

CITY OF EMERSON
STANDARD SPECIFICATIONS
FOR
WATER DISTRIBUTION
CONSTRUCTION
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SECTION 01000 - GENERAL REQUIREMENTS

PART 1 - GENERAL

- 1.1 **Scope:** This Section describes General Requirements applicable construction of any utility infrastructure to be dedicated to the City of Emerson within rights-of-way, easements, or other property owned or to be owned by the City of Emerson. The requirements of this Section are supplemental to and made a part of the City of Emerson Development Regulations.
- 1.2 **Administrative Procedures:**
- A. **Pre-Construction Meeting:** Schedule a Pre-Construction meeting with the City Manager or his/her representative and other City and regulatory agency representatives prior to start of any construction. Contractor's superintendent shall attend the meeting. The date and time of the meeting shall be as scheduled by the City Manager. Such Pre-Construction meeting shall not relieve the Contractor from cooperating should the City or other regulatory agencies desire additional meetings or visits.
 - B. **Construction Schedules:** Submit a proposed Construction Schedule to the City at the Pre-Construction Meeting.
 - C. **Construction Sequence:** Perform Work in a sequence to be agreed to at the Pre-Construction Meeting, unless otherwise directed.
 - D. **Construction by Others:** Coordinate with related construction projects of the City of Emerson or by others, if any.
 - E. **City of Cartersville Sewer System Regulations:** The design, construction, testing and approval of sanitary sewerage facilities intended to convey sewage to the City of Cartersville sewer system, shall comply with current ordinances and regulations of the City of Cartersville, or City of Emerson Standard Specifications, whichever are more stringent, as determined by Emerson.
 - F. **Insurance Requirements:** Provide certificate of liability insurance to the City Manager for approval prior to start of any construction. The insurance requirements, which are set forth in the City of Emerson Development Regulations, Section 209, require \$1,000,000 in general liability insurance coverage for all contractors, subcontractors, property owners, or entity working on the project, with the City of Emerson listed as co-insured.
- 1.3 **Safety and Security:**
- A. Contractors undertaking Work under these Standard Specifications of the City of Emerson are solely and fully responsible for the protection and **SAFETY** of the site(s) of the Work, including the public, the workmen, the City's employees and representatives, and other regulatory personnel.
 - B. Provide all construction aids and equipment required for job safety, for protection of the public, to facilitate execution of the Work and to facilitate access by the City representatives and regulatory personnel.
 - C. Provide fences, barriers, lights, signs, ladders, sheeting, shoring, railings, hoists, and other such facilities and equipment and maintain all such facilities and equipment in "like new" condition.
 - D. **Traffic Regulation:** Comply with traffic control and safety requirements of local authorities and any Georgia DOT permits applicable to the Work.

1. Provide and operate traffic control and directional signals, barricades, warning signs, etc. to direct and maintain an orderly safe flow of traffic in all areas affected by Contractor's operations.
2. All traffic control signs, barricades, etc. shall be clean, in a "like-new" condition, and easily seen and read. **Old, faded, and/or dirty signs will not be allowed at the site(s) and shall be replaced.**
3. Provide qualified and suitably equipped flaggers whenever and wherever construction operations encroach on traffic lanes, as required for regulation of traffic, and/or as required by applicable DOT permits, and/or the City representatives.
4. Provide lights at night and during periods of low visibility to clearly delineate traffic lanes and to alert traffic to construction operations underway.

1.3 Submittal Procedures:

- A. Unless otherwise specified, submit at least 4 copies (includes only 1 for return to Contractor) of required submittals to the City at least 7 days prior to start of the Work. If re-submittals are required, the Contractor will be notified in writing of required corrections or of rejected submittals and shall submit new or corrected submittals within 5 days after such notification.
- A. Each submittal shall include the Contractor's statement that the submission has been **reviewed and APPROVED** by the Contractor. This statement shall warrant that the submittal conforms to the requirements of these specifications except for any deviations, which shall be clearly noted.

1.4 Permits & Regulations:

- A. Verify that applicable Land Disturbing Activity Permits have been obtained for land disturbing activities associated with the water and sewer utility Work.
- B. Obtain NPDES permit for construction activities, if applicable, under the Georgia EPD General Permit GAR100002, *Permit to Discharge Storm Water Associated with Construction Activity*.
- C. Provide an Erosion, Sedimentation and Pollution Control Plan, issue a Notice of Intent (NOI), and undertake monitoring responsibilities related to the Georgia EPD General Permit, GAR100002.
- D. Verify that Georgia DOT utility encroachment permits, if required, have been issued for the Work. Provide advance notice to the Georgia DOT Utilities Engineer prior to excavating bore pits, jacking, boring or tunneling pipe, excavating within rights-of-way, making tie-ins or cross connections, or storing any material on rights-of-way. Obtain all blasting permits, if required. Contractor's work shall conform to all requirements of applicable DOT permits.
- E. Prior to start of construction, confirm that all required approvals and permits for construction of water and sewer utilities have been obtained from the Georgia Environmental Protection Division.
- F. All construction shall comply with the Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, Subpart P, latest edition.

1.5 Reference Standards: Comply with specified Reference Standards as minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher

standards or more precise workmanship. Conform to reference standards by date of issue current as of the date of approval of the Drawings by the City.

1.6 Construction Quality Control Testing and Inspection:

- A. Employ an independent testing laboratory, acceptable to the City, for performing all specified field and laboratory quality control testing and inspection specified herein at Contractor's expense.
- B. Schedule required quality control testing, cooperate with all testing personnel, and provide equipment and labor required for all sampling, preparation of samples, field testing, and transport of samples to the testing laboratory.
- C. The City may also employ a testing laboratory for performing all specified field and laboratory quality control testing. If the City's quality control testing indicates Contractor's failure to meet specifications, the cost of such tests, and subsequent re-tests, shall be borne by the Contractor.
- D. Provide two signed copies of each field and laboratory testing report to the City immediately upon receipt.
- E. When any portion of the Work is ready for final testing, Schedule the testing, provide the specified notice to the City, and conduct the tests in the presence of the City's Representative(s).

1.7 Protection of Existing Facilities:

- A. The Work may require Contractor operations on, or in the vicinity of, existing public or private utility systems. Protect existing underground and overhead utility pipes, poles, lines, services, structures, etc. from damage or interruption of service by the conduct of construction operations. Provide at least 24 hour advance notice to the Utility Owner for any planned interruptions of service. Furnish and have available at all times an electronic pipe detector in working order, and use to survey the proposed path of trenching prior to excavation.
- B. Comply with the Georgia Utility Facility Protection Act and the Georgia High Voltage Safety Act. The position of known underground and overhead utilities as shown on drawings or flagged by Utility Owners for the Contractor's information may not be accurate or complete. The accurate location and protection of all underground and overhead utilities and structures in the construction area is the sole responsibility of the Contractor.
- C. Take extreme care to avoid contamination or unnecessary interruption of service to the public. Should contamination or unplanned interruption occur, devote full efforts, in coordination with the Utility Owner's personnel, to correcting the problem without delay. It is the Contractor's responsibility to shall have a representative on call at all times and shall maintain a crew with necessary tools and equipment available on call after normal working hours, on weekends, during inclement weather and other times when work is not in progress, to perform any necessary emergency repair work which may occur. Failure to promptly repair in such situations shall be just cause for the City of Emerson to take whatever action necessary to remedy the situation and to invoice the cost to the Contractor.
- D. The Contractor shall be responsible for paying all fines, penalties, and other costs resulting from damage to existing utilities and other facilities resulting from the Contractor's operations.

1.8 Site Conditions:

- A. Maintain access to the existing facilities and private property at all times. Provide crushed stone, cover plates, or temporary pavement as necessary to maintain roadways in a safe and passable condition at all times until the permanent roadway surface is repaired.
 - B. Protect carefully all existing benchmarks, monuments, and other reference points. Replacement, if required, shall be by a licensed land surveyor at Contractor's cost.
 - C. Conduct all Work required on public rights-of-way in strict conformance with rules, regulations, and permit conditions of governing bodies having jurisdiction over the Work.
 - D. If articles of historical or archaeological value, including coins, fossils, and articles of antiquity are uncovered by the Work, or otherwise brought to the attention of the Contractor during the course of the Contract, all construction activities in the vicinity shall be stopped and the City shall be notified immediately. All such articles of historical or archaeological value found in the public rights of way shall remain the property of the City of Emerson.
 - E. Do not conduct blasting operations for rock removal within six feet (6 feet) of edge of any public roadway pavement.
 - F. Check existing grades on the site prior to starting. Beginning of any grading shall constitute acceptance of the existing site conditions.
 - G. Prior to starting any excavation contact the Utilities Protection Center, "Call Before You Dig," telephone number 1-800-282-7411.
 - H. Allowable borrow or waste areas, unless designated on the Drawings, shall be approved by the Owner prior to start of construction.
 - I. All unsuitable excavated material must be properly disposed of in a manner acceptable to the Owner and in a manner that will not adversely impact the environment.
 - J. The bypassing of raw wastewater onto the ground or into a receiving stream is prohibited.
- 1.9 Temporary Utilities: Provide and maintaining temporary utilities and facilities/controls as necessary for construction.
- A. Temporary Electricity: Provide temporary electric power service to the site(s) for the duration of construction activities as required for the Work.
 - B. Temporary Lighting: Provide temporary lighting for the site(s) as necessary for safety, for construction operations, and for the Contractor's and City's quality control inspections.
 - C. Temporary Telephone Service: Provide temporary telephone service to the site(s). Contractor's personnel shall have a functional cell telephone activated at site(s) at all times that construction activities are taking place.
 - D. Temporary Trash and Garbage Disposal: Provide trash containers for the site(s) and properly dispose of all trash, debris and garbage as necessary to keep the site(s) clean and sanitary at all times, including storage and parking area, along access roads, and haul routes.
 - E. Temporary Water Service: Provide temporary water as needed for construction activities on the site(s).

- F. Temporary Sanitary Facilities: Provide and maintain required toilet facilities and enclosures and maintain in clean and sanitary condition for workmen's use.
- 1.10 Environmental Controls: Provide and maintain methods, equipment, and temporary construction, etc. as necessary to provide controls over environmental conditions at the construction site(s) and related areas under Contractor's control; removal of physical evidence of temporary facilities at completion of Work.
- A. Noise Control: Comply with all local, state, and federal (OSHA) requirements. Limit all operations, except during emergencies, to daylight periods when noise from operations will not disturb residential neighborhoods. No work shall be executed prior to 6 AM, after 10 PM, or on Sundays.
- B. Dust Control: Provide positive dust control methods at the site and all off-site borrow areas. Apply water or other dust control materials as required to minimize dust emissions from construction operations, and provide positive means to prevent air-borne dust from dispersing into the atmosphere at all times. Prevent dust being a nuisance to the public, the neighbors, and a detriment to the performance of work at the site(s).
- C. Storm Water: Comply with storm water controls specified by the applicable Land Disturbance Permit and approved Erosion Control Plan.
- D. Stored Materials: Provide methods to control surface water to prevent damage to the stored materials, installed work, the site, and adjoining properties. Control all earthwork filling, grading and ditching to direct surface drainage away from excavations, pits, tunnels and other construction areas; and to direct drainage to proper runoff.
- E. Debris Control: Maintain the site(s) and all areas under Contractor's control free of extraneous debris and prevent accumulation of debris at construction site, storage and parking areas, or along access roads.
- F. Pollution Control: Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge or spills of noxious substances from construction operations. Take special measures to prevent harmful substances from entering public waters. Prevent disposal of wastes, effluent, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.
- G. Erosion Control: Do not begin clearing or grading operations until a Land Disturbance Permit has been issued. Periodically inspect excavated or disturbed areas to detect any evidence of the start of erosion, apply corrective measures as required to control erosion. Provide supplementary erosion and run-off control measures when it becomes apparent that additional problems exist.
- H. Removal of Temporary Facilities and Controls: Remove all temporary facilities and controls from the site(s) promptly upon completion of the Work.
- 1.11 Restoration:
- A. Restore all areas that are disturbed areas equal to their original condition, with the exception of trees or other physical features that are designated to be removed.
- B. Establish a full stand of permanent grass on all undeveloped areas that have been disturbed such as woods and open fields, to protect against erosion.
- C. Re-establish lawn and previously grassed areas that are disturbed by construction with permanent grass equal to that which existed prior to construction. Restored grass must be mowable with residential type lawnmower.

- D. Restore or replace all disturbed features of any type (including landscaping, shrubs, structures, fences, signs, mailboxes, bridges, walkways, pavements, etc.) equal to their condition prior to construction.
- 1.12 Record Drawings: Upon completion, testing, and acceptance of the Work, comply with as-built requirements of the City of Emerson Development Regulations.
- A. Keep an extra set of approved drawings on site and mark-up as the Work progresses to show all deviations from the approved Drawings and specifications. Upon completion of the Work, deliver the field set of "as-built" drawings to the City Manager.
 - B. Provide accurate as-built drawings prepared and certified by a licensed Professional Engineer or Land Surveyor. Submit two sets of certified drawings to the City Manager on standard 24"x36" sheets with maximum scale 1"=50"
 - C. Provide the as-built drawings in digital format in AutoCAD (2004 or newer) and ESRI shapefile format for inclusion in the City's Geographic Information System (GIS). Files must be geo-referenced and include all construction and project details which truly reflect the final project as it was constructed. All datums shall be Georgia West State Plane and NAVD88 respectively.

END OF SECTION

SECTION 02316 - TRENCHING, BACKFILLING AND COMPACTION

PART 1 - GENERAL

- 1.1 **Section Includes:** Trenching, excavation of all materials encountered, including rock and unsuitable materials; disposal of excess and unsuitable materials; sheeting and shoring; pumping and de-watering; bedding; backfilling; and compaction for installation of pipe, piped utilities, underground conduits, and appurtenances thereto, which are 5 feet outside building lines.
- 1.2 **Related Sections:**
- A. SECTION 02370 - EROSION CONTROL
 - B. SECTION 02920 - GRASSING AND LANDSCAPING
- 1.3 **Quality Assurance:**
- A. Contractor shall employ an independent testing laboratory, acceptable to the City for performing all specified field and laboratory quality control testing and inspection specified herein at Contractor's expense.
 - B. Imported fill material, if required, shall be subject to approval by the City Engineer.
 - C. Fill material which settles shall be removed and replaced with suitable material at no cost to the Owner. Structures, paving, landscaping, and other improvements damaged by settlement shall be removed and replaced, or reworked with suitable material at no cost to the Owner.
- 1.4 **Reference Standards:**
- A. ASTM C33-03 Concrete Aggregates
 - B. ASTM C136-01 Test Method of Analysis of Fine and Course Aggregates
 - C. ASTM D698-00, Laboratory Compaction Characteristics of Soil Using Standard Effort (Standard Proctor).
 - D. ASTM D1556-00, Density and Unit Weight of Soil in Place by the Sand-Cone Method.
 - E. ASTM D2321-05, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
 - F. ASTM D2487-00, Test Method Classification of Soils for Engineering Purposes.
 - G. NEPA 495, Code for the Manufacture, Transportation, Storage and Use of Explosives.
 - H. "Standard Specifications for Construction of Transportation Systems, 2001 Edition," Georgia Department of Transportation. Referred to herein as the "DOT Specifications."
 - I. City of Emerson Water & Sewer Standard Detail Drawings, latest revision.

1.5 Site Conditions:

- A. All construction shall comply with the Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 126, latest edition. Trenching and backfilling operations shall conform to Subpart P, Excavations.
- B. Maintain access to the existing facilities and private property at all times.
- C. Perform operations with special care in the vicinity of existing facilities. Protect above or below-ground utilities which are to remain. If any damage is done to these facilities, repair immediately.
- D. Conduct all work required on public rights-of-way in strict conformance with rules and regulations of governing bodies having jurisdiction over the rights-of-way.
- E. Provide traffic protection by means of suitable signs, barricades, lights, and flaggers.
- F. Protect existing underground and overhead utility pipes, poles, lines, services, structures, etc. from damage or interruption of service by the conduct of construction operations. Furnish and have available at all times an electronic pipe detector in working order, and use to survey the proposed path of trenching prior to excavation. The approximate position of known utilities is shown on the Contract Drawings for the Contractor's information. The utilities shown on the Contract Drawings were located during an above-ground investigation and may not be accurate or complete. Location and protection of all underground and overhead utilities and structures in the construction area is the responsibility of the Contractor.
- G. All unsuitable excavated material must be properly disposed of in a manner acceptable to the Owner and in a manner that will not adversely impact the environment.

PART 2 - PRODUCTS

- 2.1 General: Bedding and backfill material shall be subject to approval of the City Engineer. For approval of imported backfill or bedding material, give at least five (5) working day's advance notice of intent to import material and designate the proposed borrow area. Allow the Owner's testing laboratory to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.
- 2.2 Native Material Suitable for Backfill: Soils excavated on site which do not contain "Unsuitable Material" as defined herein may be approved for general backfill. Excessively wet or dry soils may not be used until moisture is adjusted to optimum level to permit proper compaction.
- 2.3 Granular Material for Bedding and Embedding or Initial Backfill: An approved manufactured aggregate or coarse-grained, clean soil which are classified as Class IA, IB, or II soils per ASTM D2321. Acceptable materials which may be approved include sand, chert, crushed stone, gravel, or mixture of these, all of which meets the requirements of ASTM C33 for coarse aggregate, or Graded Size No. 57 stone, all free of Unsuitable Material, may be acceptable for bedding, embedment or initial backfill.
- 2.4 Stone (Crushed Stone or GAB) for Trench Bottom Stabilization or Backfill under Pavement Areas: Sound, durable "crusher run" rock, all of which passes a 1½ inch sieve, free of Unsuitable Material, graded 1-1/2" down per DOT Specification standard gradation, Section 815 for Graded Aggregate. Graded Size No. 57 stone is not an acceptable alternative to "crusher

run rock.”

- 2.5 Unsuitable Material: Any fine-grained soil, Group PT, OH, OL, CH, ML or MH, classified per ASTM D 2487, silt, highly organic soil, topsoil, roots, vegetable matter, trash, debris, asphalt, frozen or excessively wet soil, and stone or gravel larger than 3 inch in maximum dimension. Unsuitable Material shall include any material with greater than 5% passing No. 200 sieve.
- 2.6 Rock Definition for Trenching: Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 33,000 pounds (Caterpillar 225B or equivalent).

PART 3 - EXECUTION

3.1 Preparation: Prior to excavation activities:

- A. Prior to starting any excavation or construction contact the Utilities Protection Center, “Call Before You Dig,” telephone number 1-800-282-7411.
- B. Install erosion and sediment control measures. The installation of erosion and sedimentation control measures and practices shall occur prior to, or concurrent with, land-disturbing activities.
- C. Perform demolition, clearing and grubbing as required.
- D. Strip and properly stockpile all sod and topsoil suitable for reuse in restoration. Protect until use.
- E. Remove pavement only as necessary for excavating the trench and installing the pipelines and appurtenances. Cut all asphalt pavement in straight, uniform lines by means of a jack hammer or suitable pavement cutter. Cut all concrete pavements to a depth of at least 2 inches along the cut line with a rotary saw, after which the pavement may be broken with a jack hammer or suitable pavement cutter.
- F. Determine location of existing utilities (underground and overhead utility lines, poles, pipes, services, structures, etc.) and mark them in advance of trenching operations. Furnish and have available at all times an electronic pipe detector in working order, and use said detector to survey the proposed path of excavation. Excavate and expose underground utilities in test pits to verify the locations, depths, materials of construction. Notify Engineer of potential conflicts and presence of cathodic protected facilities. No extra compensation will be given for manual excavation required to locate, protect or restore underground utilities.

3.2 Trench Excavation:

- A. Excavate all subsurface material within the trenching limits specified regardless of the material encountered, including rock. Excavated materials satisfying the requirements of this Section for Native Material Suitable for Backfill may be used for final backfill. Remove surplus excavated material and Unsuitable Materials from the job site.
- B. Do not excavate in areas of excessive groundwater until sufficient dewatering equipment, in good working order, is available at the site. In all cases, continuously remove water accumulated in trenches prior to installing bedding or laying pipes. Provide de-watering by pumping or well-pointing, as determined by the Contractor, as required to achieve dry ditches and continuously maintain a water level two feet below the trench

bottom. All water pumped, bailed, or otherwise removed from the excavation shall be conveyed to a suitable discharge point and disposed in a manner that neither violates regulatory requirements nor causes injury to public health, property, work completed, work in progress, or creates a public nuisance of any type.

- C. Excavate the banks of trenches vertical from bottom of trench to 1 foot above the top of the pipe or conduit.
- D. Keep the trench width within the limits specified below, However OSHA safety requirements shall supersede the requirements stated herein whenever applicable and shall be followed:
 - (1) Maximum trench width at top of pipe = Pipe outside diameter (O.D.) plus 24 inches. If the maximum trench width is exceeded, the required bedding must be upgraded to the next higher class, at Contractor's expense, for that part of trench that exceeds the maximum allowable width.
 - (2) Minimum width of trench = O.D. of bell or coupling plus 16 inches. (This minimum applies to all trenches including those in rock excavation.)
- E. Place excavated material (spoil) sufficiently back from the edge of trench to prevent caving of the trench wall and to permit safe access along the trench. Provide at least 3 ft. clear from toe of spoil bank on at least one side of trench for access. Do not endanger the workers, the public, or obstruct roadways or sidewalks. Comply with OSHA trench safety standards at all times.
- F. Do not excavate more than 400 feet in advance of pipe laying. Unless prior approval is obtained from the Owner, limit the length of open trench to that which can be completed in one working day.
- G. Do not leave trenches open overnight unless there are extenuating circumstances *approved by the Owner*, and the excavations are fully protected by safe and effective barricades, fencing and lights. Provide precast concrete barriers equal to those specified by Georgia DOT Standard Specifications, Section 622.
- H. Where necessary, and as required by OSHA regulations, provide and install sufficient and suitably sized movable trench boxes, shields, sheeting, shoring and/or bracing which shall remain in place until the backfill has proceeded to a point where it can be removed safely. When damage is liable to result from withdrawing sheeting, it shall remain in place. Movable shields, sheeting, shoring, bracing, etc. are considered as an integral part of the Work and no extra payment will be allowed.
- I. Where necessary to place excavated material or spoil on paved streets or parking lots, first provide a thick underlayment of straw matting on the pavement to receive excavated material or spoil. Sweep the pavement clean upon removal of the excavated material or spoil.
- J. Remove rock encountered in trench excavation for the specified minimum width of the trench (but not less than 30 inches width) and to a depth of 6 inches below the invert of the pipe.
- K. Obtain all required permits for handling explosives and performing blasting. Conduct blasting operations in strict accordance with all existing ordinances and regulations and only with the prior approval of the Owner. Carefully protect all exposed structures from

the effects of blast and cover all blasts with heavy timbers, mats or other suitable protection. Blasting shall be done only by licensed personnel. Use very light charges to prevent damage to adjacent structures. Promptly repair any damage. Store all blasting supplies in accordance with local ordinances. In no case shall caps or other explosives be kept at the place where dynamite or other explosives are stored.

- L. As trenching approaches existing underground utilities, perform excavation with extreme care. Perform necessary removals, relocations, or relaying of pipes, utility lines, and appurtenances which will obstruct the Work. Provide temporary support, adequate protection, and maintenance of all underground and surface utilities, drains, structures, or other obstructions encountered.
- M. Promptly correct damage to existing utilities or structures caused by construction activities. Promptly restore disrupted utility service and provide a condition at least equal to the original condition before the damage occurred. Should the Contractor fail to promptly restore service or correct damage, the Owner or utility companies may correct the damage and back-charge the Contractor for costs incurred for the required corrective work.
- N. Where existing storm drains or culverts are damaged or destroyed by removal to facilitate trenching and pipe laying, replace the damaged or destroyed drains or culverts with new reinforced concrete pipe meeting the requirements of ASTM Designation C76-04, Class II. Drain pipe shall be equal to that removed except sizes smaller than 12 inches which shall be replaced with 12 inch pipe.
- O. If trench sub-grade is found to contain unsuitable or potentially corrosive material, such as ashes, cinders, refuse, petroleum contaminated soil or organic matter, immediately stop trenching and pipe installation until further notice and notify the Engineer. PVC pipe will not be suitable where susceptible to permeation by certain organic contaminants and shall be replaced by ductile iron pipe. Undercut and remove all unsuitable or potentially corrosive material at least 6 inches below the trench bottom and replace with Granular Bedding Material.

3.3 Bedding and Embedment:

- A. Bedding and embedment shall conform to the individual requirements for the pipe or conduit material being used. Refer to the Drawings for Bedding/Embedment Details. Unless otherwise specified or shown on the Drawings, bedding shall be:
 - 1. PVC Sanitary Sewers: Class B
 - 2. DIP Sanitary Sewers: Class C
 - 3. PVC Water Pipe: Class C
 - 4. DIP Water Pipe: Class D
 - 5. Plastic Storm Sewer: Class C
 - 6. RCP or CMP Storm Sewer: Class D
- B. Grade the trench bottom to provide a firm, uniform, and continuous bearing all along the entire length of the barrel of the pipe. Excavate bell holes no larger than necessary to allow joint assembly and to ensure that the pipe barrel will lie flat on the trench bottom. Pipe bells or couplings shall not support any load. Where trench excavation is carried below or beyond required limits, backfill the over-excavated space with specified bedding material.

- C. In areas of rock excavation, and where needed in other areas, provide compacted Granular Bedding Material cushion across the full width of the excavation to a minimum 6 inch depth under the pipe, fittings, valves, manholes, or other structures.
- D. Whenever the subgrade is unstable or too soft to provide a satisfactory foundation for any pipe, de-water and undercut as necessary and stabilize with Stone. Compact and bring the trench bottom to proper grade to create a firm, unyielding stabilized subgrade for bedding material and/or pipe.

3.4 Backfill:

- A. General - Backfill and compact all trenches and excavations immediately after the pipe or appurtenance has been installed.
- B. Initial Backfill and Embedment - Place select backfill around haunches of the pipe and appurtenance by hand placement and compaction, from the trench bottom up to the springline of the pipe. Place embedment materials by methods that will not disturb or damage the pipe. Continue initial embedment of the pipe to at least 6 inches above the pipe crown or to the dimensions shown on the Bedding Detail. Use no stone larger than 3/4 inches maximum dimension in the embedment. Compact the initial backfill and embedment firmly and evenly, but without use of mechanical compactors.
- C. Remaining or Final Backfill - Unless otherwise specified or shown on the Drawings, use excavated Native Material Suitable for Backfill for the final, or general backfilling. If sufficient suitable Native Material Suitable for general backfill is not available on site, furnish sufficient and suitable borrow material from an approved source. Place backfill from top of Initial Backfill up to the trench surface as described herein. Do not place rocks larger than 12 inches in maximum dimension in the upper layer of backfill unless otherwise approved by the Engineer.
 - (1) **Trenches in streets, pavements, driveways (paved or unpaved), in areas to be paved, and in areas beneath proposed structures:** Backfill above the Initial Backfill with crusher run stone. Place the stone backfill to achieve 6 inch compacted layers at 95% Standard Proctor Density. Use mechanical tamping to achieve the required compaction. In paved roadways also install and compact the specified pavement base material to the required thickness as shown on the Pavement Replacement Detail. Install a temporary traffic surface at grade consisting of 2 inches compacted depth of crushed stone or pug mix. Leave backfilled trench open to traffic and maintain the surface at a uniform grade by refilling with stone and re-compacting as necessary to remedy any settlement. Continue such maintenance, including dust control, until surface paving is authorized by the Engineer.
 - (2) **Trenches in drainage ditches or other areas subject to erosion:** Unless otherwise specified, backfill trenches with Native Material Suitable for Backfill and mechanically compact in 6 inch layers to achieve 95% Standard Proctor Density per ASTM D698. Refill and re-compact eroded or settled trenches as often as necessary to restore and maintain the surface at the required finished grade. Immediately stabilize the surface against erosion.
 - (3) **Trenches in areas to be grassed or landscaped:** Unless otherwise specified, backfill trenches with Native Material Suitable for Backfill and compact by methods of Contractor's choice to achieve at least 85% Standard Proctor Density

per ASTM D698. However, if the trench is on DOT or Railroad rights-of-way, compact to the density specified in the applicable permit. Refill and re-compact settled trenches as often as necessary to restore and maintain the trench surface at the required finished grade.

3.5 Field Quality Control:

- A. Perform routine quality control compaction testing at a frequency sufficient to ensure adequate compaction throughout the trenching and backfilling.
- B. In streets, paved areas, or areas to be paved, perform compaction testing of the underlying backfill prior to placing pavement base material.
- C. Notify the testing laboratory and the City Engineer 24 hours prior to need for testing.
- D. When any tests indicate the density, moisture content, or compaction does not meet requirements specified herein, as determined by the City Engineer, rework until the required density has been obtained and approved by the City Engineer.

END OF SECTION

SECTION 02370 - EROSION CONTROL

PART 1 - GENERAL

- 1.1 **Section Includes:** Providing adequate protection against erosion and sediment transport off the site(s) during the execution of the Work, including, but not limited to, installation and removal of those features specifically shown on the approved Erosion and Sediment Control Plan, if any, which is applicable to the Work.
- 1.2 **Related Sections:** SECTION 02920 GRASSING AND LANDSCAPING
- 1.3 **Reference Standards:**
- A. "Manual for Erosion and Sediment Control in Georgia", Fifth Edition, Revised 2000, prepared by the Georgia Soil and Water Conservation Commission.
 - B. "Standard Specifications for Construction of Transportation Systems, 2001 Edition," Georgia Department of Transportation. Referred to herein as the "DOT Specifications."
 - C. "Emerson Soil Erosion and Sedimentation Control Ordinance," as adopted by the City of Emerson, and subsequent amendments.
- 1.4 **Site Conditions:**
- A. Protect all adjacent public and private property from siltation and other damage due to construction activities.
 - B. Confirm that a Land Disturbing Activity (LDA) Permit has been obtained for the Work, if applicable. Comply with approved Erosion and Sediment Control Plan and with all local and state regulations relating to erosion/sediment control.
 - C. If one acre or more will be disturbed, confirm that a Notice of Intent (NOI) has been filed under the applicable NPDES general construction permit.
 - D. Maintain all temporary controls in place until permanent grassing, landscaping and other controls have been completed.
 - E. Do not excavate pipeline trenches more than 100 feet in advance of pipe laying.
 - F. **Provide supplementary erosion and run-off control measures whenever it becomes apparent that additional problems exist.**
 - G. **The installation of erosion and sedimentation control measures and practices shall occur prior to, or concurrent with, land-disturbing activities.**

PART 2 - PRODUCTS

- 2.1 **Mulch and Hay/Straw Bales:** DOT Section 893.2.02 and 719.2.
- 2.2 **Silt Fence Filter Fabric:** DOT Section 881.2.07 as listed on Georgia DOT Qualified Products List #36. Woven or nonwoven fabric for Type A and Type B fences. For Type C use non-calendered woven fabric constructed with monofilament yarns only.

- 2.3 Stakes and Fencing: DOT Section 894.02.06. Posts for or Type A and Type B Silt Fence: 1.5" x 1.5" x 48" hardwood, or 2" x 4" x 48" soft wood, or 1.15 lb/ft. steel. Provide maximum 6 ft. spacing. Posts for Type C Silt Fence: Steel 1.15 lb/ft. minimum weight and woven wire fencing.
- 2.4 Grass Seed or Sod: DOT Section 890.2. Select plants appropriate to the season, location, and site conditions from DOT Section 700.3 Seeding Table, for Planting Zone 1. Temporary grass shall be a quick growing species such as millet, rye grass, Italian rye grass, or cereal grasses suitable to the area providing a temporary cover which will not later compete with grasses sown for permanent cover. Seed shall meet the requirements of the Georgia Seed Law and Rules and Regulations.
- 2.5 Lime: DOT Section 882.2.01 Agricultural grade ground or pulverized limestone.
- 2.6 Fertilizer: DOT Section 891.2 Standard commercial grade, 10-10-10 or 6-12-12.
- 2.7 Erosion Control Mats: DOT Section 716.
- 2.8 Stone for Construction Exit/Entrance Pad: National Stone Association R-2 (1-1/2 inch to 3-1/2 inch stone), or DOT Specifications. Section 800, Size No. 3 (1 inch to 2-1/2 inch).
- 2.9 Riprap: Conforming to DOT Specifications Section 805.2.01, Stone for Plain Rip Rap, Type 3 (or Type 1 if noted on Drawings).
- 2.10 Corrugated Metal Pipe: 16 gauge, type I or II culvert pipe conforming to AASHTO M36.

PART 3 - EXECUTION

- 3.1 Inspection: Prior to clearing the site, inspect site and determine all preliminary erosion control measures that will be required to prevent erosion and sedimentation problems and comply with any applicable Erosion Control Plans approved by local and/or state authorities.
- 3.2 Preparation: Provide all necessary materials at the site prior to clearing and/or grading.
- 3.3 Installation: Install all structural and vegetative erosion control measures strictly in accordance with the "Manual for Erosion and Sediment Control in Georgia."
 - A. Where applicable, provide temporary stone exit/entrance pad located at all points of vehicular ingress and egress to the site and maintain these in service until pavement is placed. Minimum pad thickness shall be 6 inches; minimum width shall be 20 feet; minimum length shall be 50 feet. Maintain pads in a condition that will prevent tracking or flow of mud onto public roads.
 - B. Promptly clean-up any mud and debris tracked on to public roadways. Clean by scraping, power brushing, and hosing down with water.
 - C. If impoundments or sediment traps are required, construct these prior to clearing operations except for minimum clearing necessary for construction of the sediment impoundments.
 - D. Install any permanent site drainage facilities as early as practical in the construction process. Where practical without creating erosion problems, divert run-off into permanent drainage facilities.

- E. Provide temporary sediment barriers around drainage structures and all grading areas and excavations where subgrades are being prepared.
 - F. Provide diversion berms or dikes at top of all slopes and abrupt changes in slope. Diversion dikes or berms to be minimum 2 feet in width and 18 inches in height. Machine compact and provide temporary seeding immediately after construction.
 - G. Provide temporary drains where necessary to convey water down slopes. Drains may consist of pipes, filter cloth, rubble, concrete, asphalt, or plastic sheets. Inspect for damage after each rainfall event and repair as required.
 - H. Provide riprap or other protection at all drainage discharge points to prevent scour at these points. Provide 4 inch filter material under riprap.
 - I. As soon as practical following grading of areas to be paved, apply an initial base course of stone of at least 4 inch thickness and maintain by periodic top dressing until final base course and pavement are installed.
 - J. Provide temporary seeding immediately on all disturbed areas which will not receive final grading or landscaping within 14 days.
 - K. Where no specific controls are called for on the Drawings for drainage leaving the site, provide check dams to create ponding for sediment deposition and collection of debris. Maximum height shall be 4 feet and the impounded area shall be kept cleaned out as often as practical.
- 3.4 Temporary Grass: Provide temporary grassing or other vegetative cover as specified in the "Manual for Erosion and Sediment Control in Georgia" and Specification Section 2920 for all disturbed areas which will not receive final grading or landscaping within 14 days. Furnish all required preparation, liming, fertilizer, seed, mulch, or watering. Grassed areas will be considered acceptable when a viable stand of grass covers at least 98% of the total area, with no bare spots exceeding one square foot and the ground surface is fully stabilized against erosion.
- 3.5 Maintenance: **Inspect for damage after each significant rainfall event.** Clear all debris and accumulated sediment from behind barriers, check dams, etc. so that the functional capacity of these items is not significantly reduced throughout the construction period. The Contractor shall be responsible for keeping traffic off of grassed areas until acceptance of the work.
- 3.6 Removal of Temporary Facilities: Following completion of permanent site drainage, landscaping, and establishment of full stand of permanent grassing, remove and dispose of all temporary erosion control facilities.
- 3.7 Clean-Up and Restoration: Remove all debris and waste materials from the site and dispose of in a manner approved by the City Engineer and in compliance with the law. Seed and mulch any areas that are disturbed by removal activities and restore to conform to, and blend with, the remainder of the site landscaping.

END OF SECTION

SECTION 02445 - BORING AND JACKING PIPE

PART 1 - GENERAL

- 1.1 **Section Includes:** Furnishing and installing bored and jacked or open-cut pipeline casings, including installation of carrier pipe within the casings, at locations shown.
- 1.2 **Related Work:**
- A. SECTION 02316 - TRENCHING, BACKFILLING AND COMPACTION
 - B. SECTION 02370 – EROSION CONTROL
- 1.3 **Reference Standards:** All Work under this Section shall conform to the following:
- A. Field Welding of Steel Water Pipe, (AWWA C206-03).
- 1.4 **Submittals:** Submit under provisions of Section 01000.
- A. Submit casing pipe manufacturer's certification stating the pipe class and wall thicknesses and that all specified tests have been made and the results thereof comply with the requirements of this Specification.
 - B. Submit manufacturer's material specifications and installation instructions for pipe spacers and end seals.
- 1.5 **Site Conditions:**
- A. All Work under this Section shall conform fully to applicable OSHA rules and regulations.
 - B. Conduct all Work in strict conformance with applicable rules and regulations, with applicable permits, and under supervision of highway or railroad officials having jurisdiction over the Work.
 - C. Provide traffic protection by means of suitable signs, barricades, and lights.
 - D. Do not interfere with highway operation and do not weaken the roadbed or structure.

PART 2 - PRODUCTS

- 2.1 **Casing Pipe:** Welded steel, smooth wall, un-coated pipe conforming to ASTM A139, Grade B, except that the hydrostatic test is not required.
- A. Unless otherwise specified on the Drawings, casing wall thickness shall be 0.25 inch for 12 inch NPS and smaller, 0.375 inch for 14 inch NPS through 24 inch NPS, and 0.50 inch for 26 inch NPS and larger.
 - B. Casings for railroad crossings shall be Standard Weight (STD) for sizes up to 24 inch NPS and Extra Strong (XH) Weight for 24 inch NPS and larger.
 - C. Diameter shall be NPS size as indicated on the Drawings.

- D. Pipe shall be furnished with beveled ends for field-butt welding.
- 2.2 Carrier Pipe: Ductile iron pipe with push-on joints, conforming to other Sections of these Specifications, as applicable, except that carrier pipe 24 inch diameter or less shall have Field Lok Gaskets by U.S. Pipe or Fast Grip Gaskets by American Cast Iron Pipe Co.
- 2.3 Casing Spacers: Type 304 stainless steel spacers with PVC liners and abrasion resistant, low friction polymer runners. Center restrained type, as manufactured by Cascade Waterworks Mfg. Co., PowerSeal Type 304, the BWM Co. Model SS, or Advance Products & Systems, Inc. (Two spacers per pipe joint).
- 2.4 End Seals: Flexible Rubber End Seal by Maloney, or an equal approved by City Engineer, and all stainless steel hardware.

PART 3 - EXECUTION

- 3.1 Preparation:
 - A. Perform demolition, clearing and grubbing as required.
 - B. Install erosion and sediment control measures as required.
 - C. Remove pavement only as necessary for excavating bore pit and installing the casing and pipeline appurtenances. Cut all asphalt pavements in straight, uniform lines by means of a jack hammer or suitable pavement cutter. Cut concrete pavements to a depth of at least 2 inches along the cut line with a rotary saw, after which the pavement may be broken with a jack hammer or suitable pavement cutter.
 - D. Provide protection of utilities as follows;
 - (1) Contact all local utility owners and with their assistance, locate underground structures, pipes and utility lines, and mark them in advance. Excavate and expose underground utilities in test pits to verify locations and depths.
 - (2) Promptly correct damage to utilities or structures, to provide a condition at least equal to the original condition before the damage occurred. Should the Contractor fail to promptly correct the damage, the Owner may correct the damage and back-charge the Contractor for costs incurred for the correction.
- 3.2 Techniques of Construction: Unless otherwise specified, the construction techniques (for whichever Method of Installation is used) shall be the Contractor's choice. However, the Work must be performed using generally accepted, and safe, construction procedures using adequate equipment, by experienced workmen, and in conformance with applicable permit requirements and all federal, state, and local laws.
- 3.3 Installation by Open Cut Method: Use the open-cut method for crossing a roadway or stream only when specifically shown on the Drawings or directed by the City Engineer when permission has been obtained from the governing authority for a specific highway or roadway crossing.
 - A. Cut pavement and excavate trenches in accordance with Section 02316. Provide suitable sheeting and bracing where necessary. Keep the Work de-watered at all times.

- B. The bottom of the trench shall be evenly graded to a depth of approximately 6-inches below the bottom of the casing in order to accommodate bedding materials. Bedding material shall be compacted crushed stone.
- C. Accurately lay the casing pipe on the prepared bed to the alignment and grade indicated and securely block in place to prevent movement during the succeeding phase of the backfilling operation.
- D. Backfill over the casing shall conform to requirements of Section 02316 for casings and pipelines under pavement, or shall be placed in accordance with the requirements of DOT permits, whichever are more stringent.
- E. Pavement replacement shall conform to the requirements herein, but shall not be less than applicable DOT requirements unless specific written approval is received.
- F. Make all arrangements for diversion of traffic and control of traffic during the making of the crossing, all in accordance with the requirements described herein.
- G. In the event that open-cut road crossings cannot be completed in one day, cover the open section of trench with steel plates of such size and thickness as to safely withstand heavy traffic over the trench and remain in place under such heavy traffic.

3.4 Installation by Boring and Jacking Method: Use the boring and jacking method where a crossing is designated on the Drawings, unless Open-Cut is specified or directed by the City Engineer. The boring-and-jacking method of installation of casing for the carrier pipe shall be a "dry" operation without use of hydraulic jetting to soften, loosen or sluice away the material to be excavated.

- A. Excavate suitable bore pits or trenches in accordance with Specification Section 02316. Provide suitable sheeting and bracing where necessary. Keep the Work de-watered at all times. Provide suitable traffic signs, barricades, and lights for protection of all open excavations and to conform to all permit conditions.
- B. Excavate and remove whatever material is encountered in the bore pit and boring excavation, including rock, and extend excavation no farther than two feet ahead of the casing pipe.
- C. Limit minimum diameter of the boring excavation to the outside diameter of the casing pipe as closely as practical.
- D. Remove excavated material from the boring as the excavation progresses. Accumulation of excavated material within the casing pipe will not be permitted.
- E. Should appreciable loss of ground occur as a result of boring and jacking operations, immediately fill the voids with soil cement using a 1 part cement to 5 parts granular soil ratio. Mix and place the soil cement as rapidly as possible after loss of ground.
- F. If blasting operations are required, apply for and obtain all required permits for handling explosives and performing blasting operations. The use of explosives on a state or interstate highway right-of-way is prohibited unless approved in writing by Owner and authorized by a separate DOT blasting permit obtained by the Contractor.

3.5 Alignment and Grade:

- A. Install casing pipe at the location and grade shown on the Drawings. Variations in the installed position of the casing from the line and grade shown on the Drawings will be permitted only if approved by the City Engineer. However, the Contractor shall be responsible for any costs of related realignment of pipelines which may result from misaligned casings.
- B. If site conditions are suitable, leave casing pipe exposed at both ends until inspected and approved by the City Engineer and DOT or railroad inspector. Otherwise, provide temporary backfill, then re-excavate and expose both ends for inspection when requested to do so.
- C. Assist the City's representative in obtaining a dimensioned as-built drawing showing horizontal and vertical location of both ends of the casing.
- D. Fill all abandoned casings with sand and plug ends with masonry or concrete at least 12 inches depth or by welded steel plate.

3.6 Welding: Steel casing pipe shall be field-butt welded by experienced welders generally according to AWWA C206, Section 5: Welding-Procedure Details. Field joints shall be continuous, circumferential welded to result in a joint meeting the minimum strength requirements of the base metals and which is completely watertight.

3.7 Installation of Carrier Pipe:

- A. Notify the City Engineer as least two (2) days prior to installation of the carrier pipe and obtain City Engineer's approval prior to proceeding with sealing and backfilling. Install carrier pipe only in the presence of City's Representative.
- B. Provide a minimum of 2 stainless steel spacers per section of pipe. Mount spacers and install pipe in strict accordance with manufacturer's written instructions.
- C. After inspection by the City's Representative, seal casing ends against entrance of foreign material by means of flexible rubber end seal.
- D. Installation, testing, and disinfection of carrier pipe shall be as specified in other Sections of these Specifications, as applicable.

3.7 Backfilling: Permanently backfill the bore pits and trenches immediately after approval of the casing and carrier pipe installation by the City Engineer. Backfilling and compaction shall be as specified in Section 02316 of these Specifications and applicable DOT or railroad permits.

3.8 Restoration and Clean-up: Remove all material not used and all rubbish of every description for the job site. Restore all private and public facilities and structures that have been disturbed to as good a condition as existed prior to the Work.

END OF SECTION

SECTION 02510 - WATER DISTRIBUTION SYSTEMS

PART 1 - GENERAL

- 1.1 **Section Includes:** Furnishing and installing water distribution piping, valves, fittings, and other appurtenances, including reaction blocking, flushing, testing, and disinfection.
- 1.2 **Related Work:**
- A. SECTION 02316 - TRENCHING, BACKFILLING AND COMPACTION
 - B. SECTION 02370 - EROSION CONTROL
 - C. SECTION 02920 - GRASSING AND LANDSCAPING
- 1.3 **Reference Standards:**
- A. All materials and installation shall conform to requirements of Georgia Rules for Safe Drinking Water Chapter 391-3-5, latest revisions, and Environmental Protection Division's *Minimum Standards for Public Water Systems*, latest edition.
 - B. Drinking Water System Components-Health Effects (NSF ANSI Standard 61).
 - C. Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water (AWWA C104-03).
 - D. Polyethylene Encasement for Ductile Iron Pipe Systems (AWWA C105-05)
 - E. Ductile-Iron and Gray-Iron Fittings, 3 Through 48 In., for Water (AWWA C110-03).
 - F. Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings (AWWA C111-07).
 - G. Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges (AWWA C115-05).
 - H. Protective Fusion-Bonded Epoxy Coatings for Interior or Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service (AWWA C116-03).
 - I. Ductile-Iron Pipe, Centrifugally Cast, for Water (AWWA C151-02).
 - J. Ductile-Iron Compact Fittings for Water Service (AWWA C153-06)
 - K. Poly (Vinyl Chloride)(PVC) Pressure-Rated Pipe (SDR Series) (ASTM D2241-04a).
 - L. Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds (ASTM D1784-03).
 - M. Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. for Water Distribution (AWWA C900-97).
 - N. Metal-Seated Gate Valves for Water Supply Service (AWWA C500-02).
 - O. Dry-Barrel Fire Hydrants (AWWA C502-05).
 - P. Rubber-Seated Butterfly Valves (AWWA C504-06).
 - Q. Swing-Check Valves for Waterworks Service, 2 In. - 4 In. NPS (AWWA C508-01).

- R. Resilient-Seated Gate Valves for Water Supply Service (AWWA C509-01).
- S. Double Check Valve Backflow-Prevention Assembly (AWWA C510-97).
- T. Air Release, Air/Vacuum, and Combination Air Valves for Water Works Service (AWWA C512-04)
- U. Protective Interior Coatings for Valves and Hydrants (AWWA C550-05).
- V. Installation of Ductile-Iron Water Mains and Their Appurtenances (AWWA C600-05).
- W. Underground Installation of PVC Pressure Pipe and Fittings for Water (AWWA C605-05).
- X. Disinfecting Water Mains (AWWA C651-05).
- Y. Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals (ASTM D3139-98).
- Z. Elastomeric Seals (Gaskets) for Joining Plastic Pipe (ASTM F477-02e1).
- AA. City of Emerson Water & Sewer Standard Detail Drawings, latest edition.

1.4 Submittals: Submit under provisions of Section 01000.

- A. Submit complete descriptions, including manufacturer's catalog data and operation and maintenance instructions, for all products for approval prior to shipment.
- B. Submit manufacturer's certification for all pipe, valves, hydrants, and fittings shipped to the job stating that specified tests have been made and the results thereof comply with applicable specifications.

1.5 Delivery, Storage, and Handling:

- A. Properly and safely unload, and store all material furnished until incorporated into the Work and accepted.
- B. Unload pipe, fittings, valves, and hydrants by lifting with hoists or skidding to avoid damage. Do not roll or drop off trucks. Do not skid or roll against pipe already on the ground.
- C. Unload material at the site of the Work near the place where it will be installed. Do not interfere with traffic or create safety hazard. Provide signs, lights, and barricades as necessary to protect the public.
- D. Keep interior of pipe, fittings, valves, hydrants, etc. free of all dirt or foreign matter at all times. Do not store materials in drainage ways or ditches.
- E. When materials cannot be placed near the Work site, store in protected area at no expense to the Owner.

1.6 Site Conditions: Contractor shall be responsible for obtaining potable water needed for construction, testing, flushing, and disinfection.

PART 2 - PRODUCTS

- 2.1 General: All products shall be new and unused. All materials that come into contact with the drinking water shall be certified for conformance with ANSI/NSF Standard 61.
- 2.2 Ductile Iron Pipe (DIP): Manufactured in USA in conformance with AWWA C151 and cement mortar lined in accordance with AWWA C104, standard thickness, with seal coat.
- A. Unless otherwise specified, Pressure Class 350 for 4-in to 12-in. dia. pipe, Pressure Class 300 for 14-in to 20-in. pipe and Pressure Class 250 for all larger diameters.
 - B. Unless otherwise specified, the pipe shall have push-on (P-O) compression type joints conforming to AWWA C111.
 - C. Restrained joint (RJ) pipe, where specified or indicated on drawings, shall consist of push-on compression type joint with a locking gasket with stainless steel locking segments vulcanized into the gasket to grip the pipe to prevent joint separation. Restrained joints shall be Fast Grip Gasket by American Cast Iron Pipe Co. or Field-Lok Gasket by U.S. Pipe Co., or equal approved by the City Engineer. Retainer glands with set screws are not acceptable.
- 2.3 Plastic Pipe (PVC): Polyvinyl Chloride (PVC) pipe conforming to all requirements of ASTM D2241. PVC plastic extrusion compound shall meet the requirements of ASTM D1784-03 for Class 12454-B (PVC 1120).
- A. Pipe and fittings shall be Standard Dimension Ratio 21 (SDR 21), unless otherwise specified on the Drawings. C900 pipe, if specified, shall be pressure Class 200, DR14, CI pipe equivalent OD, conforming to AWWA C900.
 - B. Pipe, couplings, and fittings shall bear the National Sanitation Foundation Testing Laboratories, Inc. (NSF) seal of approval for potable water use.
 - C. Pipe joints: Integral push-on type complying with ASTM D3139, designed to provide for thermal expansion or contraction experienced with a total temperature change of at least 75°F. in each length of pipe. Gaskets shall be vulcanized natural or synthetic rubber conforming to AWWA C111 and ASTM F477.
- 2.4 Ductile Iron Fittings and Accessories: Manufactured in USA in conformance with AWWA C153 for diameters through 24 inches and AWWA C110 for diameters larger than 24 inches. Fittings shall be pressure rated 350 psi for diameters through 24 inches and 250 psi for diameters larger than 24 inches. ***Fittings will be paid at AWWA C110 weights (body weights only), regardless of actual weight of fitting used.***
- A. Cement mortar lined in accordance with AWWA C104, standard thickness, with seal coat. *Interior walls shall be smooth and free of defects.*
 - B. Mechanical joint (MJ) unless otherwise specified on the Drawings.
 - C. Fittings used on restrained joint (RJ) fittings shall be restrained joint, push-on compression type joints equal to those specified for restrained joint DI pipe.
 - D. Rubber gasket joints: AWWA C111.
 - E. Gaskets for PVC pipe shall be plain rubber transition type compatible with the type of pipe and fittings used.

2.5 Joint Restraint Devices:

- A. DIP with Push-on Joints: Wedge action restraint ring on the spigot end joined by tie rods to a ductile iron follower gland behind the bell. Rated for 350 psi for 16-in. and smaller and 250 psi for 18-in and larger. Series 1700 Megalug restraint harness as manufactured by EBAA Iron, Inc., or equal specifically approved by the City Engineer.
- B. DIP and Fittings with Mechanical Joints: Follower gland with individually actuated wedges. Rated for 350 psi for 16-in. and smaller and 250 psi for 18-inch and larger. Series 1100 Megalug restraint as manufactured by EBAA Iron, Inc., Ford Uni-Flange Series 1400, or equal specifically approved by the City Engineer.

2.6 Butterfly Valves (BFV): All valves larger than 16-inch shall be butterfly valves conforming to AWWA C504.

2.7 Gate Valves, Metal-Seated: (Acceptable only for 8-inch and smaller mains.) Shall conform to AWWA C500 for double-disc type, iron body, bronze mounted valves for buried, vertical installation, except that valves shall be rated for 200 psi working pressure.

- A. Valve Ends: Mechanical joint unless shown otherwise on the Drawings.
- B. Valve Discs: Double-disc type, parallel seat.
- C. Stem and Seal: Bronze, non-rising stem (NRS), unless shown otherwise on the Drawings; O-ring seals.
- D. Epoxy Coating: Interior and exterior, in accordance with AWWA C550.
- E. Operator: Manual operating nut, 2 inches square, unless shown otherwise on the Drawings; valve to open when turned to the left (counter-clockwise).

2.8 Gate Valves, Resilient Seat: Shall conform to AWWA C515 for reduced-wall, resilient-seated, iron body, bronze mounted gate valves, except that all cast ferrous valve components shall be ductile iron.

- A. Valve Ends: Mechanical joint unless shown otherwise on the Drawings.
- B. Seat: Resilient rubber seat ring.
- C. Stem and Seal: Bronze, non-rising stem (NRS), unless shown otherwise on the Drawings; O-ring seals.
- D. Coating: Interior and exterior, shall conform to AWWA C550.
- E. Operator: Manual operating nut, 2 inches square, unless shown otherwise on the Drawings, valve to open when turned to the left (counter-clockwise).

2.9 Small Gate Valves: Gate valves smaller than 3 inches shall conform to the level of quality and manufacturing standards established for valves 3 inches and larger by the respective AWWA Standards. *All small gate valves shall be rated for 200 psi working pressure.*

- A. Valves for non-buried service shall be bronze body, rising stem, solid wedge disc, with handwheel, Crane 428, Jenkins 47, or equal specifically approved by the City Engineer.

- B. Valves for buried service shall be 200 psi iron body, non-rising stem, bronze mounted, metal seated, Mueller A-2360, Kennedy 1571X, 1579X, or an equivalent resilient seat type specifically approved by the City Engineer. Provide standard 2-inch square operating nut on all valves for buried service.
- 2.10 Ball Valves 4" and Smaller: Two-way, lever-operated bronze body Ball Valve, Standard Port size, Pittsburgh Brass Manufacturing Co., Watts, Milwaukee Valve, or equal specifically approved by the City Engineer. All ball valves shall be rated for 200 psi working pressure. PVC ball valves, if specified, shall be Full-Flo True Union Ball Valve as manufactured by Hayward Manufacturing Co., Inc., or equal specifically approved by the City Engineer.
- 2.11 Check Valves: In-line swing check style conforming to AWWA C508, ductile iron body, mechanical joint ends, resilient material-to-metal type seat. Check valves shall be rated for 200 psi working pressure. Provide outside spring and lever unless shown otherwise on the Drawings. Epoxy coating, interior and exterior, shall conform to AWWA C550.
- 2.12 Backflow Preventer for Fill Valve Assembly: Double check valve assembly conforming to AWWA C510, bronze body, ball type test cock, ball valve shut offs with Tee handles. Watts Series 007, Hersey Model No. FDC, Conbraco Series 40-100, or equal specifically approved by the City Engineer.
- 2.13 Air Release Valves: Air valves for release of air under pressure shall conform to AWWA C512 for Air Release Valves rated to withstand 300 psi working pressure. Provide ductile iron body, threaded connections, stainless steel float and compound lever system, Buna N seat; with all internal trim stainless steel or bronze. Valve size shall be 1" inlet 1/2" outlet unless otherwise specified; *orifice size to be determined by working pressure*. Provide Crispin Model PL10-H, APCO Model 200A, or ValMatic Model 38.
- 2.14 Combination Air Valves: Shall conform to AWWA C512 for Combination Air Valves rated to withstand 300 psi working pressure. Provide ductile iron body, threaded connections, stainless steel floats and compound lever system, Buna N seat; with all internal trim stainless steel or bronze. Valve shall have 1-in. inlet and outlet, unless larger size is indicated on the Drawings. Provide Crispin Model UL10-H, APCO Model 143C, or ValMatic Model 201C.
- 2.15 Fire Hydrants: Shall conform to AWWA C502 for dry-barrel fire hydrants, traffic type, with safety flange which allows the valve to remain closed when the hydrant is broken or damaged above or near the grade level. Hydrants shall be Mueller Super Centurion A-423, with tamper-proof option 114.
- A. Size: Hydrant main valve opening 5-1/4 inches. Inlet shall be 6 inch, mechanical joint, with strapping lugs.
- B. Bury: Unless otherwise specified, with bury required by water main diameter, and to provide 18 inches from centerline of nozzles to the bury line of installed hydrant. However, vertical extensions shall be provided as required to bring the hydrant to its proper finished grade.
- C. Outlet Nozzles: Two 2-1/2 inch dia.; one 4-1/2 inch dia. Nozzle threads shall conform to those in service where the hydrant is to be installed unless otherwise specified. Provide field replaceable nozzle threads.
- D. Stem Seals: O-ring.

- E. Valve: Compression type closing with pressure. Facings shall be rubber.
 - F. Color: Top bonnet: Silver; Barrel: Yellow
 - G. Barrel Drain: Provide integral drain outlet.
 - H. Anchoring: Provide harnessing lugs. Use mechanical joint anchoring coupling (up to 36" in length) or 3/4 inch galvanized, threaded rods, with galvanized bolts and washers.
- 2.16 Piping Accessories: Any accessories required shall be compatible with pipe and fittings used. Small valves, pipe, and fittings shall conform to AWWA Standard C800.
- A. Tapping saddle for pipe 6 inches and smaller: Dresser Style 91, double strap, JCM Model 402, Smith-Blair No. 313, or equal specifically approved by the City Engineer. (For tapping pipe larger than 6 inches in diameter use a DI tapping saddle or tee)
 - B. Couplings for 3-in. and smaller pipe: Dresser Style 38.
- 2.17 Manhole for Air Valves or Check Valves: Precast concrete conforming to ASTM C478-03a, with cast iron cover, NEENAH R-6041-A for cast-in-slab, or R-1776 if not cast-in-slab type. Cover shall read, "CITY OF EMERSON WATER."
- 2.18 Vault for Air Valves: For air valves installed in vault in non-vehicular traffic areas only, use Carson Industries L Series 24 light duty HDPE vault, with extension for 24" minimum depth, with 24" sq. x 3" thick polymer concrete lid.
- 2.19 Valve Boxes: Cast iron, 5-1/4 inch diameter, suitable for the valve installed; two piece screw type adjustable to suit the depth of bury. Provide extension stem as required for deep valves so that no operating nut is deeper than 1.5 feet below the cover. Cover shall be cast iron, marked "WATER."
- 2.20 Valve Collars: Reinforced Concrete. Provide pre-cast 24-inch diameter x 6-inch thick pad for non-traffic areas. For valve boxes located in traffic and/or paved areas, provide poured-in-place, 24-inch square or round x 6-inch thick pad.

PART 3 - EXECUTION

3.1 Preparation:

- A. Perform demolition, clearing and grubbing as required.
- B. Install erosion and sediment control measures as required.
- C. Strip and stockpile all sod topsoil suitable for reuse in restoration.
- D. Remove pavement only as necessary for excavating the trench and installing the pipeline and appurtenances. Cut asphalt pavement in straight, uniform lines by means of a suitable pavement saw. Cut concrete pavements to a depth of at least 2 inches along the cut line with a rotary saw, after which the pavement may be broken with a jack hammer.
- E. Provide protection of utilities by notifying all local utility owners and, with an electronic

pipe locator and their assistance, locate underground structures, pipes and utility lines, and mark them in advance of trenching operation. Excavate and expose underground utilities in test pits to verify locations and depths. As excavation approaches the marked areas, dig with extreme care if using conventional trenching machines. Promptly restore utilities or structures damaged by construction activities to their original condition before the damage occurred. Upon Contractor's failure to promptly correct such damage, Owner may correct the damage and back-charge the Contractor for costs incurred.

- F. As part of the trenching operations, perform removal, relocation, or relaying of pipes, utility lines, and appurtenances which will obstruct the completed water mains or appurtenances.

3.2 Trenching, Backfilling and Compaction: Conform to Specification Section 02316.

3.3 Bedding: Bedding shall conform to the individual requirements for the pipe or conduit material being used. Unless otherwise specified or shown on the Drawings, bedding shall be Class C for Plastic Pipe (4 inches of stone under pipe) and Class D for ductile iron pipe.

3.4 Alignment, Grade, and Cover:

- A. Install pipe and appurtenances at the locations, positions, alignments, and grades shown on the Drawings. In the event of conflict, install as directed by the City Engineer.
- B. Provide **36 inch depth of cover** measured from finished grade to top of pipe barrel unless otherwise shown on the Drawings. Where obstruction are encountered, the depth of cover may be more or less than 36 inches, provided that the greater or lesser depths are approved by the City Engineer.
- C. For pipelines parallel to existing public roads and highways, provide minimum 48 inch depth of cover below the finished grade **OR** 48 inch depth measured below the centerline elevation of the road or highway, **whichever depth is at lowest elevation.**
- D. Limit pipe curvature to the horizontal or vertical joint deflection specified by the pipe manufacturer or AWWA Standard C600. Use fittings if required curvature cannot be maintained by allowable joint deflection. Do not bend PVC pipe.

3.5 Installing Pipe: Install pipe and appurtenances only when trench conditions are suitable. Trenches must not contain water that can enter open end of pipe. Provide proper implements, tools, and facilities for the safe and convenient performance of the Work.

- A. Lower all pipe, fittings, valves, and hydrants carefully into the trench piece by piece by means of a derrick, ropes, or other suitable tools or equipment. Prevent damage to water main materials and protective coatings and linings. Do not drop or dump water line materials into the trench.
- B. Carefully examine all pipe and fittings for cracks and other defects while suspended above the trench immediately before installation in final position. Defective pipe or fittings shall be clearly marked and shall be removed from the site.
- C. Clean the interior and bell and spigot ends of each piece of pipe thoroughly before the pipe is laid.
- D. Prevent foreign material from entering the pipe while it is being placed in the line. if

necessary, provide protective covering for the ends of the pipe until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe.

- E. As each length of pipe is placed in the trench, center the spigot end in the bell, force the pipe home and bring to correct line and grade. Secure the pipe in place with approved backfill material tamped around it. Take precautions to prevent dirt from entering the joint space.
 - F. At times when pipe laying is not in progress, close the open ends of pipe with a watertight plug. Maintain plug in place until the trench is pumped completely dry.
 - G. Lay pipe with bell ends facing in the direction of laying, unless directed otherwise by the City Engineer. Where pipe is laid on a grade of 10 percent or greater, start the laying at the bottom and shall proceed upward with the bell ends of the pipe upgrade.
- 3.6 Cutting Pipe: Use pipe-cutter for inserting valves, fittings, or closure pieces in a neat and workmanlike manner without damage to the pipe or lining. Cut at right angles to the axis of the pipe.
- 3.7 Detection of Non-ferrous Pipe: Install one continuous strand of approved detection tape directly over all non-ferrous pipe, approximately 18 inches above the pipe and one continuous strand of No. 12 solid copper wire in blue insulation directly under the pipe. Pull wire up into valve boxes to within 2 inches of top of valve box. Installed detection device shall be such that Owner can locate installed pipe using a standard electronic detector.
- 3.8 Jointing: Provide jointing of all pipe, fittings, valves, and hydrants in strict compliance with manufacturer's instructions.
- A. Mechanical Joints (MJ): Tighten all nuts with torque limiting wrench. Nuts spaced 180 degrees apart shall be tightened alternately in order to produce equal pressure.
 - B. Push-on Joints (P-O): Furnish and install adaptor as required to join bells and spigots of different sizes. Complete joint by forcing the plain end to the bottom of the socket with a forked tool or jack-type tool.
 - C. Restrained Joints (RJ): Follow same procedure as for push-on joints and manufacturer's procedure for type of restrained joint installed.
- 3.9 Setting of Valves and Fittings:
- A. Set valves plumb. (No exceptions will be allowed.) Tamp backfill around valves and boxes carefully in 6 inch layers for the full depth of trench.
 - B. Provide a valve box, cast iron lid, and concrete collar for every valve. For valves in areas that will not be paved, 6" PVC pipe riser may be used in lieu of C.I. box. The valve box or riser shall not transmit shock or stress to the valve, with the box cover flush with the surface of the finished pavement or such other level as may be directed.
 - C. Provide an extension stem on any operating nut that is greater than 5 feet below the valve box lid. If used, extension shall terminate 18 inches below grade.
 - D. Upon final completion of valve and valve box, including surface restoration, operate

each valve in presence of City Engineer to demonstrate proper valve operation.

- E. Provide and install concrete valve marker ***only for valves specifically designated by Owner's Representative***. Install markers after final grading of the site.
 - G. Provide accurate and complete sketch for each valve showing measured distances to at least three permanent points. Measure for valve sketches upon job completion and submit to Engineer when application is made for final payment.
- 3.10 **Setting of Hydrants**: Set all hydrants plumb with nozzles parallel with, or at right angles to, the street with the pumper nozzle facing the street unless otherwise specified.
- A. Provide and install vertical extensions if required to match the "bury line" with finished grade after backfill. Do not bury the break-away flanges under any conditions.
 - B. Immediately upon installation, install black polyethylene bag (or other approved cover) over all inoperable fire hydrants, new or existing.
 - C. Upon final completion of fire hydrants ready for service, demonstrate proper installation and operation by: (1) operating each hydrant under flowing conditions and (2) closing and opening the hydrant isolation valve.
- 3.11 **Thrust (Reaction) Blocking**: Provide blocking for all plugs, caps, tees, bends, valves, hydrants, etc. unless otherwise specified. Generally, concrete thrust blocking is required whether or not restrained joints are used.
- A. Blocking shall be purchased Ready-Mix concrete having a compressive strength of not less than 3,000 psi at 28 days. Place blocking between solid, unexcavated earth and the fitting to be anchored. The area of bearing on the pipe and on the ground in each instance shall withstand thrust forces created by the specified test pressure. In no instance shall the bearing area be smaller than shown on the Drawings for firm, dry clay (3000 lb. per sq. ft.). Where soils are encountered with less than 3000 lb. per sq. ft. bearing capacity are encountered, increase bearing area dimensions as necessary. All blocking shall be placed such that the joints will be accessible for repair, unless otherwise shown or directed.
 - B. Metal harnesses, tie rods, or clamps may not be used except in special situations specifically approved by the City Engineer. Steel rods or clamps, if their use is approved, shall be galvanized.
- 3.12 **Utility Crossings**: Use extreme caution to avoid damage or disruption where crossings are necessary over or under other utility pipes or structures, such as sanitary sewers, storm sewers, culverts, gas mains, telephone ducts, buried cables, other water mains, or other structures.
- A. Do not pass water pipe through any drainage pipe, culvert, sanitary or storm sewer, or manhole, or any other structure.
 - B. Provide minimum of 6 inch cushion of earth or sand between water pipe and any other utility or structure.
 - C. If practical, provide at least 10 feet horizontal and 18 inches clear vertical separation at all structures and other pipelines or utilities.

- D. See additional requirements herein for separation water main from storm or sanitary sewers and natural gas mains.

3.13 Stream and River Crossings:

- A. For open-cut stream crossings, install water pipe as indicated on the Stream Crossing Detail Drawing. Provide minimum cover of 24 inches under bottom of stream beds or ditches.
- B. Where indicated on the Drawings and for streams greater than 15 ft. wide, place ball joint river crossing pipe beneath the river bed to maintain minimum 24 inches of cover. Install river crossing pipe by means and methods of Contractor's choice while ensuring that all conditions of applicable permits are complied with. Handle, install, and join ball joint pipe strictly in accordance with manufacturer's written instructions. Use extreme care to avoid flotation of pipe under all conditions.

3.14 Sewer Separation: Use special precautions to maintain minimum separation distances between water main and any existing or proposed sanitary sewer, storm sewer, or manhole.

- A. To the maximum extent practical, maintain at least 10 feet of horizontal separation between the water main and any existing or proposed sewer. Under no circumstances shall a sewer and a water main be laid in the same trench.
- B. Maintain a minimum vertical separation of 18 inches between the outside of the water main and the outside of any sewer or forcemain. Arrange the crossing so that the water main joints will be equidistant and as far as possible from the sewer joints. **Install water pipe above (over) sanitary sewers.** Where local conditions prohibit laying water pipe above (over) a sewer, maintain 18 inches minimum vertical separation and provide adequate structural support and protection for the sewer to prevent damage during pipe laying and backfilling operations. Insure that any sewer or forcemain crossing over a water main is constructed of materials and with joints that are equivalent to water main standards and tested to assure water-tightness.
- C. Notify City Engineer immediately upon encountering field conditions that do not allow If at least 18 inch vertical between the water pipe and existing or proposed sewer is not possible, notify City Engineer and use 18 ft. length of ductile iron pipe for the water main, centered on the sewer at the point of crossing.

3.15 Gas Main Separation: Use special precautions to maintain minimum separation distances between water main and any existing or proposed natural gas mains.

- A. Where practical, maintain a minimum 5 ft. clear vertical separation and minimum horizontal separation of 10 ft. between the water main and any steel gas main. Notify City Engineer immediately upon encountering field conditions that do not allow the specified minimum distances.
- B. Pipe wrapping or encasement of DI water pipe, where specified or directed, shall be performed in accordance with requirements of AWWA Standard C105.

3.16 Connection to Existing Mains:

- A. Coordinate connections to existing water facilities with Utility Owner and do not make connections to existing mains without specific approval of time of day and allowable

duration of service disruption.

- B. Ascertain the exact locations and depths of existing mains prior to connection. Locations of required connections to existing mains shown on Drawings may be approximate only.
 - C. Make connections to existing mains in a complete and workmanlike manner using only approved fittings and specials to suit conditions encountered.
 - D. Repair, reconnect, and return to service in equal or better condition all existing pipes which are cut or damaged.
- 3.17 **Filling for Testing:** Connect temporary fill valve assembly to existing water main or hydrant as shown on the Drawings. Coordinate with Utility Owner's forces for filling and testing. Provide adequate backflow protection on fill line between potable water supply source and new water main. Fill slowly, as directed by the Utility Owner.
- 3.18 **Hydrostatic Test:** Perform pressure and leakage tests on ***each section of the pipe between valves*** in accordance with AWWA C600, except as otherwise specified herein. All thrust blocking shall be in place and properly cured prior to start of hydrostatic testing. If directed by the City Engineer, pipelines may be tested before the trench is completely backfilled.
- A. Furnish and install corporation stops at high points on the pipe to release air as pipe is slowly filled with test water. When a segment of pipe between two valves is filled and ready for testing, the segment of pipe shall be thoroughly blown free of air and prepared for testing. Air must be removed prior to testing.
 - B. Furnish suitable test pump, meters, connections, pressure gages approved by the City Engineer, and all necessary apparatus including means for accurately measuring water introduced into the pipe during testing.
 - C. Maintain full test pressure for a **minimum of 8 hours**. Maintain **200 pounds per square inch (psi)** for pipe 16-in. and smaller; maintain 150 psi for pipe larger than 16-in. Pressure shall not vary by more than 5 psi during the test.
 - D. The length of pipe included in each pressure test shall be limited to the segment between two valves, unless otherwise directed by the City Engineer because of topography or other conditions which might prevent a valid test.
 - E. Concurrently with the pressure tests, conduct leakage tests on all pipe. Maximum allowable leakage shall be **six (6) gallons per mile of pipe per inch of nominal diameter per day**.
 - F. Locate, remove, and replace all defective pipe, valves, fittings, or hydrants. Clamps or other repair devices shall not be used for repair.
 - G. Repeat pressure and leakage tests until results are satisfactory to the City Engineer.
- 3.19 **Initial Flushing:** **After completion of hydrostatic testing, and prior to disinfection**, thoroughly flush the pipelines, in presence of City Engineer's Representative. Provide adequate backflow protection for the flushing water source, to be approved by the City Engineer prior to flushing.
- A. Produce a minimum velocity of 3.0 feet per second in pipe for as long as necessary to

clean out silt and debris, unless Owner determines otherwise.

- B. Provide adequate outlet piping and/or diffuser nozzle for proper disposal of flush water without causing erosion or other damage.
- 3.20 **Disinfection:** After initial flushing, disinfect all installed pipe, fittings, valves, and appurtenances or other facilities exposed to contamination by the construction. Disinfect strictly in accordance with AWWA Standard C651, **using the continuous-feed method**, except as otherwise specified. Use of the slug method may be directed by the City Engineer for larger pipelines to reduce volume of heavily chlorinated water to be flushed to waste. **Use of the tablet method is not acceptable.**
- A. Disinfect all pipe and appurtenances using calcium or sodium hypochlorite solution. Do not use calcium hypochlorite intended for swimming pool disinfection.
 - B. Provide constant feed of chlorine such that the main will have not less than 25 mg/L free chlorine. After 24 hour retention period, all portions of the main shall have a residual of not less than 10 mg/L of free chlorine.
 - C. **Final Flushing:** After 24 hrs. flush chlorinated water from the line until chlorine concentration of water leaving the main is no higher than that generally prevailing in the existing system, or less than 1.0 mg/l. Provide proper treatment and disposal of chlorinated water in accordance with federal, state, and local law.
 - D. Repeat disinfection procedure until bacteriological analysis results are acceptable to the Owner and the local regulatory agencies.

END OF SECTION

SECTION 02511 - WATER SERVICE CONNECTIONS

PART 1 - GENERAL

- 1.1 **Section Includes:** Making water service connections to the water distribution system. Includes new connections, replacing existing service laterals, and re-connecting to the new water mains.
- 1.2 **Related Work:**
- A. SECTION 02510 - WATER DISTRIBUTION SYSTEMS
- 1.3 **Reference Standards:**
- A. All materials and installation shall conform to requirements of Georgia Rules for Safe Drinking Water Chapter 391-3-5, latest revisions, and Environmental Protection Division's *Minimum Standards for Public Water Systems*, latest edition.
- B. Drinking Water System Components-Health Effects (NSF/ANSI Standard 61)
- C. Underground Service Line Valves and Fittings (AWWA C800-05).
- D. Seamless Copper Water Tube (ASTM B-88-92)
- E. Fabricated Steel and Stainless Steel Tapping Sleeves (AWWA C223-02).
- F. Cold-Water Meters - Multijet Type (AWWA C708-05)
- G. Specifications for Gray Iron Castings (ASTM A48-94a)
- H. Standard Specification for Polyvinyl Chloride(PVC) Plastic Pipe (SDR-PR and Class T) (ASTM D 2241-96b)
- I. City of Emerson Water & Sewer Standard Details, latest revision.
- 1.4 **Submittals:** Submit under provisions of 01000.
- A. Prior to installation of any service connection, submit product data, dimensions, and catalog numbers for all products to be used.
- B. Manufacturer's certification of compliance with ANSI/NSF 61 for all products to be used in the Work.
- 1.5 **Site Conditions:**
- A. The location and size of service connections shall be subject to approval by the City of Emerson prior to installation. Do not install until approved.

PART 2 PRODUCTS

- 2.1 **General:** All products shall be new and unused. All materials and components that come into contact with the drinking water shall conform to ANSI/NSF Standard 61 and shall be "**lead free**" in compliance with federal, state and local requirements. Lead free is defined as 8% or less lead for pipes and fittings and 0.2% lead for solders and flux.

- 2.2 Service Tubing: ASTM B-88 copper tubing type K, 3/4 inch minimum size, unless otherwise shown on the approved Drawings.
- 2.3 Casing for Service Tubing: 2-inch dia. SDR 21 PVC conforming to all requirements of ASTM D 2241, for 3/4 inch and 1 inch tubing.
- 2.4 Water Meters: Sensus PPM, 5/8" x 3/4" AWWA C708, registration in gallons, with Sensus ICE Radio Read Unit. Deliver to City of Emerson in original containers for installation by City when needed and after all tap fees and deposits are fully paid.
- 2.5 Meter Boxes: Provide new plastic body meter box for each service connection. Boxes shall have reinforced at top and bottom, with cast iron meter reading lid compatible with Sensus Radio Read units, DFW D-1200 or Brooks 1914. Large meter boxes DFW D-1500 or Brooks 1220-12.
- 2.6 Accessories: Accessories shall conform to AWWA Standard C800 and City's standard practice.
- A. Use City approved service saddle for tapping all PVC pipe and DIP pipe which is 12-in. and larger. Ductile Iron pipe, 6-inch and 8-inch only, may be direct tapped.
 - B. Corporation stop: 3/4 inch ball stop for 3/4 inch service; 1-inch ball stop for 1-inch service or branch connector; AWWA taper thread x compression connection for CTS O.D. tubing. Mueller B-25008, Ford FB 1000-3, or approved equal.
 - C. Branch connector: 1-inch x 3/4-inch x 3/4-inch for CTS O.D. tubing. Mueller h-15343, Ford Y44-243G, or approved equal.
 - D. Coupling: 3/4-inch one-eight bend coupling, F.I.P. thread x compression, CTS O.D. tubing. Mueller H 15534, Ford LA 14-33-G, or approved equal.
 - E. Meter Yoke: Copper meter yoke with lock wing angle meter ball valve, ASSE dual cartridge check, and MIP thread ends.
 - (a) For 3/4-inch service: 5/8 x 3/4 x 9-inch riser, Mueller B2434R-6A, Ford VBHC72-9W MM33, or McDonald 28-209WDPP 33.
 - (b) For 1-inch service: 1 X 12-inch riser Mueller B2434F-2A, Ford BHC74-18W MM44, or McDonald 28-412WDpp44.
 - F. Customer Cut-off Valve: (Provide only as replacement for existing valve when re-connecting services.) 3/4-inch bronze gate valve, F.I.P. threads, 200 psi minimum working pressure, with handwheel, NIBCO T-113, Hammond 606, or approved equal. Provide PVC irrigation valve box and lid for standard service; At PRV services, install in meter box, DFW D-1200 or Brooks 1914.
 - G. Pressure Reducing Valve (PRV): 3/4" Conbraco Series 36.
 - H. Nipple connection: 18-inch long, sch. 80 PVC pipe with schedule 80 PVC coupling, FIP x FIP.

PART 3 - EXECUTION

3.1 General:

- A. Install service connections and re-connections in the same manner as water distribution mains and in accordance with Specification Section 02310, except that depth of cover shall be 36 inches minimum.
- B. Install service connections where directed by the City's Representative and after the new main is fully installed, tested, disinfected and approved. It is intended that all service connections will be reconnected to the new water main using copper tubing and *all existing polyethylene service tubing shall be abandoned.*
- C. Use Standard service connections unless PRV (high pressure) service connections are directed by the City's Representative.
- D. Install water meters boxes on public right-of-way at the property line, unless otherwise directed by City's Representative. Install customer cut-off valves and PRV's on customer's property, at the property line, unless otherwise directed by City's Representative.
- E. Provide and install all necessary fittings and couplings for re-connecting existing meters.
- F. If approved by the City's Representative, use a single 1-inch copper tube lateral under roadway pavement to serve two standard residential meters where two long-side residential meters are less than 15 ft apart.

3.2 Installation:

- A. Make service re-connections in accordance with Emerson's Standard Detail Drawing for Water Service connections.
- B. Install 2-in PVC casing pipe for all service tubing to be under existing or proposed pavements. Extend casing 5 feet beyond edge of pavement on each side, unless otherwise directed. (Extend 10 ft. each side for Georgia DOT roads.) Install casing pipe with 36 inches cover under road or shoulder surface, or ditch line.
- C. Normally, pavement cutting will not be permitted for installing service tubing or casing. Install casings for service tubing under pavements by jacking or boring where practical. However, the City Engineer's Representative may approve installation of 2-inch PVC casing by open cut methods if rock or other obstructions are encountered by attempts to install by jacking or boring.
- D. Set meter boxes level, on well compacted earth, and in a manner such that stormwater will not accumulate on, into, or over, the meter box.
- E. Install the meters with extra fiber or rubber washers so that washers create at least 0.1" separation between the meter and coupler on each side of meter.
- F. Securely cap valves and meter setters that are installed temporarily without meters. Provide caps to prevent damage to ends or entry of contamination.

END OF SECTION

SECTION 02920 - GRASSING AND LANDSCAPING

PART 1 - GENERAL

- 1.1 **Includes:** Preparing the ground surface; furnishing and applying lime; applying fertilizer and seed; and mulching to establish a stand of mowable grass in all unpaved areas that have been disturbed; and replacement of all disturbed shrubs, trees, and miscellaneous plants that are to remain.
- 1.2 **Reference Standards:** "Standard Specifications for Construction of Transportation Systems, 2001 Edition," Georgia Department of Transportation, referred to herein as the "DOT Specifications."
- 1.3 **Quality Assurance:**
 - A. Provide an approved written guarantee from nursery for replacement of failed plants within one year after final acceptance.
 - B. Guarantee grassing for one year and provide for mulching, fertilizing and watering of replaced plants and grassing. Extend the guarantee for one year from date of replacement.
- 1.4 **Submittals:** Submit list of grasses, seeding rates, and seeding dates for City Engineer's review and approval prior to seeding.

PART 2 - PRODUCTS

- 2.1 **Fertilizer:** Standard commercial grade, 6-12-12 (N-P-K).
- 2.2 **Lime:** Agricultural grade, ground or pulverized limestone.
- 2.3 **Grass Seed and Sod:** Select grasses or sod appropriate to the season and site conditions from the Seeding Table in Section 700 of DOT Specifications. Seed and sod shall conform to Section 890. Grass seed to be used in previously grassed areas shall be equal type and grade to the previously existing grass. Include a mixture of temporary grasses when applying permanent grass.
- 2.4 **Mulch:** As specified in Sections 893.2.02 and 718.2 of DOT Specifications.
- 2.5 **Erosion Control Mats:** As specified in Section 716 of DOT Specifications.
- 2.6 **Trees, Shrubbery, and Miscellaneous Plants:** To be as specified in Standard Specification Section 893.2.03. All trees, shrubbery, and plants damaged by the Work shall be replaced with identical plants of the same general size and quality as previously existed.

PART 3 - EXECUTION

- 3.1 **Areas to be Grassed:** All areas which are disturbed by construction activities, including trenches and ungraded cleared areas, except areas to be paved, shall be provided with a full stand of permanent grass. Seed with temporary grass and mulch cover for any disturbed areas that for any reason cannot be permanently grassed within 14 days after disturbing.
- 3.2 **Preparation:**

- A. Remove all rocks and debris of any kind from the area to be grassed and rake surface smooth to conform to adjacent ground. Loosen surface by discing, raking, or harrowing to result in a smooth surface, free of rocks over 2" in size and mowable by agricultural-type mower.
 - B. Apply lime at the rate of 2 tons/acre. (92 lbs. per 1000 sq. ft.)
 - C. Apply fertilizer at the rate of 1,500 lbs. per acre. (34 lbs. per 1000 sq. ft.) (Fertilizer may be applied by hydroseeding.)
 - D. Prepare seed bed by thoroughly mixing lime with soil into the top 4 inches of the surface by discing or tilling prior to seeding. Roll to provide a firm, smooth seed bed.
- 3.3 Seeding: Apply seed evenly on freshly prepared and rolled seed bed. (May be applied by hydro-seeder). Include both temporary and permanent grasses in all seeding of permanent grass. Include wood fiber mulch used as a metering agent applied at a rate of approximately 500 lbs./acre with the seed and fertilizer in the form of a slurry.
- 3.4 Rolling: Roll all seeded areas before applying mulch.
- 3.5 Mulching: Mulch the entire seeded area as specified in Section 700.3.05 of the DOT Specifications. Apply straw or hay mulch to evenly cover the ground to a depth of at least three quarters of an inch (3/4"). Apply mulch within 24 hours after seeding. Anchor mulch in place using a disk harrow, a commercial tackifier, or 1 inch mesh netting.
- 3.6 Watering: Provide watering as required to establish and maintain a full stand of healthy grass and landscaping.
- 3.7 Re-seeding: Re-seed as required to establish and maintain permanent vegetative cover to prevent sheet and rill erosion. Repair erosion damage as required and re-seed as necessary to obtain a full stand of healthy grass.
- 3.8 Planting of Shrubbery, Trees, and Misc. Plants: Plant shrubbery in accordance with written recommendations of nursery supplying the plants, including mulching, fertilizing, and watering instructions.
- 3.9 Maintenance: Establish a full stand of permanent grass and healthy shrubs, trees, and plants before final acceptance of the Work by the Owner. Control erosion at all times. Where damage occurs, repair landscaping work as quickly as practical after a problem is identified. Eradicate weeds appearing in grassed areas. After grass has been established, mow as often as needed to maintain height between 1-1/2 and 3 inches until final acceptance.

END OF SECTION