

400. **SEWER REGULATIONS**

401. **General Information**

401.1 **Use of This Document:**

- A. This document is subject to periodic revision to meet changing requirements for materials, environmental regulations, etc. At the beginning of a project the user should verify that he has the latest edition.
- B. This document is intended to convey the general design and construction requirements for a typical project. It also lists specific City of Emerson requirements relating to plan review, inspection, testing and acceptance of facilities. It is not intended as a substitute for site-specific engineering and construction techniques.

401.2 **Connection To Existing Sewers:**

- A. Except as provided below, all future buildings within the city's corporate limits which are to be utilized for occupancy or any other use such as commercial or industrial purposes which requires sanitary sewerage facilities shall be connected to the public sewer system. Cost of constructing the necessary facilities for connection to public sewers shall be at the expense of the developer.
- B. Waiver of the requirement to connect to public sewers will be considered on a case-by-case basis for non-subdivided, single-lot buildings when the nearest connection point to a public sewer is more than 200 feet from the property line, when such buildings are to be used for single-family dwelling or some other use where the wastewater loading is no more than that of a single-family dwelling.
- C. The City maintains the option of requiring developers of individual lots to construct main line extensions of up to 200 feet to avoid cutting pavement on existing streets for connection to the public sewer.

401.3 **Definition of Sewer Line Terminology:**

- A. "Building Sewers" or "Service Laterals" are defined as those pipes used to convey wastewater from the building or portions of a building to a main sewer. The minimum diameter for a service lateral is 4 inches. These sewers are privately funded and owned.
- B. "Main Sewers" are located in streets or dedicated easements. They are

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gravity piping systems used to collect sewage from one or more service laterals to other main sewers. Main sewers are a minimum of eight (8) inches in diameter and may extend beyond the property boundaries of a development. Funding of main sewers is by the developer.

- C. "Force Main Sewers" are pressure piping systems which convey sewage from a pump station to a main sewer. These sewers are constructed of ductile iron pipe and have a minimum diameter of four (4) inches. Funding of force mains is by the developer.

**401.4 When Public Sewers Are Not Available:**

- A. If sewers are not available within 200 feet of the property line the options available are:
1. Do not develop.
  2. Install septic tanks or other on-site treatment system.
  3. Extend city sewers to the area.

**402. Plans, Specifications and Submittals**

- 402.1 **General:** All projects which involve construction of Main Sewers and/or Force Mains and Pumping Facilities shall have detailed construction plans and specifications prepared by a Registered Professional Engineer or Licensed Surveyor licensed in the State of Georgia. Developments which only involve Building Sewers may have plans and specifications prepared by the project Architect.
- 402.2 **Preliminary Review:** Preliminary plans will be prepared and submitted for review as described elsewhere in the development regulations. Questions relating to availability of sewers and proposed location of connection should be resolved at this stage before proceeding with final planning. A submittal for preliminary review must include all land to be developed although the land is to be developed in several phases or units. Availability determinations will be made only for the phases of the project proposed for current construction. Availability determinations will be valid for a period of one year from the date of project approval. The Developer must submit any data required for accurately projecting sewer flow quantities and rates. The Developer is also responsible for furnishing any other information deemed necessary for evaluating service feasibility.
- 402.3 **Sewer Construction Plans:** All plans for public sewer facilities shall be prepared in accordance with the requirements outlined herein and as required in regulations promulgated by the Georgia Environmental Protection Division. The developer shall be responsible for submitting

plans and other data to the Georgia EPD for required approvals. Projects involving sewers greater than 36 inches in diameter or pump stations with capacity of 700 gallons per minute and greater must be submitted to EPD for required approvals. The following requirements will apply to preparation of sewer construction plans:

- A. The site plan shall show land lots, district and north arrow, lot layout, and existing and proposed building locations. The site plan shall also show all existing and proposed streets and their names, all streams, water courses, existing and proposed storm drains, and the discharge points for all drainage structures. The site plan shall accurately show the topography with contour lines at two-foot intervals. Elevations shall be referenced to Mean Sea Level and plans shall note the location of the specific USGS Vertical Elevation Marker used for deriving site elevations. The site plan shall show the sewer layout with existing and proposed lines, manhole numbers, line designation and direction of flow, and proposed sewer easements and other utility easements. It shall also show the location of proposed services.
  
- B. The design of cross-country sewer lines and force mains shall be based on field-run surveys. The site plan for cross-country sewer lines and force mains need not show contour intervals on the plan view, but the profile views shall accurately depict ground level elevations and elevations of all relevant structures. Site plans for lift stations shall show existing and proposed contours. In the event the subdivision is developed in phases, the final construction plans for sewers may be submitted in phases or units. However, at the time the first phase is submitted, the engineer will submit one copy of the preliminary layout of the entire sewer system. This layout will show all lines required to serve any lots to be developed and any surrounding property that may be served through the property. The site plans for each phase or unit shall contain a location drawing showing the relationship of the phase or unit to the total project and to the surrounding streets and sewers.
  
- C. Profiles should have a horizontal scale of not more than 100 feet to the inch for cross-country lines and 50 feet to the inch for congested areas, and a vertical scale of not more than 10 feet to the inch. The plan view should be drawn to a corresponding horizontal scale. The plan view should normally be shown on the same sheet as the profile. In any case both the plan and profile view should have line designations, station numbers, manhole numbers and any other indexing necessary to easily correlate the plan and profile view.

Plans and profiles shall show:

1. Location of streets, sewers and utility easements.
2. Profile of ground surface, the grade of the sewer between each two adjacent manholes, size and material of pipe, length between manholes, invert of sewer in and out of each manhole, and ground surface elevation at each manhole. All manholes shall be numbered on the plan and correspondingly numbered on the profile and station numbers will be shown for each manhole. The profile of adjacent parallel stream beds and of adjacent lake surfaces, low buildings, and lots shall be shown on the profile.
3. Locations of all special features such as connection to existing sewers, concrete encasements, collar walls, ductile iron pipe sections, elevated sewers, piers, special manhole covers such as vented outfall covers or sealed covers, etc.
4. All known existing structures both above and below ground which might interfere with the proposed construction, particularly water mains, gas mains, storm drains, utility conduits, etc.
5. The vertical datum used shall be the elevation above mean sea level with benchmarks shown on the plans.

**402.4 Erosion And Sedimentation Control Plan:**

- A. The Georgia Soil and Water Conservation Commission has taken provisions of ACT 599 and published a **MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA**, 1992 Edition (or any more current edition as they are published). Sewer construction plans and specifications shall include appropriate segments of this manual. Developers, Engineers and Contractors performing work in the City of Emerson are responsible for acquiring a copy of this manual and using the best practical methods contained therein to control the erosion and sedimentation of the construction site in conformance with the intent of ACT 599.

Copies may be purchased from the Georgia Soil And Water Conservation Commission, P.O. Box 8024, Athens, Georgia 30603. For additional information, call the Commission at 706-542-3065.

- B. Plan: An erosion and sediment control plan, meeting the requirements of applicable state regulations, shall be provided as part of the overall construction drawings.

#### 402.5 **Detail Drawings:**

- A. Sewer Details: Special detail drawings made to a scale to clearly show the nature of the design shall be furnished to show the following particulars:

1. All stream crossings and storm drain outlets with elevations of the stream bed and of normal and extreme high and low water levels.
2. Details of special sewer joints and cross sections.
3. Details of special sewer appurtenances such as manholes, service connections, elevated sewers, piers, pipe bedding, special highway crossings, railroad crossings, etc.

- B. Erosion Control Details: Erosion Control Details and Symbols may be taken directly from the **Manual For Erosion and Sediment Control In Georgia**, 1992 referenced above.

402.6 **As-Built Drawings:** At the completion of construction (and preferably prior to the final field inspection), “As-Built” drawings of the project shall be submitted to the city to serve as a permanent record of the project and shall be furnished in the form of one set of mylar sepias (or other suitable form of reproducible drawings) and two sets of blue line copies. Acceptance by the city will be made only after satisfactory as-built drawings have been submitted. As-built drawings will be in the same format as the original construction plans and normally will be an updated version of the construction plans. As-built drawing shall be prepared by the project design professional. Each sheet of these drawings shall bear words “As-Built” or “Record Drawings”.

Guidelines for preparation of As-Built:

1. As-Built drawings will be same format as the original construction

- plans.
2. Contour lines are required.
  3. Road names and lot numbers should be on plan.
  4. "As-Built" or "Record Drawing" is to be stamped in large clear print on plans.
  5. Sheet should be no larger than 24" X 36".
  6. Lateral locations must show distance from the downstream manhole. Ends of lateral lines must show distance from downstream manhole and offset distance from the main line. Approximate depth of end of lateral must be indicated.
  7. Show elevations of manhole inverts and tops.
  8. Show field-measured distance between manholes.
  9. For any lines which are outside paved streets, show the field-measured azimuth or bearing of the line from manhole to manhole.
  10. Show actual slope of pipe.
  11. When a phase of a subdivision is completed, a location sketch of entire subdivision with said phase outlined shall appear on plans.
  12. Maximum error of as-built measurements shall be:
    - a. Manhole inverts: measure to 0.10' with maximum vertical error of 0.15' per 1,000 feet of horizontal traverse.
    - b. Manhole tops: measure to 0.10' with maximum vertical error of 0.50' per 1,000 feet of horizontal traverse.
    - c. Horizontal Locations: Measure to nearest 1.0' with allowable error of 1.0' per 1,000' of traverse.

#### 402.7 Easement Acquisition And Utility Encroachment Permits:

- A. It shall be the responsibility of the developer to obtain any off-site easements required to connect the project to existing public sewers. Easements will be conveyed to the City of Emerson for all facilities which are to be conveyed to the city. This process must be started early enough to allow construction of the sewer before any building construction is to begin. No building permits or sewer tap applications can be issued until off-site sewers have been constructed and accepted. This condition shall override any provision for speed up of house starts such as furnishing a bond to guarantee completion of the streets and other appurtenances.
- B. All easements shall allow adequate room to construct the sewer and appurtenances. Permanent easements shall be a minimum of 20 feet wide, 10 feet on each side of the line; except that when the depth of the sewer exceeds 10 feet the required sewer easement width shall increase such that the easement width is at least twice the depth from the ground surface to bottom of the pipe. Designs

involving utilities sharing a common easement will be coordinated with the utilities to insure adequate separation of utilities and overall easement width is achieved.

- C. Easement drawings for work outside the development shall be furnished and recorded prior to approval of the sewer plans. The drawings shall be of a size suitable for legal recording and shall be prepared by a Registered Land Surveyor. The drawing will show property lines, the name of property owners with the length of line encroaching on each property owner, size of line, line designation, manhole numbers and stations, width of permanent and construction easement, scale of drawing, north arrow, land lot and district numbers, and a tie to the nearest land lot corner. Any streets or other existing easements shall also be shown.

The title block shall be shown as follows:

City of Emerson  
NAME OF OUTFALL OR SUBDIVISION  
EASEMENT FOR PROPOSED  
SANITARY SEWER  
CROSSING PROPERTY OF

John Doe

LL: District: Section: Date: Revised Date:

- D. The engineer shall furnish appropriate drawings for submittal to the of any state or federal highways, railroads, power lines, water lines, gas lines, petroleum lines, or any other utility lines on which the sewer construction will encroach. The drawing shall normally be 8-1/2" X 11" or 8-1/2" X 14" and shall show a plan view and profile view. The drawing will show the same information required for easement drawings. Also, the drawing will show the right-of-way of the existing street or utility, the owner's designation of the line, the name or number of the nearest intersection or mile-post or tower number and the distance to that appurtenance. The clearance distance between the street surface, or the bottom of the rail, or the utility and the sewer will be shown. The drawing will show the type of material to be used for the sewer and the method of construction to be used. The drawing will also contain any other special information required by the controlling authority of the facility on which the sewer is encroaching. A minimum of five copies of the utility encroachment drawing will be furnished with the plans when they are submitted for approval. The engineer is also responsible for furnishing a completed encroachment permit application ready for signature by Department Superintendent. Construction permits

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will not be issued until the utility encroachment permit has been obtained and until any special conditions such as insurance requirements have been complied with.

403. **Design Criteria And Materials For Sewers**

- 403.1 **General:** The criteria listed herein is not intended to cover all aspects of design, but rather to mention the basic guidelines and those particulars that are required by the City of Emerson Water Department. For more detailed criteria, the reader should refer to standard references such as “Ten States Standards”, Georgia EPD rules, Water Pollution Environment Federation Manual of Practice NO. FD-5, and other available literature.
- 403.2 **Types of Sewers:** All sewers for the conveyance of wastewater shall be designed as separate sanitary sewers in which groundwater, stormwater or other runoff from roofs, streets, parking lots, foundation drains and any source other than wastewater are excluded. Overflows from sewers shall not be permitted.
- 403.3 **Design Period:** Gravity sewer pipelines should, as a minimum, be designed with capacity sufficient to handle the estimated tributary population. Tributary population is considered to be all areas upstream of the discharge point of the system being designed as well as any anticipated pumped flow from other basins. Sewers will be designed and installed to the uppermost property line of the development being served. Consideration should be given to the maximum anticipated capacity of institutions, industrial parks, etc.
- 403.4 **Capacity And Size Determinations:** In determining the required capacities of sanitary sewers, the following factors should be considered:
1. Maximum hourly sewage flow.
  2. Additional maximum sewage or waste flow from industrial plants.
  3. Ground water infiltration.
  4. Topography of the area.
  5. Depth of excavation.

New sewer systems shall be designed on the basis of an average daily flow of sewage of not less than 400 gallons per household per day. Normally, all sewers shall be designed for a peak flow of not less than 2-1/2 times the average flow; this peak factor will be higher for smaller basins (see design guides). Sewers should be designed to carry the peak flow when flowing at a depth of 2/3 pipe diameter. The city land use plan should be consulted and special consideration given to commercial and industrial areas. Where developers are installing major trunk lines or interceptor sewers, the city’s long range plan should be consulted as a guide and the

sewer should as a minimum be of the size called for in the long range plan.

If proposed land use conditions have changed subsequent to the plan, these changes should be factored into the determination.

**403.5 Special City Requirements:**

- A. Distance Between Manholes: Maximum distance between manholes shall be 400 feet.
- B. Depth: Any sewers installed in the street shall, topography permitting, be sufficiently deep to provide 5 feet of cover over service laterals at the street right-of-way, and over any part of the main or service within the street right-of-way. The maximum depth for PVC pipe shall be 15 feet, depths in excess of this shall be ductile iron. Sewers installed in streets shall have maximum depth of 12 feet. Any sewers on off street easements shall have a minimum of three feet of cover unless ductile iron pipe is used. Filling over the pipe to obtain minimum cover is not allowed.
- C. Drop Across Manholes: All manholes shall be provided with, a minimum vertical drop across the manhole (between in and out pipes) of 0.10 feet.
- D. Detection tape shall be installed over all sewer pipe. Bury tape 18 to 24 inches below grade. Use detection wire on all service laterals.

**403.6 Slope:** All sewers shall be so designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second based on Manning’s formula using an “n” value of 0.013. The following are the minimum slopes which should be provided; however, slopes greater than these are desirable:

Minimum Slope in Feet	
<u>Sewer Size</u>	<u>Per 100 Feet</u>
8”	0.40
10”	0.29
12”	0.22
14”	0.17
15”	0.15
16”	0.14
18”	0.12
21”	0.10
24”	0.08

These minimum slopes will be used only when sufficient flows are expected to maintain a velocity of 2.0 feet per second and maintain a

cleaning action in the line. Sewers shall be laid with uniform slope between manholes. Sewers on 20 percent slope or greater shall be ductile iron pipe and shall be anchored securely with concrete anchors (See Standard Details) to prevent displacement by erosion or shock. Maximum slope of sewers shall be 30 percent and sewers shall be designed at less than 20 percent whenever possible.

**403.7 Increasing Size:** When a small sewer is connected to a large one, the connection shall not be lower than matching the top of both sewers to the same elevation.

**403.8 Gravity Sewer Pipe Materials:** The city reserves the right to disallow any Manufacturer that does not have a consistent, long-term record of quality control and successful product performance. Gravity sanitary sewer pipe up through 15-inch diameter will normally be Polyvinyl Chloride (PVC), solid wall type SDR 35 thickness meeting ASTM D3034. Ductile Iron Pipe (DIP) will be used where certain conditions exist (see discussion of D.I.P.). For 18-inch diameter pipe and above, the Contractor may have the option of using either Polyvinyl Chloride (P.V.C.), Reinforced Concrete Pipe (R.C.P.), or Ductile Iron Pipe. The city may approve other types of pipe on a case by case basis and may limit the options of type of pipe depending on site conditions. This should be addressed at the preliminary review stage.

Bedding for sewer pipe shall be as follows (also see city standard details): For PVC the minimum bedding shall be #57 or #89 crushed stone a minimum of 6 inches below bottom of pipe extending up to 6 inches above top of pipe for the full width of the trench.

For Concrete and Ductile Iron pipe the minimum bedding shall be #57 or #89 crushed stone a minimum of 6 inches below bottom of pipe extending up to the top of pipe. In wet areas, the minimum bedding requirements will be increased as required to ensure a stable support under the pipe and on the sides of the pipe.

**A. Ductile Iron Pipe (DIP):**

1. **Scope:** Ductile iron sewer pipe shall be required at all utility crossings with less than 2 foot of clearance, in locations where cover is less than 3 feet, at stream crossings, where slopes exceed 20 percent, and where cover exceeds 15 feet. Ductile Iron Pipe shall be designed in accordance with ANSI Specification A21.50 - 81. The thickness and class of the pipe shall be governed by ANSI Specification A21.50-81, but shall be no less than class 50 thickness. Pipe shall be manufactured in accordance with ANSI Specification A21.51 - 81 latest

revision. Pipe shall be coal tar epoxy lined and seal coated with approved bituminous seal coat in accordance with AWWA C151, latest revision. Coal tar epoxy lining shall adhere to the following specifications.

2. Joints: DIP joints shall be of the bell and spigot type with push-on joints, conforming to ANSI Specification A21.11 or mechanical joints.

B. Polyvinyl Chloride (PVC) Sewer Pipe:

1. Scope: The Contractor shall provide unplasticized polyvinyl chloride (PVC) plastic gravity sewer pipe meeting the requirements of ASTM D3034 (Latest Revision) in the sizes shown unless otherwise indicated on the contract documents.
2. Materials: Pipe and fittings shall meet the requirements as specified under ASTM D3034 (Latest Revision) for pipe through 15” and ASTM F679 for pipe 18” through 27”. All pipe and fittings shall be suitable for use as a gravity sewer conduit. Bell joints shall consist of an integral wall section with elastomeric gasket joint which provides a watertight seal. The pipe shall be capable of passing all tests which are detailed in this specification. Minimum wall thickness shall be SDR 35.
3. Fittings: All fittings and accessories shall be manufactured and furnished by the pipe supplier. They shall have bell and/or spigot configurations compatible with that of the pipe and shall have an equivalent wall thickness.
4. Pipe and Fittings Tests: Before shipping any pipe, the Manufacturer shall submit shop drawings to the City and shall furnish written certification that all pipe through 15” meets ASTM Specification D3034 and that pipe 18” through 24” meets ASTM F679. The City reserves the right to require additional laboratory testing at the Developer’s expense to verify minimum quality standards are being met.
6. Pipe Stiffness: Minimum “pipe stiffness” (F/Y) at 5 percent deflection shall be 46 psi for all sizes, when tested in accordance with ASTM Standard Method of Test D2412 (Latest Edition), to determine the “External Loading Properties

of Plastic Pipe by Parallel-Plate Loading”. There shall be no evidence of splitting, cracking, or breaking at a deflection of up to 30 percent of the original diameter.

6. Fusion Quality: There shall be no evidence of flaking, swelling, or disintegration when the pipe material is tested in accordance with ASTM D2152, “Quality of Extruded Poly (Vinyl Chloride) pipe by Acetone Immersion”.
7. Joint Tightness: Pipe and fitting joints shall comply with ASTM D3212 (Latest Edition) for “Joints for drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals”. Joint assemblies shall not leak when subjected to both an internal and external hydrostatic test at equivalent pressures of 10.8 psi gauge for a period of one hour. Pipes shall be tested in straight alignment, axially deflected position, and by shear load test as otherwise defined in Paragraphs 7.2, 7.3, and 7.4 of ASTM D3212.
8. Installation: PVC pipe will be installed in accordance with ASTM D2321 (Latest Revision). Initial backfill shall be compacted to the densities outlined in D2321. The City may require random compaction tests at the Developer’s expense to insure compliance with D2321.
9. Deflection Limit: Vertical deflection of installed pipe shall not exceed 5 percent of the un-deflected diameter as defined in ASTM D3034. Upon completion of the pipe laying the pipe will be tested for conditional acceptance. The test shall be performed by the Contractor pulling a mandrel of specified dimensions through the pipeline.

C. Reinforced Concrete Pipe (R.C.P.):

1. General: The use of reinforced concrete pipe for sewers will be subject to approval on a case-by-case basis depending upon size of the sewer and site conditions. When approved for use, concrete gravity sewer pipe shall meet all materials and testing requirements of ASTM C-76, ASTM C-443, and ASTM C-497 (except where modified herein).
2. Quality Assurance: The Contractor must submit to the Owner and Engineer the concrete pipe manufacturer’s evidence of a working Quality Control Program for approval, prior to any pipe being manufactured. The program and standards of

manufacturing must be established and well defined. The program must include the minimum following requirements:

- a. A full time Quality Control Technician.
  - b. A complete and working Quality Control Laboratory capable of testing and recording the requirements set forth in these Specifications for concrete pipe.
  - c. A zero defect program for daily material testing and finished product testing to assure quality control as the pipe is being manufactured and shipped for this particular project.
3. Guarantee: The Contractor shall provide a guarantee against defective materials and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these specifications.
4. Material:
- a. All concrete pipe and fittings 12 inches in diameter and larger shall be reinforced concrete sewer pipe conforming to the latest requirements of ASTM C-76 with the following modifications: All concrete pipe with 0-20 feet of fill shall be a minimum of Class III with 4500 psi concrete. All pipe with 20-30 feet of fill shall be Class IV with 4500 psi concrete. All pipe with 30 feet of fill and over shall be Class V with 5500 psi concrete.
  - b. Pipe shall have circumferential reinforcement as required for the particular class of pipe furnished. The bell and spigot of the joint shall contain circumferential and longitudinal reinforcement. Reinforced concrete pipe shall be centrifugally cast or vibrated, horizontally or vertically cast or made on a Packerhead machine and shall be furnished in lengths not more than 20 feet and not less than 8 feet, except where short lengths are required for construction conditions. Reinforced concrete pipe shall have bell and spigot joints suitable for the use of a rubber gasket to be provided as a part of this item.
  - c. Concrete pipe for sanitary sewers shall have bell and spigot joints consisting of self-centering steel joint rings securely attached to the pipe reinforcing steel. The steel joint rings shall be suitable for use with a rubber O-ring type gasket to be provided as part of this item.

- d. Bell and spigot joints consisting of self-centering steel joint rings shall have the joint rings securely attached to the pipe reinforcing steel. The rings which form the joint shall be made so that they will join with a close, sliding fit. The joint surfaces shall be such that the rubber gasket shall be confined on all sides and shall not support the weight of the pipe. The spigot ring shall have an external groove accurately sized to receive the gasket. Special section steel for spigot rings shall conform to ASTM A-283, Grade A, or ASTM A-306, Grade 50. The bell ring shall be flared to permit gradual deformation of the gasket when the joint is assembled. Minimum thickness of bell rings shall be 3/16 inch. Bell rings 1/4 inch or thicker shall conform to ASTM A-283, Grade A, or ASTM A-306, Grade 50. Bells less than 1/4 inch thick shall conform to ASTM A-570, Grade A. Each ring shall be precisely sized by expansion beyond the elastic limit of the steel and then gauged on an accurate template. All exposed surfaces of both rings shall be protected by a corrosion-resistant coating of zinc applied by an approved metalizing process after proper cleaning.

5. Lining:

The coal tar epoxy system shall be Koppers 300 M, Porter Tarsol, Wise Chem CTE 200, Amercoat 78, Protecto 101 or equal.

The interior concrete or mortar surfaces of pipe and fittings are to be sandblasted and painted with one coat of a high-build, coal tar epoxy system or two coats of a standard coal tar epoxy system. The dry film thickness of the total system shall be 16 mils minimum on concrete or mortar surfaces and on steel joint ring surfaces.

Sandblasting shall result in a clean dry surface free of oil, grease, or other contaminants. Any air pockets over 1/4 inch in diameter and 1/8 inch deep appearing on the concrete surface after sandblasting will be filled with an epoxy sand patching material such as those sold by Sherwin-Williams, Glidden, or Moran. The epoxy sand patch should be troweled prior to the application of the coal tar epoxy.

Any steel surfaces to be painted should be sandblasted, solvent cleaned, or wire brushed prior to painting.

Application of the coal tar epoxy shall be by brush, roller, or spray system using equipment recommended by the manufacturer of the coal tar epoxy system. The temperature during application and curing of coal tar epoxy shall be as recommended by the manufacturer of the coal tar epoxy. Time between coats (if applicable) shall be as recommended by the manufacturer of the coal tar epoxy.

If the inside joint recess will be mortared and painted with coal tar epoxy in the field, the pipe supplier shall not paint the inside vertical surfaces at the ends of the pipe. When the inside joints will not be mortared in the field, the pipe supplier shall paint the inside vertical concrete or mortar surfaces at each end of the pipe.

The paint shall be extended continuously over the front lip of the steel spigot ring and a minimum of 2 inches onto the sealing surface of unrestrained bell rings so that all interior joint surfaces which can be exposed to the fluid inside the pipe are coated.

#### 403.9 Precast Concrete Manholes:

- A. Manholes: Sewer manholes shall consist of precast reinforced concrete sections with eccentric top section, or flat slab for shallow manholes, and a base section conforming to the typical manhole details as shown on the Standard Detail Drawings. Flat top manholes will be approved only if a need for such can be demonstrated by the design engineer.
- B. Manhole Sections: Precast manhole sections shall be manufactured, tested, and marked in accordance with the latest provisions of ASTM Standard Specifications, Serial Designation C 478.
- C. Manhole Section Joints: Joints of the manhole sections shall be of the tongue-and-groove type with the inside tongue in the up position, sections shall be joined using a double strand seal of butyl mastic sealant (Kent Seal, Ram-Nech or equal). The inside and outside of all joints, lift holes and any bricks or precast adjusting rings shall be covered with non-shrink grout.
- D. Lift Holes: Each section of the precast manhole shall have not more than two holes for the purpose of handling and laying. These holes shall be sealed before backfilling using either rubber plugs specially designed for this purpose or with quick-setting cement mortar.
- E. Manhole Steps: Manhole steps conforming to the applicable provisions of ASTM Specification C 478, latest edition, shall be of

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#4 steel reinforcing bars covered with Polypropylene Plastic or rubber and shall be supplied with depth rings and other necessary appurtenances. See the Standard Details for a typical manhole step detail.

- F. Pipe Holes: Holes in precast bases to receive sewer pipe shall be precast at the factory at the required locations and heights. Knocking out of holes in the field will not be permitted on new construction; however, holes can be cored in the field with a coring machine. All manholes shall have Kor-N-Seal by Press Seal Gasket Corporation (or equal) rubber boots for all pipe entries/exits.
- G. Inverts: Manhole inverts shall be constructed of either concrete or brick in accordance with details on Standard Detail Drawings and the invert (flow channel) shall have the same cross-section as the sewers which it connects. The manhole bench and invert shall be carefully formed to the required size and grade by gradual and even changes in direction. Changes in direction of flow through the invert shall be made to a true curve with as large a radius as the size of the manhole will permit. Inverts shall have a “smooth trowel” finish. The manhole bench shall be sloped 30° from the manhole wall toward the invert.
- H. Manhole Foundation: The manhole base shall be set upon a 12-inch minimum thickness compacted mat of Size #57 crushed stone graded level. In wet areas the crushed stone mat shall be thickened as needed to provide a non-yielding foundation.
- I. Brick: Brickwork required to complete the precast concrete manhole shall be constructed using 1 part portland cement to 2 parts clean sand, meeting ASTM Specifications, Serial Designation C 144, thoroughly mixed to a workable plastic mixture. Brickwork shall be constructed in a neat and workmanlike manner. Nonshrink grout shall be used to grout interior and exterior exposed brick joints and faces. No more than 3 courses of brick with 9 inch maximum total depth of bricks may be used to adjust manhole covers.
- J. Frame and Cover: The cast iron frame for the manhole cover shall be set at the required elevation and thoroughly anchored to the masonry in a bed of mortar. Frames and covers shall be City of Emerson standard casting design by Vulcan Foundry, Standard Model V1327-1-CWD (see standard drawings). Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted, if necessary, to conform to the exact slope, crown and grade of the existing adjacent pavement. In areas where manhole tops may be submerged by street runoff or high flood waters, the manhole lid shall be water-tight by Vulcan Foundry, water-tight Model V2327-1-CWD.

- K. **Masonry Work:** Masonry work shall be allowed to set for a period of not less than 24 hours before being placed under traffic or in operation. All loose or waste material shall be removed from the interior of the manhole.
- L. **Location:** Manholes shall be installed at the end of each line; all changes in grade, size, or alignment; at all intersections; and at distances normally not greater than 400 feet. Cleanouts may be used only for special conditions and shall not be substituted for manholes nor installed at the ends of laterals greater than 150 feet in length. Manholes in cross-country areas shall be elevated so that the top is 24 inches above ground.
- m. **Drop Manholes:** A drop pipe shall be provided for a sewer entering a manhole at an elevation of more than 3.0 foot above the manhole invert. The drop pipe shall be of PVC materials with ductile iron mechanical joint fittings. All outside 90° elbows shall have concrete support blocking poured below the elbow to rest on stable undisturbed earth. Outside Drop Manhole will be noted on the construction plans at any time the drop exceeds 3.0 foot. Where the difference in elevation between the incoming sewer and the manhole invert is less than 3.0 foot, the invert shall be sloped from invert to invert to prevent solids deposition. Areas around the pipe will be backfilled with #57 or #89 crushed stone.

- 403.10 **Casings:** Steel casing pipe shall be used where boring and jacking of more than 20 feet in length is required for installation.

Steel casing pipe shall be Standard Class thickness with a minimum yield strength of 35,000 psi and shall conform to the requirements of ASTM A139. It shall be fully coated on the exterior and interior with a coal tar coating. The casing pipe diameter shall be six to eight inches greater than the “bell” diameter of the carrier pipe.

Wherever steel casing is required, the carrier pipe shall be ductile iron pipe with push-on joints or PVC. Approved spacers made of stainless steel straps with nylon skids shall be used to center the carrier pipe; two spacers per section of pipe will be used.

- 403.11 **Wastewater Lift Stations:**

1. **Lift stations serving two or more buildings.** All wastewater lift stations installed in the city which serve two or more buildings shall be designed and constructed in strict conformity to the city standards defined below. Engineering plans shall be prepared for all wastewater lift stations, and such plans shall be approved by the City prior to construction. Following the construction and acceptance by the city of a wastewater lift station, title to the lift station shall be conveyed to the city.

2. **Lift stations serving a single building.** *Unless otherwise approved by the City of Emerson, all wastewater lift stations serving a single building shall be owned, operated and maintained by the building owner.*

The following minimum requirements apply to wastewater lift stations:

A. General:

1. Minimum pump size for pump stations shall be 150 gpm with 10 hp motors. Lift stations shall utilize two submersible centrifugal pumps each having a capacity equal to the design flow. Provide a spare pump of identical capacity.
2. Lift stations having a capacity of 500 gpm or more shall be reviewed on an individual basis and may have requirements differing from those outlined herein.
3. Force mains shall be sized to provide a velocity of at least 2 feet per second.
4. The design shall allow for easy removal of any pump or equipment item without the need of shut-down of the entire lift station.
5. The design engineer should consult the City Water Department after preliminary design data has been developed for information on approved pump Manufacturers. The City reserves the right to review each application on an individual basis and to reject the use of non-approved manufacturers or designs.

B. Submittals:

1. Submittal of construction plans shall include the following lift station information:
  - ✓ Capacity calculations. Use 1 gpm capacity per house on residential developments of less than 200 units, except that the minimum pump capacity shall be 150 gpm.
  - ✓ System head calculations; tabulated and plotted on the pump curve. Include a plot of force main velocity.
  - ✓ Standard drawings, details and specifications sufficient to ascertain compliance with these regulations.

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- ✓ Cycle time. Calculations showing determination of wet well volume and cycle time at design conditions. Wet well volume should be sufficient to provide a cycle time of no less than 5 minutes from a pump “on” to the next pump “on” time.
  - ✓ Storage Volume. Calculations showing volume of storage available in the event of a power outage. The storage zone shall be delineated on plan and profile drawings of the sewer system. (See subsection “Standby Power” below.)
  - ✓ Construction drawings and specifications in sufficient detail to ascertain compliance with these regulations.
  - ✓ Buoyancy computations showing that structures are protected against flotation.
2. Shop Drawings. After construction plan approval but before purchasing any lift station equipment, shop drawings shall be submitted including the following information:
    - ✓ Manufacturer’s catalog sheets, performance curves, installation drawings, specifications and list of options for the specific pump that is offered for approval.
    - ✓ Similar catalog data for controls, valves, hatches, yard hydrants, precast wet well and other manufactured items.
  3. Certification. After installation and before placing the system into full operation, the work must be inspected by the Developer’s Engineer who must then issue a certification to the City verifying that all work has been done in accordance with approved plans. After acceptance of the work by the City, a factory representative shall inspect and start up the system certifying rotation, capacity, amperage draw, lack of vibration and other standard check points. This certification shall state the beginning date of the warranty and include a copy of the warranty. The Factory Representative shall provide a minimum of 4 hours training.
  4. O & M Manuals. On or before the date of start-up, five sets of factory O & M Manuals shall be delivered to the City. These shall include the name of the purchaser, the serial numbers of pumps, detailed wiring schematics, telephone number and address for purchase of parts.
  5. After construction is complete as-built drawings shall be furnished including 1 set of mylar sepias plus 2 sets of prints.

C. Spare Parts

1. Lift stations shall be supplied with a spare complete pump plus a complete set of manufacturer's recommended spare parts.

D. Standby Power

1. The minimum requirement for standby power for lift stations shall be that each station have a permanent in-place generator and shall have an automatic transfer switch.
2. Emergency standby power will be supplied by an on-site emergency generator. The generator shall be diesel powered with an automatic transfer switch and provisions for an automatic exercise cycle.

E. Site Requirements:

1. Flooding. Lift stations shall remain fully operational and accessible during the 25-year flood. All electrical controls shall be above the 100-year flood level. All motors and mechanical equipment shall be protected against physical damage from the 100-year flood.
2. Access Road. Access roads shall be paved with a 12-foot wide surface of either concrete (4" thick with wire mesh) or asphalt (6" Graded Aggregate Base plus 2" Type E asphalt). Maximum grade shall be 20%.
3. Ownership. Both the lift station site and the access road right-of-way shall have ownership dedicated to the City, and this shall be indicated on the subdivision plat. The dedicated space for the lift station shall include sufficient space for parking of two trucks, plus turn-around, plus slope maintenance. The dedicated width on road right-of-way shall be 30 feet minimum.
4. Fencing. Lift station sites shall be fenced with a minimum of 6 foot high chain link fencing topped with 3 strands of barbed wire. Access gates shall be a minimum of 15 feet in width. The space inside the fencing shall be large enough to facilitate service vehicle access to the pumping station wet well and other facilities. A paved turn around area shall be provided whenever the access road length exceeds 200 feet or when the road grade exceeds 10 percent.
5. Water Supply. A metered water supply line (3/4" minimum size) shall be installed to the site, and a freeze-proof yard hydrant located near the wet well. The hydrant shall be equipped with a suitable backflow preventer.

6. Lighting. One pole-mounted, photo cell controlled, 150 watt mercury vapor security light shall be installed. It shall be equipped with a manual on/off switch (located in the main control panel) to override the photo cell control.
7. Screening. Where natural screening is not present to screen the site from view of residences, special plantings shall be installed to screen the site.
8. Ground Covers. All unpaved ground areas inside the fence and extending 4 feet beyond the fence shall be treated with a herbicide and covered with a geotextile fabric, followed with a 4-inch thick layer of no. 57 stone. The geotextile fabric shall be a non-woven polypropylene weighing 8 oz./S.Y. with a minimum burst strength of 250 psi, such as Amoco type 4553 or equal.

F. Design Features:

1. Wet Well Volume. The wet well volume shall be sized to limit pump cycles to no more than 4 cycles per hour under worst conditions.
2. Ventilation. For wet wells, the minimum requirement shall be a single 6 inch vent with stainless steel mesh screen designed for natural ventilation. Where conditions are conducive to formation of hazardous conditions (in the design engineer's opinion) then mechanical ventilation shall be provided. For dry wells, mechanical ventilation shall be required.
3. Structures. Submersible lift stations shall have a wet well structure and a separate valve pit. Both structures shall be precast concrete with a monolithic base. The valve pit shall be a minimum of 4' X 4' X 5' deep with manhole steps, and provided with a floor drain pipe, and a 3' X 3' lockable aluminum access hatch. Wet wells may be either round or rectangular and shall have a diameter or width of at least 4 feet. Wet wells shall be sized to meet cycle time requirements with a drawdown (i.e. the distance between high water level and low water level) of not more than 3.0 feet. The wet well shall have a lockable aluminum hatch large enough for easy removal of pumps. Riser sections in precast units shall be sealed watertight using two strands of mastic and a coating of mortar on the inside and outside of the structure. Structures shall be adequately reinforced for all loading conditions normally encountered during shipping, construction and service. All openings (for pipes, hatch, conduits) shall be either cast in place or neatly cut. Sewer pipe connections shall utilize rubber boot connectors, and be watertight. The wet well shall be equipped with an aluminum ladder.

4. Accessories. All materials inside the wet well and valve pit shall be corrosion resistant. Mechanical equipment requiring ferrous metals shall have a coal tar epoxy coating. Guide rails for pumps shall be stainless steel. Miscellaneous metals including fasteners shall be aluminum or stainless steel; anchor bolts shall be stainless steel.
5. Pressure gage. A pressure gage shall be installed on the force main downstream of the gate valves, inside the valve pit and visible from ground level. A corporation stop shall be installed on the tap to allow removal of the gage.
6. Valves. The discharge pipe of each pump shall have a check valve followed by a gate valve before the two pipes join into a common force main.
7. Surge control valves. The pumping system shall be checked to determine if a surge control valve is required. If a valve is required, it shall be located within the valve pit on the common force main and a drain line installed to drain to the wet well.

G. Pump Features:

1. Pumps shall have the following features:
  - a. Non-clog impeller.
  - b. Be capable of passing a 3" sphere.
  - c. Be capable of dry operation without overheating.
  - d. Have dual mechanical seals with seal leak indicator light in the control panel.
  - e. Pump and motor casings shall be cast iron, and all fasteners shall be stainless steel.
  - f. Motor shall be selected to be non-overloading under all operating conditions.
  - g. Motor winding shall have a heat sensor with auto reset to prevent overheating; three-phase motors shall have two sensors.
  - h. Operating speed of the pump shall not exceed 1800 rpm without special approval.
  - i. Motor shall have upper and lower roller bearings.

- j. The pump shall be automatically connected to the discharge connection elbow when lowered into place, and shall be easily removed for inspection or service. There shall be no need for personnel to enter pump well. Sealing of the pumping unit to the discharge connection elbow shall be accomplished by a simple linear downward motion of the pump. Each pump shall be equipped with a chain (of aluminum or other non-corrosive material) for easy removal.

H. Force Main:

1. The force main shall be sized for a minimum velocity of 2 feet per second with one pump operating.
2. Force mains shall be ductile iron pipe.
3. The force main profile shall slope continuously upward where practical. If high points occur where air could be trapped in the pipe, then an air release valve (of the type made for sewage applications) will be installed (in a manhole) at the high points.

I. Electrical:

1. Lift station controls and electrical components shall be factory-wired in completely weather proof stainless steel metal cabinets (NEMA 4X stainless steel). The cabinet shall be provided with condensate heaters. Spare fuses of each type that is used in the electrical/control system shall be furnished.
2. A main circuit breaker shall be installed to disconnect power to the entire station.
3. Three phase power will be provided for all motors.
4. Protection against voltage surge and loss of a phase shall be provided.
5. The factory-wired panel shall be equipped with a ground bus and neutral bus. Terminal shall be suitable for either aluminum or copper wire. All internal panel wiring shall be copper.
6. Motors shall be suitable for either 230 volt or 460 volt operation. Design engineer shall consult with City of Emerson Electrical Department to verify specifics pertaining to electrical power availability.
7. Wet well level shall be controlled by four sealed mercury tube float switches. All floats shall be provided with 25' of Type SJO flexible cord and shall be attached to a bracket mounted at the top of the wet well. Float functions shall be as follows:

- Float no. 1 Low Level (Pumps Off)
- Float no. 2 High Level (Lead Pump On)
- Float no. 3 Extra High Level (Lag Pump On)
- Float no. 4 Surge Level (Alarm Activated)

8. The pump control system shall include the following features:

- a. Lead pump/lag pump alternator.
- b. Alarm light and horn to indicate high water level.
- c. Seal failure indicating light.
- d. Pump failure indicating light.
- e. Condensate heater.
- f. Lead pump selector switch.
- g. H-O-A switch and run light for each pump.
- h. Control voltage shall be 120V.
- i. Wiring shall be neatly tied and number coded to facilitate maintenance. A schematic diagram shall be furnished with the panel.
- j. A 120 V. GFCI type electrical receptacle shall be located at the control panel.
- k. Pump stations will be equipped with a remote transmitting

unit and telemetering circuitry connecting to the city's SCADA system. The design engineer should consult the city for specific requirements at the beginning of design.

J. Warranty:

- 1. Regardless of the manufacturer's warranty terms, the Developer will be responsible for all repairs necessary within one year from the date the station is completed and approved by the City. The Developer will be required to furnish such assurances to the City as deemed appropriate by the City to ensure prompt action.

404. **Construction Methods**

404.1 **Licensing and Safety:** All contractors who work on sewer systems that will be owned by the City of Emerson must be licensed in accordance with State of Georgia law and local ordinance. Compliance with applicable safety regulations is the responsibility of each company engaged in the work; the city assumes no responsibility for the actions of others on the job site. It is the responsibility of those installing sanitary sewers, lift stations and related appurtenances to conform to OSHA regulations, 29 CFR Part 1926, Subpart P, Paragraph 1926.650 through 1926.653.

Publications from OSHA can be obtained by contacting OSHA Publications Distribution, Washington, D.C.

- 404.2 **Construction Permits:** No construction shall be allowed until a construction permit has been issued by the City of Emerson.

The contractor shall submit one copy of the approved construction plans which have been stamped approved. The contractor shall furnish his name and address, telephone number. He shall also furnish the name of the person in charge of the project and any subcontractors and the name and telephone number of a responsible person who can be contacted in case of emergencies during nonworking hours.

The contractor shall furnish his construction schedule and shall notify the City 24 hours prior to doing any work. Once the contractor begins work, he shall proceed in a workmanlike manner and shall complete the work in a reasonable time without undue off days and periods of inactivity which make it hard for the City to keep up with his activity.

- 404.3 **Changes From Approved Plans:** Any major changes from the approved plans will require that the engineer submit revised drawings along with a request explaining the reason for the change prior to construction of the change. Any deviation from City of Emerson standards will be considered

a major change as will any change that will affect capacity, longevity, operation or maintenance of the facility. Any deviation from approved materials will not be accepted without prior approval.

- 404.4 **Trench Excavation:** Sewer lines shall normally be installed by open-cut trench excavation. Trenches shall be cut true to the lines and grades shown on the plans.

Pipe trenches shall not be excavated more than 100 feet in advance of pipe laying, and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic.

All excavations shall be adequately guarded with barricades and lights in compliance with all OSHA and Georgia Department of Transportation requirements so as to protect the public and workers from hazard.

Excavations adjacent to existing or proposed buildings and structures, or in paved streets or alleys shall be adequately protected by the use of trench boxes, sheeting, shoring and bracing to prevent cave-ins of the excavation, or the undermining or subsequent settlement of adjacent structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition.

Streets, sidewalks, landscapes, and other public and private property disturbed in the course of the work shall be restored to as near as original condition as possible or better in a manner satisfactory to the City.

Trenches shall be kept free of water by pumping or well-pointing, as determined by the contractor. No structure shall be built or pipe shall be laid in water. Water shall not be allowed to flow over or rise upon any concrete, masonry or pipe until the same has been inspected and the concrete or joint material has thoroughly set. All water pumped, bailed, or otherwise removed from the trench or other excavation shall be conveyed in a proper manner to a suitable place of discharge. Such discharge shall not cause injury to public health, property, work completed, work in progress, or to any street surface, or cause any interference with the use of same by the public.

Construction occurring around active sewer systems shall be done in such a way so as to prevent the spillage of wastewater.

404.5 **Rock Excavation:** Drilling and blasting operations shall be conducted with due regard for the safety of persons and property in the vicinity and

in strict conformity with requirements of all ordinances, laws and regulations governing blasting and the use of explosives. Rock excavation near existing pipelines or other structures shall be conducted with the utmost care to avoid damage. Injury or damage to other structures and properties are the sole responsibility of the installation contractor and shall be promptly repaired by the Contractor to the satisfaction of the City and property owner.

Rock in trenches shall be excavated over the horizontal limits of excavation and to depths as follows:

<u>Size of Pipeline Inches</u>	<u>Depth of Excavation Below Bottom of Sewer Pipe, Inches</u>
4 to 8	6
8 to 18	8
18 to 30	10

The undercut space shall then be brought up to grade by backfilling with Size #57 crushed stone material or approved equal.

404.6 **Installation of Sewer Pipe:** Construction stake-out will be required prior to construction of sewer lines. As a minimum, the horizontal alignment

will be staked at 100 foot intervals and each manhole will be located with a centerline stake and two offset hubs. "Cuts" to invert elevations will be shown for each manhole entry and exit pipe. A copy of the stake-out notes will be provided to the city.

Pipe and accessories shall at all times be handled with care to avoid damage. Whether moved by hand, skidways or hoists, material shall not be dropped or bumped. The interior of all pipe shall be kept free from dirt and foreign matter at all times. Each joint of pipe shall be unloaded opposite or near the place where it is to be laid in the trench.

All such material that is defective in manufacture or has been damaged in transit or after delivery shall be removed from the job site.

Sewer pipes shall be joined by "push-on" joints using elastomeric gaskets to affect the pressure seal. The ends of pipe to be joined and the gaskets shall be cleaned immediately before assembly, and the assembly shall be made as recommended by the pipe manufacturer. Lubricant used must be non-toxic and supplied or approved for use by the pipe manufacturer. Sewer pipes shall be laid in the uphill direction with the bells pointing upgrade. Any variation from this procedure shall require approval from the City.

When pipe laying is not in progress, the open ends of installed pipe shall be plugged with a watertight plug to prevent entrance of trench water into the line.

Bedding for pipe shall normally be as listed below (also see city standard details):

For PVC the minimum bedding shall be #57 or #89 crushed stone a minimum of 6" below bottom of pipe. For Concrete and Ductile Iron pipe the minimum bedding shall be #57 or #89 crushed stone a minimum of 6" below bottom of pipe and initial backfill to the top of pipe for the full width of the trench.

In wet areas, the minimum bedding requirements will be increased as required to ensure a stable support under the pipe and on the sides of the pipe.

Backfill material up to 12 inches above the top of the pipe shall be compacted dry, loose, soil unless PVC is used in which case the first 6 inches above the top of pipe is required to be crushed stone. If such material is not available from the site then #57 stone shall be used to backfill up to 12 inches above the top of the pipe. Backfilling the remainder of the trench may utilize soil and blasted rock (not over 12

inches in any dimension) compacted sufficiently to avoid excessive settlement. Under no circumstances will tree parts, vegetation, building materials or any other type of debris be used for backfill.

All backfill beneath roads, sidewalks or other critical areas shall be compacted to ninety-five percent (95%) Standard Proctor or as otherwise required by the D.O.T. or other such agency having jurisdiction using mechanical tamping equipment. Moisture control of the material may be required to achieve this compaction and hauling in of select material may be required. Compaction testing and certification by an independent soil testing company will be required in these areas at the Developer's expense.

- 404.7 **Railroad Crossings:** All railroad crossing shall conform to the requirements of the American Railway Engineering Association Manual for Railway Engineering, Part 5. The Contractor shall secure permission from the railroads to schedule the work so as not to interfere with the operation of the railroads. The Contractor shall be held responsible for any delays or damages occurring to the railroads. The Contractor will furnish the railroad with such additional insurance as may be required, cost of same to be borne by the Contractor, together with the costs for flagmen, watchmen, temporary work of any nature, safety devices and any other items that may be imposed by the railroad.
- 404.8 **Highway Crossings:** All construction work in the State Highway right-of-way shall be approved by the Georgia Department of Transportation. Developer shall be responsible for obtaining encroachment permits.
- 404.9 **Stream Crossings:** The preferred method of crossing a river, stream, creek, impoundments, or wet weather ditch is with a minimum of six inches (6") of cover between the lowest point in the stream and the top of outside diameter of the pipe. Ductile iron pipe is required for all stream crossings and shall extend a minimum of ten feet (10') beyond the top of bank on each side. Concrete collars or encasement must be provided at all joints for ductile iron pipe with less than three feet (3') of cover. The stream bed and sides at the crossing site shall be protected from erosion with the use of Rip-Rap, as defined and sized in the **Manual For Erosion and Sediment Control In Georgia**, Appendix C - Construction Materials, 1992 or most current edition.

Aerial Crossings will require detailed plans and will be allowed only when, in the city's opinion there is no reasonable alternative.

Erosion control measures shall be installed prior to installing pipe across any stream. All work should be performed when stream flows are at their lowest, and all work should be performed as quickly and safely as possible. As soon as conditions permit, the stream bed shall be cleared of

all falsework, debris, and other obstructions placed therein or caused by the construction operations.

Erosion control measures can include, but is not limited to, the following items:

- a. Silt fencing, types A, B, and/or C
- b. Erosion control check dams
- c. Channel diversion through temporary storm drain pipe.
- d. Rock filter dams

The construction and installation of these various structures are detailed in the **Manual For Erosion And Sedimentation Control In Georgia** or the Georgia Department of Transportation Standards and Construction Details, both of which are available for purchase by the Contractor.

**404.10 Casing for Sewers:** Where pipe is required to be installed under railroads, highways, streets or other facilities by jacking or boring methods, construction shall be done in a manner that will not interfere with the operation of the facility, and shall not weaken the roadbed or structure.

The diameter of the bore shall conform to the outside diameter and circumference of the casing pipe as closely as practicable. Any voids which develop during the installation operation shall be pressure grouted. Each segment of the casing pipe shall be welded (full circumference butt weld) to the adjoining segment. The completed casing shall have no sags or crowns which cause the grade for any segment to be less than the minimum slope for the size pipe being installed.

The carrier pipe shall be fitted with approved spacers to secure its position within the casing. At each end of the casing pipe the void between the carrier pipe and casing shall be sealed with brick and mortar.

**404.11 Replacement of Pavement:** Contractor shall fully restore and replace all pavement, curbs, gutters, sidewalks and other surface structures removed or disturbed, to a condition that is equal to or better than the original condition in a manner satisfactory to the City (see standard details).

**404.12 Location/Protection of Existing Underground Utilities:** It is the responsibility of the Contractor to locate all underground utilities and to protect same. Utility lines or services damaged by the Contractor shall be repaired by the Contractor at the Contractor's own expense. The Contractor has sole responsibility of complying with all provisions of the Utilities Protection Code.

**404.13 Protection of Water Supply and Other Utilities:**

The City of Emerson has an established Cross-Connection Program to prevent the entry of contaminants or pollutants into any area of the potable water supply through the control of cross connections. It is illegal to introduce any substance into or to have any cross connections with the potable water supply. There shall be no physical connection between a public or private potable water supply system and a sanitary sewer which would permit the passage of any sewage or polluted water into the potable water supply.

Whenever possible, sewers should be laid at least 10 feet horizontally from any existing or proposed water main. Should conditions prevent a separation of 10 feet, the lines shall be laid in separate trenches.

**404.14 Sewer Services:** A sewer service shall be provided for every existing or proposed lot or building. All sewer services shall be a minimum of 4" in diameter unless otherwise specified. All service lines shall be designed to maintain a minimum of 2 ft/sec. sewer velocity. All services shall be shown on the construction and as-built drawings. A common service shall not be allowed for two or more buildings. The service shall extend to 5' inside the property line of the lot being served and normally be within 10 feet of the lower corner of the lot. All service laterals shall be a minimum of 5' deep at the property line. Where 5' of cover cannot be achieved, sewer services shall be constructed of ductile iron. A 90° bend, constructed from two 45° fittings shall be installed at the end of all sewer services with a vertical section of pipe to extend a minimum of 4' above existing ground level (See Standard Details). Connections to the main exceeding 8 feet in depth may have the saddle or tee rotated to a bend inserted in the service to provide 5' lateral depth at the property line.

The developer shall be responsible for serving all lots developed. On any lot where the service cannot be found, the developer shall be responsible for payment of the cost of installation of the service. Also, unless noted on the final plat, the service shall be low enough to serve the first floor elevation at the building line. Install 14 gauge detector wire on all laterals.

The builder shall be responsible for the location of the service prior to the pouring of the foundation, driveway or other appurtenance. The City will not be responsible for any house built too low to be served nor for any service covered by construction.

No plumber or contractor will be allowed to connect to the sewerage system except to the end of the service provided for his connection. Also, any service provided will be utilized without the installation of additional services.

404.15 **Clean-Up:** Prior to requesting the “completion of sewer construction” inspection, the Contractor shall remove and dispose of in an acceptable manner all shipping timbers, shipping bands, spacers, excess materials, broken material, crates, boxes and any other material brought to the job site.

Any work areas within public right-of-way or property outside of the development that were damaged by the sewer construction shall be repaired or replaced with the same kind of material as existed prior to the damage occurring. All easement areas shall be cleared of trees, stumps and other debris and left in a condition such that the easement can be maintained by bush-hog equipment.

All shoulders, ditches, culverts, and other areas impacted by the sewer construction shall be at the proper grades and smooth in appearance.

All manhole covers shall be brought to grade.

A uniform stand of grass or mulch for erosion protection, as defined in the **Manual For Erosion and Sediment Control In Georgia**, is required over all construction easements and sanitary sewer easements prior to the City’s acceptance of the sewer. Use a grass mixture consisting of at least 50% fescue.

405. **Inspection of Sewers**

405.1 **City Inspection:** The developer’s contractor will be responsible for the quality, accuracy and workmanship of his completed work.

City personnel will visit the job site on a periodic basis and will make spot checks as they deem appropriate. The City of Emerson shall have the right to review and inspect all construction and may reject any work that does not meet quality control standards.

405.2 **Access To Project:** Authorized representatives of the City of Emerson, which may include city employees, the city engineer, state or federal agencies, shall have access to the site for inspection at any time.

405.3 **Communications During Construction:** A preconstruction conference will be required for all projects. The Developer has sole responsibility for scheduling. The Developer, design professional, contractor, and subcontractor(s) are required to meet with the City and all private utilities in this conference. The contractor will notify the city in writing 2 days before starting construction. The contractor will provide notification by phone any time the work is to be vacated and will provide notice by phone prior to resuming work. The contractor shall request the final inspection.

The city inspector may have informal verbal communications with the contractor foreman or superintendent at any time during construction. The city inspector will not direct the actions of contractor's workmen.

405.4 **Concealed Work:** The city inspector may direct that the contractor notify the city and receive inspection approval prior to concealing certain work such as manhole foundations, pipe bedding, tees, bends, service laterals, or other appurtenances. At the City's discretion, the City may require work to be uncovered which was not inspected prior to backfilling.

405.5 **Minimum Inspection By Developer:** The following minimum information shall be determined and certified by the engineer:

1. Horizontal location. Horizontal location of the line will be checked by measuring "as-built" distances between manholes and bearings from manhole to manhole.
2. Elevation and slope. Elevation of each invert and top of manhole will be measured and recorded. Actual pipe slope will be computed and any segment having less than minimum allowable slope will be rejected and re-done.

405.6 **City Inspection:** Cost for all testing shall be paid for by the developer.

1. Manhole construction. Manholes will be visually inspected to check for plugging of lift holes, use of connecting boots, use of joint material, leakage, proper invert construction, proper setting of frame and cover.
2. Pipe straightness. Sections of sewer line will be visually checked for straightness. A passing section shall show at least 80% of a full circle when observed from one end. Any section which fails this visual test shall be further checked.  
The section shall have water run through it sufficient to fill any sags that may exist. Then it shall have a television camera pulled through it to check for sags. Any sag holding more than one and one-half inches of water will require that the pipe be removed and replaced to proper grade after which the section shall be televised again to verify correction. The contractor may propose alternative methods other than televising sewers for the City's approval to determine failing sections of sewers.
3. Infiltration. The allowable limit for any section from manhole to manhole will be 100 gallons per day per inch of pipe diameter per mile of pipe. If any infiltration is present at the most downstream point, then it will be measured using a specially-made weir and measurements will also be made at each upstream manhole that has any visible flow of water. Any individual segment

which exceeds the allowable infiltration shall be corrected to within allowable limits.

4. Compaction of backfill. Compaction testing may be required for sewers constructed in paved areas or where pavement is planned. A minimum of two tests per 500 feet of trench line located in roadways will be required. If any of these tests show failing results, then the failing backfill will be removed, re-compacted and re-tested, and one additional area will be tested as well.

**405.7 Other Testing Requirements:** The tests listed below shall be performed by the contractor in the presence of the City. The city will be notified at least 2 days prior to these tests.

A. Mandrel Test For PVC Pipe: Procedure for testing PVC sewer pipe for maximum allowable deflection shall be generally as follows (Mandrel sized to 95% of the nominal internal pipe diameter):

1. Completely flush the line making sure the pipe is clean of any mud or trash that would hinder the passage of the mandrel.
2. During the final flushing of the line, attach a floating block or ball to the end of the mandrel pull rope and float the rope through the line. (A nylon ski rope is recommended).
3. After the rope is threaded through the line, connect the pull rope to the mandrel and place the mandrel in the entrance of the pipe.
4. Connect a second rope to the back of the mandrel. This will enable the mandrel to be retrieved if excessive deflection is encountered.
5. Draw the mandrel through the sewer line.
6. An increasing resistance to pull is an indication of excessive deflection. If this occurs mark the rope to note the location. Televis the sewer section to identify the extent of the problem and develop a plan, subject to city approval, for correcting the problem. The contractor may propose an alternative method other than televising sewers for the City's approval to determine locations of failing sewers.
7. Retest.

B. Air Pressure Test: A low pressure test of each sewer line section will be conducted by the contractor to check for leaks. The following general procedures will apply (also refer to ASTM specs):

1. Temporarily plug the line segment between two manholes

using plugs having air tight fittings through which low pressure air can be introduced into the pipe segment being tested.

2. Introduce low pressure air into the test pipe segment until the internal air pressure reaches 4.5 psig above ground water pressure, if any.
3. Wait at least five minutes for air temperature in the test segment to stabilize while internal air pressure remains no less than 3.5 psig above ground water pressure.
4. Bleed internal air pressure to exactly 3.5 psig above ground water pressure.
5. Accurately determine the elapsed time for internal pressure to drop to 2.5 psig above ground water pressure.
6. The air test is acceptable if elapsed time is no less than shown by the following table:

<u>Pipe Dia.</u> <u>Inches</u>	<u>Seconds Per</u> <u>100 Ft. of Pipe</u>	<u>Pipe Dia.</u> <u>Inches</u>	<u>Seconds Per</u> <u>100 Ft. of Pipe</u>
4	11	27	77
6	17	30	85
8	23	36	102
10	28	42	119
12	34	48	136
15	43	54	153
18	51	60	170
21	60	66	187
24	68	72	204

Air leakage time is based on pipe being damp. If pipe and joints are dry, dampen line if helpful in meeting air test time requirement.

Permanently correct excessive leakage determined by air testing, and repeat operations until City witnesses a successful test on each line segment.

Note: Upon request, the city may allow substitution of exfiltration test in lieu of air pressure test. If used, the exfiltration test will be conducted with a minimum water head of 2 feet above the groundwater table and the allowable exfiltration will be limited to 100 gallons per day per inch diameter of pipe per mile of pipe.

C. Manhole Testing: All manholes require testing by either the vacuum test or exfiltration test.

1. Exfiltration Test: Manholes which have been backfilled around shall be tested for exfiltration. The minimum test time duration is 1 hour. Manholes shall be filled with water to the top of ring. The maximum allowable exfiltration rate is 2 gal./ft. of depth/ft. of manhole diameter.
2. Vacuum Test: Vacuum testing of manholes for water tightness may be used in lieu of the exfiltration test prior to backfilling. After temporarily plugging pipe openings and installing the vacuum base on top of the cone, a vacuum of 10 inches of Mercury shall be drawn and the vacuum pump shut off. With valves closed, the pressure shall be monitored for a time period of 60 seconds. At the end of the test period, if the vacuum is 9 inches or greater, the manhole has passed the test. If the vacuum drops below 9 inches, the manhole has failed.

405.8 **Final Inspection And Conditional Acceptance:** In no circumstances shall any buildings and plumbing fixtures be connected to the sewers until inspected and approved by the City.

The contractor shall request in writing a final inspection. This final inspection will generally include spot checks of manholes and sewer lines and a complete overview of the project.

After any discrepancies are corrected, the city will issue a letter certifying conditional acceptance of the sewer system. This letter shall commence the start of the 18 month warranty period which is required of the contractor.

On projects having phased development, this letter will allow the developer to apply for a permit for the next phase of development.

At the end of 18 months, the subdivision inspection team will again reinspect the entire development. When all discrepancies have been corrected, the city will issue an acceptance letter and will begin perpetual maintenance and operation of the sewerage system.

405.9 **Maintenance Bond or Letter of Credit:** The developer shall post a maintenance bond or Letter of Credit of 25% of the total project cost on the facility for an eighteen-month period two year period after completion and conditional acceptance of the facility by the City of Emerson for all projects whose costs exceeds \$20,000.00.

**405.10 Maintenance Until Final Acceptance:** It shall be the developer's obligation to provide all maintenance for an 18 month period after conditional acceptance of the project by the City of Emerson. At the end of the 18 month maintenance period the City shall inspect the sewer system, and upon correction by the developer of all deficiencies noted by the City, the City will accept the sewer system for operation.

406. **Standard Details:**