STANDARD SPECIFICATIONS

FOR

WATER MAIN CONSTRUCTION

PUBLIC UTILITIES DEPARTMENT
UNIFIED GOVERNMENT
OF
ATHENS-CLARKE COUNTY
GEORGIA

August 2025

PREFACE

These Standard Specifications have been prepared to complement and include by reference the Standard Detail Drawings and to provide the qualitative requirements for products, materials and workmanship for construction of additions to and replacements of the water system (main sizes 8 inches through 16 inches and services) which is under the jurisdiction of the Unified Government of Athens-Clarke County, Georgia.

All references in these Standard Specifications to "Engineer" shall mean the legal and authorized representative of the Department of Public Utilities, Unified Government of Athens-Clarke County. All references to "Project" shall mean the work being constructed under the jurisdiction of these Standard Specifications. All references to "Contractor" shall mean the individual, company or corporation constructing work under the jurisdiction of these Standard Specifications. All references to "Drawings" shall include, by reference, the Standard Detail Drawings accompanying these Standard Specifications.

These Standard Specifications may be supplemented due to exceptional circumstances, with such noted on the Drawings or supplemental Specifications approved by Director of Public Utilities.

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Part 1 General

1.01 Scope

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

B. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion and sedimentation control procedures, as required by state Erosion and Sedimentation, Georgia Manual (latest edition).

1.02 Quality Assurance

A. The Contractor shall comply with applicable codes, ordinances, rules, regulations and laws of local, municipal, state or federal authorities having jurisdiction over the Project. All required permits of a temporary nature shall be obtained for construction operations by the Contractor.

B. Open burning will not be allowed.

1.03 Job Conditions

A. Location of the Work: The area to be cleared and grubbed is shown schematically on the Drawings or specified below. It includes all areas designated for construction.

B. The Contractor shall comply with conditions of special agreements and easements negotiated by the Unified Government of Athens-Clarke County (UGACC) with private property owners and public agencies.

Part 2 Products

2.01 Equipment

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

Part 3 Execution

3.01 Scheduling of Clearing

A. The Contractor shall clear at each construction site only that length of the right-of-way, permanent or construction easement which would be the equivalent of one month's pipe laying.

B. UGACC may permit clearing for additional lengths of the pipe line provided that temporary erosion and sedimentation controls are in place and a satisfactory stand of temporary grass is established. Should a satisfactory stand of grass not be possible, no additional clearing shall be permitted beyond that specified above.

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

3.02 Clearing and Grubbing

A. Clear and grub the permanent easement or 5 feet on each side of the pipeline, whichever is greater, before excavating. Remove all trees, growth, debris, stumps and other objectionable matter. Clear the construction easement or road right-of-way only if necessary.

B. Materials to be cleared, grubbed and removed from the Project site include, but are not limited to, all trees, stumps, roots, brush, trash, organic matter, paving, miscellaneous structures, houses, debris and abandoned utilities.

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

D. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and roadways or two feet below finish grade, whichever is lower.

E. Landscaping features shall include, but are not necessarily limited to, fences, cultivated trees, cultivated shrubbery, property corners, man-made improvements, subdivision and other signs within the right-of-way and easement. The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features. Existing structures shall be relocated such that they are off the easement.

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

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

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

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

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

K. The Contractor shall be responsible for all damages to existing improvements resulting from Contractor's operations.

3.03 Disposal of Debris

The debris resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the Contractor and shall be disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property except with written consent of the property owner. A copy of written consent shall be provided to UGACC for permanent records. In no case shall any material or debris be left on the Project, shoved onto abutting private properties or buried on the Project.

END OF SECTION

Part 1 General

1.01 Scope

A. The work specified in this Section consists of providing, maintaining and removing temporary erosion and sedimentation controls.

B. Temporary erosion controls, include, but are not limited to, grassing, mulching, watering and reseeding on-site surfaces and spoil and borrow area surfaces, and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the "Erosion and Sedimentation Act of 1975" as amended (O.C.G.A. § 12-7-1 et seq.), Section 402 of the Federal Clean Water Act, and applicable codes, ordinances, rules, regulations and laws of local and municipal authorities having jurisdiction.

C. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, filter stone and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the Federal Clean Water Act of 1987, as amended.

D. Land disturbance activity shall not commence until the Land Disturbance Permit has been issued, which authorizes land disturbance activities.

E. Basic Principles

1. Conduct the earthwork and excavation activities in such a manner to fit the topography, soil type and condition.

2. Minimize the disturbed area and the duration of exposure to erosion elements.

3. Stabilize disturbed areas immediately. Do not allow any undisturbed area to remain unstabilized for fourteen (14) days or more.

4. Safely convey run-off from the site to an outlet such that erosion will not be increased off site.

5. Retain sediment on site that was generated on site.

6. No construction activities shall occur within a dedicated stream buffer, unless otherwise approved by the Unified Government of Athens-Clarke County (UGACC) and the Georgia EPD.

7. All erosion and sedimentation control measures shall be designed for a minimum 25-year storm event.

8. Construct erosion and sedimentation control devices prior to or concurrent with land disturbing activities.

9. Minimize encroachment on water courses.

F. Temporary Erosion and Sedimentation Control: In general, temporary erosion and sedimentation control procedures shall be directed toward:

1. Preventing soil erosion at the source.

2. Preventing silt and sediment from entering any waterway if soil erosion cannot be prevented.

3. Preventing silt and sediment from migrating downstream in the event it cannot be prevented from entering the waterway.

G. Permanent Erosion Control: Permanent erosion control measures shall be implemented to prevent sedimentation of the waterways and to prevent erosion of the Project site.

1.02 Quality Assurance

A. General: Perform all work under this Section in accordance with all pertinent rules and regulations including, but not necessarily limited to, those stated above and these Specifications.

B. Conflicts: Where provisions of pertinent rules and regulations conflict with these Specifications, the more stringent provisions shall govern.

C. The Contractor shall provide to UGACC, prior to initiating land disturbance activities, the name and 24-hour phone number of the individual responsible for inspection, installation and maintenance of erosion and sedimentation control devices on a 24 hour everyday basis.

1.03 Quality Standards

A. Part III, Special Condition, Management Practices, Permit Violations and Other Limitations of the General Permit allows for the discharge of waterline flushing provided flows are not contaminated with process materials or pollutants. Chlorine shall be removed prior to discharging water and waterline.

B. Fluids used for horizontal directional drilling shall not be discharged without treatment to reduce the turbidity to less than twenty-five (25) nephelometric turbidity units (NTU).

C. Erosion Control features installed shall be effectively maintained to control erosion within the limits of the project and to control the discharge of stormwater from disturbed areas such that turbidity of the stream shall not exceed twenty-five (25) NTU higher than the turbidity level of the stream immediately up stream of construction. Turbidity testing will be done by UGACC. Any erosion control devices damaged by contractor or any of his subcontractors either by neglect, by his construction methods or for any other reasons including acts of nature shall be immediately repaired by the contractor at no

additional cost to UGACC.

1.04 Dust Control

Dust from any of the contractor's activities shall be controlled to keep dust pollution to a minimum. Comply with Georgia Environmental Protection Division Air Pollution Standards for Nuisance Dust Control. Contractor may be directed to wet areas where dust may be or is a problem to achieve the desired results.

Part 2 Products

2.01 Temporary Erosion and Sediment Control Materials

A. Silt Fence: Silt fence shall meet the requirements of Section 171 - Temporary Silt Fence of the Department of Transportation, State of Georgia, Standard Specification, latest edition.

B. Hay Bales: Hay bales shall be clean, seed-free cereal hay.

C. Stone Check Dams: Stone shall conform to the requirements of Section 805.01 of the Georgia Department of Transportation Standard Specification, latest edition, for Stone Dumped Rip Rap except the stone shall be 8-inches or less at the greatest dimension.

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

2.02 Rip Rap

A. Use sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall be 2.0 or greater. Rip rap shall have less than 66 percent wear when tested in accordance with AASHTO T-96. Unless shown or specified otherwise, stone rip rap shall be Type 1 rip rap.

B. Type 1 Rip Rap: The largest pieces shall have a maximum volume of two cubic feet. At least 35 percent of the mass shall be comprised of pieces, which weigh 125 pounds or more. The remainder shall be well graded down to the finest sizes. Rock fines shall comprise a maximum of 10 percent of the total mass. Rock fines are defined as material passing a No. 4 sieve. Rip rap size shall conform to Georgia Department of Transportation Section 805.01 Stone Dumped Rip Rap, Type 1.

C. Type 3 Rip Rap: The largest pieces shall have a maximum approximate volume of one cubic foot. At least 35 percent of the mass shall be comprised of pieces, which weigh 15 pounds or more. The remainder shall be well graded down to the finest sizes. Rock fines shall comprise a maximum of 10 percent of the total mass. Rock fines are defined as material passing a No. 4 sieve. Rip rap size shall conform to Georgia

Department of Transportation Section 805.01 Stone Dumped Rip Rap, Type 3.

D. 200 Pound Rip Rap: Minimum weight of individual stones shall be 200 pounds.

2.03 Filter Fabric

The filter fabric for use under rip rap shall be a monofilament, polypropylene woven fabric meeting the specifications as established by Task Force 25 for the Federal Highway Administration. The filter fabric shall have an equivalent opening size (EOS) of 70.

2.04 Concrete

Concrete shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5-inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

2.05 Erosion Control Matting

Erosion control matting shall be constructed of 100 percent agricultural straw and lightweight biodegradable top and bottom nets. The components shall be sewn together on approximately 1.5-inch centers with degradable thread. The functional longevity of the mat shall be approximately ten months. The straw fibers shall weigh approximately 0.5 pound/square yard.

2.06 Grassing

A. Grassing materials shall meet the requirements of the following sections of the Georgia Department of Transportation Standard Specifications, latest edition:

Material	Section
Topsoil	893.01
Seed and Sod	890
Fertilizer	891.01
Agricultural Lime	882.02
Mulch	893.02
Inoculants	893.04

B. Seed species shall be provided as shown on the approved Erosion Control Plan.

C. Mulch Binder: Mulch on slopes exceeding 3 (horizontal) to 1 (vertical) shall be held in place by the use of a mulch binder, as approved by the Unified Government of Athens-Clarke County (UGACC). The mulch binder shall be non-toxic to plant and animal life and shall be approved by the UGACC.

D. Water: Water shall be free of excess and harmful chemicals, organisms and substances, which may be harmful to plant growth or obnoxious to traffic. Salt or brackish water shall not be used. Water shall be furnished by the Contractor.

Part 3 Execution

3.01 General

A. Standards: Provide all materials and promptly take all actions necessary to achieve effective erosion and sedimentation control in accordance with the Georgia Erosion and Sedimentation Act of 1975, as amended, Section 402 of the Federal Clean Water Act, and applicable codes, ordinances, rules, regulations and laws of local and municipal authorities having jurisdiction.

B. Implementation: The Contractor shall have the responsibility to actively take all steps necessary to control soil erosion and sedimentation.

C. Erosion and sedimentation controls shall be constructed in accordance with the Manual for Erosion and Sedimentation Control in Georgia, latest edition, these Specifications and Standard Detail Drawings.

3.02 Temporary Erosion and Sedimentation Control

A. Temporary erosion and sedimentation control procedures should be initially directed toward preventing silt and sediment from entering the waterways. The preferred method is to provide an undisturbed natural buffer, extending a minimal 25 feet from the water's edge (edge of the wrested vegetation), to filter the run-off. Should this buffer prove infeasible due to construction activities being too close to the water, or if the amount of sediment overwhelms the buffer, the Contractor shall place silt fences to filter the run-off and, if necessary, place permanent rip rap to stabilize the bank.

B. Silt dams, silt fences, traps, barriers, check dams, appurtenances and other temporary measures and devices shall be installed as indicated on the approved plans and working drawings, shall be maintained until no longer needed, and shall then be removed. Deteriorated hay bales and dislodged filter stone shall be replaced with new materials.

C. Where permanent grassing is not appropriate, and where the Contractor's temporary erosion and sedimentation control practices are inadequate, UGACC may direct the Contractor to provide temporary vegetative cover with fast growing seedings.

D. All erosion and sedimentation control devices, including check dams, shall be inspected

by the Contractor at least weekly and after each rainfall occurrence and cleaned out and repaired by the Contractor as necessary.

E. Temporary erosion and sedimentation control devices shall be installed prior to and maintained during disturbance activity until the satisfactory completion and establishment of permanent erosion control measures. At that time, temporary devices shall be removed.

3.03 Permanent Erosion Control

A. Permanent erosion control shall include:

1. Restoring the work site to its original contours, unless shown otherwise on the Drawings or directed by UGACC.

2. Permanent vegetative cover shall be provided in accordance with "Grassing" of this Section.

3. Permanent stabilization of steep slopes and creeks shall be performed in accordance with Article 3.05 of this Section.

B. Permanent erosion control measures shall be implemented as soon as practical after the completion of pipe installation or land disturbance for each segment of the Project. In no event shall implementation be postponed when no further activities related t o pipe installation will impact that portion or segment of the Project. Partial payment requests may be withheld for those portions of the Project not complying with this requirement.

3.04 Grassing

A. General

1. Grassing shall be performed as shown on the approved Erosion Control Plan, and in accordance with the Georgia Department of Transportation Standard Specification Section 700.

2. All references to grassing, unless noted otherwise, shall relate to establishing permanent vegetative cover as specified herein for seeding, fertilizing, mulching, etc.

3. When final grade has been established, all bare soil, unless it is to be paved within the next 14 days, shall be seeded, fertilized and mulched in an effort to restore to a protected condition. Critical areas shall be sodded as approved or directed by UGACC.

4. Specified permanent grassing shall be performed at the first appropriate season following establishment of final grading in each section of the site.

B. Replant grass removed or damaged in residential areas using the same variety of grass

and at the first appropriate season. Where sod is removed or damaged, replant such areas using sod of the same species of grass at the first appropriate season. Outside of residential or landscaped areas, grass the entire area disturbed by the work on completion of work in any area. In all areas, promptly establish successful stands of grass.

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

3.05 Rip Rap

A. Unless shown otherwise on the Drawings, rip rap shall be placed where ordered by UGACC, at all points where banks of streams or drainage ditches are disturbed by excavation, or at all points where natural vegetation is removed from banks of the streams or drainage ditches. Carefully compact backfill and place rip rap to prevent subsequent settlement and erosion. This requirement applies equally to construction along side a stream or drainage ditch as well as crossing a stream or drainage ditch.

B. When trenching across a creek, place rip rap a distance of 10 feet upstream and 10 feet downstream from the top of the trench excavation. Place rip rap across creek bottom, across creek banks and extend rip rap placement five feet beyond the top of each creek bank.

C. Preparation of Foundations: The ground surface upon which the rip rap is to be placed shall be brought in reasonably close conformity to the correct lines and grades before placement is commenced. Where filling of depressions is required, the new material shall be compacted with hand or mechanical tampers. Unless at creek banks or otherwise shown or specified, rip rap shall begin in a toe ditch constructed in original ground around the toe of the fill or the cut slope. The toe ditch shall be two feet deep in original ground, and the side next to the fill or cut shall have that same slope. After the rip rap is placed, the toe ditch shall be backfilled and the excess dirt spread neatly within the construction easement.

D. Placement of Filter Fabric: The surface to receive fabric shall be prepared to a relatively smooth condition free from obstructions, depressions and debris. The fabric shall be placed with the long dimension running up the slope and shall be placed to provide a minimum number of overlaps. The strips shall be placed to provide a minimum width of one foot of overlap for each joint. The filter fabric shall be anchored in place with securing pins of the type recommended by the fabric manufacturer. Pins shall be placed on or within 3-inches of the centerline of the overlap. The fabric shall be placed so that the upstream strip overlaps the downstream strip. The fabric shall be loosely so as to give and therefore avoid stretching and tearing during placement of the stones. The stones shall be dropped no more than three feet during construction. The fabric shall be protected at all times during construction from clogging due to clay, silt, chemicals or other contaminants. Any contaminated fabric or any fabric damaged during its installation or during placement of rip rap shall be removed and replaced with uncontaminated and undamaged fabric at no expense to UGACC.

E. Placement of Rip Rap

1. Rip rap shall be placed on a 6-inch layer of soil, crushed stone or sand overlaying the filter fabric. This 6-inch layer shall be placed to maximize the contact between the soil beneath the filter fabric and the filter fabric. Rip rap shall be placed with its top elevation conforming with the finished grade or the natural slope of the stream bank and stream bottom.

2. Stone rip rap shall be dumped into place to form a uniform surface and to the thickness specified on the Drawings. The thickness tolerance for the course shall be -6-inches and +12-inches. If the Drawings or the Bid do not specify a thickness, the course shall be placed to a thickness of not less than 18-inches.

3.06 Erosion Control Matting

The erosion control matting shall be placed after areas have been seeded and be installed in accordance with the manufacturer's recommendations. Matting shall be held in place by 6-inch long wire staples or wooden pegs. Staples or pegs shall be provided at all overlaps and ends, as well as throughout the mat, based on slope length and grade and soil type. On severe slops, the top of the matting shall be placed in an anchor trench a minimum of 6 inches deep.

END OF SECTION

Part 1 General

1.01 Scope

A. The work under this Section consists of furnishing all labor, equipment and materials and performing all operations in connection with the trench excavation and backfill required to install the pipelines shown on the Drawings and as specified.

B. Excavation shall include the removal of any trees, stumps, brush, debris or other obstacles which remain after the clearing and grubbing operations, which may obstruct the work, and the excavation and removal of all earth, rock or other materials to the extent necessary to install the pipe and appurtenances in conformance with the lines and grades shown on the Drawings and as specified.

C. Backfill shall include the refilling and compaction of the fill in the trenches and excavations up to the surrounding ground surface or road grade at crossing.

D. The trench is divided into five specific areas:

1. Foundation: The area beneath the bedding, sometimes also referenced to as trench stabilization.

2. Bedding: The area above the trench bottom (or foundation) and below the bottom of the barrel of the pipe.

3. Haunching: The area above the bottom of the barrel of the pipe up to a specified height above the bottom of the barrel of the pipe.

4. Initial Backfill: The area above the haunching material and below a plane 18-inches above the top of the barrel of the pipe.

5. Final Backfill: The area above a plane 18-inches above the top of the barrel of the pipe.

E. The choice of method, means, techniques and equipment rests with the Contractor. The Contractor shall select the method and equipment for trench excavation and backfill depending upon the type of material to be excavated and backfilled, the depth of excavation, the amount of space available for operation of equipment, storage of excavated material, proximity of man-made improvements to be protected, available easement or right-of-way and prevailing practice in the area.

1.02 Quality Assurance

A. Density: All references to "maximum dry density" shall mean the maximum dry density defined by ASTM D 698, except that for cohesion less, free draining soils "maximum dry density" shall mean the maximum index density as determined by ASTM D 4253. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet with the requirements of ASTM D 1556, ASTM D 2922 or ASTM D 2937.

B. Sources and Evaluation Testing: Testing of materials to certify conformance with the Specifications shall be performed by an independent testing laboratory.

1.03 Safety

Perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The Contractor shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P "Excavation, Trenching & Shoring" as described in OSHA publication 2226. Particular attention is drawn to the requirement that the Contractor must have on site a competent individual with current confined space entry training certification. It is the Contractor's sole responsibility to follow all OSHA safety regulations.

Part 2 Products

2.01 Trench Foundation Materials

Crushed stone shall be utilized for trench foundation (trench stabilization) and shall meet the requirements of the Georgia Department of Transportation Specification 800.01, Group I (limestone, marble or dolomite) or Group II (quartzite, granite or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.

2.02 Bedding and Haunching Materials

A. Unless shown on the Drawings or specified otherwise, bedding and haunching materials shall be as follows:

1. Water Mains: Earth materials as specified below.

B. Under Pavement: Bedding and haunching material under all pavement areas shall be No.57 crushed stone as specified above.

C. Earth materials utilized for bedding and haunching shall be suitable materials selected from materials excavated from the trench. Suitable materials shall be clean and free of rock larger than 2 inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes and other unsuitable materials. Should the material excavated from the trench be saturated, the saturated material may be used as earth material, provided it is allowed to dry properly and it is capable of meeting the specified compaction requirements. When necessary, earth bedding and haunching materials shall be moistened to facilitate compaction by tamping. If materials excavated from the trench are not suitable for use as bedding or haunching material, provide select material conforming to the requirements of this Section.

D. Suitable earth materials shall be defined as Class II or Class III soil types described in ASTM D2321 and as further defined in ASTM D2487 (Unified Soil Classification System).

1. Soil Type II: Course grained soils with little or no fines- GW, GP, SW, SP; containing less than 12 percent fines (maximum particle size 1 ½ inches).

2. Soil Type III: Course grained soils with fines- GM, GC, SM, SC; containing more than 12 percent fines (maximum particle size 1 ½ inches).

E. Unsuitable earth materials for bedding and haunching shall be defined as Class IV or Class V soil types as described in ASTM D 2321 and as further defined in ASTM D 24B7 (Unified Soil Classification System).

1. Soil Type IV: Inorganic fine-grained soils, inorganic silts or clays- ML, CL, MH, CH; containing 50 percent or more fines passing No. 200 sieve.

2. Soil Type V: Organic or highly organic soils, organic silts, clays and peat- OL, OH, PT; containing 50 percent or more fines passing No. 200 sieve.

F. Filter Fabric

1. Filter fabric associated with bedding shall be a polypropylene woven fabric. The fabric shall be a high modulus type with good separation capabilities. The fabric shall be inert to biological degradation and naturally occurring chemicals, alkalies and acids.

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

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

3. If ordered by the Unified Government of Athens- Clarke County (UGACC), the filter fabric manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe. This service will be furnished for a minimum of 3 days during initial pipe installation.

2.03 Initial Backfill

Initial backfill material shall be suitable soil or crushed stone as specified for bedding and haunching materials. Do not use rock excavated from trenches in the backfill. UGACC inspector shall determine the final acceptability of initial backfill material.

2.04 Final Backfill

Final backfill material shall be general excavated earth materials, shall not contain more than 20% evenly distributed rock larger than 6 inches in any dimension, nor shall it contain cinders, stumps, limbs, man-made wastes and other unsuitable materials. If materials excavated from the trench are not suitable for use as final backfill material, provide select material conforming to the requirements of this Section. UGACC inspector shall determine the final acceptability of final backfill material.

2.05 Select Backfill

Select backfill shall be materials which meet the requirements as specified for bedding, haunching, initial backfill or final backfill materials, including compaction requirements. UGACC inspector shall determine the final acceptability of select backfill material.

2.06 Concrete

Concrete for bedding, haunching, initial backfill or encasement shall have a compressive strength of not less than 3,000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5 inches. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

2.07 Flowable Fill, where required for trench backfill, shall meet the requirements of GDOT 600 for Excavatable type. Maximum compressive strength at 28 days shall be 100 psi.

Part 3 Execution

3.01 Trench Excavation

A. Topsoil and grass shall be stripped to a minimum depth of 6-inches over the trench excavation site and stockpiled for replacement over the finished grading areas.

B. Trenches shall be excavated to the lines and grades shown on the Drawings or specified with the centerlines of the trenches on the centerlines of the pipes and to the dimensions, which provide the proper support, and protection of the pipe and other structures and accessories.

C. Trench Width for Pipelines

1. The sides of all trenches shall be vertical, as much as possible, to a minimum of one foot above the top of the pipe. Unless otherwise indicated on the Drawings, the maximum trench width shall be equal to the sum of the outside diameter of the pipe plus two feet. The minimum trench width shall be that which allows the proper consolidation of the haunching and initial backfill material.

2. Excavate the top portion of the trench to any width within the construction easement or right-of-way, which will not cause unnecessary damage to adjoining

structures, roadways, pavement, utilities, trees or private property. Where necessary to accomplish this, provide sheeting and shoring.

3. Where rock is encountered in trenches, excavate to remove boulders and stones to provide a minimum of 6-inches clearance between the rock and any part of the pipe or manhole.

4. Wherever the prescribed maximum trench width is exceeded, the Contractor shall use the next higher Class or Type of bedding and haunching as shown on the Drawings for the full trench width as actually cut. The excessive trench width may be due to unstable trench walls, inadequate or improperly placed bracing and sheeting which caused sloughing, accidental over-excavation, intentional over-excavation necessitated by the size of the Contractor's tamping and compaction equipment, intentional over-excavation due to the size of the Contractor's excavation equipment, or other reasons beyond the control of the UGACC.

D. Depth

1. The trenches shall be excavated to the required depth or elevation, which allow for the placement of the pipe and bedding to the dimensions shown on the Drawings or specified.

2. Where rock is encountered in trenches for pipelines, excavate to the minimum depth which will provide clearance below the pipe barrel of 8 inches for pipe 21 inches in diameter and smaller and 12 inches for larger pipe, valves and manholes. Remove boulders and stones to provide a minimum of 6-inches clearance between the rock and any part of the pipe, manhole or accessory.

E. Excavated Materials

1. Excavated materials shall be placed adjacent to the work to be used for backfilling as required. Top soil shall be carefully separated and lastly placed in its original location.

2. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause any drainage problems. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements.

F. Trench excavation shall not extend more than 100 feet beyond pipe installation.

3.02 Sheeting, Bracing and Shoring

A. Sheeting, bracing and shoring shall be performed in the following instances:

1. Where sloping of the trench walls does not adequately protect persons within the trench from slides or cave-ins.

2. In caving ground.

3. In wet, saturated, flowing or otherwise unstable materials. The sides of all trenches and excavations shall be adequately sheeted, braced and shored.

4. Where necessary to prevent damage to adjoining buildings, structures, roadways, pavement, utilities, trees or private properties which are required to remain.

5. Where necessary to maintain the top of the trench within the available construction easement or right-of-way.

B. In all cases, excavation protection shall strictly conform to the requirements of the Occupational Safety and Health Act of 1970, as amended.

C. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good, serviceable condition. Size and spacing shall be in accordance with OSHA regulations.

D. Steel Sheeting and Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and live loads. Procedure for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The Contractor shall provide closure and sealing between sheet piling and existing facilities. Sheet piling within three feet of an existing structure or pipeline shall remain in place, unless otherwise directed by UGACC.

E. Trench Shield: A trench shield or box may be used to support the trench walls. The use of a trench shield does not necessarily preclude the additional use of bracing and sheeting. When trench shields are used, care must be taken to avoid disturbing the alignment and grade of the pipe or disrupting the haunching of the pipe as the shield is moved. When the bottom of the trench shield extends below the top of the pipe, the trench shield will be raised in 6-inch increments with specified backfilling occurring simultaneously. At no time shall the trench shield be “dragged” with the bottom of the shield extending below the top of the pipe.

F. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when in the opinion of the UGACC it cannot be safely removed. Cut off any sheeting left in place at least two feet below the surface.

3.03 Trench Rock Excavation

A. Definition of Trench Rock: Any material, which cannot be excavated with conventional excavating equipment, and is removed by drilling and blasting, and occupies an original volume of at least one cubic yard.

B. Blasting: Exhaust other practical means of excavating prior to utilizing blasting as a means of excavation. Provide licensed, experienced workmen to perform blasting. Conduct blasting operations in accordance with all existing ordinances and regulations. Protect all buildings and structures from the effects of the blast. Repair any resulting damage. If the Contractor repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, UGACC may direct the Contractor to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge.

C. Removal of Rock: Dispose of rock off site that is surplus or not suitable for use as rip rap or backfill, unless directed otherwise by UGACC.

D. The Contractor shall notify UGACC prior to any blasting. Additionally, the Contractor shall notify UGACC and local fire department before any charge is set. The Contractor is responsible for obtaining all required permits (including permit from local fire department) and paying all fees associated with each blasts.

E. Following review by UGACC regarding the proximity of permanent buildings and structures to the blasting site, UGACC may direct the Contractor to employ an independent, qualified specialty sub-contractor, approved by UGACC, to monitor the blasting by use of a seismograph, identify the areas where light charges must be used, conduct pre-blast and post-blast inspections of structures, including photographs or videos, and maintain a detailed written log.

F. Where blasting is to be performed on Georgia Department of Transportation right-of-way, the Contractor shall be responsible for providing UGACC sufficient information in a timely manner to obtain a blasting permit from the Georgia DOT. UGACC shall not be responsible for delays in construction due to DOT review time or for the Contractor's failure to provide complete and accurate information required to obtain the permit.

3.04 Dewatering Excavations

A. Dewater excavation continuously to maintain a water level two feet below the bottom of the trench.

B. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water running into the excavation.

C. There shall be sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavations. Where the pipe line crosses natural drainage channels, the work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the work will be prevented. Provision shall be made for the satisfactory disposal of surface water to prevent damage to public or private property.

D. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete or backfilling.

E. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least two feet below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump two feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operation.

F. If pumping from sumps does not lower the water level the specified minimum two feet below the trench bottom, dewatering shall be accomplished by use of a well point system. Where soil conditions dictate, the Contractor shall construct well points cased in sand wicks. The casing, 6 to 10-inches in diameter, shall be jetted into the ground, followed by the installation of the well point, filling casing with sand and withdrawing the casing.

3.05 Trench Foundation and Stabilization

A. The bottom of the trench shall provide a foundation to support the pipe and its specified bedding. The trench bottom shall be graded to support the pipe and bedding uniformly throughout its length and width.

B. If, after dewatering as specified above, the trench bottom is spongy, or if the trench bottom does not provide firm, stable footing and the material at the bottom of the trench will still not adequately support the pipe, the trench will be determined to be unsuitable and UGACC shall then order trench stabilization by directing the Contractor to over excavate the trench bottom and fill with crushed stone.

C. Where the replacement of unsuitable material with crushed stone does not provide an adequate trench foundation, the trench bottom shall be excavated to a depth of at least two feet below the specified trench bottom. Place filter fabric in the bottom of the trench and support the fabric along the trench walls until the trench stabilization, bedding, haunching and pipe have been placed at the proper grade. The ends of the filter fabric shall be overlapped above the pipe.

D. Where trench stabilization is provided, the trench stabilization material shall be compacted to at least 90 percent of the maximum dry density, unless shown or specified otherwise.

3.06 Bedding and Haunching

A. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders or large dirt clods.

B. Bedding material shall be placed to provide uniform support along the bottom of the pipe and to place and maintain the pipe at the proper elevation. The initial layer of bedding placed to receive the pipe shall be brought to the grade and dimensions indicated on the Drawings. All bedding shall extend the full width of the trench bottom. The pipe shall be placed and brought to grade by tamping the bedding material or by removal of the excess amount of the bedding material under the pipe. Adjustment to

grade line shall be made by scraping away or filling with bedding material. Wedging or blocking up of pipe shall not be permitted. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except immediately at the joint.

C. At each joint, excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.

D. After the pipe section is properly placed, add the haunching material to the specified depth. The haunching material shall be shovel sliced, tamped, vigorously chinked or otherwise consolidated to provide uniform support for the pipe barrel and to fill completely the voids under the pipe, including the bell hole. Prior to placement of the haunching material, the bedding shall be clean and free of any water, loose rocks, boulders or dirt clods.

E. Water Mains:

1. Unless otherwise shown on the Drawings or specified, use minimum Type 2 Bedding, utilizing earth materials for bedding and haunching.

2. Unless specified or shown otherwise use minimum Type 3 Bedding for restrained joint pipe and fittings.

3. Type 4 Pipe Bedding called for on the Drawings, specified or ordered by UGACC, shall meet requirements for Type 4 Pipe Bedding, utilizing crushed stone bedding and haunching material.

F. Appurtenances: Excavate to a minimum of 12-inches below the planned elevation of the base of the manhole, vault or other type appurtenance. Place and compact crushed stone bedding material to the required grade before constructing the appurtenance.

G. Excessive Width and Depth

1. Water Mains: If the trench is excavated to excess width, provide the next higher type or class of pipe bedding, but a minimum of Type 4, as detailed on the Drawings.

2. If the trench is excavated to excessive depth, provide crushed stone to place the bedding at the proper elevation or grade.

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

3.07 Initial Backfill

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

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

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

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

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

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

3.08 Concrete Encasement For Pipelines

Where concrete encasement is shown on the Drawings, excavate the trench to provide a minimum of 12-inches clearance from the bell of the pipe. Provide polyethylene encasement on the segment of pipe in contact with concrete. Lay the pipe to line and grade on concrete blocks. In lieu of bedding, haunching and initial backfill, place concrete to the full width of the trench and to a height of not less than 12-inches above the pipe bell. Do not backfill the trench for a period of at least 24 hours after concrete is placed.

3.09 Final Backfill

A. Backfill carefully to restore the ground surface to its original condition.

B. Except under pavement areas, the top 6 inches shall be topsoil obtained as specified in "Trench Excavation" of this Section.

C. Excavated material, which is unsuitable for backfilling, and excess material, shall be disposed of in a manner approved by UGACC and in a manner that will not adversely impact the environment. Surplus soil may be neatly distributed and spread over the site, if approved by UGACC, except that surplus soil shall not be distributed and spread over the site in areas under Corps of Engineers jurisdiction. If such spreading is allowed, the site shall be left in a clean and sightly condition and shall not affect pre-construction drainage patterns. Surplus rock from the trenching operations shall be removed from the site, unless directed otherwise by UGACC.

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

E. After initial backfill material has been placed and compacted, backfill with final backfill material. Place backfill material in uniform layers, compacting each layer thoroughly as follows:

1. In 6-inch layers, if using light power tamping equipment, such as a "jumping jack"

2. In 12-inch layers, if using heavy tamping equipment, such as hammer with tamping feet

3. In 24-inch layers, if using a hydra-hammer

F. Settlement: If trench settles, re-fill and grade the surface to conform to the adjacent surfaces.

G. Final backfill shall be compacted to a minimum 90 percent of the maximum dry density, unless specified otherwise.

3.10 Additional Material

Where final grades above the pre-construction grades are required to maintain minimum cover, additional fill material will be as shown on the Drawings. Utilize excess material excavated from the trench, if the material is suitable. If excess excavated materials are not suitable, or if the quantity available is not sufficient, provide additional suitable fill material.

3.11 Backfill Under Roads

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

3.12 Backfill Within Georgia Dot Right-of-Way

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

3.13 Backfill Along Restrained Joint Pipe

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

3.14 Flowable Fill

A. Where flowable fill is required, excavate the trench to provide a minimum of 6-inches clearance on either side of the pipe barrel. Lay the pipe to line and grade on solid concrete blocks or bricks. In lieu of bedding, haunching and initial backfill, place

flowable fill to the full width and depth of the trench.

B. Flowable fill shall be protected from freezing for a period of 36 hours after placement. Minimum temperature of flowable fill at point of delivery shall be 50 degrees F.

C. The Contractor shall provide steel plates over flowable fill in road locations.

3.15 Compacted Granular Material

Where compacted granular material is required as initial and final backfill material, it shall be placed after bedding and haunching material specified elsewhere has been placed. Compacted granular material shall be compacted to a minimum 95 percent of the maximum dry density.

3.16 Testing and Inspection

A. All costs associated with compaction testing ordered by UGACC shall be paid for by the Contractor.

B. Frequency: The extent of testing required shall be reasonable, but shall also be dependent upon soil conditions, Contractor's means and methods of operation, and regulatory requirements. UGACC will direct where density tests will be performed along the Project route. Up to one test will be performed for each sewer segment, or minimum 500 foot intervals, whichever is more frequent. Tests shall be taken at a depth up to 3 feet. In the event of a failing test, up to two additional tests shall be performed along the same segment as directed. Retesting will be performed until passing results are obtained.

C. The soils testing laboratory is responsible for the following:

1. Compaction tests in accordance with Article 1.02 of this Section.

2. Inspecting and testing stripped site, subgrades and proposed fill materials.

3. Field density tests as directed by UGACC personnel.

D. The Contractor's duties relative to testing include:

1. Notifying laboratory of conditions requiring testing.

2. Coordinating with laboratory for field testing.

3. Providing excavation as necessary for laboratory personnel to conduct tests.

E. Inspection

1. Earthwork operations, acceptability of excavated materials for bedding or backfill, and placing and compaction of bedding and backfill is subject to inspection by UGACC.

2. Foundations and shallow spread footing foundations are required to be inspected by a geotechnical engineer, who shall verify suitable bearing and construction.

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

END OF SECTION

Part 1 General

1.01 Scope

A. The work covered by this Section includes furnishing all labor, materials and equipment required to bore and jack casings and/or pipe and to properly complete pipeline construction as described herein and/or shown on the Drawings.

B. Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI) or other recognized standards. Latest revisions of all standards are applicable. If requested by the Unified Government of Athens-Clarke County (UGACC), submit evidence that manufacturer has consistently produced products of satisfactory quality and performance over a period of at least two years.

1.02 Submittals

A. If required by UGACC, submit shop drawings, product data and experience.

B. Material Submittals: If required by UGACC, the Contractor shall provide shop drawings and other pertinent specifications and product data as follows:

1. Shop drawings for casing pipe showing sizes and connection details.

2. Design mixes for concrete and grout.

3. Casing Spacers.

4. Locking Gaskets (Restrained Joints)

C. Experience Submittals: Boring and jacking casings is deemed to be specialty contractor work. If the Contractor elects to perform the work, the Contractor shall provide evidence as required by the General Conditions, if ordered by UGACC. A minimum of five continuous years of experience in bore and jack casing construction is required of the casing installer. Evidence of this experience must be provided with the shop drawings for review.

1.03 Storage and Protection

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

Part 2 Products

2.01 Materials and Construction

A. Casing

1. The casing shall be new and unused pipe. The casing shall be made from steel plate having a minimum yield strength of 35,000 psi. The steel plate shall also meet the chemical requirements of ASTM A 36.

2. The thicknesses of casing shown in Paragraph B. below are minimum thicknesses. Actual thicknesses shall be determined by the casing installer, based on its evaluation of the required forces to be exerted on the casing when jacking. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to UGACC.

3. The diameters of casing shown in paragraph B. below and shown on the Drawings are minimum. Larger casings, upon approval, may be provided at no additional cost to UGACC, for whatever reasons the Contractor may decide, whether casing size availability, line and grade tolerances, soil conditions, etc.

B. Casing Sizes

Under Railroads		
Pipe Diameter, inches	Casing Diameter, inches	Wall Thickness, inches (Uncoated)
6	14	0.282
8	18	0.313
10	20	0.344
12	22	0.375
14	24	0.407
16	30	0.469
18	30	0.469

Under Highways		
Pipe Diameter, inches	Casing Diameter, inches	Wall Thickness, inches
6	12	0.250
8	16	0.250
10	16	0.250

Under Highways		
Pipe Diameter, inches	Casing Diameter, inches	Wall Thickness, inches
12	18	0.250
14	22	0.250
16	24	0.250
18	30	0.312

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

1. Type I casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch thick also having a hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing.

2. Type II casing spacers shall be a two-section, flanged, bolt on style constructed of heat fused PVC coated steel, minimum 14 gauge band and 10 gauge risers, with 2-inch wide glass reinforced polyester insulating skids, heavy duty PVC inner liner, minimum 0.09-inch thick having a hardness of 85-90 durometer, and all stainless steel or cadmium plated hardware.

D. Restrained Joints

1. Restrained joints shall be ACIPCO "FLEX-RING" or "FAST-GRIP", or U.S. "TR-FLEX" or "FIELD LOK".

2. Bolts and nuts shall be in accordance with the manufacturer's recommendations.

3. Gaskets shall be in accordance with the manufacturer's recommendations.

E. Grout: Cement shall conform to ASTM C 150, Type I or Type II. Grout shall have a minimum compressive strength of 100 psi attained within 24 hours.

F. Carrier Pipe: All ductile iron pipe installed in casings shall be restrained joint pipe meeting requirements specified in Section 02665 of these Specifications.

G. Surface Settlement Markers: Surface settlement markers within pavement areas shall be P.K. nails. Surface settlement markers within non-paved areas shall be wooden hubs.

2.02 Equipment

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

Part 3 Execution

3.01 General

A. Interpretation of soil investigation reports and data, investigating the site and determination of the site soil conditions prior to bidding is the sole responsibility of the Contractor. Any subsurface investigation by the Bidder or Contractor must be approved by the appropriate authority having jurisdiction over the site.

B. Casing construction shall be performed so as not to interfere with, interrupt or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The Contractor shall be responsible for all settlement resulting from casing operations and shall repair and restore damaged property to its original or better condition.

C. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing.

D. Casing Design: Design of the bore pit and required bearing to resist jacking forces are the responsibility of the Contractor. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the Contractor, at no additional cost to UGACC. Due to restrictive right-of-way and construction easements, casing lengths less than the nominal 20 foot length may be necessary.

E. Highway Crossings

1. The Contractor shall be held responsible and accountable for the coordinating and scheduling of all construction work within the highway right-of-way and posting of appropriate permits.

2. Work along or across the highway department rights-of-way shall be subject to inspection by such highway department.

3. All installations shall be performed to leave free flows in drainage ditches, pipes, culverts or other surface drainage facilities of the highway, street or its connections.

4. No excavated material or equipment shall be placed on the pavement or shoulders of the roadway without the express approval of the highway department.

5. In no instance will the Contractor be permitted to leave equipment (trucks, backhoes, etc.) on the pavement or shoulder overnight. Construction materials to be installed, which are placed on the right-of-way in advance of construction,

shall be placed in such a manner as not to interfere with the safe operation of the roadway.

6. Where blasting is to be performed on Georgia Department of Transportation right-of-way, the Contractor shall be responsible for providing UGACC sufficient information in a timely manner to obtain a blasting permit from the Georgia DOT. UGACC shall not be responsible for delays in construction due to DOT review time or for the Contractor's failure to provide complete and accurate information required to obtain the permit.

F. Railroad Crossings

1. UGACC will obtain the encroachment permit from the Railroad. However, the Developer/Contractor shall pay any and all costs and fees. The Contractor shall secure permission from the Railroad to schedule work so as not to interfere with the operation of the Railroad.

2. Additional insurance is required for each railroad crossing. The Contractor shall furnish the Railroad with such additional insurance as may be needed, cost of the same shall be borne by the Contractor.

3. All work on the Railroad right-of-way, including necessary support of tracks, safety of operations and other standard and incidental operation procedures may be under the supervision of the appropriate authorized representative of the Railroad affected and any decisions of this representative pertaining to construction and/or operations shall be final and construction must be governed by such decisions.

4. If, in the opinion of the Railroad, it becomes necessary to provide flagging protection, watchmen or the performance of any other work in order to keep the tracks safe for traffic, the Contractor shall coordinate such work and shall reimburse the Railroad, in cash, for such services, in accordance with accounting procedures agreed on by the Contractor and affected Railroad before construction is started.

5. No blasting shall be permitted within the Railroad right-of-way.

3.02 Groundwater Control

A. The Contractor shall control the groundwater throughout the construction of the casing.

B. Methods of dewatering shall be at the option and responsibility of the Contractor. Maintain close observation to detect settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify UGACC immediately and take such action as necessary to maintain safe conditions and prevent damage.

C. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24 hour basis keeping excavations free of water until the

backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. Dewater into a sediment trap and comply with requirements specified in Section 02125 of these Specifications.

3.03 Safety

A. Provide all necessary bracing, bulkheads and shields to ensure complete safety to all traffic, persons and property at all times during the work. Perform the work in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it.

B. Observe all applicable requirements of the regulations of the authorities having jurisdiction over this site. Conduct the operations in such a manner that all work will be performed below the level of the roadbed.

C. Perform all activities in accordance with the Occupational Safety and Health Act of 1970 (PL-596), as amended, applicable regulations of the Federal Government, OSHA 29CFR 1926 and applicable criteria of ANSI A10.16-81, “Safety Requirements for Construction of Tunnel Shafts and Caissons”.

D. Bore pits shall not be left unattended unless proper safety barriers are in place.

E. Construction activities adjacent to roadways, including traffic control, shall meet the requirements of Section 02665, Article 3.02 of these Specifications.

3.04 Surface Settlement Monitoring

A. Provide surface settlement markers for casings 24-inches in diameter and larger. Place marker as specified and as directed by UGACC. The Contractor shall place settlement markers outside of pavement area, along the centerline of the casing at 20 foot intervals and offset 10 feet each way from the centerline of the casing. Markers shall also be placed at each shoulder of the roadway, at each edge of pavement, at the centerline of the pavement and at 10 and 25 feet in each direction from the centerline of the casing. Tie settlement markers to bench marks and indices sufficiently removed as not to be affected by the casing operations.

B. Make observations of surface settlement markers, placed as required herein, at regular time intervals acceptable to UGACC. In the event settlement or heave on any marker exceeds 1-inch, the Contractor shall immediately cease work and using a method approved by UGACC and the authority having jurisdiction over the project site, take immediate action to restore surface elevations to that existing prior to start of casing operations.

C. Take readings and permanently record surface elevations prior to start of dewatering operations and/or shaft excavation. The following schedule shall be used for obtaining and recording elevation readings: all settlement markers, once a week; all settlement markers within 50 feet of the casing heading, at the beginning of each day; more frequently at UGACC's direction if settlement is identified. Make all elevation measurements to the nearest 0.01 foot.

D. The Contractor shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by, and at the expense of, the Contractor.

E. Promptly report any settlement and horizontal movement immediately to UGACC and take immediate remedial action.

3.05 Casing Installation

A. Shaft

1. Conduct boring and jacking operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.

2. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to site and soil conditions. Keep preparations dry during all operations. Perform pumping operations as necessary.

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

B. Jacking Rails and Frame

1. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.

2. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.

3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

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

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

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

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

G. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation. For casing pipe installations over 100 feet in length, the auger shall be removed and the alignment and grade checked at minimum intervals of 60 feet.

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

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

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

K. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.

L. Care shall be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.

M. The Contractor shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.

N. Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring and bracing shall be left in place, cut off or removed, as designated by UGACC.

O. Trench excavation, all classes and type of excavation, the removal of rock, muck, debris, the excavation of all working pits and backfill requirements of Section 02225 are included under this Section.

P. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.

Q. Grout backfill shall be used for unused holes or abandoned pipes.

R. Any replacement of carrier pipe in an existing casing shall be considered a new installation, subject to the applicable requirements of these Specifications.

3.06 Free Boring

A. Where the Drawings indicate a pipeline is to be installed by boring without casing, the Contractor shall construct the crossing by the free bore method. The free bore method shall be accomplished by the dry auger boring method without jetting, sluicing, or wet boring.

B. The diameter of the free bore shall not exceed the pipe bell outside diameter or the pipe barrel outside diameter plus 1-inch, whichever is greater.

C. Free boring, where indicated on the Drawings, is to be performed at the Contractor's option. The Contractor may choose to construct the crossing by the conventional bore and jack casing methodology.

D. The Contractor shall be responsible for any settlement of the roadway caused by the free bore construction activities.

3.07 Ventilation and Air Quality

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

3.08 Rock Excavation

A. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of UGACC, cannot be removed through the casing, UGACC may authorize the Contractor to complete the crossing by a method established in a change order.

B. At the Contractor's option, the Contractor may continue to install the casing and remove the rock through the casing.

3.09 Installation of Pipe

A. After construction of the casing is complete, and has been accepted by UGACC, install the pipeline in accordance with the Drawings and Specifications.

B. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper alignment, grade and elevation, without any sags or high spots.

C. The carrier pipe shall be held in the casing pipe by one of the following methods:

1. The carrier pipe shall be held in the casing pipe by the use of hardwood blocks spaced radially around the pipe and secured together so that they remain firmly in place. The spacing of such blocks longitudinally in the casing pipe shall not be greater than 10 feet.

2. The pipe shall be supported within the casing by use of casing spacers sized to limit radial movement to a maximum of 1-inch. Provide a minimum of two casing spacers per nominal length of pipe. Casing spacers shall be attached to the pipe at maximum 9 to 10 foot intervals.

D. Close the ends of the casing with 4-inch brick walls.

3.10 Sheeting Removal

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

END OF SECTION

Part 1 General

1.01 Scope

A. The work to be performed under this Section shall consist of removing and replacing existing pavement, sidewalks and curbs in paved areas where such have been removed for construction of utilities and appurtenances.

B. Existing pavement, sidewalks and curbs shall be replaced to the current Unified Government of Athens-Clarke County (UGACC) standards or to match existing, whichever is more stringent.

1.02 Submittals

If required by UGACC, provide certificates stating that materials supplied comply with Specifications. Certificates shall be signed by the asphalt producer and the Contractor.

1.03 Conditions

A. Weather Limitations

1. Apply bituminous tack coat only when the ambient temperature in the shade has been at least 50 degrees F for 12 hours immediately prior to application.

2. Do not conduct paving operations when surface is wet or contains excess of moisture which would prevent uniform distribution and required penetration.

3. Construct asphaltic courses only when atmospheric temperature in the shade is above 40 degrees F, when the underlying base is dry and when weather is not rainy.

4. Place base course when air temperature is above 35 degrees F and rising.

B. Grade Control: Establish and maintain the required lines and grades for each course during construction operations.

Part 2 Products

2.01 Materials and Construction

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

B. Black Base: Black base course shall be of uniform quality throughout and shall conform to the requirements of Section 828 of the Georgia Department of Transportation Standard Specifications.

C. Bituminous Tack Coat: The bituminous tack coat shall conform to the requirements of Section 400 of the Georgia Department of Transportation Standard Specifications.

D. Surface Course: The surface course for all asphaltic concrete pavement shall conform to the requirements of Section 400, Type "F" (Super Pave 9.5 mm) of the Georgia Department of Transportation Standard Specifications unless other types are noted on the Drawings or required by UGACC.

E. Concrete: Provide concrete and reinforcing for concrete pavement or base courses in accordance with the requirements of the Georgia Department of Transportation Standard Specifications, Section 430. Concrete shall be of the strength classifications shown on the Drawings.

F. Special Surfaces: Where driveways or roadways are disturbed or damaged which are constructed of specialty type surfaces, e.g., brick or stone, these driveways and roadways shall be restored utilizing similar, if not original, materials. Where the nature of these surfaces dictate, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

2.02 Types of Pavements

A. General: All existing pavement removed, destroyed or damaged by construction shall be replaced with the same type and thickness of pavement as that existing prior to construction, unless otherwise directed by UGACC. Materials, equipment and construction methods used for paving work shall conform to the Georgia Department of Transportation specifications applicable to the particular type required for replacement, repair or new pavements.

B. Aggregate Base: Aggregate base shall be constructed in accordance with the requirements of Section 310 of the Georgia Department of Transportation Standard Specifications. The maximum thickness to be laid in a single course shall be 6-inches compacted. If the design thickness of the base is more than 6-inches, it shall be constructed in two or more courses of approximate equal thickness. After the material placed has been shaped to line, grade and cross-section, it shall be rolled until the course has been uniformly compacted to at least 100 percent of the maximum dry density when Group 2 aggregate is used, or to at least 98 percent of maximum dry density when Group 1 aggregate is used.

C. Concrete Pavement: Concrete pavement or base courses shall be replaced with concrete. The surface finish of the replaced concrete pavement shall conform to that of the existing pavement. The surface of the replaced concrete base course shall be left rough. The slab depth shall be equivalent to the existing concrete pavement or base course, but in no case less than 6-inches thick. Transverse and longitudinal joints removed from concrete pavement shall be replaced at the same locations and to the

same types and dimensions as those removed. Concrete pavements or concrete base courses shall be reinforced.

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

E. Surface Treatment Pavement: Bituminous penetration surface treatment pavement shall be replaced with a minimum thickness of 1-inch conforming to Section 424, Georgia Department of Transportation Standard Specifications.

F. Gravel Surfaces: Existing gravel road, drive and parking area replacement shall meet the requirements of graded aggregate base course. This surfacing may be authorized by UGACC as a temporary surface for paved streets until replacement of hard surfaced pavement is authorized.

G. Temporary Measures: During the time period between pavement removal and complete replacement of permanent pavement, maintain highways, streets and roadways by the use of steel running plates anchored to prevent movement. The backfill above the pipe shall be compacted, as specified in Section 02225 of these Specifications, up to the existing pavement surface to provide support for the steel running plates. All pavement shall be replaced within seven calendar days of its removal.

Part 3 Execution

3.01 Pavement Replacement

A. See detail G-1 for pavement removal and replacement requirements associated with trenching.

B. Resurfacing Requirements: where longitudinal pavement cuts exceed 150 feet in length, the cut shall be patched in accordance with these specifications and the entire roadway width shall be resurfaced with a minimum of 1-1/2" of Type "F" (Super Pave 9.5 mm) asphalt for the entire length of the cut plus 20 feet in each direction. All striping and pavement markings shall be replaced to pre-existing conditions.

C. "Graded Aggregate" pavement repair shall be used only to replace existing gravel or crushed stone surfaces. Thickness of replacement stone shall be a minimum of 4 inches, regardless of thickness of existing stone.

3.02 Removing Pavement

A. General: Remove existing pavement as necessary for installing the pipe line and appurtenances.

B. Marking: Before removing any pavement, mark the pavement neatly paralleling pipe lines and existing street lines. Space the marks the width of the trench.

C. Breaking: Break asphalt pavement and concrete pavement along the marks by cutting through with a rotary saw.

D. Machine Pulling: Do not pull pavement with machines until the pavement is completely broken and separated from pavement to remain.

E. Damage to Adjacent Pavement: Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.

F. Sidewalk: Remove and replace any sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.

G. Curbs: Tunnel under or remove and replace any curb disturbed by construction to the nearest undisturbed joint.

3.03 Replacing Pavement

A. Preparation of Subgrade: Upon completion of backfilling and compaction of the backfill, arrange to have the compaction tested by an independent testing laboratory approved by UGACC. After compaction testing has been satisfactorily completed, replace all pavements, sidewalks and curbs removed.

1. The existing street pavement or surface shall be removed along the lines of the work for the allowable width specified for the trench or structure. After the installation of the sewerage or water works facilities and after the backfill has been compacted suitably, the additional width of pavement to be removed, as shown on the Drawings, shall be done immediately prior to replacing the pavement.

2. Trench backfill shall be compacted for the full depth of the trench as specified in Section 02225 of these Specifications.

3. Temporary trench backfill along streets and driveways shall include 6-inches of crushed stone or cherty clay as a temporary surfacing of the trenches. This temporary surface shall be maintained carefully at grade and dust-free by the Contractor until the backfill of the trench has thoroughly compacted in the opinion of UGACC and permission is granted to replace the street pavement.

4. When temporary crushed stone or chert surface is considered by UGACC to be sufficient surface for gravel pavement, the surface shall be graded smooth and to

an elevation that will make the final permanent surfacing level with the adjacent surfacing that was undisturbed.

B. Pavement Replacement

1. Prior to replacing pavement, make a final cut in concrete pavement 12-inches back from the edge of the damaged pavement with a concrete saw. Remove asphalt pavement 12-inches back from the edge of the damaged pavement using pavement shearing equipment, jackhammers or other suitable tools. Pavement cuts shall be parallel or perpendicular to the road centerline as much as practical. On parallel installations the final cut shall be long and straight and consistent.

2. Replace all street and roadway pavement as shown on the Drawings. Replace driveways, sidewalks and curbs with the same material, to nearest existing undisturbed construction joint and to the same dimensions as those existing.

3. If the temporary crushed stone or chert surface is to be replaced, the top 6-inches shall be removed and the crushed stone surfacing for unpaved streets or the base for the bituminous surface shall be placed.

4. Following this preparation, the chert or crushed stone base shall be primed with a suitable bituminous material and surfaced with the proper type of bituminous surface treatment.

5. Where the paved surface is to be replaced with asphaltic concrete pavement, concrete pavement or with a concrete base and a surface course, the temporary chert or crushed stone surface and any necessary backfill material, additional existing paving and new excavation shall be removed to the depth and width shown on the Drawings. All edges of the existing pavement shall be cut to a straight, vertical edge. Care shall be used to get a smooth joint between the old and new pavement and to produce an even surface on the completed street. Concrete base slabs and crushed stone bases, if required, shall be placed and allowed to cure for three days before bituminous concrete surface courses are applied. Expansion joints, where applicable, shall be replaced in a manner equal to the original joint.

6. Where driveways or roadways, constructed of specialty type surfaces, e.g., brick or stone are disturbed or damaged, these driveways and roadways shall be restored utilizing similar materials. Where the nature of these surfaces dictate, a specialty contractor shall be used to restore the surfaces to their previous or better condition. Special surfaces shall be removed and replaced to the limits to which they were disturbed.

C. Pavement Resurfacing

1. Certain areas to be resurfaced are specified or noted on the Drawings. Where pavement to be resurfaced has been damaged with potholes, the Contractor shall remove all existing loose pavement material and fill the hole with black base,

as specified, to the level of the existing pavement. After all pipe line installations are complete and existing pavement has been removed and replaced along the trench route, apply tack coat and surface course as specified.

2. Resurfacing limits shall be perpendicular to the road centerline. The limits of resurfacing shall be 10 feet beyond the edge of the pavement replacement on the main road being resurfaced, and to the point of tangency of the pavement on the side streets.

3. Pavement resurfacing shall be performed by a contractor certified by the Georgia DOT.

D. Pavement Striping: Pavement striping removed or paved over shall be replaced with the same type, dimension and material as original unless directed otherwise by UGACC.

3.04 Sidewalk and Curb Replacement

A. Construction

1. All concrete sidewalks and curbs shall be replaced with concrete.

2. Preformed joints shall be 1/2-inch thick, conforming to the latest edition of AASHTO M 59 for sidewalks and AASHTO M 123 for curbs.

3. Forms for sidewalks shall be of wood or metal, shall be straight and free from warp, and shall be of sufficient strength, when in place, to hold the concrete true to line and grade without springing or distorting.

4. Forms for curbs shall be metal and of an approved section. They shall be straight and free from distortions, showing no vertical variation greater than 1/8-inch in 10 feet and no lateral variation greater than 1/4-inch in 10 feet from the true plain surface on the vertical face of the form. Forms shall be of the full depth of the structure and constructed such to permit the inside forms to be securely fastened to the outside forms.

5. Securely hold forms in place true to the lines and grades indicated on the Drawings.

6. Wood forms may be used on sharp turns and for special sections, as approved by UGACC. Where wooden forms are used, they shall be free from warp and shall be the nominal depth of the structure.

7. All mortar and dirt shall be removed from forms and all forms shall be thoroughly oiled or wetted before any concrete is deposited.

B. When a section is removed, the existing sidewalk or curb shall be cut to a neat line, perpendicular to both the centerline and the surface of the concrete slab. Existing concrete shall be cut along the nearest existing construction joints.

C. Existing concrete sidewalks and curbs that have been cut and removed for construction purposes shall be replaced with the same width and surface as the portion removed. Sidewalks shall have a minimum uniform thickness of 4-inches. The new work shall be neatly jointed to the existing concrete so that the surface of the new work shall form an even, unbroken plane with the existing surfaces.

D. The subgrade shall be formed by excavating to a depth equal to the thickness of the concrete, plus 2-inches. Subgrade shall be of such width as to permit the proper installation and bracing of the forms. Subgrades shall be compacted by hand tamping or rolling. Soft, yielding or unstable material shall be removed and backfilled with satisfactory material. Place 2-inches of porous crushed stone under all sidewalks and curbs and compacted thoroughly, then finish to a smooth, unyielding surface at proper line, grade and cross section.

E. Joint for Curbs

1. Joints shall be constructed to match existing and as specified. Construct joints true to line with their faces perpendicular to the surface of the structure and within 1/4-inch of their designated position.

2. Thoroughly spade and compact the concrete at the faces of all joints filling all voids.

3. Install expansion joint materials at the point of curve at all street returns. Install expansion joint material behind the curb at abutment to sidewalks and adjacent structures.

4. Place contraction joints every 10 feet along the length of the curbs and gutters. Form contraction joints using steel templates or division plates which conform to the cross section of the structure. Leave the templates in place until the concrete has set sufficiently to hold its shape, but remove them while the forms are still in place. Contraction joint templates or plates shall not extend below the top of the steel reinforcement or they shall be notched to permit the reinforcement to be continuous through the joint. Contraction joints shall be a minimum of 1-1/2-inches deep.

F. Expansion joints shall be required to replace any removed expansion joints or in new construction wherever shown on the Drawings. Expansion joints shall be true and even, shall present a satisfactory appearance, and shall extend to within 1/2-inch of the top of finished concrete surface.

G. Finishing

1. Strike off the surface with a template and finish the surface with a wood float using heavy pressure, after which, contraction joints shall be made and the surface finished with a wood float or steel trowel.

2. Finish the face of the curbs at the top and bottom with an approved finishing tool of the radius to match existing.

3. Finish edges with an approved finishing tool.

4. Provide a final broom finish by lightly combing with a stiff broom after troweling is complete.

5. The finished surface shall not vary more than 1/8-inch in 10 feet from the established grade.

H. Driveway and Sidewalk Ramp Openings

1. Provide driveway openings of the widths and at the locations indicated on the Drawings and as directed by UGACC.

2. Provide sidewalk ramp openings to match existing in conformance with the applicable regulations and as directed by UGACC.

I. Concrete shall be suitably protected from freezing and excessive heat. It shall be kept covered with burlap or other suitable material and kept wet until cured. Provide necessary barricades to protect the work. All damage caused by people, vehicles, animals, rain, the Contractor's operations and the like shall be repaired by the Contractor.

3.05 Maintenance

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

3.06 Supervision and Approval

A. Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. Obtain agency approval of pavement restorations before requesting final payment.

B. Obtain UGACC's approval of restoration of pavement, such as private roads and drives that are not the responsibility of a regulatory agency.

C. Complete pavement restoration as soon as possible after backfilling.

D. Failure of Pavement: Should any pavement restoration or repairs fail or settle during the life of the Contract, including the bonded period, promptly restore or repair defects.

3.07 Cleaning

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

END OF SECTION

Part 1 General

1.01 Scope

A. This Section described products to be incorporated into the water mains and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.

B. Supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable

1.02 Qualifications

All products and materials provided or installed on any project must be pre-approved and included in the approved manufacturer's list for water or wastewater system construction (see Appendix A).

1.03 Submittals

If required by The Unified Government of Athens- Clarke County (UGACC), complete product data and engineering data, including shop drawings, shall be submitted to UGACC for review.

1.04 Transportation and Handling

A. Unloading: Furnish equipment and facilities for unloading, handling, distributing, and storing pipe, fittings, valves, and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handling on skids shall not be rolled or skidded against the pipe on the ground.

B. Handling: Handle pipe, fittings, valves, and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front end loader. Do not use material damaged in handling. Slings, hooks, or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe. Do not use chains in handling pipe, fittings, and appurtenances.

1.05 Storage and Protection

A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.

B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves

and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.

C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.

D. Store joint gaskets in a cool location, out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

E. Mechanical-joint bolts shall be handled and stored in such a manner that will ensure proper use with respect to types and sizes.

1.06 Quality Assurance

Product manufacturers shall provide written certification to UGACC that all products furnished comply with all applicable requirements of these Specifications.

Part 2 Products

2.01 Ductile Iron Pipe

A. Ductile iron pipe shall be manufactured in accordance with AWWA C151. All pipe, except specials, shall be furnished in nominal lengths of 18 to 20 feet. Sizes will be as shown on the Drawings. All pipe shall have a minimum pressure rating of 350 psi and corresponding minimum wall thickness, unless otherwise specified or shown on the drawings.

B. Flanged pipe minimum wall thickness shall be equal to Special Thickness Class 53. Flanges shall be furnished by the pipe manufacturer.

C. Pipe and fittings shall be cement lined in accordance with AWWA C104. A seal coat over the cement lining is not required. Pipe and fittings shall be furnished with a bituminous outside coating.

D. Fittings shall be ductile iron and shall conform to AWWA C110 or AWWA C153 with a minimum rated working pressure of 250 psi.

E. Joints

1. Unless shown or specified otherwise, joints shall be push-on or restrained joint type for pipe and standard mechanical, push-on, or restrained joints for fittings. Push-on and mechanical joints shall conform to AWWA C111.

2. The only acceptable restrained joint systems are identified in the table below. No field welding of restrained joint pipe will be allowed.

Size	ACIPCO	U.S. Pipe	Generic[1]
4-12	Fast-Grip Flex Ring	Field Lok TR Flex	MJ with Retainer Gland
16-18	Fast-Grip Flex Ring	Field Lok TR Flex	MJ with Retainer Gland

[1]Fittings and valves only, and only where specifically allowed.

3. Restrained joint pipe (RJP) on supports shall have bolted joints and shall be specifically designed for clear spans of at least 36 feet.

4. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.

F. Provide the appropriate gaskets for mechanical and flange joints. Gaskets for flange joints shall be made of 18-inch thick, cloth reinforced rubber; gaskets may be ring type or full face type.

G. Bolts and Nuts

1. Provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit. All bolts and nuts shall be made in the U.S.A.

2. Bolts and nuts for mechanical joints shall be Tee Head Bolts and nuts of high strength low-alloy steel in accordance with ASTM A 242 to the dimensions shown in AWWA C111/ANSI A21.11.

3. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.

4. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to ASTM A 307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to ASTM B 633, Type II.

5. Bolts for submerged service shall be stainless steel machine bolts conforming to ASTM A 193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to ASTM A 194, Grade 8.

H. Mechanical joint glands shall be ductile iron.

I. Welded Outlet: Welded outlets may be provided in lieu of tees or saddles. The pipe joint on the outlet pipe shall meet the joint requirements specified above. The minimum pipe wall thickness of the parent pipe and the outlet pipe shall be Special Thickness Class 53. The welded outlet shall be rated for 250 psi working pressure.

Each welded outlet shall be hydrostatically tested at 500 psi. The welded outlet shall be fabricated by the manufacturer of the parent pipe.

J. Ductile iron pipe shall be encased with polyethylene film where shown on the Drawings or Specified. Polyethylene film shall be in accordance with AWWA C105.

K. Thrust collars shall be welded-on ductile iron body type designed to withstand thrust due to 250 psi internal pressure on a dead end.

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

2.02 Copper Pipe

A. Pipe shall be hard drawn copper tubing, ASTM B 88, Type K. Fittings shall be flare type. No sweat or compression joints shall be used.

B. Where required, flare to screw adapters shall be cast bronze ANSI B16.18. Unions shall be cast bronze.

2.03 Piping Appurtenances

A. Retainer Glands

1. Retainer glands shall be provided with wedge type set screws and inherent torque limiting devices, including twist-off nuts. Retainer glands shall have a rated working pressure of 350 psi through 16-inch size, and 250 psi in larger sizes.

2. Retainer glands shall be provided at all mechanical joints, including fittings, valves, hydrants, and other locations as shown on the Drawings.

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

C. Anchor Couplings: Lengths and sizes shall be as shown on the Drawings. Anchor couplings shall be as shown on the Drawings. Anchor couplings shall be equal to ACIPCO A10895 or U.S. Pipe U-591.

D. Hydrant Connector Pipe: The connector pipe shall be ductile iron meeting the requirements of AWWA C153. Connector pipe shall be of the 24-inch offset design so that the hydrant can be adjusted to ensure placement at the proper grade. Connector pipe shall have an anchoring feature at both ends so that when used with mechanical joint split glands a restrained joint is provided. The connector pipe shall be cement-lined in accordance with AWWA C104.

E. Tapping Saddles: Tapping saddles shall be ductile iron body type with O-ring gasket and alloy steel straps. Connection shall be flanged or mechanical joint as detailed on the Drawings. Tapping saddles shall be equal to ACIPCO A-10920 and ACIPCO A-30920.

2.04 Gate Valves (GV)

A. Gate valves shall be resilient-seated type conforming to the requirements of AWWA C509 or AWWA C515.

B. Valves through 12-inches in diameter shall have a minimum rated working pressure of 200 psi. 16-inch and 18-inch valves shall have a minimum rated working pressure of 150 psi.

C. Valves less than 4-inches in diameter shall have threaded ends. Larger valves shall be mechanical joint unless shown otherwise on the Drawings.

D. Valves shall be non-rising stem type with a 2-inch square wrench nut, and shall open left. The manufacturer shall provide an affidavit of compliance with the applicable AWWA standards.

E. All internal ferrous surfaces shall be coated with epoxy to a minimum thickness of 4 mils. The epoxy shall be non-toxic, impart no taste to the water and shall conform to AWWA C550.

F. All seals between valve parts, such as body and bonnet cover, shall be flat gaskets or O-rings.

G. Valve disks shall be made of cast or ductile iron having a vulcanized, synthetic rubber coating.

2.05 Butterfly Valves (BV)

A. Unless indicated on the Drawings to be 250 pound valves, butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with all requirements of AWWA C504 for Class 150B.

B. Where butterfly valves are indicated on the Drawings to be 250 pound valves, butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with all requirements of AWWA C504, and as modified below. Valves shall be designed for a rated working pressure of 250 psi. Class B, AWWA C504 Section 5.2 testing requirements are modified as follows:

1. The leakage test shall be performed at a pressure of 250 psi.

2. The hydrostatic test shall be performed at a pressure of 500 psi.

3. Proof of design tests shall be performed and certification of such proof of design test shall be provided to the Engineer.

C. 150 Pound Valves: Valve bodies shall be ductile iron conforming to ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. Shafts shall be ASTM A276, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A

536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. The valve shall have a resilient seat.

D. 250 Pound Valves: Valve bodies shall be ductile iron conforming to ASTM A 536, Grade 65-45-12 or ASTM A 126, Grade B cast iron. Shafts and shaft hardware shall be ASTM A 564, Type 630 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A 536, Grade 65-45-12. The resilient seat shall be located either on the valve disc or in the valve body and shall be fully field adjustable and field replaceable.

E. Valves shall be installed with the valve shafts horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.

F. Actuators

1. Valves shall be equipped with traveling nut, self-locking type actuators designed, manufactured, and tested in accordance with AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc.

2. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable.

3. Valve actuators shall be capable of withstanding a minimum of 450 foot pounds of input torque in either the open or closed position without damage.

G. Operators: Valves for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension, as required.

H. Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are shown. Flange joints shall meet the requirements of ANSI B16.1, Class 125.

2.06 Fire Hydrants (FH)

A. All fire hydrants shall conform to the requirements of AWWA C502 for 150 psi working pressure. Hydrants shall be the compression type, closing with line pressure. The valve opening shall not be less than 5-1/4-inches.

B. In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and inexpensive restoration without digging or cutting off the water.

C. The means for attaching the barrel to the standpipe shall permit facing the hydrant a minimum of eight different directions.

D. Hydrants shall be fully bronze mounted with all working parts of bronze. Valve seat ring shall be bronze and shall screw into a bronze retainer.

E. All working parts, including the seat ring shall be removable through the top without disturbing the barrel of the hydrant.

F. The operating nut shall match those on the existing hydrants. The operating threads shall be totally enclosed in an operating chamber, separated from the hydrant barrel by a rubber O-ring stem seal and lubricated by a grease or an oil reservoir.

G. Hydrant shall be a non-freezing design and be provided with a simple, positive, and automatic drain which shall be fully closed whenever the main valve is opened.

H. Hose and pumper connections shall be breech-locked, pinned, or threaded and pinned to seal them into the hydrant barrel. Each hydrant shall have two 2-1/2-inch hose connections and one 4-1/2-inch pumper connection, all with National Standard threads and each quipped with cap and non-kinking chain.

I. Hydrants shall be furnished with a mechanical joint connection to the spigot of the 6-inch hydrant lead.

J. Minimum depth of bury shall be 4.5 feet. Provide extension section where necessary for proper vertical installation and in accordance with manufacturer's recommendations.

K. Hydrant shoe shall incorporate a fabric and steel reinforced elastomeric flapper check valve, allowing normal operation of and access to the hydrant main valve. Check valve shall provide non-slam, quiet operation and bubble-tight shut off. The valve body shall be constructed of ductile iron ASTM A-536 Grade 65-45-12 with a flow area equal to the nominal pipe inside diameter throughout the valve. Seat shall be constructed on a 45 degree angle to reduce disc travel. The seat and internal body shall be fully coated with a two part thermosetting epoxy. The bonnet shall have stainless steel bolts and provide for easy inspection of the flexible disc and seat. Check valve can either be manufactured directly onto hydrant shoe or can be a separate valve that connects directly to the shoe with a mechanical joint connection. If a separate check valve, it shall be of the anchoring type (male mechanical joint on one end and male mechanical joint with swivel gland on the other end) with no internal moving parts except for the resilient disc. Valve shall be rated to 250 psi.

L. Hydrants shall be furnished with a security device manufactured of 14 gauge 304 stainless steel straps with a stainless steel barrel lock which has a key that is uniquely coded for the Owner and strictly controlled by the manufacturer. All locks shall be keyed similarly, and one key per hydrant shall be provided to the Owner.

M. All outside surfaces of the barrel above grade shall be painted with Sherwin Williams KEM 400, silver in color.

2.07 Valve Boxes (VB) and Extension Stems

A. All valve boxes shall be equipped with valve boxes. The valve boxes shall be cast iron two-piece screw type with drop covers. Valve boxes shall have a 5.25-inch inside diameter. Valve box covers shall weigh a minimum of 13 pounds. The valve boxes shall be adjustable to 6-inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "WATER VALVE" or "WATER" cast into them. Valve boxes shall be manufactured in the United States.

B. All valves shall be furnished with extension stems if operating nut is greater than four feet deep, to bring the operating nut to within 24-inches of the top of the valve box. Connection to the valve shall be with a wrench nut coupling and a set screw to secure the coupling to the valve's operating nut. The coupling and square wrench nut shall be welded to the extension stem.

2.08 Valve Markers (VM)

The Contractor shall provide a concrete valve marker as detailed on the Drawings for each valve installed. Valve markers shall be stamped "WATER".

2.09 Tapping Sleeves and Valves (TS&V)

Tapping sleeves shall be cast or ductile iron of the split-sleeve, mechanical joint type. The Contractor shall be responsible for determining the outside diameter of the pipe to be connected to prior to ordering the sleeve. Valves shall be gate valves furnished in accordance with the specifications shown above, with flanged connection to the tapping sleeve and mechanical joint connection to the branch pipe. The tapping sleeve and valve shall be supplied by the valve manufacturer.

2.10 Corporation Cocks and Curb Stops

Corporation cocks and curb stops shall be ground key type, shall be made of bronze conforming to ASTM B 61 or B 62, and shall be suitable for the working pressure of the system. Ends shall be suitable for flared tube type joint. Threaded ends for inlet and outlet of corporation cocks shall conform to AWWA C800; coupling nut for connection to flared copper tubing shall conform to ANSI B16.26.

2.11 Air Valves for Water Service

A. Air Release Valves: Air release valves shall be one of the following types:

1. The air release valve shall automatically release air accumulations from the pipeline due to the action of the float. When the air valve body fills with air, the float falls freely from the orifice to allow the air to escape to the atmosphere. When all the air has been exhausted from the valve body, the float will be buoyed up to seat against the orifice and prevent water from being exhausted from the

valve. The valve body and cover shall be constructed of cast iron (ASTM A 126-B). A synthetic orifice button shall be affixed to the valve cover to provide a non-corrosive seat for the float. The float shall be constructed of stainless steel. A resilient, Buna-N seat shall be attached to the float for drop-tight closure. The float shall be free floating within the valve body. Valve orifice size shall be as shown on the Drawings.

2. The air release valve shall automatically release air accumulations from the pipeline due to the action of the float and lever mechanism. When the air valve body fills with air, the float falls through the leverage mechanism. This causes the resilient seat to open the orifice and allow the air to escape to the atmosphere. When all the air has been exhausted from the valve body, the float will be buoyed up. Through the leverage mechanism, this will cause the resilient seat to close the orifice, preventing water from being exhausted from the valve. The valve body and cover shall be constructed of cast iron (ASTM A 126-B). The float shall be constructed of stainless steel and attached to a stainless steel lever mechanism. A resilient, Buna-N seat shall be attached to the lever mechanism for drop-tight closure. Valve orifice size shall be as shown on the Drawings.

B. Air/Vacuum Valve: The air/vacuum valve shall discharge large amounts of air as the pipeline fills and allow air to enter the pipeline as it drains or in the event of vacuum conditions. The valve shall operate by means of a non-collapsible stainless steel float which seals an orifice. As air enters the valve, the float shall drop from the orifice and allow the air to escape. As water rises in the valve, the float will again seal the orifice. The valve will be of such design that the float cannot blow shut at any air velocity. All working parts shall be of stainless steel. The inside of the valve body shall be epoxy coated. Valve inlet size shall be as shown on the Drawings.

C. Combination Air Valves: Combination air valves shall combine the features of an air release valve and an air/vacuum valve and shall be of one of the following types:

1. Valve shall consist of an air/vacuum valve described in paragraph B. above, with an air release valve described in A. above tapped into its body. The valve shall be of two-piece body design with an isolation gate valve separating the two valves.

2. Valve shall be single body, double orifice, allowing large volumes of air to escape out the larger diameter air and vacuum orifice when filling a pipeline and closes watertight when the liquid enters the valve. During large orifice closure, the smaller diameter air release orifice will open to allow small pockets of air to escape automatically and independently of the large orifice. The large air/vacuum orifice shall also allow large volumes of air to enter through the orifice during pipeline drainage to break the vacuum. The Buna-N seats must be fastened to the valve, without distortion, for drop-tight shut-off. The float shall be stainless steel. Valve sizes shall be as shown on the Drawings.

D. Surge Check Valve: Where shown on the Drawings or specified, provide a surge check valve on the inlet of the air/vacuum valve. The surge check valve shall be normally open, spring loaded valve consisting of a body, seat, and plug bolted to the

inlet of the air/vacuum valve. The surge check shall operate on the interphase between the kinetic energy and relative velocity flows of air and water, allowing air to pass through but water shall close the surge check, reducing the rate of water flow by means of throttling orifices in the plug to prevent shock closure of the air/vacuum valve. The surge check orifices must be an adjustable type to suit operating conditions in the field.

E. All air valves and accessories shall be supplied by a single manufacturer.

2.12 Manholes and Precast Concrete Products

A. Provide precast concrete products in accordance with the following:

1. Precast Concrete Sections

   a. Precast concrete sections shall meet the requirements of ASTM C 478 for circular shaped and ASTM C 913 for rectangular shaped precast concrete products. The minimum compressive strength of the concrete in precast sections shall be 4,000 psi. The minimum wall thickness shall be one-twelfth of the inside diameter of the base, riser, or the largest cone diameter.

   b. Transition slabs which convert bases larger than four feet in diameter to four foot diameter risers shall be designed by the precast concrete manufacturer to carry the live and dead loads exerted on the slab.

   c. Seal joints between precast sections by means of rubber O-ring gaskets or flexible butyl rubber sealant. Butyl rubber sealants shall meet the requirements of AASHTO M-198. Sealant shall be pre-formed type with a minimum nominal diameter of 1-inch.

   d. Butyl rubber sealant shall be equal to Kent Seal No. 2 or Concrete Sealants CS 202.

2. Brick and Mortar: Brick shall be whole and hardburned, conforming to ASTM C 32, Grade MS. Mortar shall be made of one part Portland cement and two parts clean sharp sand. Cement shall be Type 1 and shall conform to ASTM C 150. Sand shall meet ASTM C 144.

3. Iron Castings

   a. Cast iron manhole frames, covers, and steps shall meet the requirements of ASTM A 48 for Class 30 gray iron and all applicable local standards. All castings shall be tough, close grained, smooth, and free from blow holes, blisters, shrinkage, strains, cracks, cold shots, and other imperfections. No casting will be accepted which weighs less than 95 percent of the design weight. Shop drawings must indicate the design weight and provide sufficient dimensions to permit checking. All castings shall be thoroughly cleaned in the shop and given two coats of approved bituminous paint before rusting begins.

b. Manhole frames and covers shall be Athens-Clarke County standard:

Type	Design Weight	Manufacturer's Reference
Traffic	390#	Vulcan V-1360
Bolt Down	400#	Vulcan V-2358

c. All frames and covers shall have machined horizontal bearing surfaces.

d. Bolt-down covers shall be quipped with four 12-inch stainless steel bolts and an 18-inch red rubber or rubber O-ring gasket. Covers shall be rotatable and interchangeable. Bolt holes shall be bored through so that debris entering the bolt hole will fall into the manhole. Bolt holes shall have the full 360 degree circle within the cover's radius when bored through the cover.

4. Plastic Steps: Manhole steps of polypropylene, molded around a steel rod, equal to products of M.A. Industries may be used.

5. Floor Door

a. Door shall be single or double leaf type as shown on the Drawings.

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

6. Vents

a. Where vent pipes are shown on the Drawings, vents shall be of one-piece welded steel construction. Vent pipes shall equal air valve size, but no less than 4-inches. The vent pipe shall be grouted into a precast hole in the vault. The discharge of the vent pipe shall be provided with a 3/16-inch PVC coated mesh screen.

b. Where vent pipes are not shown on the Drawings, the frame and cover or floor door shall be provided with 1-inch holes to provide equivalent opening as in air valve, but not less than two. The quantity for each valve size is as follows: 2-inch, 4; 3-inch, 9; 4-inch, 16; 6-inch 36.

2.13 Concrete

Concrete shall have a compressive strength of not less than 3000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5 inches. For job mixed concrete, submit the concrete mix design for approval by the Engineer. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615. Grade 50.

Part 3 Execution

3.01 Existing Utilities and Obstructions

A. The Drawings shall indicate utilities or obstructions that are known to exist according to the best information available. The Contractor shall call the Utilities Protection Center (UPC) (325-5000 or 1-800-282-7411) as required by Georgia law (O.C.G.A. §§ 25-9-1 through 25-9-13) and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site, at least 72 hours (three business days) prior to construction, to verify the location of the existing utilities.

B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.

1. Provide the required notice to the utility owner and allow them to locate their facilities according to Georgia law. Field utility locations are valid for only 10 days after original notice. The Contractor shall ensure, at the time of excavation, that a valid utility location exists at the point of excavation.

2. Expose the facility, for a distance of at least 200 feet in advance of pipeline construction, to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.

3. Avoid utility damage and interruption by protection with means or methods recommended by the utility owner.

4. Maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any.

C. Conflict with Existing Utilities

1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation of the water main by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the water main to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement and complies with regulatory agency requirements after a written request to and subsequent approval by UGACC. If, in the opinion of UGACC, the water main's proposed location cannot be adjusted,

thus requiring the relocation of an existing utility, UGACC will direct the Contractor to have the utility relocated.

2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The Contractor may change the proposed grade of the water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements, after written request to and subsequent approval by UGACC. If, in the opinion of UGACC, the water main's proposed location cannot be adjusted, thus requiring the relocation of an existing utility, UGACC will direct the Contractor to have the utility relocated.

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D. Water and Sewer Separation

1. Water mains should maintain a minimum 10 foot edge-to-edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right-of-way and provide the 10 foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of 18-inches above the top of the sewer. Should neither of these two separation criteria be possible, the water main shall be installed below the sewer with a minimum vertical separation of 18-inches.

2. The water main, when installed below the sewer, shall be encased in concrete with a minimum 6-inch concrete depth to the first joint in each direction. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.

3. No water main shall pass through, or come in contact with, any part of a sanitary sewer manhole.

3.02 Construction Along Highways, Streets And Roadways

A. Install pipe lines and appurtenances along highways, streets, and roadways in accordance with the applicable regulations of, and permits issued by, the Department of Transportation and UGACC with reference to construction operations, safety, traffic control, road maintenance, and repair.

B. Traffic Control

1. The Contractor shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights, and other traffic control devices; provide qualified flagmen where necessary to direct traffic; take all necessary precautions for the protection of the work and the safety of the public. Flagmen shall be certified by a Georgia DOT approved training program.

2. Construction traffic control devices and their installation shall be in accordance with the current Manual On Uniform Traffic Control Devices for Streets and Highways.

3. Placement and removal of construction traffic control devices shall be coordinated with the Georgia Department of Transportation and UGACC a minimum of 48 hours in advance of the activity.

4. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right-of-way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as “Flagmen Ahead”, shall be removed and replaced when needed.

5. Existing traffic control devices within the construction work zone shall be protected from damage. Traffic control devices requiring temporary relocation shall be located as near as possible to their original vertical and horizontal locations. Original locations shall be measured from reference points and recorded in a log prior to relocation. Temporary locations shall provide the same visibility to affected traffic as the original location. Relocated traffic control devices shall be reinstalled in their original locations as soon as practical following construction.

6. Construction traffic control devices shall be maintained in good repair and shall be clean and visible to affected traffic for daytime and nighttime operation. Traffic control devices affected by the construction work zone shall be inspected daily.

7. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective requirements of the Georgia Department of Transportation and UGACC. Sign panels shall be of durable materials capable of maintaining their color, reflective character, and legibility during the period of construction.

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

9. Lane closure must be approved by the UGACC Transportation and Public Works Department. Requests for such closures must be submitted at least 48 hours before closures are needed.

C. Construction Operations

1. Perform all work along highways, streets, and roadways to minimize interference with traffic.

2. Stripping: Where the pipe line is laid along road right-of-way, strip and stockpile all sod, topsoil and other material suitable for right-of-way restoration.

3. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.

4. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod, and any other materials removed from shoulders.

5. Construction operations shall be limited to 400 feet along areas, including clean-up and utility exploration.

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

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

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

G. Maintaining Highways, Street, Roadways, and Driveways

1. Maintain streets, highways, roadways, and driveways in suitable condition for movement of traffic unit completion and final acceptance of the Work.

2. During the time period between pavement removal and completing permanent pavement replacement, maintain highways, streets, and roadways by the use of steel running plates. Running plate edges shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted as specified elsewhere up to the existing pavement surface to provide support for the steel running plates. Steel running plates shall be designed for H-2O traffic loading.

3. Furnish a road grader or front-end loader for maintaining highways, streets, and roadways. The grader or front-end loader shall be available at all times.

4. Immediately repair all driveways that are cut or damaged. Maintain them in a suitable condition for use until completion and final acceptance of the Work.

3.03 Pipe Distribution

A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.

B. No pipe shall be strung further along the route than 1,000 feet beyond the area in which the Contractor is actually working without written permission from UGACC. UGACC reserves the right to reduce this distance to a maximum distance of 200 feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.

C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets, and roadways upon which pipe is distributed.

D. No distributed pipe shall be placed inside drainage ditches.

E. Distributed pipe shall be placed as far as possible form the roadway pavement, but no closer than five feet from the roadway pavement, as measured edge-to-edge.

3.04 Location and Grade

A. The Drawings show the alignment of the water main and the location of valves, hydrants, and other appurtenances.

B. Construction Staking

1. The base lines for locating the principal components of the work shall be shown on the Drawings. Base lines shall be defined as the line to which the location of the water main is referenced, i.e., edge of pavement, road centerline, property line, right-of-way or survey line. The Contractor shall be responsible for performing all survey work required for constructing the water main, including the establishment of base lines and any detail surveys needed for construction. This work shall include the staking out of permanent and temporary easements to ensure that the Contractor is not deviating from the designated easements.

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

C. Reference Points

1. The Contractor shall take all precautions necessary, which includes, but is not necessarily limited to, installing reference points, in order to protect and preserve the centerline or baseline.

2. Reference points shall be placed, at no more than three feet, from the outside of the construction easement or right-of-way. The location of the reference points shall be recorded in a log with a copy provided to UGACC for use, prior to verifying reference point locations. Distances between reference points and the manhole centerlines shall be accurately measured to 0.01 foot.

3. The Contractor shall give UGACC notice that reference points are set.

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

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

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

3.05 Laying and Jointing Pipe and Accessories

A. Lay all pipe and fittings to accurately conform to the lines and grades shown on the drawings.

B. Pipe Installation

1. Proper implements, tools, and facilities shall be provided for the safe performance of the Work. All pipe, fittings, valves, and hydrants shall be lowered carefully into the trench by means of slings, ropes, or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.

2. All pipe, fittings, valves, hydrants, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.

3. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit, or any foreign materials before the pipe is laid. No pipe containing dirt shall be laid.

4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing, or other materials shall be placed in the pipe at any time.

5. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.

6. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade, shall not be permitted.

C. Alignment and Gradient

1. Lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer.

2. Maintain a transit, level, and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.

D. Expediting of Work: Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push-on, mechanical joint, restrained joint, or as approved by UGACC.

E. Joint Assembly

1. Push-on, mechanical, flange, and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.

2. The Contractor shall inspect each pipe joint within 1,000 feet on either side of main line valves to ensure 100 percent seating of the pipe spigot, except as noted otherwise.

3. Each restrained joint shall be inspected by the Contractor to ensure that it has been "homed" 100 percent.

4. The Contractor shall internally inspect each pipe joint to ensure proper assembly for pipe 24-inches in diameter and larger after the pipe has been brought to final alignment.

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

G. Polyethylene Encasement: Installation shall be in accordance with AWWA C105 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired to the satisfaction of the Engineer.

H. Valve and Fitting Installation

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

2. Valves, fittings, plugs, and caps shall be set and joined to the pipe in the manner specified in this Section for cleaning, laying, and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads, or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.

3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut, and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the Engineer.

4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.

5. A valve marker shall be provided for each underground valve. Unless otherwise detailed on the Drawings or directly by the Engineer, valve markers shall be installed 6-inches inside the right-of-way or easement.

I. Hydrant Installation

1. For mains 16-inches and smaller, the isolation valve shall be attached to the main by connecting the valve to the hydrant tee.

2. For mains larger than 16-inches, the isolation valve shall be attached to the main by providing an anchor coupling between the valve and welded outlet, or tapping saddle.

3. The isolation valve shall be attached to the hydrant providing an anchor coupling or hydrant connector pipe between the valve and hydrant, if the hydrant and valve are less than two feet apart. Otherwise, provide ductile iron pipe with retainer glands on the hydrant and valve.

4. Prior to installation, inspect all hydrants for direction of opening, nozzle threading, operating nut and cap nut dimensions, tightness of pressure-containing bolting,

cleanliness of inlet elbow, handling damage, and cracks. Defective hydrants shall be corrected or held for inspection by the Engineer.

5. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the roadway, with pumper nozzle facing the roadway.

6. Hydrants shall be set to the established grade, with the centerline of the lowest nozzle at least 18-inches above the ground or as directed by the Engineer.

7. Each hydrant shall be connected to the main with a 6-inch branch controlled by an independent 6-inch valve. When a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing coarse gravel or crushed stone mixed with coarse sand from the bottom of the trench to at least 6-inches above the drain port opening in the hydrant to a distance of 12-inches around the elbow.

8. When a hydrant is set in clay or other impervious soil, a drainage pit 2 x 2 x 2 feet shall be excavated below each hydrant and filled with coarse gravel or crushed stone mixed with coarse sand under and around the elbow of the hydrant and to a level of 6-inches above the drain port.

9. Hydrants shall be located as shown on the Drawings or as directed by the Engineer. For hydrants that are intended to fail at the ground-line joint upon vehicle impact, specific care must be taken to provide adequate soil resistance to avoid transmitting shock moment to the lower barrel and inlet connection. In loose or poor load bearing soil, this may be accomplished by pouring a concrete collar approximately 6-inches thick to a diameter of 24-inches at or near the ground line around the hydrant barrel.

10. Immediately after installing a hydrant, place an orange polyethylene bag securely over the top of the hydrant. The bag shall be a standard ply, orange polyethylene bag with the words “Out of Service” clearly printed and visible on the bag. Maintain the bag over the hydrant until such time as the hydrant is accepted and placed in service.

J. Air Valve Vaults

1. Construct the vault or manhole as detailed on the Drawings.

2. The frame and cover or floor door shall be cast into the top slab. The floor drain shall be piped to vault exterior.

3. Manholes shall be constructed such that their walls are plumb.

3.06 Connections to Water Main

A. Make connections to existing pipe lines with tapping sleeves and valves, unless specifically shown otherwise on the Drawings.

B. Location: Before laying pipe, locate the points of connection to existing water mains and uncover as necessary for the Engineer to confirm the nature of the connection to be made.

C. Interruption of Services: Make connections to existing water mains only when system operations permit. Operate existing valves only with the specific authorization and direct supervision of UGACC.

D. Tapping Saddles and Tapping Sleeves

1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted.

2. Prior to attaching the saddle or sleeve, the pipe shall be thoroughly cleaned, utilizing a brush and rag, as required.

3. Before performing field machine cut, the watertightness of the saddle or sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with water. An air compressor shall be attached, which will induce a test pressure as specified in this Section. No leakage shall be permitted for a period of five minutes.

4. After attaching the saddle or sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall be swabbed or sprayed with a one percent hypochlorite solution.

E. Connections Using Solid Sleeves: Where connections are shown on the Drawings using solid sleeves, the Contractor shall furnish materials and labor necessary to make the connection to the existing pipe line.

F. Connections Using Couplings: Where connections are shown on the Drawings using couplings, the Contractor shall furnish materials and labor necessary to make the connection to the existing pipe line, including all necessary cutting, plugging, and backfill.

3.07 Thrust Restraint

A. Provide restraint at all points where hydraulic thrust may develop.

B. Retainer Glands: Provide retainer glands where shown on the Drawings and where specified. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the set screws. The Contractor shall furnish a torque wrench to verify the torque on all set screws which do not have inherent torque indicators.

C. Harnessing

1. Provide harness rods only where specifically shown on the Drawings or directed by the Engineer.

2. Harness rods shall be manufactured in accordance with ASTM A 36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling.

3. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, provide 90 degree bend eye bolts.

4. Eye bolts shall be of the same diameter as specified in AWWA C111 for that pipe size. The eye shall be welded closed. Where eye bolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eye bolts shall be of the same material and coating as the harness rods.

D. Thrust Collars: Collars shall be constructed as shown on the Drawings. Concrete and reinforcing steel shall meet the requirements as specified in this Section. The welded-on collar shall be designed to meet the minimum allowable load shown on the Drawings. The welded-on collar shall be attached to the pipe by the pipe manufacturer.

E. Concrete Blocking

1. Provide concrete blocking for all bends, tees, valves, and other points where thrust may develop, except where other exclusive means of thrust restraint are specifically shown on the Drawings.

2. Concrete shall be as specified in this Section.

3. Form and pour concrete blocking at fittings as shown on the Drawings and as directed by UGACC. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation.

4. All pipe, fittings, valves, and accessories to be in contact with concrete shall be provided with polyethylene encasement.

3.08 Inspection and Testing

A. All sections of the water main subject to internal pressure shall be pressure tested in accordance with AWWA C600 and these Specifications. A section of main will be considered ready for testing after completion of all thrust restraint and backfilling.

B. Each segment of water main between main valves shall be tested individually.

C. Test Preparation

1. Flush sections thoroughly at flow velocities, greater than 2.5 feet per second, adequate to remove debris from pipe and valve seats. Partially open valves to allow the water to flush the valve seat.

2. Partially operate valves and hydrants to clean out seats.

3. Provide temporary backing, bulkheads, flanges, and plugs as necessary, to assure all new pipe, valves, and appurtenances will be pressure tested.

4. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Insert corporation cocks at high points to expel air as main is filled with water as necessary to supplement automatic air valves. Corporation stops shall be constructed as detailed on the Drawings with a meter box.

5. Fill pipeline slowly with water. Provide a suitable pump with an accurate water meter to pump the line to the specific pressure.

6. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure. Where necessary, provide temporary backpressure to meet the differential pressure restrictions.

7. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.

D. Test Pressure: Test the pipeline at 200 psi measured at the lowest point for at least two hours. Maintain the test pressure within 5 psi of the specified test pressure for the test duration. Should the pressure drop more than 5 psi at any time during the test period, the pressure shall be restored to the specified test pressure. Provide an accurate pressure gage with gradation not greater than 5 psi.

E. Leakage

1. Leakage shall be defined as the sum of the quantity of water that must be pumped into the test section, to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.

2. UGACC assumes no responsibility for leakage occurring through existing valves.

F. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:

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

Where: L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

As determined under Section 4 o AWWA C600.

If the water main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results.

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

3.09 Disinfecting Pipeline

A. After successfully pressure testing each pipeline section, disinfect in accordance with AWWA C651 for the continuous-feet method and these Specifications.

B. Specialty Contractor: Disinfection shall be performed by an approved specialty contractor. Before disinfection is performed, the Contractor shall submit a written procedure for approval before being permitted to proceed with the disinfection. This plan shall also include the steps to be taken for the neutralization of the chlorinated water.

C. Chlorination

1. Apply chlorine solution to achieve a concentration of at least 25 milligrams per liter free chlorine in new line. Retain chlorinated water for 24 hours.

2. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the 24 hour period.

3. After 24 hours, all samples of water shall contain at least 10 milligrams per liter free chlorine. Re-chlorinate if required results are not obtained on all samples.

D. Disposal of Chlorinate Water: Reduce chlorine residual of disinfection water to less than one milligram per liter if discharged directly to a body of water or to less than two milligrams per liter if discharged onto the ground prior to disposal. Treat water with sulfur dioxide or other reducing chemicals to neutralize chlorine residual. Flush all lines until residual is equal to existing system.

E. Bacteriological Testing: After final flushing and before the water main is placed in service, the Contractor shall collect samples from the line and have tested for bacteriological quality in accordance with the rules of the Georgia Department of Natural Resources, Environmental Protection Division. Testing shall be performed by the UGACC's laboratory. Re-chlorinate lines until required results are obtained.

3.10 Protection and Restoration of Work Area

A. General: Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is started.

1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.

2. All restoration work, including grading, dressing, grassing, and pavement replacement shall be maintained within 2,000 feet of the pipelaying operation.

3. Prepare photographic documentation of sensitive areas along the project route/site to document conditions existing prior to project construction.

4. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

5. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.

6. UGACC or the Georgia Department of Transportation will be authorized to stop all work by the Contractor on its right-of-way when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.

B. Man-Made Improvements: Protect, or remove and replace with the Engineer's approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cable, property pins, and other improvements that may be encountered in the Work.

C. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by UGACC. Any such trees or shrubbery which must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.

D. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. Repair any damaged tree over 3-inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the Contractor. No stumps, wood piles, or trash piles will be permitted on the work site.

E. Planting of new trees for restoration within the permanent easement shall not be allowed. Construction of permanent road beds, beams, drainage structures, or other structures shall not be allowed within the permanent easement.

F. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate county, state, and federal regulatory agencies.

G. Swamps and Other Wetlands

1. The Contractor shall not construct permanent roadbeds, berms, drainage structures, or any other structures which alter the original topographic features within the easement.

2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding swamp or wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the Contractor.

3. The Contractor shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland, or stream which may be temporarily divided by construction.

4. The Contractor shall not spread, discharge, or dump any fuel oil, gasoline, pesticide, or any other pollutant.

H. Dust Control: The Contractor shall use all means necessary to control dust on and near the work, and on and near all off-site borrow areas when dust is caused by the operations during performance of the work or if resulting from the condition in which the subcontractor leaves the site. The Contractor shall thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors, and concurrent performance of work on the site.

I. Contractor shall be responsible for overall project site safety and the safety of employees on the project site and shall be responsible for complying with all applicable safety standards. UGACC assumes no responsibility for safety related to the Contractor's activities

3.11 Abandoning Existing Water Mains

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

B. Capping and Plugging: Disconnect by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is shown on the Drawings or directed by the Engineer. Provide a watertight pipe cap or plug and concrete blocking for restraint to seal off existing mains indicated to remain in service. Seal ends of existing mains to be abandoned with a pipe cap or plug or with a masonry plug and minimum 6-inch cover of concrete on all sides around the end of the pipe. The

Contractor shall be responsible for uncovering and verifying the size and material of the existing main to be capped or plugged.

C. Salvaging Materials: Salvage existing fire hydrants, valve boxes, valve markers, and other materials as indicated on the Drawings and deliver salvaged items in good condition to UGACC's storage yard. Coordinate delivery and placement of salvaged material in advance with UGACC.

D. Blow-Off Piping: Remove existing blow-off piping, located on segments of water main to be abandoned, to a minimum of two feet below finished grade. Seal the end of remaining piping as specified above in paragraph B. Blow-off piping remove becomes the property of the Contractor.

E. Pavement Removal and Replacement: Perform any necessary pavement removal and replacement in accordance with the details on the Drawings and Section 02575 of these Specifications.

3.12 Record Drawings

A. Unless noted otherwise, Record Drawings shall provide dimensions, distances and coordinates to the nearest 0.1 foot.

B. Unless noted otherwise, Record Drawings shall provide elevations to the nearest 0.01 foot for all pertinent items constructed by the Contractor.

C. The Contractor shall employ a currently registered surveyor to prepare the Record Drawings from a post construction, field run survey. The Record Drawings shall provide elevations to the nearest 0.01 foot for all manhole inverts, manhole frames and other pertinent items constructed by the Contractor. The Record Drawings shall provide dimensions, distances, and coordinates to the nearest 0.01 foot and horizontal angles to the nearest 10 seconds.

D. Other required information:

1. Any changes in dimension and detail.

2. Details not on original drawings.

3. Horizontal and vertical locations of all exposed and underground utilities and appurtenances, both new facilities constructed and those utilities encountered, referenced to permanent surface improvements.

4. Location of and dimensions of roadways and parking areas, providing dimensions to back of curb when present.

5. The locations shall be referenced to at least two easily identifiable, permanent landmarks (e.g., power poles, valve markers, etc.) or benchmarks.

6. For each fire hydrant, include the manufacturer, year, barrel diameter, and nozzle

diameters.

7. The Record Drawings shall include the horizontal angle and distance between manhole covers.

E. Record Drawing Deliverables

1. Provide an electronic copy of record drawings to UGACC in AutoCAD 2000 (dwg.) or later format.

2. Electronic file shall be in Georgia State Plane Coordinates, NAD 1983 West FIPS 1002, feet.

3. Format shall include the following features:

   a. Water Main- Polyline/continuous

   b. Water system appurtenances- single point

   c. Sewer Main- Polyline/continuous

   d. Sewer manholes and appurtenances- Single Point

4. Drawing layers shall be:

   a. FH- Fire hydrant

   b. WV- Water valve

   c. FDC- Fire Department Connection

   d. WL- Water Line

   e. Vault

   f. Meter

   g. Fittings (tees, crosses, taps)

   h. SSMH- Sanitary Sewer Manhole

   i. SSL- Sanitary Sewer Line

END OF SECTION

Part 1 General

1.01 Scope

A. The work covered by this Section includes furnishing all materials and equipment, providing all required labor and installing water service connections and all appurtenant work according to these Specifications and/or to the Water Connection Detail as shown schematically on the Drawings.

B. Water meters are not to be furnished nor installed. However, the water meter connection must be compatible with the water meters currently used by the Unified Government of Athens-Clarke County (UGACC).

1.02 Locations

Locations shall be as shown on the Drawings and as directed by UGACC along the route of the water mains.

1.03 Service Compatibility

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

1.04 Quality Control

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

Part 2 Products

2.01 Materials and Construction

A. Service Line - Copper Tubing: Tubing shall be ASTM B 88, Type K. Fittings shall be brass with flare connection inlets and outlets, ANSI B16.26. Where required, adapters shall be brass ANSI B16.18. Unions shall be cast bronze. Joints shall be flare type. All fittings shall be of bronze construction with flare type connection.

B. Meter Boxes: Meter boxes will be furnished by UGACC.

C. Valves and Accessories

1. Corporation Cocks and Curb Stops: Corporation cocks and curb stops shall be ground key type, shall be made of bronze conforming to ASTM B61 or B62 and shall be suitable for the working pressure of the system. Ends shall be suitable for flare type joint. Threaded ends for inlet and outlet of corporation cocks shall

conform to AWWA C800; coupling nut for connection to flared copper tubing shall conform to ANSI B16.26.

a. Corporation Cocks shall be one of the following:

Size	Manufacturer	No.
¾" thru 2"	Mueller	H-15000
1-1/2" & 2"	Ford	FB600
¾" thru 2"	A.Y. McDonald	4701B
¾" & 1"	Hays	

b. Curb Stops for Domestic Line use shall be one of the following:

Size	Manufacturer	No.
1-1/2" & 2"	Mueller	B-25166 or B-25174
1-1/2"	Ford	B21-666
2"	Ford	B21-777
¾" & 1"	A.Y. McDonald	6102
1-1/2" & 2"	A.Y. McDonald	6100MW
¾" & 1"	Hays	

c. Curb Stops for Fire Line use shall be one of the following:

Size	Manufacturer	No.
1-1/2"	Mueller	B-25166 or B-25174
1-1/2"	Ford	B21-666
2"	Ford	B21-777
1-1/2" & 2"	A.Y. McDonald	6102

2. Service Clamps: Service clamps shall be ductile iron, double strap clamps.

D. Connections to Water Mains: Connections to ductile iron pipe water mains shall be by the direct tap method or service clamp, as detailed on the Drawings in full accordance with AWWA requirements.

Part 3 Execution

3.01 Installation

A. Water Service Connections

1. Water service connections shall be installed to the approximate right-of-way for properties adjacent to the water mains both to the same side of the roadway (Short Side Service) and to the opposite side of the roadway (Long Side Service), unless directed otherwise by UGACC.

2. Water service connections installed under roadway shall be pulled through a bored hole approximately equal in diameter to the external diameter of the service line. No casing will be required. Minimum cover under roadway shall be four feet. At other locations minimum cover shall be two feet.

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

4. No water service connections shall be performed until the main is tested and disinfected.

B. Permanent Water Services

1. Each new service line shall be tapped into the main through a corporation stop as detailed on the Drawings. A new service line shall be provided to the meter as shown on the Drawings. Services 1-inch and smaller shall be direct-tapped. Larger services shall require a double strap service clamp with the tap.

2. A corporation cock shall be provided in the water main for each service line.

3. A curb stop shall be provided at each existing or future water meter location.

4. A service line, sized to match the existing line unless directed otherwise by the UGACC, shall be provided between the corporation cock and curb stop.

C. Relocation of Service Lines

1. Before disconnecting the existing meter, the existing corporation in the main shall be closed. All existing meters and meter boxes, if not already located at the right-of-way, shall be removed, reinstalled and reconnected as indicated on the Drawings.

2. Existing service lines shall be field-located by the Contractor. The Contractor shall be responsible for locating existing water meters, relocating the meters and meter boxes as necessary, and determining the existing size service line to reconnect the meters to the new water mains. All service lines installed under existing pavement, including streets, driveways and sidewalks, shall be installed by boring.

3. The Contractor shall be prepared to make emergency repairs to the water system, if necessary, due to damage by others working in the area. In conjunction with this requirement, the Contractor shall furnish and have available at all times, a tapping machine, for the purpose of making temporary water service taps or emergency repairs to damaged water services.

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

END OF SECTION

Appendix A

Approved Manufacturer's List for Water Main Construction

APPENDIX A

APPROVED MANUFACTURER'S LIST FOR
WATER MAIN CONSTRUCTION

PUBLIC UTILITIES DEPARTMENT
UNIFIED GOVERNMENT OF ATHENS-CLARKE COUNTY

Part 1 General

Where specific products are listed below, only products from the listed manufacturers shall be used for water main construction under the jurisdiction of the Unified Government of Athens-Clarke County (UGACC), Georgia. For those products identified in these Standard Specifications for which no specific manufacturer is listed below, products from any manufacturer which meet the requirements of the Standard Specifications may be used.

Part 2 Approved Manufacturers

A. Section 02125 - Soil Erosion and Sediment Control

1. Silt Fence: Those manufacturers on the Georgia DOT Qualified Products List.

2. Filter Fabric: Mirafi, Amoco, or Exxon

B. Section 02229 - Bore and Jack Crossings

1. Casing Spacers

a. Type I: Cascade Waterworks Manufacturing Company, Advanced Products and Systems, Inc., Spider Manufacturing, Inc.

b. Type II: Pipeline Seal and Insulator, Inc.

C. Section 02665 - Water Mains and Accessories

1. Ductile Iron Pipe: American Cast Iron Pipe Company, United States Pipe and Foundry Company, Griffin Pipe Products Company

2. Ductile Iron Fittings: American Cast Iron Pipe Company, United States Pipe and Foundry Company, Union Foundry, Tyler

3. Retainer Glands: EBAA Iron (Megalug Series 1100), Ford Meter Box Company (Uniflange Series 1400)

4. Hydrant Tees: Same as ductile iron fittings

5. Anchor Couplings: Same as ductile iron fittings

6. Hydrant Connector Pipe: Assured Flow Sales, Inc.

7. Tapping Saddles: Same as ductile iron pipe

8. Gate Valves: American Flow Control, Mueller or Clow

9. Butterfly Valves: Mueller, DeZurik

10. Fire Hydrants: Mueller (Super Centurion or Super Centurion High Security) or Clow (Medallion series)

11. Fire Hydrant Check Valve: Mueller SA-Series

12. Fire Hydrant Security Device: Mueller Hydrant Defender Security Device

13. Valve Boxes: Opelika Foundries, Tyler

14. Corporation Cocks and Curb Stops: Mueller, Ford, A. Y. McDonald, Hays

15. Air Valves: G.A. Industries, APCO Valve Corporation, Val-Matic

16. Manhole Frames and Covers: Vulcan

D. Section 02668 - Water Service Connections

1. Meter Boxes: furnished by Athens-Clarke County Public Utilities Department

2. Corporation Cocks and Curb Stops: Mueller, Ford, A. Y. McDonald, Hays

3. Service Clamps (Double Strap Saddle): Mueller, Ford, A. Y. McDonald, Smith-Blair, JCM, Romac

4. Water Service Line Components: Mueller, Ford, A. Y. McDonald, Hays

Part 3 Application Procedures

A. Individuals who desire a manufacturer to be listed as an “Approved Manufacturer” may submit an application to the Public Utilities Department.

B. The Application must be submitted at least ninety days prior to intended actual use of product.

C. The Application must include the following prior to evaluation:

1. Generic name of product, including Specification Section, Article and Paragraph number.

2. Manufacturer of product, along with local manufacturer representative and local distributor of product.

3. Statement, on manufacturer's letterhead, of total compliance with Specifications, or a statement with a list of exceptions to the Specifications.

4. Laboratory test results from independent testing laboratory stating that item meets stated Specifications.

5. Shop Drawings and Product Data.

6. Product Sample (random sample selection by Unified Government of Athens-Clarke County.

7. Plant visit.

8. Product availability.

9. List of three other municipal users (of comparable size) in the State of Georgia. Include name and phone number of contact persons.

10. Other information deemed pertinent by the Unified Government of Athens-Clarke County.

D. Upon completion of evaluation by UGACC, written notification will be issued of said results. Not all applications will be approved, even if products meet the Specifications. The Unified Government of Athens-Clarke County reserves the right to not accept products where it is deemed in its best interest.

Appendix B

Contractor's Warranty Obligation
Policy and/or Procedure Statement

APPENDIX B

POLICY AND/OR PROCEDURE STATEMENT

PUBLIC UTILITIES DEPARTMENT
UNIFIED GOVERNMENT OF ATHENS-CLARKE COUNTY

Policy Subject: Contractor's Warranty Obligations
Functional Area: Water and Sewer

Part 1 Purpose

A. The following is a step by step outline of action required by the Contractor in regard to water and sanitary sewer line extension warranty work:

1. The Contractor performing the initial utility line extensions is responsible for a one year warranty period commencing with the date of written acceptance of same by Unified Government of Athens–Clarke County (UGACC), Public Utilities Department (PUD). All repairs performed under the warranty provision shall be the responsibility of the Contractor and made entirely at the Contractor's expense.

2. Emergency warranty repairs which require the immediate attention of the Contractor, as determined by the Public Utilities Director, shall be performed within the same day of notification with actual repair commencing within two hours from time of actual notification and completed within a maximum of 24 hours.

3. Repairs that are non-emergency in nature, as determined by the Public Utilities Director, must be repaired by the Contractor within five working days to the Public Utilities Director's satisfaction.

4. Failure by the Contractor to respond in a manner acceptable to the Public Utilities Director and within the time frames identified will result in the Contractor being placed on probationary status for a six-month period. At the end of said six-month probationary period, the Contractor can request reinstatement to permanent status.

5. Any repetition of a failure to respond to an emergency repair request in accordance with this policy statement within any given six-month time frame will result in the Contractor being removed from the Public Utilities Department's list of qualified contractors for a one year period.

6. At the end of said one year period, the Contractor can submit a written request for reinstatement on a probationary basis for a six-month time frame. At the end of said six-month probationary period, the Contractor can request reinstatement to a permanent status.

7. Should the Contractor be unable to perform the necessary repairs within the guidelines of this policy statement, the following action will be taken:

   a. The Public Utilities Director will direct the Public Utilities Department's work forces to make the necessary repairs.

   b. A cost determination will be made as to the actual expense incurred by the Public Utilities Department to make said repairs. The Contractor will be responsible for reimbursing the Public Utilities Department 200 percent of said cost. Failure by the Contractor to reimburse the Public Utilities Department in the amount established within 30 working days will result in the Contractor's immediate removal from the Public Utilities Department's list of approved contractors for one year beginning no later than the date of actual remittance for cost incurred. Upon expiration of said one year time frame, the Contractor can request reinstatement on a probationary basis for six months.

B. Notes

1. All repairs must be performed in compliance with UGACC standards and procedures.

2. The appropriate Public Utilities Department representative must be notified prior to the commencement of any warranty work repairs.

3. The Contractor performing the warranty work repairs is responsible for obtaining the appropriate permits and any associated fees.

4. Reference is made to the "Maintenance Guarantee of Subdivision Improvements". This form is separate from the Warranty discussed herein and must be filled out, submitted, and accepted by UGACC as part of the Warranty Obligations.

Place Holder

For

Maintenance Guarantee of Subdivision Improvements