DEVELOPMENT REGULATIONS - SECTION 400

CITY OF EMERSON

STANDARD SPECIFICATIONS
FOR
GRAVITY SANITARY SEWER
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 882.2.01Agricultural 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 within14 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 within14 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.

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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 02530 - GRAVITY SANITARY SEWERS AND LATERALS

PART 1 - GENERAL

1.1 Section Includes: Furnishing, installing, and testing gravity sanitary sewers and service laterals. Unless otherwise specified or indicated on the Drawings, only smooth-wall PVC pipe and ductile iron pipe (DIP) shall be used. Other pipe materials may be used only in special applications indicated on Drawings or where specifically directed by the City Engineer.

1.2 Related Work:

A. SECTION 02316 - TRENCHING, BACKFILLING AND COMPACTION
B. SECTION 02531 - MANHOLES AND ACCESSORIES

1.3 Reference Standards:

A. Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings, ASTM D3034-06

B. Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings, ASTM F679-06a.

C. Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications, ASTM D2321-05.

D. Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals, ASTM D3212-96a(2003).

E. Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe, ASTM F477-07.

F. Standard Specification for Poly(Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings, ASTM F679-06a.

G. Standard Specification for Ductile Iron Gravity Sewer Pipe, ASTM A746-03.

H. Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines using Low-Pressure Air, ASTM F1417-92(2005).

I. Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method, ASTM C924-02.

J. Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines, ASTM C969-02.

K. City of Emerson Water & Sewer Standard Detail Drawings, latest revision.

1.4 Submittals:

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 certifications for all pipe and related materials shipped to the job site stating that all specified tests have been made and the results thereof comply with the requirements of this Specification. Each certificate shall be signed by a person having legal authority to bind the manufacturer.

1.5 Delivery, Storage, and Handling:

A. Inspect pipe prior to acceptance of delivery for dimensions and to ensure the absence of fractures, cracks damaged ends, markings and other defects.

B. Deliver pipe and joint materials to the job site and store in accordance with the manufacturer's recommendations. Make whatever special arrangements are necessary to provide such storage.

C. Take special care to avoid deformation or compression of PVC pipe ends. Store pipe in unit packages provided by the manufacturer.

PART 2 - PRODUCTS

2.1 General: All products and materials shall be new. Used or reconditioned products and materials are not acceptable and shall be removed from the site. The City reserves the right to disallow any manufacturer or supplier that does not have a consistent, long-term record of quality control and successful product performance.

2.2 Smooth Wall Poly Vinyl Chloride (PVC) Pipe and Fittings: Shall be manufactured in USA. Type PSM Pipe which is 15" or less in diameter shall conform to requirements of ASTM D3034 for SDR 26. Pipe 18" in diameter or larger shall conform to requirements of ASTM F679, T-1 wall.

A. Length of sections not less than 10 ft. or greater than 14 ft.

B. Integral bell and spigot "O" ring joints conforming to ASTM D3212 with gaskets conforming to ASTM F477. Material for seal ring shall be specifically formulated for wastewater service.

C. Fittings for PVC sewer pipe shall have PVC push-on joints manufactured in accordance with the same specifications as pipe and pipe joints.

D. Pipe and fittings shall be marked in accordance with applicable ASTM specification. Spigot ends shall be marked to indicate position of spigot in bell has been attained.

2.3 Ductile Iron Pipe (DIP): Shall be manufactured in USA in conformance with AWWA C151 (or ASTM A746).

A. Unless otherwise specified or shown on the Drawings, Pressure Class 350 for 4-in. to 12-in. dia. pipe; Class 250 for 14-in. to 20-in. dia. pipe; and Class 200 for all larger diameters. Nominal laying length shall be 18 to 20 ft.

B. Fittings may be cast or ductile iron manufactured in accordance with AWWA C153 or C110 with interior lining same as pipe.

C. Interior Lining: Cement mortar lined in accordance with AWWA C104, standard thickness with seal coat, unless epoxy lining is otherwise specified. Where epoxy lining is indicated, use Protecto 401 or equal approved by the City Engineer.

D. Joints shall be push-on joint with lubricated rubber gaskets provided by the pipe manufacturer in accordance with AWWA C111.

E. Compression joint sealers and flexible couplings shall be provided for joining DI pipe and fittings to different types of pipe less than 15 inches in diameter. Couplings shall be by Fernco Joint Sealer Company, or equal approved by the Engineer.

F. Restrained joint (RJ) pipe, where specified or indicated on drawings, shall be 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 Engineer.

2.4 Service Lateral Pipe and Fittings (if required):

A. Service lateral pipe and fittings shall conform to the same material specifications as the main sewer to which they are connected, unless otherwise shown on the approved, or otherwise required by local plumbing codes.

B. Service laterals shall be 4 inches (4") diameter minimum or 6 inches (6") diameter (I.D.) as shown on the approved Drawings or as directed by the City Engineer.

PART 3 - EXECUTION

3.1 Preparation:

A. Provide 48 hr. notice to the City Engineer prior to start of sanitary sewer installation.

B. Provide construction stake-out and verify inverts.

C. Examine all pipe and fittings. Mark damaged pipes and fittings in such a manner that identification is permanent and easily recognizable. Immediately remove such pipe and fittings from the job site.

3.2 Trenching, Backfilling and Compaction: Conform to Specification Section 02316 and ASTM Standard Practice D2321.

3.3 Bedding and Embedment: Provide bedding and embedment appropriate for the pipe material being used and the site conditions encountered. Specific bedding requirements are as follows:

A. Smooth Wall PVC: Install and bed PVC sewer in accordance with ASTM Practice D2321. Provide Class B bedding using approved Granular Bedding Material. (See Pipe Bedding Detail.)

B. DIP: Install Ductile Iron Sewer in Class C bedding, unless directed otherwise by the Engineer. (See Pipe Bedding Detail.)

C. Carefully excavate areas under bells sleeves, etc. for all types of pipe and prepare

bedding to ensure uniform support for the entire length of pipe barrel.

D. Limit trench widths as specified in Specification Section 02316. If the maximum trench width is exceeded, the bedding must be increased by one class at Contractor's expense.

3.4 Installation of Pipe and Fittings:

A. Unload, store, lay, joint, and backfill all pipes and fittings pipe in strict accordance with the manufacturer's printed instructions and recommendations.

B. Carefully examine all pipe and fittings for cracks or other defects before being lowered into the trench. Remove all damaged pipe, fittings or other material from the site immediately and properly discard.

C. Carefully grade the bottom of the trench and excavate bell holes. Lay each pipe to the line and grade shown on the Drawings, or as directed by the City Engineer. Accuracy of the finished line and grade of the pipe shall be obtained in the preparation of the trench bottom. Do not lay pipe on blocking of any kind. Where finished work does not conform to the specified grades and inverts, adjust the grades as required.

D. Lay pipe only in dry trenches. Provide de-watering as specified in Specification Section 02316 – Trenching, Backfilling and Compaction.

E. Lay pipe upgrade with the spigots pointing downwards (No exceptions will be allowed). All pipes shall be straight and show a uniform grade between manholes.

F. Take special care that each spigot is properly centered in the bell of the preceding pipe and that each pipe is solidly bedded so that settlement does not occur.

G. Thoroughly clean the joint surfaces and apply jointing material as recommended by the pipe manufacturer. After each join is made, check for proper position prior to installation of next length of pipe.

H. Keep the interior of the pipe clear of all debris and superfluous material of every description as the work progresses.

I. When the pipe laying is suspended, either at night or at other times, close the end of the pipe with a water-tight plug.

J. Any pipe which has its alignment, grade, or joints disturbed after installation shall be taken up, re-laid, and re-tested.

K. All PVC sewers shall have minimum 3 ft. cover. Filling over the pipe to obtain minimum cover is not allowed.

3.5 Connection to Existing Facilities:

A. Make connections of pipe or laterals to manholes or other structures by means of mechanical coring and installation of watertight flexible gaskets (boots) as specified in Specification Section 02531- Manholes and Accessories.

B. The bypassing or spillage or raw wastewater onto the ground or into waters of the State is prohibited.

3.6 Installation of Sewers at Streams, Drainage Structures, and other Utility Crossings: Where indicated on the Drawings, or required by field conditions, install sewer beneath stream beds or ditches. Aerial stream crossings are not allowed.

A. Use ductile iron pipe for the sewer if a minimum cover of 36 inches cannot be maintained for sewers passing under streams or drainage ditches.

B. Do not extend the sewer through any drainage pipe, culvert, or other structure.

C. Provide minimum of 6 inch thickness of earth or sand cushion between proposed sewer and any other pipe or structure.

3.7 Water Main Separation: Use special precautions to maintain minimum separation distances between sewer and any existing or proposed water main.

A. Where practical, maintain a minimum vertical separation of 18 inches between the outside of any water main and the outside of the sewer. Arrange the crossing so that the sewer joints will be equidistant and as far as possible from the water main joints. Where a sewer pipe must cross a water main, provide adequate structural support and protection for the water main to prevent damage.

B. To the maximum extent practical, maintain at least ten (10) feet of horizontal separation between the sewer and any existing or proposed water main. Under no circumstances shall the sewer and a water main be laid in the same trench.

C. Where proposed sewer unavoidably conflicts with an existing water main, relocate the water main to maintain at least 18 inches of vertical separation under or over the sewer. Reconstruct the conflicting water main with ductile iron pipe or copper pipe, 18 ft. minimum length, centered at the sewer. Coordinate all water main relocation with water system's owner and perform all water main reconstruction in strict conformance with water system requirements.

D. Notify City Engineer's Representative immediately upon encountering field conditions that do not allow at least 18 inch vertical and/or10 ft. horizontal separation between sewer and any existing or proposed water main. Where it is not possible to obtain at least 18 inch vertical separation, install a 18 ft. length of DIP pressure pipe for the sewer centered on the water main. Or, as an alternate, encase the sewer in concrete.

3.8 Utility Tracer System for all PVC or other Non-ferrous Sewers:

A. For all PVC or other non-ferrous sewers, provide a continuous parallel tracer consisting of insulated 12 gauge copper wire. Place wire with the initial backfill 1 ft. above the pipe and continuing uninterrupted around manholes. Provide connection to any above-ground appurtenances so that the sewer can be located with a pipe detector after backfilling. Splice with electrical tape to provide 100% equivalent insulation.

B. Also provide a continuous non-biodegradable plastic tape 6" x .004" with the words "Caution Sewer Pipe." Place the tape in the trench directly above the pipe and

between 18 inches and 24 inches below finished grade.

3.9 Installation of Service Laterals: (Applies to laterals in the street and to laterals on private property or easements).

A. Install laterals in the same manner as sewer main with the same bedding and backfill as specified for the main sewer in Specification Section 02316 and in accordance with the Standard Detail for Sewer Service Lateral.

B. Install wyes and laterals in the street, or in easements, at the same time that the main sewer is installed. Install street laterals to the edge of right-of-way, to the edge of easement, or 4 feet from main sewer, whichever is the greater distance.

C. Temporarily plug and protect the upstream end of all street laterals at the edge of the right-of-way or at the tie-in point for testing. Install a temporary, watertight plug with "O" ring gaskets at each opening.

D. Services laterals shall not be extended and connected to any building sewer until street lateral construction has been completed to the edge of the street right-of-way, tested, and approved.

E. Lay all laterals to a uniform line and at grades specified or required by local plumbing codes. No service lateral shall be covered until it has been inspected and measured by the City's Representative.

F. Provide an approved non-biodegradeable plastic tape 6" x .004" with the words "Caution Sewer Pipe." Place the tape in the trench directly over the service lateral between 18 inches and 24 inches below finish grade.

G. Install wyes at 45 degrees up from the horizontal except where the City's Representative directs otherwise.

H. For sewers eight feet or more in depth, connect the service with tee with a vertical riser, rather than a wye, as shown on the Standard Detail. Use 45 degree or less bends in all cases. No 90 degree bends will be permitted.

I. For service laterals on private property, provide clean-outs at each change of grade or direction, at edge of right-of-way, as detailed on the Drawings, and at intervals required by the local plumbing code.

3.10 Inspection and Tests: All material and work shall be subject to inspection at any time. All inadequate, defective, or improper work or materials will be rejected and the Contractor will be required to replace or reconstruct the work. Provide 48 hour notice to tests and conduct all testing in presence of the City's representative. Gravity flow pipelines which fail any of the tests specified herein shall be repaired by a method approved by the City Engineer, or replaced, and re-tested until acceptable.

A. Lamping Test: Before calling for inspection of the installed sewers, flush all sewers clean of all water, sand, dirt, debris, or other obstructions. After the sewers have been fully backfilled for at least 30 days, provide labor, supplies, and equipment for lamping the completed sewers. Lamp the sewers in presence of the City Engineer. Any section of sewer which does not exhibit a smooth, straight, "full-moon" bore will be rejected.

B. Deflection Test for PVC Pipe: Conduct deflection tests on all PVC sewers after the sewers have been fully backfilled for at least 30 days (or longer if, in the opinion of the Engineer, soil moisture conditions have not allowed full backfill settlement). The deflection test shall consist of free passage of a properly sized solid mandrel or solid sewer ball sized to allow deflection no greater than 5% of the pipe actual interior diameter. Push or pull the mandrel or sewer ball by an approved method in the presence of the Engineer. Any section of sewer which exhibits deflection exceeding 5% of the interior diameter will be rejected.

C. Infiltration Testing: Perform infiltration tests on all sewers in accordance with procedures set forth in ASTM C969. Measure *infiltration* flow with a calibrated V-notch weir for a minimum of 4 hours. The length of sewer tested shall not exceed 700 feet. For infiltration testing, the pipeline shall not leak in excess of a rate of ***25 gallons per inch of diameter per mile of pipe line per day.***

D. Exfiltration Testing: If, in the opinion of the Engineer, ground water levels will not provide sufficient hydrostatic water pressure to warrant infiltration testing, perform exfiltration testing in accordance with procedures set forth in ASTM C969. Fill the pipeline and manholes with water so that a head of at least 2 feet is provided above the top of the pipe at the uppermost end. Allow line to stand until the pipe has reached its maximum absorption, but not less than 4 hours. Refill line as required to re-establish minimum hydrostatic head and measure exfiltration rate over a 4 hour period. For exfiltration testing, the pipeline shall not leak in excess of a rate of ***25 gallons per inch of diameter per mile of pipe line per day.***

E. Air Testing: Perform low pressure air testing for PVC sewers in accordance with ASTM F1417 for each section of sewer line. Temporarily plug and adequately brace all pipes prior to testing. Temporary restraints are also required for cleanouts and plugs for testing. Provide backfill sufficiently completed to prevent movement of the pipeline under air testing pressure. Allowable leakage will be based on an allowable loss as provided in Table 1 of ASTM F1417, using an initial pressure of 4.0 psi and maintaining a minimum of 3.5 psi. Observe all reasonable safety precautions during air testing, at a minimum those precautions specified by ASTM F1417.

3.11 Sewer Maintenance: Protect all sewers, manholes, laterals and cleanouts from damage and maintain sewers free from debris and siltation until final acceptance.

3.12 Site Clean-up and Restoration: Remove any and all material not used (including excess excavation and rock) and rubbish of every character from the job site. Restore all items disturbed by the construction to their original condition as soon as possible after disturbance and maintain the site until final acceptance.

END OF SECTION

SECTION 02531 - MANHOLES AND ACCESSORIES

PART 1 - GENERAL

1.1 Includes: Furnishing all labor, materials, supplies, and equipment necessary for the construction of manholes and manhole accessories for water distribution systems, sanitary sewers, sewage force mains, or storm sewers.

1.2 Related Work:

A. SECTION 02316 - TRENCHING, BACKFILLING AND COMPACTION
B. SECTION 02530 - GRAVITY SANITARY SEWERS AND LATERALS

1.3 Reference Standards:

A. Standard Specification for Precast Reinforced Concrete Manhole Sections, ASTM C478-07.

B. Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures, ASTM C890-06.

C. Standard Practice for Installation of Underground Precast Concrete Utility Structures, ASTM C891-90(2003).

D. Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals, ASTM C923-07).

E. Standard Test Method for Concrete Manholes by Negative Air Pressure (Vacuum) Prior to Backfill, ASTM C1244-05ae1.

F. City of Emerson Water & Sewer Standard Detail Drawing, latest revision.

1.4 Submittals:

A. Submit Shop Drawings for precast sections, steps, pipe joint seals, and frames and covers for approval before placing orders to suppliers for the job.

B. Submit manufacturer's certifications that all manholes and accessories have been manufactured in accordance with this Specification and that they meet all the standards referenced herein. Provide certified test results for manhole steps.

1.5 Delivery, Storage and Handling: Inspect manholes and accessories immediately upon delivery to ensure that no damaged or unsatisfactory materials are allowed on the job.

PART 2 - PRODUCTS

2.1 General: All products and materials shall be new. Used or reconditioned products and materials are not acceptable and shall be removed from the site. The Owner reserves the right to disallow any manufacturer or supplier that does not have a consistent, long-term record of quality control and successful product performance.

2.2 Precast Manholes: Materials and manufacture shall conform to ASTM C478. All manhole sections shall be wet-precast and furnished by the same manufacturer, unless otherwise

approved by the City Engineer. All manholes shall comply with Emerson Standard Manhole Details.

A. Riser Sections: 4, 5 or 6 feet in diameter as required, with reducer rings for base sections of diameter greater than 4 feet.

B. Top Sections: Eccentric cone top sections for manholes deeper than 5.5 feet; and flat slab tops for manholes 5.5 feet or less in depth. Flat slab tops to be reinforced concrete, designed for HS-20 traffic loading in accordance with ASTM C890, with eccentric manhole opening. Concentric cone top sections are not allowed.

C. Base Sections: 4, 5 or 6 feet in diameter as required by the Drawings. Provide monolithically cast wall and bottom slab for all new sewers. Minimum height of bases shall be 48-inches, unless special manholes are required. Use precast "dog-house" section with poured-in-place bottom for manholes on existing sewers.

D. Steps: Polypropylene plastic reinforced by a ½-inch diameter steel rod, ASTM A-615, Grade 60. Steps shall meet requirements of ASTM C478 and shall be installed by the manhole manufacturer.

E. Exterior Coating: Coal Tar Bitumastic Super Service Black by Kop-Coat, or equal approved by the City Engineer. Coating shall be field applied only.

2.3 Frames and Covers:

A. Standard: Equal to manhole frame and cover Model R-1736 or R-1777 by Neenah Foundry Co; USF 363 DS by U.S. Foundry & Mfg. Corp.; or V-1480-1 by East Jordan Iron Works, Inc. Provide mud ring. Provide solid cover concealed pick holes and "CITY OF EMERSON SANITARY SEWER" lettering (or “WATER” lettering if used for a water system appurtenance).

B. Vented Cover: Only if designated on the Drawings, identical to those provided for standard frames and covers, except that cover shall have six, equally spaced, drilled holes 1/2 inch in diameter. Lettering same as for Standard Frame and Cover.

C. Waterproof: Equal to Model R-1915-G2, Type P with bolted cover, by Neenah Foundry Company; USF 363 DS-BWT by U.S. Foundry & Mfg. Corp.; or V2480-1 by East Jordan Iron Works, Inc. Provide solid lid with four stainless steel bolts, 1/8 inch neoprene single-piece gasket, and lettering same as for Standard Frame and Cover.

D. Flat Slab Tops and Manholes in Unpaved Areas: Frame shall be precast in the top slab or manhole cone. Covers shall Standard, Vented or Waterproof, as designated on the Drawings and shall be identical to those specified elsewhere.

E. All manhole frames and covers for the project shall be furnished by a single manufacturer and shall not be delivered to site until submittals are approved by the City Engineer.

2.4 Joints:

A. Riser Section Joint Seals: Butyl rubber rope equal to Ram-Nek, ConSeal CS-30R, or Kent-Seal No. 2 joint sealer.

B. Riser Section External Seals: Flat butyl rubber sheet not less than 1/16" thick and 6" wide applied to the outside perimeter of the joint, Polywrap by RuVan Inc. or equal approved by the City Engineer.

C. Pipe-to-Manhole Connectors: Kor-N-Seal as manufactured by NPC Systems, Inc., or equal specifically approved by the City Engineer prior to shipment of manholes.

2.5 Grout: Embeco 167 Mortar, or equal non-shrink mortar specifically approved by the City Engineer.

PART 3 - EXECUTION

3.1 General:

A. Construct and set all manholes in accordance with the Drawings and the Standard Manhole Details.

B. Provide standard frames and covers unless otherwise noted on the Drawings or directed by the City Engineer.

C. Where no special instructions are provided on the Drawings or in the field by the City's representative, set the top of manholes as follows:

(1) Outside of roads, streets, or shoulders, set the top level and 24 inches above the existing or proposed grade of the surrounding landscape. Cast-in-place frames and covers shall be used for all manholes outside of paved areas.

(2) In roads, streets, road shoulders, sidewalks, and lawns, adjust the tops flush with the proposed finished surface. Maximum vertical adjustment shall be 9 inches. On sloped surfaces, adjust the top of manhole as an angle as necessary to conform to slope or gradient of the proposed or existing finished surface or pavement.

3.2 Preparation:

A. Excavate strictly in accordance with applicable OSHA regulations and requirements and maintain a safe work area at all times.

B. Do not install manholes in excavations containing water or on fluid soil. Prior to installation, de-water each excavation as necessary in accordance with Specification Section 02316 – Trenching, Backfilling and Compaction. Maintain a dry excavation until the manhole has been completely installed, tested, and backfilled.

C. Prepare an unyielding foundation of crushed stone, 12 inch minimum compacted thickness, as shown on the Drawings, prior to installation of base section.

3.3 Installation:

A. Align eccentric manhole openings longitudinally over the main sewer, unless otherwise directed by the City Engineer.

B. Set the bottom as near practical to the required grade to ensure that a properly grouted channel can be provided. Manholes must be vertical, no exceptions.

C. Whenever the difference in elevation between the inlet and outlet sewer inverts exceed 2 ft. an outside drop connection must be provided. Inside drops are not allowed.

D. Carefully assemble manhole sections and sewer entrance using gusseted joints installed in accordance with the manufacturer's recommendations to ensure a tight and permanent fit. Seal joints between sections with Ram-Nek, ConSeal CS-30R, or Kent-Seal No. 2 joint sealer. Do not use grout in horizontal manhole joints.

E. Using approved non-shrink epoxy grout, fill all lift holes, inside and out, whether or not the lift holes penetrate through manhole walls. Fill lift holes prior to manhole coating and backfilling.

F. Do not use grouting or caulking of any kind in the interior horizontal joints of manhole sections prior to vacuum testing and approval. Wipe grout in the interior horizontal joint only upon final manhole testing and approval.

G. If manhole step installation is required in the field, use approved epoxy grout.

H. After manhole testing, approval and acceptance, construct invert channels as shown on the Standard Detail Drawings for Manhole Inverts. Use 1:2 (cement:sand) mortar to provide smooth channel through pipe inlets to true line and grade as shown on the Drawings. Concrete blocks or bricks may be used for fill in deep base sections under mortar. Provide 3 inch minimum thickness of mortar over filler block or brick. Precast manhole inverts are not acceptable.

I. Provide precast concrete rings as required at top section to adjust to finished grade. Install with non-shrink grout. Adjustment using brick courses is not allowed unless specifically approved. Maximum height of adjustment shall be 9 inches.

3.4 Exterior Coating: Field coat exterior of manhole (including leveling rings and base of frame) with approved coal tar bitumastic coating in accordance with coating manufacturer's directions, 16 mil minimum thickness. If coating is brushed (rather than sprayed) take care to thoroughly coat all surface irregularities and joints. Fill lift holes prior to coating. Allow ample time for exterior coating to dry completely before leakage testing and backfilling. DO NOT APPLY COATING TO "GREEN", UNCURED CONCRETE. No other coating or wrapping materials or systems shall be used to seal the exterior of any manhole.

3.5 Backfilling: Backfill and compact around manholes in accordance with Specification Section 02316 – Trenching, Backfilling and Compaction.

A. Do not place permanent backfill until manhole leakage testing has been completed and approved.

B. Backfill with clean Native Material and compact as specified for pipe trenching at manhole excavations except those located fin existing pavement or areas to be paved.

C. For manholes located in existing or proposed streets or in other paved areas or areas to be paved, backfill with crusher run stone and compact as specified for pipe

trenching.

3.6 Inspection and Tests: All material and work shall be subject to inspection at any time. All inadequate, defective, or improper work or materials will be rejected and the Contractor will be required to replace or reconstruct the work.

A. Provide 48 hour notice prior to testing and conduct all tests in presence of the City's representative.

B. Prior to backfilling, conduct a vacuum leakage test on each completed sanitary sewer manhole in accordance with ASTM C1244. Place a vacuum of 10" Hg on the manhole as measured by an approved vacuum gauge. Maximum allowable vacuum loss shall be 1 inch Hg in 60 seconds for 4 ft. diameter manhole, 75 seconds for 5 ft. diameter manhole, or 90 seconds for 6 ft. diameter manhole.

C. Grouting repairs will be allowed on the exterior walls of the manhole only.

D. Manholes which fail any of the tests specified herein shall be repaired by a method approved in advance by the City Engineer, or replaced, and re-tested until acceptable results are obtained. Correct all visible leaks regardless of test results.

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 between1-1/2 and 3 inches until final acceptance.

END OF SECTION