

SECTION FOUR

COBB COUNTY WATER SYSTEM SPECIFICATIONS

WATER 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.
- * Minor manhole adjustments.
- * Preconstruction staking.
- * Coordination of additional project access as may be desired.
- * All temporary taps necessary for sterilization and testing.
- * Temporary mulching of all disturbed areas until final permanent stabilization is performed.
- * Protection of all work from traffic, vandalism, and weather conditions.

BASE FEE

Lump sum price is for mobilization and administrative cost associated with each work order. A base fee will be paid for each work order.

ADD-ON FEE FOR EMERGENCY REPAIR

Lump sum additional fee will be paid in addition to the base fee if a work order requires initiation immediately and significant progress and/or completion within 48 hours (or upon utility location).

ADD-ON FEE FOR PERFORMANCE AND PAYMENT BONDS

Lump sum additional fee will be paid in addition to the base fee for each work order that requires performance and payment bonds to be furnished. This additional fee shall cover bond amounts in the range of \$50,000 to \$100,000.

ADD-ON FEE FOR RECORD DRAWINGS

Lump sum additional fee will be paid in addition to the base fee for each work order that requires the Contractor to provide as-built, Record Drawings to be submitted with the final invoice for the work order. Requirements shall be in full accordance with Specification Section 01720, Project Record Documents.

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.

EXTRA DEPTH

Unit price per linear foot in addition to the price per linear foot of WATER MAIN is for labor and equipment only to install any size water main at a depth exceeding the nominal depth. Extra Depth will be measured for payment in linear feet along the horizontal centerline of the pipe and paid at the unit price for each cut class included in the bid schedule. The length of fittings and valves in the line will be included in the measurement of the pipe. Pipe material is not included and will be paid for under WATER MAIN.

POLYETHYLENE ENCASEMENT

Unit price per linear foot for the pipe manufacturer's standard 8-mil low density polyethylene encasement. Encasement will be measured in linear feet along the horizontal centerline of the water main pipe and fittings covered.

VALVE ASSEMBLY

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

CONCRETE VALVE MARKER

Unit price each is for concrete valve marker installed as required or directed.

ADJUSTMENT TO GRADE OF EXISTING VALVE BOX

Unit cost each includes all labor, material, and equipment for the adjustment to grade of existing valve box; valve nut extension if required; pre-cast donut if required; concrete; asphalt; gravel or other base materials necessary for pavement replacement, and align for proper valve operation.

VALVE ASSEMBLY CUT-IN

Unit price each is for labor and equipment only to cut-in a valve assembly, notify customers, and temporarily shut down water supply. Miscellaneous fittings and valve assembly will be paid for under corresponding bid items.

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.

TRANSITION COUPLINGS

Unit price each is for transition couplings installed where required.

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.

NEW FIRE HYDRANTS

Unit price each includes the furnishing and installation of the fire hydrant with barrel height as necessary for proper standard setting at required nominal depth of water main, **hydrant rotated to correct position**, operation and flushing of the new fire hydrant, and a seal test of the fire hydrant. Anchor couplings, fittings, valve assembly and any necessary vertical or horizontal extension will be paid for under the corresponding bid items.

REPLACE EXISTING FIRE HYDRANTS

Unit price each is for the complete removal of an existing fire hydrant and the furnishing and installation of a new fire hydrant from the boot (shoe) to the bonnet, **hydrant rotated to correct position**, operation and flushing of the new fire hydrant, and a seal test of the fire hydrant. 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.

ANCHOR COUPLINGS

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

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.

CONNECT TO EXISTING WATER MAIN - WET TAP

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

CONNECT TO EXISTING WATER MAIN - WET (NO 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, valves, customer notification, and temporary water shut down. 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 - 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.

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. Typical short side is up to 25 linear feet and long side is up to 55 linear feet.

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.

ADDITIONAL LENGTH OF SERVICE LINE WHERE DIRECTED

Unit price per linear foot includes all labor, material, and equipment to install additional lengths of each size of copper water service piping. Locations and estimated lengths shall be as directed by Owner. Unit price includes necessary termination connections. Additional lengths directed shall be beyond limits of typical short side and long side service lines and replacements.

REPLACE EXISTING WATER METER

Unit price each is for all required labor to replace an existing water meter with an Owner-furnished water meter in conjunction with the corresponding bid item for service line replacement. Water meter size shall be as indicated in the Bid Schedule.

Meter replacement includes prior coordination with the Owner for availability of replacement meters, pick-up at the Owner's warehouse facilities, accurate record keeping of existing and replacement meters' numbers, consumption readings, change-out date, address, etc.

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 up to 15 feet, miscellaneous fittings, testing, and disinfection as required. Water meter size shall be as indicated in the Bid Schedule.

REMOVE EXISTING WATER METER

Unit price each is for all required labor, tools, equipment, and materials to remove an existing water meter, vault or meter box, and backflow prevention device including abandonment in-place of the existing service line and restoration of the landscaping in the area of the meter. The water meter, meter box/vault, and backflow prevention device shall be delivered to the Cobb County Water System Warehouse. Water meter size shall be as indicated in the Bid Schedule.

WATER METER BOX ADJUSTMENT TO GRADE

Unit price each includes all labor and equipment required for the adjustment to grade of an existing water meter box. Includes any required excavation, meter box modifications, ensuring that meter assembly remains properly protected, backfill, etc. If meter box requires replacement, an Owner furnished box shall be installed.

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.

ABANDON EXISTING VALVE BOX - IN PAVEMENT

Unit price each is for all materials and labor required to remove valve box lid and to fill valve box with concrete flush with existing pavement.

ABANDON EXISTING VALVE BOX - OUT OF PAVEMENT

Unit price each is for all materials and labor required to remove the complete valve box and concrete collar, backfill with suitable materials, and replace landscaping in kind.

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.

REMOVE EXISTING FLUSH HYDRANT

Unit price each includes all required labor and equipment to remove any style of existing flush hydrant, flush valve, flushing standpipe, etc. from the existing water main including necessary plugging or capping of the existing line below ground (at source).

LOWER EXISTING DUCTILE IRON PIPE WATER MAIN IN PLACE

Unit price per linear foot includes all labor, equipment, coordination, etc. to isolate an in-service ductile iron pipe water main, lower it to the prescribed depth, reconnect ends; backfill and compact trench. Necessary additional pipe, fittings, valves, side connections and/or services (to be considered "short side") shall be measured and paid the separate payment items.

SEWER PIPELINE

Unit price per linear foot includes all labor, equipment, and material to install each size of sewer pipe installed including connecting the pipe to the proposed manholes and utility tracer system. Pipe will be measured for payment along the horizontal centerline of the pipe from center to center of manholes and by cut classification determined by the difference in elevation between the original ground elevation and the pipe invert.

SEWER PIPE IN CASING

Unit price per linear foot includes all labor, material, and equipment for installation of sewer pipe through casing pipe and includes casing spacers, brick bulkheads, utility tracer system, as well as installation to required alignment and grade. Casing pipe installation is not included and will be paid for under the separate pay items.

LONG SPAN DUCTILE IRON PIPE AERIAL SEWER

Unit price per linear foot includes all labor, material, and equipment to install each size of "long-span" ductile iron pipe with flanged connections and specialized gaskets as a gravity sewer aerial crossing. Unit price shall include appropriate couplings and connections to adjacent pipe sections and/or manholes at each end. Measurement for payment shall be made along the horizontal centerline of the pipe from connection to connection.

STANDARD & DOGHOUSE PRECAST MANHOLE (CEMENT AND POLYMER)

Unit price each includes all labor, material and equipment for the installation of manholes 0'-6' in depth including the base, risers, cone (or flat top), connecting boots, and invert. Unit price per vertical foot is for additional depth greater than 6'. Manholes will be measured for payment from the invert or flow line of the lowest pipe to the top rim of the manhole ring and cover.

MANHOLE RING AND COVER

Unit price each includes all labor, material and equipment to install the manhole ring and cover, including grouting, minor grade adjustments, etc.

INSIDE DROP ASSEMBLY

Unit price each includes all labor, material, and equipment to install each drop assembly, including all vertical pipe, fittings, strapping, coring, boot, and reworking of the invert.

OUTSIDE DROP ASSEMBLY

Unit price each includes all labor, material, and equipment to install each outside drop assembly, including all vertical pipe, fittings, strapping, coring, boot, concrete and reworking of the invert.

MANHOLE VENT ASSEMBLY

Unit price each includes all labor, material, and equipment to install each vent assembly installed as required, including the pipe, connection to the manhole, and insect fabric.

CONNECT TO EXISTING MANHOLE

Unit price each includes all labor, material, and equipment for coring into a manhole, installing a boot, reworking the invert, and installing the connection pipe.

ADJUST MANHOLE TO GRADE

Unit price each is for labor and materials to adjust to grade of manhole ring & cover on existing pre-cast manhole using up to 14-inches of Ladtech HDPE or SEC concrete adjusting rings.

GROUTING OF MANHOLE LIFT HOLES, MANHOLE JOINTS, AND PIPE PENETRATIONS

Unit price each includes all labor, material, and equipment to perform grouting to seal manhole cracks, holes, etc. from inflow/infiltration. Grout product shall be a quick-setting hydraulic cement such as HydraPlug or equal.

MANHOLE INVERT CONSTRUCTION/RECONSTRUCTION

Unit price each includes all labor, material and equipment for manhole invert construction/reconstruction based on the manhole diameter and outlet pipe size. Invert construction shall be consistent with typical new manhole invert construction techniques and materials. Should sewer by-pass pumping be required to perform this work, such shall be paid under the separate payment items.

MANHOLE ABANDONMENT

Unit price each includes all labor, material and equipment for the abandonment of manholes 0'-6' in depth by removing and disposing of the ring and cover, top cone section, and/or riser, bulk heading any inlets/outlets, and filling with select material (as specified). Landscape and/or hardscape restoration is to be paid separately under corresponding items. Unit price per vertical foot is for additional depth greater than 6'.

SERVICE STUBOUT ON MAIN

Unit price each includes all labor, material, and equipment to install service stubout on main, including the wye or tee and a 6-inch service pipe and utility tracer system to the permanent easement or roadway right-of-way limits up to a maximum length of 25 feet.

SERVICE STUBOUT FROM A MANHOLE

Unit price each includes all labor, material, and equipment to install service stubout from a manhole, including coring, grouting, boots, and a 6-inch service pipe and utility tracer system to the permanent easement limits or roadway right-of-way limits up to a maximum length of 25 feet.

ADDITIONAL 6-INCH SERVICE STUBOUT

Unit price per linear foot includes all labor, material and equipment to extend a service stubout beyond the 25 feet base length.

SERVICE CLEANOUT ASSEMBLY

Unit price each includes all labor, material, and equipment to install a service cleanout assembly with utility tracer system and cast iron frame & cover installed where required.

DISCONNECT/RECONNECT EXISTING SERVICE

Unit price each includes all labor, material and equipment for disconnecting and reconnecting existing service including the installing the wye or tee on the main or making the connection to the manhole, installing 6-inch service pipe, the disconnecting the existing service line from the customer plumbing, and connecting the new service line to the customer plumbing.

CASING, JACK AND BORED

Unit price per linear foot includes all labor, material, and equipment for the installation of casing pipe by boring and jacking, including wooden skids, casing spacers, brick bulkheads, and grouting the annular space (if required). Measurement will be made in linear feet along the horizontal centerline of the casing pipe.

CASING, OPEN CUT

Unit price per linear foot includes all labor, material, and equipment for installation of the required steel casing by the cut-and-cover method, including wooden skids, casing spacers, brick bulkheads, and grouting the annular space (if required). Measurement will be made in linear feet along the horizontal centerline of the casing pipe. Removal and replacement of asphalt and/or concrete surfaces, if required, will be paid for under the separate payment items.

CASING, AERIAL SPAN)

Unit price per linear foot includes all labor, material, and equipment for the installation of the required steel casing as an aerial span over a creek, ravine, etc., including skids, casing spacers, brick bulkheads, reinforced welded joints, and stabilized bearing support at ends. Measurement will be made in linear feet along the horizontal centerline of the casing pipe.

FREE BORE

Unit price per linear foot includes all labor and equipment for boring only. Bores will be measured for payment in linear feet along the horizontal centerline of the bore from entry to exit points as approved or as shown on the plans.

MISCELLANEOUS CONCRETE

Unit price per cubic yard includes material and delivery to the site and placement of 3000psi concrete at the dimensions indicated on the plans or otherwise directed. This payment item does not include standard thrust restraint/blocking, concrete pavement, sidewalk, or curb and gutter related work.

ADDITIONAL STABILIZATION OR TRENCH BACKFILL STONE

Unit price per ton includes material and delivery to the site and in-ditch placement. Payment is made for materials required in excess of the normal specified bedding requirements or to replace existing unsuitable soil materials. Use of additional stabilization or trench backfill stone shall be preapproved by the Owner.

SUITABLE TRENCH BACKFILL

Unit price per cubic yard is for all required labor, equipment and materials necessary for the replacement of job-excavated soils that have been determined by the Owner to be unsuitable for use as backfill with satisfactory soil materials. The suitability of excavated soils shall be determined prior to placement of any backfill. Payment will be based on the actual measurements of field authorized length and depth and maximum trench width specified. The excavation and disposal of unsuitable materials is considered to be incidental to the trench excavation and will not be paid for separately.

STREAM DIVERSION/BYPASS PUMPING

Unit price per hour or per day includes all labor, material, and equipment to coordinate, set-up, operate, monitor, and demobilize stream diversion or sewer bypass pumping of the required size/capacity. Plugs, bulkheads, cofferdams, and/or other necessary appurtenances shall be finished and installed as conditions dictate, along with up to 600 linear feet of temporary piping/hose. All work shall be performed in compliance with standards to avoid erosion, sedimentation, or sanitary sewer discharges.

ADDITIONAL TEMPORARY PIPING/HOSE

Unit price per one hundred foot lengths of the indicated diameter temporary piping/hose to satisfactorily perform Stream Diversion or Sewer Bypass Pumping. This includes all necessary fittings, supports, anchors, etc.

LABOR AND EQUIPMENT

Unit rates per hour shall only be paid when labor and equipment are requested and authorized by the Owner for specific purposes other than the descriptive payment items previously listed. Payment will be made for "on-site" time (no travel time) in full hour increments. All use of this time must be documented with the invoice.

HYDRO EXCAVATION

Unit price each includes all costs and labor associated for equipment, materials, labor, and disposal to perform hydro-excavation or other approved method of soft excavation for 0 – 4 hours. Unit price per hour is for additional time greater than 4 hours.

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 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:

Nominal Diameter (Inches) Wall Thickness (Inches)

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 have a 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, Standard for Ductile-Iron Pipe, Centrifugally Cast
- ANSI / AWWA C153/A21.53, 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, 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. Mueller Co., Model: Super Centurion 250
 2. U. S. Pipe Valve & Hydrant, LLC, Model: Metropolitan/ M-94
 3. M & H Valve Company, Model:129

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, AWWA Standard for Ductile-Iron Pipe, Centrifugally Cast
- ANSI / AWWA C153 / A21.53, 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, 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 of 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 of 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

SECTION 02723 - SANITARY SEWER FORCE MAINS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Provide all labor, equipment, materials and incidentals necessary to install and test all sanitary sewer force main piping and appurtenances as specified.
- B. Sanitary sewer force mains and fittings shall be ductile iron pipe.

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

- 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 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 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, 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
- ASME / ANSI B16.1 Standard for Cast Iron Pipe Flanges and Flanged Fittings

- ASTM A126 Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
- ANSI / AWWA C600 Standard for Installation of Ductile-Iron Mains and Their Appurtenances
- ANSI / AWWA C507-11 Standard for Ball Valves, 6 Inch Through 60 Inch
- ANSI / AWWA C504-10 Standard for Rubber- Seated Butterfly Valves
- ASTM B117-85 Standard Practice for Modified Salt Spray (Fog) Test
- ASTM D714-87 Standard Test Method for Evaluating Degree of Blistering of Paints
- ASTM B62 Standard Specification for Composition Bronze or Ounce Metal Castings
- ASTM B148 Standard Specification for Aluminum Bronze Sand Castings
- ASTM A36 Standard Specification for Carbon Structural Steel
- ASTM A536 Standard Specification for Ductile Iron Castings

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, and not less than 0.25 inches wall thickness. 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 A21.11. 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 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 PLUG VALVES

- A.** All isolation valves used for sewage force mains shall be eccentric plug valves. Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with flanged ends drilled to the ASNI 125/150 lb. standard.
- B.** Valve bodies shall be of ASTM A126 Class B semi-steel, 31,000 psi tensile strength minimum in compliance with AWWA C507 and C504. Port areas shall be 80 percent of full pipe area. All exposed nuts, bolts, springs, washers, etc. shall be zinc or cadmium plated. Resilient plug facings shall be of Hycar or Neoprene.
- C.** Valves shall be furnished with permanently lubricated stainless steel or oil-impregnated bronze upper and lower plug stem bushings in conformance with AWWA C507 and C504.
- D.** Seats shall have a welded-in overlay of a high nickel content on all surfaces contacting the plug face which comply with AWWA C507 and C504.
- E.** Valve shaft seals shall be adjustable and comply with AWWA C507.

- F. Valves shall be rated for a working pressure of 175 psig as established by hydrostatic tests as specified by ANSI B16.1. Valves shall be capable of providing drip-tight shutoff to the full valve rating with the pressure in either direction.
- G. All valves 6 inch diameter and larger shall be equipped with gear actuators. Smaller valves shall have a lever operator. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. All actuator shafts shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque. All exposed nuts, bolts, and washers shall be zinc or cadmium plated. Valve packing adjustment shall be accessible with disassembly of the actuator.
- H. 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.

2.03 CHECK VALVES

- A. Check valves for sewage service shall be of the swing type. Valve disc shall swing entirely clear of the path of flow when in the open position. All internal parts shall be readily accessible and easily replaced in the field.
- B. Check valves shall be iron body, bronze-mounted valves conforming to AWWA C508. Valves shall have 125-pound cast iron body, bolted and gasketed cover, stainless steel or brass hinge pin, renewable bronze seats and disc, outside lever and adjustable weight, and 125-pound flanged ends per ANSI B16.1. The lever arm and weights shall be designed to meet the project requirements. Cast iron for body and cap shall conform to ASTM A126, Grade B. Bronze for disc and seats shall conform to ASTM B62.
- C. Cushioned swing check valves shall meet the requirements of paragraph 2.03.B and shall have a cushion cylinder assembly externally attached to either or both sides of the valve body. The cushion cylinder assembly shall be constructed of corrosion-resistant material with a piston operating in a chamber so that it will effectively permit the valve to close without any hammering action. Unless otherwise shown or specified, the cushioning medium shall be air. The cushioning assembly shall be designed so that the closing speed can be field adjusted, if necessary, to meet the service requirements. The cushioned swing check valves shall be APCO Series 6000 Cushion Swing Check Valve as manufactured by

Valve & Primer Corp., Shockless Swing Check Valve as manufactured by GA Industries, Inc., or approved equal.

2.04 SURGE VALVES

- A. Surge valves for sewage service shall have heavily constructed cast iron body and cover to withstand severe shock conditions. Body shape shall be 90 degree angle pattern to permit side discharge.
- B. Valve disk shall be normally closed against system operating pressure by means of a spring or springs plus hydro-pneumatic accumulator. Valve shall open immediately when surge pressure exceeds operating pressure by 10 percent. Hydraulic cylinder shall be removable from the valve without removing the valve from the line. Closing speed shall be externally adjustable by means of a control valve.
- C. Materials of construction shall be certified to the following ASTM specifications:
- | | | |
|--------------------|---------------------------|------------------|
| Body | Cast iron | ASTM A126, GR. B |
| Body Seat Ring | Aluminum Bronze | ASTM B148 |
| Cover/Spacer | Ductile iron | ASTM A536 |
| Disc | Steel | ASTM A36 |
| Disc Seat | Buna-N | |
| Hydraulic cylinder | Steel | Commercial |
| Exterior paint | Phenolic Primer Red Oxide | |
- D. Manufacturers shall be APCO, Schaumburg, IL, GA Industries, or approved equal.

2.05 AIR/VACUUM RELEASE VALVES

- A. The sewage air release and vacuum break valve shall consist of a tubular all stainless steel fabricated body, hollow direct acting float and solid large orifice float in H.D.P.E., stainless steel nozzle and woven dirt inhibitor screen, nitrile rubber seals and a natural rubber seat. The valve shall have an integral "Anti-Surge" mechanism, which shall operate automatically to limit surge pressure rise or shock induced by closure to less than 2x valve rated working pressure.
- B. Connection to the valve inlet shall be by flanged ends conforming to ANSI B16.1 Class 125. 2" valves shall have a male, 2" NPT inlet.
- C. All air release, sewage air release and vacuum break valves shall be Vent-O-Mat or equal.

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 free 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 or laid, 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 installed in accordance with the Contract Drawings and shall slope uniformly between joints. All pipe shall be installed upgrade with bell end of pipe upgrade.
- E.** Extreme care shall be used when constructing piping to protect from damage 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.** The **Contractor** shall expose buried lines or structures to confirm or determine pipe material, diameter, or other information related to existing conditions, and furnish and install appropriate piping or fittings, and make proper connections.
- B.** Where shown on the plans or directed by the **Owner**, new force mains 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, as specified in Section 02722 of these Documents.

3.03 INSTALLATION

- A.** Force mains shall be installed as shown on the Contract Drawings and as specified herein. No deviation from the designed alignment and/or grades shall be made without prior approval of the **Owner**.
- 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 laying. The deflection at joints shall not exceed that recommended by the 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. Unless otherwise noted in the Contract, underground piping shall have push-on joints. 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. 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.

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 PIPE SUPPORTS AND THRUST RESTRAINT

- A. All sewage force main piping shall be properly and adequately supported. Concrete piers and pads shall be provided as indicated on the Contract Drawings. If the method of support is not indicated on the Drawings, exposed piping shall be supported as directed by the **Owner**.
- B. Longitudinal thrust along pressurized pipe lines at bends, tees, reducers, and caps or plugs shall be counteracted by reaction blocking or collar that is solidly and properly placed against undisturbed earth.
- C. Joints shall be protected by felt roofing paper prior to placing concrete thrust block / collar.
- D. Bearing area of thrust blocks and collars shall be adequate to prevent any movement of the fitting and shall be of the size and dimensions as shown on the Drawings. The dimensions and values for thrust block / collar sizing is based on a pipe test pressure of 350 psi and a horizontal bearing strength of the soil of 2,000 psf. The bearing surface of the thrust block / collar 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.

- E. Concrete for thrust blocking / collars 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 / collars.
- F. Restrained joints shall be used as shown on the Drawings. Thrust blocks / collars shall be used at all other locations or as directed by the **Owner**.
- G. Tie rods, where shown on the 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 psi and shall be coated with bitumastic paint after installation.
- H. Wedge action retainer glands where shown on the Drawings to be used in conjunction with thrust restraint devices, shall be installed in accordance with manufacturer's instructions.

3.06 UTILITY TRACER SYSTEM

- A. Force mains shall have a utility tracer system installed in accordance with details on the Drawings, with surface access at 1,000-foot intervals or selected changes in alignment. A continuous, insulated, 12 gauge, solid copper tracer wire shall be placed over the pipe with the initial backfill. Surface access shall occur in a 15-inch diameter cast iron ring and cover (Vestal RMC-15-H, East Jordan Iron Works V-8502, U.S. Foundry 7621, or equal) flush with ground surface accompanied by a force main marker post, labeled accordingly.
- B. 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.
- C. 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 discharge manhole and removed from the system.

3.08 PRESSURE AND LEAKAGE TESTS OF UNDERGROUND PRESSURE PIPING

- A. Hydrostatic pressure and leakage tests for sewage force mains shall be conducted using potable water and test procedures conforming 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. Corporation cocks at least 3/4-inches in diameter, pipe riser and angle globe valves shall be provided at each pipe dead-end and high point in order to bleed air from the line. 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 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.

If a test section fails to meet the infiltration, air, or deflection test requirements, it shall be repaired and retested at no additional cost to the **Owner**.

END OF SECTION 02723

SECTION 02750 – BYPASS PUMPING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide all materials, labor, and equipment to install, test, and maintain a temporary by-pass pumping system for the purpose of all diverting sewer flows around the work area.
- B. It is imperative that the functioning of the wastewater collection system be maintained throughout the construction period. A reliable temporary by-pass pumping system must be provided to ensure uninterrupted sewer service in the area.

1.02 RELATED WORK

- A. Section 02722: Sanitary Sewers

1.03 UNIT RESPONSIBILITY

The by-pass pumps, piping, and associated accessories shall be provided by a single supplier to ensure a completely integrated and functional system.

1.04 SUBMITTALS

- A. Submittals shall be made in accordance with Section 01300 Submittals
- B. The Contractor shall develop a by-pass pumping plan, provide all equipment necessary for by-pass pumping, and maintain the equipment throughout the duration of the work. The Contractor shall submit the by-pass pumping plan, including all product and design data and operating calculations, to CCWS Engineering for verification. The by-pass pumping plan shall include the following information as a minimum:
 - 1. By-pass pump sizing criteria (i.e. force main size and length, static and dynamic head, flow velocity, maximum wastewater level depths in manholes upstream of by-pass pump operations) and resulting capacity, number of each size to be on site, and power/fuel requirements.
 - 2. Pump curves showing the pump operating range shall be submitted.
 - 3. Method of noise control for each pump and/or generator; calculations demonstrating the expected attenuated noise levels (in decibels) at nearest residence.
 - 4. Staging area for pumps and piping

5. Number, size, material, location, and method of installation of suction and discharge piping; sewer plugging method and types of plugs; thrust and restraint block sizes and locations; temporary pipe supports and anchoring.
6. Schedule for installation and maintenance of by-pass pumping system.

1.05 ENVIRONMENTAL PROTECTION

- A. The Contractor shall take necessary precautions to ensure that by-pass operations do not result in sewer overflows, sewer backups, or related threats to the public health and do not cause flooding or damage to public or private property.
- B. The pumped sewage shall be in an enclosed hose or pipe that is adequately protected from traffic and shall be redirected to the sanitary sewer system. The dumping or free flow of sewage on public and private property, gutters, streets, sidewalks, or into storm sewers is prohibited.
- C. Should any liquid or solid matter from the sewer collection system be spilled, discharged, leaked, or otherwise deposited to the environment, the Contractor shall immediately clean and disinfect the affected area and notify the Owner.
- D. Any sewer overflows, backups, leaks, or property damage resulting from improper setup or failure of the by-pass pumping system shall be the responsibility of the Contractor. The Contractor shall be responsible for any fines, for the complete clean up of such spills, and for restoration of damaged property at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 BY-PASS PUMPS

- A. The by-pass pumps used shall be fully automatic, self-priming units. The pumps shall possess dry-running capabilities to accommodate the diurnal, cyclic nature of wastewater flow.
- B. By-pass pumps shall be of sufficient capacity to accommodate the daily peak sanitary sewer flows plus any additional flows due to rain events.

- C. The by-pass pumps may be driven by either electric motor or diesel engine.
1. Diesel engines must be provided with acoustic enclosures to minimize noise.
 2. The Contractor is responsible for providing all necessary and required power and control wiring and associated electrical devices when using electric motors.
- D. Unless otherwise specified or approved by the Owner, the pumping equipment shall be sound attenuated; noise levels shall not exceed 75 decibels at 23 feet.
- E. The Contractor shall also provide a back up, on-site by-pass pumping system that will automatically energize upon a high water level, indicating the failure of the primary by-pass pumping unit. The back-up system shall be equal in all respects to the primary system.
- F. The Contractor shall provide all signal wiring and connections from the by-pass pump system to the existing local SCADA panel. The Contractor shall make any temporary provisions to keep the existing SCADA panel operational while by-pass pumping, including, but not limited to, supports and electrical and signal wiring. The Contractor shall notify the Water System's Water Protection Division Information Technology Group prior to making final connections to the SCADA panel. The following signals will be provided to the SCADA panel:
1. Primary by-pass pump: On/Off
 2. Back-up by-pass pump: On/Off
 3. High water level
- G. The by-pass pump equipment supplier shall provide technical support and service 24 hours/day, 7 days/week.

PART 3 - EXECUTION

3.01 BY-PASS PUMPING

- A. The Contractor shall coordinate the by-pass pump installation and start-up with the Owner, specifically to include Water Protection Division personnel.
1. A minimum of 48 hours advance written notice must be given before starting by-pass operations. The by-pass pumping system must be tested for a minimum of 24 hours without incident prior to taking any part of the collection system, including pump stations, out of service; any incident shall restart the test period. By-pass operations may not start or restart on Fridays.

2. The Owner reserves the right to delay the start of by-pass operations (e.g. in the event of forecasted adverse weather).
- B. The complete by-pass pumping system shall be inspected daily by qualified personnel.
 - C. The Contractor assumes operational responsibility of the affected portions of the collection system throughout the duration of by-pass pumping operations. The Contractor shall be on-call at all times to respond to all alarm conditions and/or failure of the by-pass pumping system.
 - D. The by-pass pumping system shall remain on-site for immediate connection and use, if necessary, until the start-up testing period (24 hour minimum) for the completed work has been successfully completed.

END OF SECTION 02750

SECTION 03410 - PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.01 SCOPE OF WORK

Furnish all materials, labor and equipment and construct manholes, as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

Submit to the Owner Shop Drawings of the products specified herein. Shop drawings of the precast structures shall show details of construction, reinforcing and joints.

1.03 INSPECTION

- A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Owner.
- B. At the time of inspection, the sections will be carefully examined for compliance with the ASTM designation specified below and these Specifications, and with the approved manufacturer's drawings. Imperfections may be repaired, subject to the approval of the Owner, after demonstration by the manufacturer that strong and permanent repairs result.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE MANHOLES

- A. Precast concrete manhole base, barrel and eccentric top sections shall conform to Specifications for Precast Reinforced Concrete Manhole Sections, ASTM Designation C478, except as otherwise specified below. The method of construction shall conform to the Drawings and the following additional requirements:
 - 1. Barrel sections shall have tongue and groove joints. Joints shall have elastomeric gaskets conforming to ASTM C443 standard specifications. Flexible plastic gaskets (Ram-Nek or equal) meeting Federal 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 section, where required, shall be capable of supporting the overburden plus a live load equivalent to AASHTO H-20 loading.
 7. Manholes steps shall be cast into the precast sections and shall conform to ASTM Specification C478. Steps shall be Plastic Step by M.A. Industries, Inc., or equal.
 8. Holes in precast sections to receive sewer pipe shall be precast at the factory at the required locations. All precast holes shall have Kor-N-Seal (or equal) rubber boots.
 9. The tops of bases shall be suitably shaped to mate with the precast barrel section.
 10. All manholes, except those located in paved areas or where precise adjustment of top elevation is required, shall be furnished with the cover frame cast into the top section.
- B. Cast iron frames and covers shall be EJCO V-1480, U.S. Foundry Model USF-360E, or approved equal or as shown on the drawings. Watertight frames and covers shall be EJCO V-2480, U.S. Foundry Model USF 360E or approved equal with rubber gasket and stainless steel bolts.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Manholes and other precast structures shall be constructed to the dimensions as shown on the Drawings and as specified in these Specifications.
- B. Precast concrete structure sections shall be set so as to be vertical and with sections in true alignment with a 1/4-inch maximum tolerance to be allowed.
- C. If possible, holes in the concrete manhole sections required for handling or other purposes shall not penetrate completely through the wall. All lifting holes shall be plugged with a non-shrinking grout.
- D. Where holes must be field cut in the precast sections to accommodate pipes, the holes shall be cored to provide a smooth sealing surface for connecting boots. All coring shall be done prior to setting the manhole sections in place.
- E. Manholes shall have an invert channel shaped to correspond with the lower half of the pipe. The top of the shelf shall be sloped to drain toward the flowing through channel.
- F. Where adjustment or replacement of a manhole frame and cover is necessary, the following requirements shall apply:

1. Adjustment of frame and cover to grade shall be accomplished with a precast concrete and/or HDPE leveling rings, fully bedded in portland cement mortar. In no case shall vertical adjustment exceed 14 inches.
2. The top of the frame shall be set flush with, and match the slope of, the surrounding pavement.
3. Frame shall be set in a portland cement mortar bed (1½ inch maximum thickness).
4. Exterior surface of rings used in leveling course area shall be coated with a portland cement plaster (½ inch minimum thickness).
5. Adjustment or replacement of frame and covers on sewer outfall manholes shall require frame to be set on flexible plastic gasket (reference 2.01, A, 1. of this section), and anchored (along with any adjustment rings) to the manhole structure with four ½" diameter stainless steel threaded rods with nuts and washers. Rods shall be anchored into the existing structure using an epoxy adhesive equal to the Hilti H/T RE 500 System, following the manufacturer's instructions.

END OF SECTION 03410