilled in lifts and compacted to 98% standard proctor using select materials.
 - 4. The valve box shall be supported in place, centered accurately over the valve, and set to the elevation and slope of the adjacent roadway surface. This support and the formwork for subsequent concrete placement around the installation shall be by a proven method and deemed acceptable by the owner. The valve box shall be installed to ensure positive accessibility of the operating nut or extension stem (if required) of the valve.

5. Accurately proportion the rapid-setting, high-early strength concrete mix in accordance to manufacturer's specifications. Place the concrete along with the required reinforcing steel to the detailed clearances. Mechanically vibrate the concrete to achieve proper consolidation and the elimination of voids. The concrete collar shall be a monolithic placement, completely filling the core/cut opening and encapsulating the top 10-inches of the valve box. Screed concrete surface flush with the adjacent roadway surface. Float and/or trowel to a consistent finish. Tool a perimeter joint to a depth of 1-1/2-inch and apply a light broom finish. Following the finishing, apply a curing and sealing compound to the concrete and a crack sealant to the perimeter joint in accordance with manufacturer's.
 6. Maintain full traffic control around the freshly placed concrete until the concrete has achieved a minimum compressive strength of 1200 psi based upon manufacturer's mix design guidelines. Curing duration will be validated by the Owner by random sampling and testing during the course of the contract.
 7. Place concrete only if ambient and adjoining surface temperatures are 45 degrees and rising or if sufficient thermal protection is provided to maintain proper curing conditions. Appropriate curing precautions shall be taken to protect the concrete during hot weather conditions.
- B.** As specifically directed for coordination with select Department of Transportation roadway resurfacing projects, the Contractor shall prepare existing valve boxes prior to major road surface milling operations. The following general guideline shall apply:
1. Accurately locate the valve box (if not currently visible) and its center. Reference and record location for subsequent adjustment.
 2. Expose the valve box as necessary and/or otherwise remove the valve box cover.
 3. Pack the valve box with heavy paper or other suitable filler material to prevent milling residue from filling the valve box.
 4. Following completion of the Department of Transportation resurfacing of the roadway, permanent adjustment to grade of the valve box shall be performed in accordance with these specifications. This work will typically include valve box clean-out and valve box replacement.

3.03 ADJUSTMENT AND/ OR REPLACEMENT OUT OF PAVEMENT

- A.** The adjustment to grade and/or replacement of valve boxes out of pavement shall be performed in accordance with the following guidelines:
1. Accurately locate the valve box (if not currently visible) and its center.
 2. Excavate as necessary around the existing valve box including removing it to clean debris from the box and valve nut and to center the box on the valve nut. No existing valve box shall be reused if cracked, otherwise damaged, or if

found inappropriate for the location. The area of excavation shall be limited as much as practical. Excavation below the required depth of the concrete collar shall be backfilled in lifts and compacted to 98% standard proctor using select materials.

3. The valve box intended for installation shall be supported in place, centered accurately over the valve, and set to the elevation and slope of the adjacent ground. The valve box shall be installed to ensure positive accessibility of the operating nut or extension stem (if required) of the valve.
4. The final 4" shall be reserved for the valve collar:
 - a. Installing the cast in place concrete valve collar. Accurately proportion the rapid-setting, high-early strength concrete mix in accordance to manufacturer's specifications. Place the concrete along with the required reinforcing mesh to the detailed clearances. The concrete shall be a monolithic placement encompassing the top 4-inches of the valve box. Screed concrete surface to be flush with the adjacent ground level. Float and/or trowel to a consistent finish and apply a light broom finish.
 - i. Maintain full traffic control around the freshly placed concrete until the concrete has achieved a minimum compressive strength of 1200 psi based upon manufacturer's mix design guidelines. Curing duration will be validated by the Owner by random sampling and testing during the course of the contract.
 - ii. Place concrete only if ambient and adjoining surface temperatures are 45 degrees and rising or if sufficient thermal protection is provided to maintain proper curing conditions. Appropriate curing precautions shall be taken to protect the concrete during hot weather conditions.
 - b. Install approved precast concrete valve collar.

3.04 FIELD QUALITY ASSURANCE

- A. Owner shall field inspect all work performed before final acceptance and payment.
- B. A written two-year warranty shall be provided for the replacement work.
- C. Failures considered to be warranty repairs include concrete surface spalling, cracking of the concrete, separation of the valve box from the concrete, or other obvious defects. The Owner may require the concrete mix manufacturer's involvement in examination of failures and determination of modifications necessary to avoid future defective work

- D.** Warranty repair consists of complete removal and replacement of the valve box in accordance with these adjustment specifications at no cost to the Owner. Critical failures that create a potential traffic hazard shall be rectified within 24 hours of notice, while less serious failures shall be addressed within 30 days of notice. The failure type shall be determined by the Owner.

END OF SECTION 02660

SECTION 02713 - WATER LINES

PART 1 – GENERAL

1.01 SCOPE OF WORK

Provide all labor, equipment, materials and incidentals necessary to install and test all water supply piping and appurtenances as specified.

1.02 RELATED WORK

Section 02221 - Trenching for Utilities

1.03 SUBMITTALS

- A. Submit shop drawings for materials furnished under this section to the Owner in conformance with the requirements of Section 01300 (Submittals) of these specifications.
- B. Submit operating and maintenance information for valves and hydrants furnished under this section to the Owner in conformance with the requirements of Section 01730 (Operating and Maintenance Data) of these specifications.

1.04 INSPECTION

All materials to be installed under this contract may be inspected by the Owner at the site of manufacture for compliance with these Specifications.

1.05 DESIGN CRITERIA

Reference Standards of the American National Standards Institute (ANSI), the American Society of Testing of Materials (ASTM), and the American Waterworks Association (AWWA).

- ANSI / AWWA C151/A21.51-09, Standard for Ductile-Iron Pipe, Centrifugally Cast
- ANSI / AWWA C153/A21.53-06, Standard for Ductile-Iron Compact Fittings for Water Service
- ANSI / AWWA C115/A21.15, Standard for Flanged Ductile-Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges
- ANSI / AWWA C111/A21.11-06, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- ANSI / AWWA C110/A21.10, Standard for Gray-Iron and Ductile-Iron Fittings, 3" through 48" Inches for Water and Other Liquids
- ANSI / AWWA C600 Standard for Installation of Ductile-Iron Mains and Their Appurtenances
- ANSI / AWWA C509 Standard for Resilient-Seated Gate Valves for Water-Supply Service
- ANSI / AWWA C502 Standard for Dry-Barrel Fire Hydrants
- ANSI / AWWA C651 Standard for Disinfecting Water Mains
- ANSI / AWWA C800 Standard for Underground Service Line Valves and Fittings
- ASTM B88 Standard Specification for Seamless Copper Water Tube

All materials, testing, and incidentals referenced by the Standards and Specifications mentioned herein are to conform to the latest revisions.

PART 2 - PRODUCTS

2.01 GENERAL

- A.** All materials shall be of standard design for which the manufacturer recommends the service is intended in accordance with AWWA or ASTM Standard Specifications.
- B.** All pipe and appurtenances shall be of the type and size shown in the Contract Documents and all materials of the same type shall be from one manufacturer.
- C.** Pipe materials shall be as follows:
 - 1. Mains (public) 4 inch diameter and larger, ductile iron.
 - 2. Mains (private) 6 inch diameter and larger, ductile iron.
 - 3. Service lines, 3/4 inch diameter and larger, copper.

2.02 DUCTILE IRON PIPE AND FITTINGS

- A.** Ductile iron pipe shall meet the following requirements, and be as specified hereinafter.
 - 1. Ductile iron pipe shall be of the centrifugally cast type, either in metal or cast molds, and shall conform to ANSI A21.51 or AWWA C151. Ductile iron shall have a minimum tensile strength of 60,000 psi with a minimum yield strength of 42,000 psi, pressure rated at a minimum of 350 PSI and have a minimal wall thickness of 0.25" unless field conditions determine that a heavier wall thickness is required. The pressure rating and manufacture date shall be shown on each piece. All pipe shall be furnished in industry standard lengths, complete with all necessary glands, joint material, including rubber gaskets, lubricant, bolts and nuts, etc. Pipe furnished shall be as manufactured by U.S. Pipe and Foundry; American Cast Iron Pipe; or equal.
 - 2. All ductile iron pipe used for below-grade service in the project shall have push-on joints and shall meet the requirements of ANSI A21.11 or AWWA C111, latest revisions. Ductile iron pipe used in the project for above-ground service or in below-ground vaults shall have flanged joints conforming to the requirements of ANSI A21.15, latest revision.
- B.** Fittings:
 - 1. All pipe fittings shall be ductile iron and shall be of a standard design for use with the pipe purchased under these specifications. Fittings shall conform to the following applicable specification.
 - a. Mechanical Joint fittings: Fittings shall be ductile iron compact fittings conforming to ANSI A21.53. The rubber gasket joints shall conform to ANSI A 21.11. Bolts shall be low alloy, high strength equal to "Acipolly", "Usalloy", or "Corten" bolts.

- b. Flanged Fittings: Shall conform to ANSI A21.10 or A21.11 and shall have flanges faced and drilled in conformance with ANSI Standard A21.15. Joints shall be installed with full ring rubber gasket. Bolts shall be low alloy, high strength equal to "Acipolly", "Usalloy", or "Corten" bolts.

- C. Pipe and fittings shall have a cement mortar lining and a bituminous seal coat on the inside in accordance with ANSI A21.4 and be coated on the exterior with a 1.0 mils thick bituminous coat in accordance with ANSI A21.51. A ceramic coating shall be substituted for the cement mortar lining where shown in the Contract drawings.

- D. Polyethylene Encasement:
 - 1. Where indicated in the Contract Documents, the Contractor shall provide a double layer of polyethylene encasement over pipe, fittings and valves when installed in close proximity to steel natural gas pipelines. The material, installation and workmanship shall conform to applicable sections of ANSI Standard A21.5. Installation shall be employed using flat tube polyethylene.

- E. Restrained joints:
 - 1. Sections of ductile iron piping (including fittings) designated in the Contract Documents as having restrained joints shall be constructed using pipe and fittings equal to those listed below:
 - a. U.S. Pipe and Foundry Company TR-FLEX
 - b. American Ductile Iron Pipe Company LOK FAST or LOK RING
 - 2. Restrained joint pipe sections where specifically noted shall utilize basic push-on joints with special gaskets equal to:
 - a. U.S. Pipe and Foundry Company FIELD LOK GASKET
 - b. American Ductile Iron Pipe Company FAST-GRIP GASKET
 - 3. Wedge action retainer glands where specifically noted or directed shall be used in conjunction with other conventional thrust restraint devices (rodding, thrust blocking, thrust collars, etc.) and shall be equal to:
 - a. EBAA Iron Megalug
 - b. Ford Uni-Flange Series 1400
 - c. U.S. Pipe and Foundry M.J. Field Lok Gasket

2.03 COPPER PIPE

All copper pipe shall conform to Federal Specifications WW-T-799, Type "K" as a minimum with plain ends. Fittings and connections for pipe sizes of 1-inch and less shall be of the flared type. Pipe sizes greater than 1-inch shall have compression fittings and connections.

2.04 COPPER TUBING

All copper tubing shall conform to ASTM Designation B88 for the Type "K" Soft Temper and AWWA 7S-CR Type "K" copper. Fittings and connections for pipe sizes of 1-inch and less shall be of the flared type. Pipe sizes greater than 1-inch shall have compression fittings and connections.

2.05 GATE VALVES

- A.** All valves three to 12 inches in diameter shall be iron-body resilient-seated gate valves with non-rising stems conforming to the requirements of AWWA C-509, rated for a design working pressure of 200 psig. Valves 16 and 20 inches shall have a design working pressure of 150 psig. Sizes smaller than three inches shall meet Federal Specification WW-V-54. Gate valves shall be as manufactured by Dresser, Mueller, Darling, Clow Corporation, Kennedy, Walworth, American AVK, or similar approved equal.
- B.** All gate valves shall have mechanical joint ends meeting ANSI A21.11, be equipped with a two-inch square operating nut and open counterclockwise.
- C.** Valve stem extensions shall be provided and installed for all valves 5 feet or greater in depth (operating nut depth). Reference 2.09, Valve Boxes, below for specifics.

2.06 BUTTERFLY VALVES

- A.** All valves 16 inches and larger shall be butterfly valves of the tight closing, rubber-seat type with mechanical joint ends meeting ANSI A21.11 and shall conform to the requirements of AWWA C-504 for Class 150 B rated for a working pressure of 150 psig and as further specified herein. The butterfly valves shall be of the rubber-seat type with valve seat securely fastened to the valve body. No metal-to-metal seating surfaces shall be permitted. Valves shall be bubble-tight at rated pressures with flow in either direction, and shall be satisfactory for applications involving throttling service and/or frequent operation and for applications involving valve operation after long periods of inactivity. Butterfly valves shall be as manufactured by BIF Industries, Henry Pratt Company, Dresser, or similar approved equal.
- B.** Where shown in the Contract Documents, butterfly valves shall be furnished with a rated working pressure of 250 psig. These valves, and their operators, shall be designed, manufactured, and tested in accordance with AWWA C504, latest revision, and shall include design features for the additional working pressure.
- C.** All butterfly valve operators shall include an AWWA operating nut and shall be gasketed and grease packed for submerged operation at water pressures to 10 psig. Valves shall open counterclockwise. Extension stems shall be provided where shown on the Drawings.
- D.** Valve stem extensions shall be provided and installed for all valves 5 feet or greater in depth (operating nut depth). Reference 2.09, Valve Boxes, below for specifics.

2.07 AIR/VACUUM RELEASE VALVES

The valves shall have a cast iron body, cover, and baffle, stainless steel float, bronze water diffuser and Buna-N seat with threaded fittings. The valves shall be manufactured by GA Industries, APCO Valve and Primer Corporation or equal.

2.08 CORPORATION STOPS

Corporation stops shall be all "No-lead" brass suitable for 200 psi operating pressure and similar to A.Y. McDonald 74701B, Ford FB600, or approved equal.

2.09 VALVE BOXES, VALVE ASSEMBLIES, VALVE PADS/MARKERS

A. Valve boxes shall be cast-iron two or three piece with cast iron covers. The barrel shall be one or two-piece, screw type, having 5-1/4-inch shaft. Covers shall have "WATER" cast into the top.

B. Valves which have operating nut at depths greater than 5 feet or valves specifically designated by the drawings or Special Conditions shall be composed of a valve box and extension stem. All moving parts of the extension stem shall be enclosed in the valve box housing to prevent contact with the soil. Valve box and extension assembly shall be adjustable to accommodate variable trench depths. A debris cap or seal shall be integral to the assembly to prevent debris, silt, etc. from entering the barrel of the valve box.

The stem material shall be of plated steel square tubing. The stem assembly shall have a built in device that keeps the stem assembly from disengaging at its full extension length or from the valve nut. Valve box / extension assembly shall incorporate American Flow Control's *Trench Adapter*, Ametek's *Roadway Valve Box with Integral Key*, or equal.

C. Concrete valve pads/collars are required for all valve boxes that are not located in a paved area. Concrete valve markers shall be furnished and installed on existing roads where shown in the Contract Drawings.

2.10 FLEXIBLE COUPLINGS

Flexible couplings shall be Catalog No. 411as manufactured by Smith-Blair, Style No. 38 and 40 as manufactured by Dresser Manufacturing Company, or approved equal.

2.11 FIRE HYDRANTS

A. Fire hydrants shall conform to AWWA C502-85 for dry-barrel fire hydrants. Hydrants shall be traffic type with safety flange which allows the valve to remain closed when the hydrant is broken or damaged above or near grade level. The design of hydrant shall be of the compression type with main valves and "O" ring seal between the operating nut and the bonnet. Hydrant color shall be silver.

B. Hydrant inlet shall be 6-inch, mechanical joint with harnessing lugs. Hydrant main valve opening shall be 5-1/4-inch. Valve seats shall be bronze to bronze.

C. Operating nut shall be solid pentagon, 1-1/2 inches measured flat at point (31/32 on side). Operating nut shall turn counterclockwise to open.

D. Hydrant shall have two 2-1/2-inch diameter and one 4-1/2-inch diameter nozzle. Nozzles threads shall be the standard adopted by NBFU. Nozzles shall all have gasketed caps fitted with chain.

- E.** The hydrants shall be as follows:
1. American - AVK models 2700 & 2780
 2. Mueller - Centurion & Improved
 3. U. S. - Metro 250 Sentinel
 4. Kennedy - K81-A
 5. M & H - Models 129 & 929
 6. Clow - Medallion
 7. American Darling - B62-B
 8. EJ USA Inc, Model 5CD 250

2.12 CURB STOPS

Curb stops shall be of "No-lead" brass construction with tee handle operator. Curb stops shall be A.Y. McDonald 76102W, Ford B21, or approved equal.

2.13 TAPPING SLEEVES

Tapping sleeves shall be full-bodied mechanical joint Class 250 pipe for 200 psi cold water working pressure. Sleeves shall be either American Flow Control Series 2800, Mueller #H-615, or approved equal.

Authorized connections to water mains of the Cobb County – Marietta Water Authority require utilization of tapping sleeves / saddles approved by the Authority.

2.14 TAPPING SADDLES

Double Strap Saddles: Saddles shall be either Smith Blair 313 Double Strap, Romac 202U or approved equal.

2.15 ADAPTERS AND UNIONS

Adapters for copper flare to female iron pipe thread shall be of "No-lead" brass construction and shall be A.Y. McDonald 74754, Ford C21, or approved equal.

Adapters for copper flare to male iron pipe thread shall be of "No-lead" brass construction and shall be A.Y. McDonald 74753, Ford C28, or approved equal.

Union shall be of "No-lead" brass construction and shall be A.Y. McDonald 74758, Ford C22

PART 3 - EXECUTION

3.01 GENERAL

- A.** Care shall be taken in loading, transporting, and unloading to prevent damage to the pipe or coatings. All pipe shall be protected during handling against impact shocks and free fall, and shall be kept clean at all times. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and/or fittings for lifting, positioning, or installing material. All pipe or fittings shall be examined before installation, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Owner.

- B.** The Owner shall be notified 24 hours prior to construction beginning on Water facilities. Pipe and fittings shall be subjected to a careful inspection just prior to being laid or installed. If any defective pipe is discovered after it has been installed it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner. All pipe and fittings shall be thoroughly cleaned before installation, and shall be kept clean until they are used in the work, and when installed, shall conform to the lines and grades required.
- C.** Contractor must have a set of the original Contract plans at all times on the job site. These plans shall be kept current by the Contractor in regards to field changes.
- D.** Unless specifically indicated otherwise, underground piping shall slope uniformly between joints.
- E.** Extreme care shall be used when constructing piping to protect all existing underground utilities, and all existing structures. Any damage to existing utilities or structures shall be repaired or replaced, and restored equal to or better than pre-construction conditions.
- F.** For existing lines installed under other contracts, to which piping of this Contract must connect, the Contractor shall expose buried lines to confirm or determine pipe material and diameter, furnish and install appropriate piping, and make proper connections.
- G.** Contractor shall inscribe (saw-cut) a "V" on the concrete curb or sidewalk in line with and adjacent to a water distribution valve/valve box location (if no witness mark currently exists and no valve marker is present or required).

3.02 INSTALLATION

- A.** Pipe and fittings shall be installed as shown on the Contract Drawings, and in accordance with requirements of AWWA Standard Specifications except as otherwise provided herein. A firm, even bearing throughout the length of the pipe shall be constructed by tamping selected material at the sides of the pipe up to the springline. **BLOCKING SUPPORTS WILL NOT BE PERMITTED.** Bell holes shall be hand excavated to insure uniform bearing along the pipe barrel. Pipe shall be installed with a minimum of 42 inches of cover or as otherwise stated in the Contract Documents.
- B.** All pipe shall be sound and clean before installing. When installation is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved in installation. The deflection at joints shall not exceed that recommended by manufacturer.
- C.** When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end. Lining shall be undamaged.

- D. Push-on joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means. Hydraulic excavators, backhoes, or other machinery shall not be used to push slip-joint pipe together. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.
- E. Unless otherwise noted, underground ductile-iron piping shall be push-on with mechanical joint fittings, valves, fire hydrants, etc.
- F. The Contractor shall carefully regulate his equipment and construction operations such that the loading of the pipe does not exceed the loads for which the pipe is designed and manufactured. Any pipe damaged during construction operations shall be replaced at the Contractor's expense.
- G. Wet tap connections shall only be allowed on ductile iron water mains and with a smaller nominal size main connecting (tapped) to a larger main.
- H. Unless otherwise noted, service lines 2" inches and smaller that are to be installed under paved roadways (long side services) are to be encased in the appropriate sized conduits as shown on the Contract Drawings.

3.03 PIPE SUPPORTS AND THRUST RESTRAINT

- A. All piping shall be properly and adequately supported. Longitudinal thrust along pressurized pipe lines at bends, tees, reducers, and caps or plugs shall be counteracted by enough weight of concrete to counterbalance the vertical and horizontal thrust forces.
- B. Joints shall be protected by felt roofing paper prior to placing concrete thrust block. Bearing area of thrust blocks shall be adequate to prevent any movement of the fitting and shall be of the size and dimensions as shown on the Contract Drawings.
- C. The dimensions and values for thrust block sizing is based on a water main test pressure of 350 psi and a horizontal bearing strength of the soil of 2,000 psf. The bearing surface of the thrust block shall be placed against undisturbed soil, unless precluded by site conditions. In these cases, selected fill material shall be placed between the bearing surface and undisturbed soil and compacted to at least 95% Modified Proctor density to obtain the required bearing pressure.
- D. Concrete for thrust blocking shall be 3000 psi minimum. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts or nuts, or interfere with the removal of any joint. Wooden side forms shall be provided for thrust blocks.
- E. Restrained joints shall be used as shown on the Contract Drawings. Thrust blocks shall be used at all other locations or as directed by the Owner.

- F. Tie rods, where shown on the Contract Drawings to be used in conjunction with thrust restraint devices, shall be cold-rolled alloy steel rods with a minimum tensile strength of 125,000 p.s.i. and shall be coated with bitumastic paint after installation.
- G. Wedge action retainer glands where shown on the Contract Drawings to be used in conjunction with thrust restraint devices, shall be installed in accordance with manufacturer's instructions.

3.04 CLEANING MAINS

At the conclusion of the Work and prior to pressure testing and disinfection, the Contractor shall thoroughly clean the new pipe line by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. If, after this cleaning, obstructions remain, they shall be removed.

Flushing of pipelines shall be performed in a manner to protect the environment as well as physical features from the impacts of the discharge of water. Hoses, diffusers, or other devices shall direct or dissipate pressure impacts to structures, ground surfaces, roadways, etc. Dechlorination of discharge flow is mandatory prior to allowing it to enter any waterway or storm drainage network subsequently discharging into an active stream.

3.05 PRESSURE AND LEAKAGE TESTS OF UNDERGROUND PRESSURE PIPING

- A. Hydrostatic pressure and leakage tests shall conform to Section 5 of AWWA C600. The Contractor shall furnish all gauges, meters, pressure pumps and other equipment needed to test the line. The pressure gauge used for testing shall be laboratory calibrated suitable for the test pressure required. The Contractor must submit his plan for testing to the Owner for review at least three days before starting the test.
- B. The pressure required for the field hydrostatic pressure test shall be 150% of the maximum normal operating pressure of the test section (200 psi minimum), or the pressure class of the pipe, whichever is greater. The Contractor shall provide temporary plugs and blocking necessary to maintain the required test pressure. Duration of pressure test shall be at least 2 hours.
- C. The leakage test shall be a separate test at the maximum operating pressure as determined by the Owner following the pressure test and shall be of not less than 2 hours duration. All exposed pipes, fittings, valves and joints will be carefully examined during the tests and all leaks evident at the surface shall be repaired and leakage eliminated regardless of total leakage as shown by test. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves and accessories shall be removed and replaced. The pipe lines shall be tested in such sections as may be directed by the Owner by shutting valves or installing temporary plugs as required. The line shall be filled with water and all air removed and the test pressure shall be maintained in the pipe for the entire test period by means of a force pump to be furnished by the Contractor. Accurate means shall be provided for measuring the water required to maintain this pressure. The amount of water required is a measure of the leakage.

- D. The amount of leakage, which will be permitted, shall be in accordance with AWWA C600 Standards for all pressure lines. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{148,000}$$

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

- E. The Owner's Representative shall observe all pressure and leakage testing associated with the Contract work.
- F. The Contractor shall remove and adequately dispose of all temporary blocking material and equipment after completion and acceptance of the field hydrostatic test, unless otherwise directed by the Owner. Any damage to the pipe coating shall be repaired by the Contractor.

3.06 DISINFECTION

- A. Upon completion of the pressure and leakage test, the pipe shall be disinfected.
- B. Disinfection shall be accomplished by the continuous feed chlorination method in accordance with AWWA C651. The following steps shall be employed:
1. Begin filling main at a constant, measured rate with potable water. As water first flows in, begin adding chlorine at a point no more than ten feet from the beginning of the new main.
 2. Add chlorine at a rate to attain a 25 mg/L chlorine concentration. The acceptable method is by preparing a 1% solution with sodium hypochlorite or calcium hypochlorite. The required amount of chlorine to produce a 25 mg/L concentration in 100 feet of pipe is as follows:

<u>Pipe Dia. (in.)</u>	<u>100% Chlorine (lb)</u>	<u>1% Chlorine Solution (gal.)</u>
4	0.013	0.16
6	0.030	0.36
8	0.054	0.65
10	0.085	1.02
12	0.120	1.44
16	0.217	2.60
18	0.275	3.30
20	0.339	4.06
24	0.488	5.85

3. Continue adding chlorine at a rate to attain a minimum concentration of 25 mg/L. Measure the free chlorine concentration at regular intervals as given in AWWA M12 or with a high range test kit. Chlorine application shall continue until the entire main is filled.
4. The chlorinated water shall be retained in the water main for a minimum of 24 hours during which time valves and hydrants in the treated section shall

be operated to ensure disinfection of the appurtenances. At the end of the 24 hour period the water in all portions of the main shall have a minimum chlorine residual of 10 mg/L.

- C. The heavily chlorinated water shall be dechlorinated and flushed in a manner which is not detrimental to the environment. The method proposed shall be submitted to and approved by the Owner prior to discharge. Final flushing shall continue until the chlorine residual is less than 2 mg/L.
- D. Contractor shall coordinate sampling with the Cobb County-Marietta Water Authority (CCMWA), following authorization by the Owner. No earlier than 16 hours after final flushing, the CCMWA will obtain bacteriological samples for testing using Option B as described in AWWA C651:

Before approving a main for release, let it sit for a minimum of 16 hours without any water use. Then collect, using the sampling site procedures outlined and without flushing the main, two sets of samples a minimum of 15 minutes apart while the sampling taps are left running. Both sets of samples must pass for the main to be approved for release.

- E. If bacteriological test results are unsatisfactory, the main shall either be flushed with potable water or re-disinfected by the Contractor, as directed by the Owner, prior to obtaining additional samples. Satisfactory bacteriological test results shall be obtained prior to placing the new main in service. The disinfection process will be repeated by the Contractor at no cost to the Owner until satisfactory results are obtained.

END OF SECTION 02713

SECTION 02722 - SANITARY SEWERS (GRAVITY)

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, equipment, materials and incidentals necessary to install and test all sanitary sewer piping and appurtenances. Gravity sanitary sewer lines shall be as specified herein.
- B. Pipe materials shall be as indicated in the Contract Documents. Where materials are not specifically indicated, the **Contractor** may use any of the materials specified herein, appropriately applied based on the project conditions and the approval of the **Owner**.

1.02 RELATED WORK

Clearing, grubbing, installation of manholes, trench excavation and backfill, and cutting and replacing pavement shall be as specified in other sections.

1.03 SUBMITTALS

Submit shop drawings for materials furnished under this section to the **Owner** in conformance with the requirements of Section 01300 (Submittals) of these specifications.

1.04 INSPECTION

All materials to be installed under this Contract may be inspected, at the site of manufacture, by the **Owner** for compliance with these Specifications.

1.05 DESIGN CRITERIA

Reference Standards of the American National Standards Institute (ANSI), the American Society of Testing of Materials (ASTM), and the American Waterworks Association (AWWA).

- ANSI / AWWA C151/A21.51-09, AWWA Standard for Ductile-Iron Pipe, Centrifugally Cast
- ANSI / AWWA C153 / A21.53-06, AWWA Standard for Ductile-Iron Compact Fittings for Water Service
- ANSI / AWWA C115 / A21.15, AWWA Standard for Flanged Ductile-Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges
- ANSI / AWWA C111 / A21.11-06, AWWA Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
- ASTM D 3034 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

- ASTM F679 Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
- ASTM D 1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- ASTM F 794 Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter
- ASTM D 2412 Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
- ANSI / AWWA C301, AWWA Standard for Prestressed – Concrete Pressure Pipe, Steel-Cylinder Type
- ASTM C443 Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
- ASTM C76 Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- ANSI / AWWA C950, AWWA Standard for Fiberglass Pressure Pipe
- ASTM D 1248 Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable

All materials, testing, and incidentals referenced by the Standards and Specifications mentioned herein are to conform to the latest revisions.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE AND FITTINGS

- A.** Ductile iron pipe shall meet the following requirements, and be as specified hereinafter.
1. Ductile iron pipe shall be of the centrifugally cast type, either in metal or cast molds, and shall conform to ANSI A21.51 or AWWA C151. Ductile iron shall have a minimum tensile strength of 60,000 psi with a minimum yield strength of 42,000 psi. Pipe wall thickness shall be required by laying conditions and depth of cover. All pipe shall be furnished in industry standard lengths complete with all necessary glands, joint material, including rubber gaskets lubricant, bolts and nuts, etc. Pipe furnished shall be as manufactured by U.S. Pipe and Foundry and American Cast Iron Pipe; or equal.
 2. All ductile iron pipe used for below-grade service in the project shall have push-on joints and shall meet the requirements of ANSI A21.11 or AWWA C111, latest revisions. Ductile iron pipe used in the project for above-ground service or in below-ground vaults shall have flanged joints conforming to the requirements of ANSI A21.15, latest revision.

B. Fittings:

1. All pipe fittings shall be ductile iron and shall be of a standard design for use with the pipe purchased under these specifications. Fittings shall conform to the following applicable specification.
 - a. Mechanical Joint fittings: Fittings shall be ductile iron compact fittings conforming to ANSI A21.53. The rubber gasket joints shall conform to ANSI A 21.11. Bolts shall be low alloy, high strength equal to "Acipolly", "Usalloy", or "Corten" bolts.
 - b. Flanged Fittings: Shall conform to ANSI A21.10 or A21.11 and shall have flanges faced and drilled in conformance with ANSI Standard A21.15. Joints shall be installed with full ring rubber gasket. Bolts shall be low alloy, high strength equal to "Acipolly", "Usalloy", or "Corten" bolts.
2. The proper number of gaskets and all necessary joint materials shall be furnished with the pipe fittings.

C. Coatings and Linings:

1. Ductile iron pipe and fittings shall be coated on the exterior with a 1.0 mils thick bituminous coat in accordance with ANSI/AWWA C151/A21.51.
2. Ductile iron pipe and fittings 16-inch diameter and smaller shall have a cement mortar lining and a bituminous seal coat on the inside in accordance with ANSI / AWWA C104/A21.4.
3. Ductile iron pipe and fittings 18-inch diameter and larger shall be lined with a ceramic epoxy complying with ASTM B 117-85 and D714-87, and meeting a standard equal to PROTECTO 401 Ceramic Epoxy Lining manufactured by Induron Coatings, Inc.

D. Restrained joints:

1. Sections of ductile iron piping (including fittings) designated in the Contract Documents as having restrained joints shall be constructed using pipe and fittings equal to those listed below:
 - a. U.S. Pipe and Foundry Company TR-FLEX
 - b. American Ductile Iron Pipe Company LOK FAST or LOK RING
2. Restrained joint pipe sections where specifically noted shall utilize basic push-on joints with special gaskets equal to:
 - a. U.S. Pipe and Foundry Company FIELD LOK GASKET
 - b. American Ductile Iron Pipe Company FAST-GRIP GASKET
3. Wedge action retainer glands where specifically noted or directed shall be used in conjunction with other conventional thrust restraint devices (rodding, thrust blocking, thrust collars, etc.) and shall be equal to:
 - a. EBAA Iron Megalug
 - b. Ford Uni-Flange Series 1400
 - c. U.S. Pipe and Foundry M. J. Field Lok Gasket

2.02 SDR-35 POLYVINYL CHLORIDE PIPE

- A.** Polyvinyl Chloride (PVC) Pipe for Gravity Sewers: Class-rated PVC pipe and accessories where shown or as specified on the Drawings, shall meet extra strength minimum of SDR-35 of the requirements of ASTM D 3034 for 4" through 15" and ASTM F 679 for 18" through 27". Pipe shall be furnished in industry standard lengths. Pipe and accessories shall bear the NSF mark indicating its class, pipe size, manufacturer's name, AWWA and/or ASTM Specification number, working pressure and production code. Pipe and couplings shall be made from Class 12454-A or Class 12454-B virgin compound, as designed in ASTM D1784.
- B.** Joints: The PVC joints for pipe four inches in diameter and greater shall be of the push-on, bell-and-spigot type. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket. Gaskets shall be factory installed and meet the requirements of ASTM F477. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75°F in each joint per length of pipe. The bell shall consist of an integral wall section with a solid cross-section elastomeric ring which shall meet requirements of ASTM D3212. The thickened bell section shall be designed to be at least as strong as the pipe wall.

2.03 RIBBED (OPEN PROFILE) POLYVINYL CHLORIDE PIPE

- A.** Ribbed (Open Profile) Polyvinyl Chloride (PVC) Pipe for Gravity Sewers: Class-rated PVC pipe and accessories where shown or as specified on the Drawings, shall meet the requirements of ASTM F-794 and UNI-BELL Uni-B-9 for 8" through 30". The pipe shall be homogeneous and have a smooth interior with a solid cross-sectional rib exterior. Exterior ribs shall be open profile and perpendicular to the axis of the pipe. Pipe shall be green in color and furnished in industry standard lengths. Each length of pipe shall be marked indicating its size, manufacturer's name, product type, PVC cell classification, ASTM F-794, and date of manufacture.
- B.** Joints: The PVC joints for pipe four inches in diameter and greater shall be of the push-on, bell-spigot type. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket pretensioned around the spigot of the pipe and assembled by insertion into a smooth bell. The gasket shall be designed and shaped so that the gasket is locked in place against displacement as the joint is assembled. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75°F in each joint per length of pipe. The thickened bell section shall be designed to be at least as strong as the pipe wall.

2.04 HOLLOW CORE (CLOSED PROFILE) POLYVINYL CHLORIDE PIPE

- A.** Hollow core (Closed Profile) polyvinyl chloride (PVC) Pipe for Gravity Sewers: Class-rated PVC pipe and accessories where shown or as specified on the Drawings, shall meet the requirements of ASTM F-794 and UNI-BELL Uni-B-9 for 21" through 48". The pipe shall be homogeneous and have a smooth interior and

exterior with a hollow core closed profile wall section and minimum stiffness of 46 PSI when tested in accordance with ASTM D-2412. Pipe shall meet the minimum cell classification of 12364A as defined by ASTM D-1784. Pipe shall be white in color and furnished in industry standard lengths. Each length of pipe shall be marked indicating its size, manufacturer's name, product type, PVC cell classification, ASTM F-794, and date of manufacture. Each length of pipe shall pass a factory 3.5 PSI air test as described in ASTM F-794.

- B.** Joints: The PVC joints for pipe four inches in diameter and greater shall be of the push-on, bell-spigot type. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket. The gasket shall be factory installed and chemically bonded to the bell end of the pipe and shaped so that the gasket is locked in place against displacement as the joint is assembled. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75°F in each joint per length of pipe. The thickened bell section shall be designed to be at least as strong as the pipe wall.

2.05 CONCRETE PIPE

- A.** Concrete pipe for gravity sewer application shall be reinforced concrete or steel-cylinder type conforming to the following standards:
1. Reinforced concrete pipe shall conform to ASTM Standard Specifications for Reinforced Concrete Culvert, Storm Drain, and Sanitary Sewer Pipe, Designation C76.
 2. Steel-cylinder pipe shall conform to the requirements of AWWA C301 for Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids.

The pipe manufacturer shall furnish the **Owner** with a notarized certification that all pipe furnished by him conforms to all applicable requirements of the referenced standards and these specifications.

- B.** The design and manufacture of all concrete pipe shall be based on the following conditions:
1. All pipe barrels and joints shall be designed for an internal working pressure of 50 feet.
 2. Pipe class shall be selected to suit cover and loading conditions for the particular project. The pipe manufacturer shall submit detailed design calculations sealed by a professional engineer registered in the State of Georgia prior to manufacture of the pipe.
 3. Reinforcement shall be full circular cage. Neither elliptical nor quadrant reinforcement will be allowed.
 4. All aggregate used in concrete pipe shall be limestone.
 5. The pipe class, date of manufacture and the trademark of the manufacturer shall be clearly marked on the pipe barrel in a manner acceptable to the **Owner**. The markings shall be at the bell end of the pipe.

- C.** The pipe manufacturer shall furnish all fittings and special pieces required for closures, curves, bends, branches, manholes, connections and other pipe necessary for installing the complete piping system shown on the Drawings.
- D.** Piping shall have a minimum laying length of approximately 8 feet, except for closure and other special pieces as approved by the **Owner**.
- E.** The pipe manufacturer shall supply all necessary clamps, diapers, and steel bands for grouting all joints.
- F.** Concrete pipe for sanitary sewers shall have joints consisting of self-centering steel joint rings securely attached to the pipe reinforcing steel or steel cylinder.
1. Joint rings shall be as specified in AWWA Specification C-301.
 2. The round rubber "O-Ring" gaskets shall conform to ASTM C443 Specifications for Joints for Circular Concrete Sewer and Culvert Pipe using Rubber Gaskets.
 3. The exposed steel surfaces of the completed joints shall be protected in the following manner.
 - a. Inside joint protection shall be by means of an approved butyl rubber or bitumastic materials, similar to "Ram-Nek" as manufactured by K.T. Snyder Company, Inc. or "Kent Seal" as manufactured by Hamilton Kent, and shall be compressed so as to fill all voids and completely protect all exposed steel.
 - b. Outside joint protection shall be by means of a poured cement diaper joint or a prefabricated joint protector such as FLEX-PROTEX joint filler.
- The pipe manufacturer shall submit to the **Owner** detailed information concerning the type of joint protection methods to be used prior to the installation of the pipe.
4. Each pipe joint for pipes 30-inch diameter and larger shall be air tested after installation by utilization of the "Cherne Large Diameter Joint Tester" or equal. The joint tester shall be inflated to 4.5 psig. If the pressure drop does not exceed 1.0 psig within 10 seconds, the joint is considered acceptable. This testing shall in no way waive or supersede the air test requirement in Article 3.08 of this Section.
- G.** Interior Lining for Sewer Service
1. All concrete pipe shall have a high build protective lining on the interior. All surface area to be lined must be in a coatable condition. All surface areas must be smooth without voids and projections i.e., casting or manufacturing imperfections. Any patching of the interior of the concrete pipe shall be satisfactorily repaired by the pipe manufacturer by using a two component epoxy grout. No patching compounds containing a latex or acrylic base, or curing compounds shall be used on the interior surfaces of the concrete pipe to be lined. All rough and sharp edges on bells and spigots shall be rounded smooth with at least 1/8" radius.
 2. The lining material must be a high build multi-component amine cured novolac epoxy polymeric lining. The standard of quality is Inner-Liner by Vulcan Painters, Birmingham, Alabama. Equal products will be considered

with information provided in regards to the products permeability, abrasion resistance, pipe surface preparation, lining application, touch-up and repair, inspection, certification, handling, and field repairs.

2.06 GLASS FIBER REINFORCED THERMOSETTING RESIN PIPE

- A.** Glass fiber reinforced thermosetting resin pipe (RTRP) and fittings shall meet all requirements of AWWA C950, Type II - centrifugally cast, Grade Z - RTRP polyester. Pipe shall be furnished in nominal 20 foot lengths marked with AWWA specification number, size, type and grade, pressure class, manufacturers mark and identity code, and date of manufacture. The pipe shall have interior corrosion liner of nonreinforced thermoset polyester resin with a minimum thickness of 0.04 inches. The pipe and fittings shall be rated and fittings shall be rated for 150 psi working pressure.
- B.** Joints: The joints for pipe four inches in diameter and greater shall be of the push-on type. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket. The gasket and annular recess shall be designed and shaped so that the gasket is locked in place against displacement as the joint is assembled. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75°F in each joint per length of pipe. The thickened bell section shall be designed to be at least as strong as the pipe wall.

2.07 HIGH DENSITY POLYETHYLENE PIPE

- A.** High density polyethylene (HDPE) pipe shall be made of high density, high molecular weight polyethylene pipe material meeting the requirements of Type III, Class C, Category 5, Grade P34, as defined by ASTM D1248 Standard Specification for Polyethylene Plastics Molding and Extrusion Materials. Pipe shall be rated for 150 psi working pressure. Pipe shall be furnished in nominal 20 foot lengths marked with ASTM specification number, size, type and grade, pressure class, manufacturers mark and identity code, and date of manufacture.
- B.** Joints: The joints for pipe four inches in diameter and greater shall be of the push-on type. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket. The gasket and annular recess shall be designed and shaped so that the gasket is locked in place against displacement as the joint is assembled. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75°F in each joint per length of pipe. The thickened bell section shall be designed to be at least as strong as the pipe wall.

2.08 TRANSITION COUPLINGS

- A. Manufactured specialty transition couplings shall be utilized at locations to connect gravity sewer piping of different materials. Couplings shall be specifically sized to address the variations in pipe diameters, and wall thicknesses.
- B. Rigid PVC (C900 DR18 Class 150) transition couplings as manufactured by HARCO Corporation (Product No. 337), Specified Fittings, Inc., or mechanical joint, compact style, ductile iron solid sleeves (with appropriate transition gaskets) shall be the manner of connection. In the event of pipe materials which do not allow either of these types of transition couplings, and with the approval of the **Owner**, a flexible, one-piece, molded neoprene sleeve (with series 300 stainless steel clamps) couplings by Fernco (or equal) shall be provided and installed with a full concrete encasement around the pipe and coupling and extending a minimum of one-foot beyond each end of the coupling.

PART 3 - EXECUTION

3.01 GENERAL

- A. Care shall be taken in loading, transporting, and unloading to prevent damage to the pipe or coatings. All pipe shall be protected during handling against impact shocks and free fall, and shall be kept clean at all times. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and/or fittings for lifting, positioning, or installing material. All pipe or fittings shall be examined before installation, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the **Owner**.
- B. The **Owner** shall be notified 24 hours prior to construction beginning on Sewer facilities. Pipe and fittings shall be subjected to a careful inspection just prior to being laid or installed. If any defective pipe is discovered after it has been installed it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the **Owner**. All pipe and fittings shall be thoroughly cleaned before installation, and shall be kept clean until they are used in the work, and when installed, shall conform to the lines and grades required.
- C. **Contractor** must have a set of the original Contract plans at all times on the job site. These plans shall be kept current by the **Contractor** in regards to field changes.
- D. All pipe shall be laid true to the required lines and grades and shall slope uniformly between joints. All pipe shall be laid upgrade with bell end of pipe upgrade.
- E. Extreme care shall be used when constructing piping to protect all existing underground utilities, and all existing structures. Any damage to existing utilities or structures shall be repaired or replaced, and restored equal to or better than pre-construction conditions.

3.02 CONNECTION TO EXISTING SANITARY SEWERS

- A. For existing lines installed under other contracts, to which piping of this Contract must connect, the **Contractor** shall expose buried lines to confirm or determine

pipe material and diameter, furnish and install appropriate piping, and make proper connections.

- B.** Where shown on the plans or directed by the **Owner**, new sewers shall be connected to existing sewers either by constructing a manhole over an existing line (doghouse manhole), or by coring through the wall of an existing manhole.

1. Doghouse Manhole: The new manhole shall be set over the existing pipe, and the inverts properly formed in accordance with the Standard Detail. The lower half of the old pipe may be used as the new invert if the condition of the existing pipe is deemed suitable by the **Owner**.

2. Existing Manhole: The opening for the new pipe shall be cored at the proper elevation, using proper coring equipment, and the sewer pipe inserted with the appropriate manhole boot connection. A channel shall then be formed over the manhole table, or the table cut out and the invert formed in it, as required by grade.

- C.** When connecting to active sewer lines, either at an existing manhole or with a new doghouse manhole, the newly installed sewer line shall be plugged with a temporary plug. This plug will remain in place until the successful completion of the Final Inspection and will only be removed under the authorization of the **Owner**.

3.03 INSTALLATION

- A.** Sanitary sewers shall be installed to the lines and grades indicated on the Contract Drawings. No deviation from the designed alignment and/or grades and elevation shall be made without prior approval of the **Owner**.
- B.** A pipe laser shall be used for horizontal and vertical control of the sewer pipe installation. Also, elevation measurements shall be made with surveying instruments as the work progresses at least at each manhole to verify the accuracy of grades. These measurements shall be recorded in the **Contractor's** Daily Report and made available to the **Owner** upon request. The **Owner** shall be notified immediately of any variations from design grades.
- C.** All pipe shall be sound and clean before installing. When installation is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved in laying.
- E.** When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end. Lining shall be undamaged.
- F.** Unless otherwise noted in the Contract, underground piping shall be push-on. Push-on joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means. Hydraulic

excavators, backhoes, or other machinery shall not be used to push slip-joint pipe together. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

- G.** The **Contractor** shall carefully regulate his equipment and construction operations such that the loading of the pipe does not exceed the loads for which the pipe is designed and manufactured. Any pipe damaged during construction operations shall be replaced at the **Contractor's** expense.
- H.** A watertight plug or bulkhead shall be installed and maintained throughout construction in the most downstream manhole of the project to prevent dirt, rocks, muddy water, or other debris from entering the existing sewer system. This plug or bulkhead shall not be removed until the entire sewer has been installed, cleaned, tested, and accepted, unless otherwise directed by the **Owner**.

3.04 BEDDING OF SEWER PIPE

Bedding for all sanitary sewer pipes shall be as shown in the Contract Documents. Bedding shall be defined as that method of bedding trench conduits in which the conduit is set in thoroughly tamped, compacted, granular materials placed to the trench width and up to the centerline of the conduit. The remainder of the conduit is entirely surrounded to a height of at least one foot above its top by densely compacted backfill carefully placed by hand to completely fill all spaces above and adjacent to the conduit.

3.05 SERVICE LATERAL STUB-OUTS AND CLEANOUT ASSEMBLIES

- A.** All sewage service lateral stub-outs, either from the sewer main or from a manhole, shall be a minimum of 6-inch diameter; be SDR 35 PVC or; of the same pipe material as the sewer main; installed at a minimum 1.00% slope; and terminate with a cleanout assembly at the permanent easement or right-of-way limit as indicated on the Drawings. The tee-wye branch fitting on the sewer main shall be of the same pipe material as the main. Service lateral stub-out elevation at the clean-out assembly shall be sufficient to allow 1.00% minimum slope from that point to the residence's or business' plumbing connection (or the building finished floor elevation minus 2-feet, if plumbing elevation is unknown).
- B.** All horizontal bends (if required) as well as all service lateral stub-out terminations shall require 6-inch cleanout assemblies. If in an unfinished area, cleanout assembly shall extend a minimum of 3-feet above grade. In finished areas cleanout assembly shall be installed with a 15-inch diameter cast iron ring and cover (Vestal RMC-15-H, East Jordan Iron Works V-8502, or equal) flush with ground surface. In either case the cleanout assembly shall be permanently marked on the curb showing the location of the cleanout.

3.06 UTILITY TRACER SYSTEM

All sanitary sewer pipelines shall have a utility tracer system installed in accordance with the Contract Drawings. A continuous, insulated, 12 gauge, solid copper tracer wire shall be placed with the initial backfill. The tracer wire shall continue uninterrupted around manholes. Service lateral stub-outs shall have the same tracer wire installation with a copper-to-copper splice connection to the main tracer wire. Tracer wire shall either wrap

around or be taped to the cleanout assembly and shall terminate with a 12-inch coil accessible at the cleanout cover.

Tracer wire shall be 12 AWG solid copper rated for direct bury with minimum 30 mil polyethylene insulation. All underground splices and connections shall be protected with direct-bury connectors equal to 3M DBR/Y-6 Splice Kits.

A polyethylene, 6-inch wide, yellow warning tape marked "Sewer Line Buried Below" shall be placed in the trench backfill approximately 24-inches above the tracer wire.

3.07 CLEANING MAINS

At the conclusion of the Work and prior to pressure testing, the **Contractor** shall thoroughly clean the new pipe line by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. The flushing water and debris will be trapped at the last downstream manhole and removed from the system.

3.08 INSPECTION AND TESTING OF UNDERGROUND GRAVITY SEWERS

- A. Infiltration of groundwater into sewer line shall not exceed 25 gal/day per inch of diameter per mile of sewer. All confirmed and/or visible leaks shall be repaired whether or not infiltration limits are exceeded.
- B. **Contractor** shall air test all gravity lines following completion of construction and pipe cleaning. **Contractor** shall furnish all necessary equipment and materials for testing including but not limited to pressure gauges, plugs, pumps, bulkheads, miscellaneous piping, etc. The following procedures shall be used:
 1. The **Contractor** shall isolate the test section with required plugs, bulkheads, etc.
 2. The **Contractor** shall pressurize the test section to 3.5 psi greater than the average back pressure of groundwater around the sewer (add 0.43 psi to test pressure for each vertical foot that the groundwater is above the top of the pipe).
 3. Allow 3 minutes for the pressure to stabilize.
 4. The pressure shall not decrease more than 0.5 psi during the time periods shown below:

<u>Pipe Diameter (Inches)</u>	<u>Time/100 ft.</u>	
	<u>Minutes</u>	<u>Seconds</u>
8	1	12
10	1	30
12	1	48
14	2	00
15	2	06
16	2	12
18	2	24
20	2	48
21	3	00
24	3	36
27	4	12
30	4	48
36	6	00

- C. Subject to the approval of the **Owner**, each joint of sewer pipes larger than 24-inches in diameter may be tested during installation may be tested with an ultrasonic testing device such as an U.G.-1-U.L.T.S. by Moffatt Enterprises, Powell Butte, OR, or an approved equal. The **Contractor** shall maintain a log of all test results and submit such to the **Owner** upon request. If any joint fails this test, the **Contractor** shall disassemble pipe, correct the problem, and retest the joint.
- D. All PVC pipe must pass a 5% deflection test as follows: Not before 30 days after pipe is laid and backfill placed, the **Contractor** shall test the pipe for deflection. A mandrel sized to permit up to 5% deflection shall be used.

SDR-35 PVC Pipe			
Nominal Pipe Size	Average Inside Diameter	Base Inside Diameter	5 % Deflection Mandrel
6	5.893	5.742	5.45
8	7.891	7.665	7.28
10	9.864	9.563	9.08
12	11.737	11.361	10.79
15	14.374	13.898	13.20

- E. A visual inspection (“lamp test”) of each reach of the sewer line will be performed by the **Owner** or its representative to detect sags or misalignment of the section. A full circle of light must be visible through the pipe between manholes.
- F. **Contractor** shall inspect the interior of all gravity sewer lines following the completion of all other construction and prior to any street paving. This shall be done via (CCTV) Closed Circuit Television camera, and document inspection on (DVD) Digital Video Disc. A hard copy of the inspection log and DVD shall be provided to the **Owner**.
1. All CCTV inspections shall be performed by personnel trained in accordance with PACP standards as provided by NASSCO and using PACP Data Standards and nomenclature, including the specific date and time of the inspection, as well as other points of significance such as tap locations, unusual conditions, infiltration points, and other discernible features.
 2. The camera used for the inspection shall be specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. All components of the video system must be capable of producing picture quality that is to the satisfaction of the **Owner**.
 3. Inspection logs shall include the following information as a minimum:
 - Title: Project Name and Project Number
 - “Performed for Cobb County Water System”
 - Time of day
 - Manhole ID (Contract Drawings)
 - Manhole to manhole pipe section

- Pipe segment length
 - Pipe material
 - Pipe diameter
 - Direction of camera travel (upstream, downstream)
 - Pipe depth
 - Operator name
 - Tape counter reading at beginning and end of each manhole to manhole pipe segment.
4. DVDs shall be submitted in a format readable with standard viewing software such as Windows Media Player. DVDs that require a specific software program will not be accepted.
5. **Contractor** shall maintain a copy of all inspection documentation (DVDs, databases, and logs) for duration of Contract and warranty period.
- G.** If any section fails to meet the infiltration, deflection, air test, and/or visual inspection requirements, the **Contractor** shall determine the source(s) of leakage or deflection and make necessary repairs and retest the repaired section, all at no additional cost to **Owner**.
- H.** The **Contractor** shall provide all necessary equipment to ensure safe access to perform the visual inspections, including but not limited to oxygen/hazardous gas monitoring devices, ventilation equipment, OSHA approved body harness and lifting apparatus, etc.

END OF SECTION 02722