

City of Flowery Branch
Standard and Specifications
Chapter WM

Section One
Water Mains and Accessories

Part 1- General

1.01 Scope

- A. The Contractor shall furnish all equipment, labor and materials (unless otherwise agreed upon in writing) necessary to construct the water mains and perform all work specified or indicated on the drawings. The work shall include all necessary concrete work, diking, pumping, bailing, draining, flushing, soil erosion and sedimentation control, and testing. These specifications cover water mains and water service connections complete.
- B. The water mains shall be installed in the locations indicated on the drawings or as otherwise directed by the City of Flowery Branch.
- C. The Contractor shall arrange his work so as to minimize interference with pedestrian and vehicular traffic, and to avoid interruption of service of any existing utilities. The Contractor shall furnish and maintain suitable bridges, footways or other means of access to or across intercepted streets, alleys, driveways and walkways, where necessary.
- D. The Contractor shall be responsible for removing all water from excavations and trenches whether from surface or ground sources.
- E. The Contractor shall guarantee all materials and workmanship for a period of one (1) year from the date of final acceptance of the work. Per stipulations as stated in Section 3.A of Ordinance No. 404, if during this period any material or workmanship, etc., proves defective, the Developer or Contractor shall repair same to the satisfaction of the City of Flowery Branch at their own cost and expense.
- F. In order to be sure that the developer, owner, contractor, or any combination thereof, can actually perform and will actually perform the warranty required under this ordinance, the developer, owner, or contractor, or any combination thereof, shall agree to and provide either a guaranty agreement, a surety agreement, an escrow agreement, a cash bond, a letter of credit or other acceptable financial instrument, that obligates the warranting party to correct any defects in design, materials or workmanship during the 12 month period, and obligates a sum for said repairs during the period of at least equal to 20% of the cost of constructing and installing said line or lines. Said guaranty agreement, surety agreement, escrow agreement, cash bond, letter of credit or other financial instrument, shall be reviewed and approved by the City

City of Flowery Branch
Standard and Specifications
Chapter WM

Attorney, prior to acceptance If an issue arises as to the amount of costs that are to be warranted under said financial instrument, then the City Engineer shall provide an estimated cost that shall be used as the basis for said agreements.

- G. Changes to the Standard Specifications for Water Mains may be made by the City at any time.

1.02 Related Work

- A. Section Four: Excavation, Trenching and Backfilling.
- B. Section Five: Site Preparation, Restoration and Related Work.

1.03 Applicable Specifications and Standards

- A. The latest editions of the following specifications, standards and publications setting minimum requirements for quality, safety and performance of work and materials form a part of this specification as though fully repeated herein.

ASTM American Society of Testing Materials
ANSI American National Standards Institute
AWWA American Water Works Association

1.04 Record Drawings

- A. The Contractor shall be responsible for maintaining a set of the approved design drawings which have been marked to reflect as-built conditions. These "record drawings" shall be kept at the site during working hours and shall be made available to the City of Flowery Branch Inspector upon request.
- B. Final acceptance of water main construction will not be granted until as-built drawings have been received by the City.
- C. The record drawings shall show the as constructed location of (but not be limited to) all lines, manholes, valves, hydrants, blow-off valves, monuments, etc.
- D. Appurtenance locations shall be diminished to three (3) permanent fixtures or objects.

City of Flowery Branch
Standard and Specifications
Chapter WM

Part 2 – Materials

2.01 General:

- A. Materials to be incorporated into the work shall be new and unused, and shall conform to all applicable requirements of these specifications. Submittal and approval of all materials, shop drawings or samples shall be in conformance with these specifications. Any materials installed prior to approval by the City of Flowery Branch will be subject to rejection, and will be removed at the Contractor's expense.
- B. All water mains 6-inch or larger pipe shall be ductile iron. Water mains 2-inches in diameter shall be polyvinyl chloride (PVC) pressure rated pipe. Water service lines on the City's side of the meter shall be copper tubing.
- C. Water mains shall be located outside of paved areas. Locating water mains in paved areas will only be allowed when no other alternative exists. No 2-inch PVC water mains will be allowed under roadways. Bore under existing roadways where possible to prevent pavement damage.
- D. Acceptance will be on the basis of inspection and the manufacturer's written certification that the pipe, fittings and appurtenances were manufactured and tested in accordance with the applicable standards.
- E. Any pipe, fittings and appurtenances used in the installation or repair of water mains or services shall be lead-free.

2.02 Ductile Iron Pipe (DIP):

- A. Ductile iron pipe shall conform to **AWWA C 151 (ANSI A21.51)** and shall be a minimum of pressure Class 350 or thickness Class 50 unless otherwise specified or shown on the Drawings. Size will be as shown. All pipes shall be furnished in minimum lengths of 18 feet. Pipe and fittings shall be cement lined in accordance with **AWWA C 104**. Fittings shall be mechanical joint compact ductile iron and conform to **AWWA C 153** with rated working pressure of 250 psi. Pipe and fittings shall be furnished with a bituminous outside coating.
- B. Joints shall be push-on type for pipe and standard mechanical joints for fittings with the exception of hydrant fittings. Fittings for bends and hydrants shall be mechanical joint with retainer glands. Hydrant tees used in lieu of retainer glands and harness rods on fire hydrants shall be equal to **ACIPCO A10180** or **U.S. Pipe U-592**. Anchor couplings used in lieu of retainer glands and harness rods on fire hydrant leads shall be **American A-10895** or approved equal. Joints shall conform

City of Flowery Branch
Standard and Specifications
Chapter WM

to **AWWA C 111**. Provide and install the appropriate gaskets, nuts, and bolts for mechanical joints. Nuts shall be steel with **American Standard Regular** hexagonal dimensions, all as specified in **ANSI B 17.2**.

All bolts and nuts shall be threaded in accordance with **ANSI B 1.1, Coarse Thread Series, Class 2A and 2B fit**.

- C. When flanged joints are indicated provide gaskets for flange joints made of 1/8-inch thick cloth reinforced rubber. Gaskets may be ring type or full face type.
 - i. Provide bolts for flange connections. Bolts shall be steel with **American Regular** unfinished square or hexagonal heads. Nuts shall be steel with **American Standard Regular** hexagonal dimensions, all as specified in **ANSI B 17.2**. All

bolts and all nuts shall be threaded in accordance with **ANSI B 1.1, Coarse Thread Series, Class 2A and 2B fit**.

2.03 Polyvinyl Chloride Pressure Rated Pipe (PVC):

- A. Pipe for 2-inch diameter water mains shall be polyvinyl chloride (**PVC**) pressure rated pipe. The pipe shall conform to **ASTM D 2241**, shall have a **SDR of 13.5** and a pressure rating of not less than **315 psi**. The **PVC** material shall be designated as **PVC 1120** and shall conform to **ASTM D 1784**. The joints shall be gasketed bell joints conforming to **ASTM D 3139**.
- B. All **PVC** pipe shall bear the **NSF (National Sanitation Foundation)** seal of approval for potable water use.

2.04 Copper Tubing:

- A. Copper tubing shall be **ASTM B 88, Type K**. Fittings shall be brass with compression connection inlets and outlets, **ANSI B 16.26**.
- B. Where required, adapters shall be brass **ANSI B 16.18**. Unions shall be cast bronze. Joints shall be compression type.

2.05 Gate Valves:

- A. Gate valves size 3-inches and larger shall be resilient seat wedge type and shall conform to the specifications of the **American Water Works Association, Designation C509**, latest edition rated for 200 psi minimum working pressure. Gate valves shall be equipped with "O" ring stem seals above and below stem thrust collar. Gate valves for use on mechanical joint ductile iron pipe and slip joint ductile iron pipe shall have manufacturer's standardized mechanical joint ends. Gate valve body and bonnet shall be

City of Flowery Branch
Standard and Specifications
Chapter WM

ductile or cast iron and shall be fusion bonded, interior and exterior, with epoxy coating which conforms to **AWWA C550**, latest edition.

- B. Water mains in which the valves are installed shall be tested as specified and the valve must remain water tight under the pressure in each direction.
- C. Valves shall open counter clockwise; shall be designed for vertical installation; and shall be the non-rising stem type.
- D. Valves shall be equipped with valve boxes. Provide extension stem where required to bring the operating nut to within 36-inches of ground surface.
- E. All gate valves shall be manufactured by **Mueller, M&H valve or American Darling** or any company producing valves of comparable quality per City of Flowery Branch approval.
- F. Gate valves 2 ½ inches in diameter and smaller shall be bronze, heavy duty, rising stem (2 ½ inches and smaller only), rated for 200 pounds **WSP**. Valves shall conform to **Federal Specification WV-V-54, Class A, Type II**, and shall be equal to **Crane 428**.

2.06

Butterfly Valves:

- A. Butterfly valves shall be resilient seated, short body design and shall conform to **AWWA C-504** latest edition. Valves shall be Class 250 (250 psi bi-directional shut-off rating, 500 psi body hydrostatic shell test, fusion bonded epoxy coated interior and exterior, and maximum line velocity of 16 feet per second). Valves shall be **Mueller Class 250 M.J. (14"-48")**, **M&H Style 4500 M.J. (14"-48")**, or **American Darling Class 250 B M.J. (14"-48")** or any company producing valves of comparable quality per City of Flowery Branch approval. Certified test results shall be furnished with each valve.

2.07

Tapping Valves and Sleeves:

- A. Tapping sleeves shall be cast or ductile iron of the split-sleeve, mechanical joint type. Valves shall be resilient seat gate valves sizes 4"-12", or double disc gate valves, size 14" - 24" furnished in accordance with the specifications in Section 1, Part 2, and Section 2.05 Gate Valves with a flanged connection to the branch pipe. Tapping valves shall be **Mueller Model H687 sizes 4"-12"**, **H-667 sizes 14"-24"**, **M&H Style 3751-NRS sizes 4"-12"** or **Style 751 sizes 14"- 24"** or **American Darling No. 865 sizes 4"-12"** or **565 sizes 14"-24"**. Sleeves shall be **Mueller Model H-615**, **M&H Style 1174-01** or **American Darling M.J. 4"-48"** or any company producing valves of comparable quality per City of Flowery Branch approval.

City of Flowery Branch
Standard and Specifications
Chapter WM

2.08 Double Check Backflow Preventers:

- A. Double check backflow Preventers shall conform to the following standards: **A.S.S.E. No. 1015, A.W.W.A., C506, C.S.A. B64.5, FCCCHR of USC manual- Section 10, U.L. Classified File No. EX3185, and be accepted by IAPMO (UPC), SBCCI (Basic Plumbing Code).**
- B. Shut-off valves for backflow Preventers in sizes 2-inch and smaller shall be full-port ball-type, with threaded connections and bronze bodies with copper content not less than 80 percent. Shut-off valves for backflow Preventers in sizes 2 ½ inches and larger shall be full-port ball-type, or resilient-wedge gate-type, with flanged connections, and iron bodies with **FDA-approved** fusion bonded epoxy coating inside and out.
- C. Double check backflow Preventers shall be Watts 007 or 709 or approved equal.

2.09 Double Detector Check Valve Assembly:

Double detector check valve assemblies shall conform to the following standards: **A.S.S.E. Standards No. 1015, AWWA Standard C 506; FCCCHR of USC Manual Section 10, U.L. Classified File No. EX 3185, and be listed under CSA B.64 Standard.**

- A. All assemblies shall be standard equipped with epoxy coated UL/FM listed OS&Y resilient seat gate valves. Check valve bodies shall be epoxy coated cast iron. The by-pass line unit shall consist of an approved double check backflow preventer and the meter which reads in cubic feet, gallons or which ever is appropriate. The double check backflow preventer and the meter shall conform to all applicable City of Flowery Branch standards (stated elsewhere).
- B. Double detector check assemblies shall be **Watts 709DDC** or approved equal.

2.10 Valve Markers:

- A. Valve markers shall be 4 feet long concrete posts. They shall have a “V” stamped on one side. A brass disc should be cast into the marker immediately below the “V”.

City of Flowery Branch
Standard and Specifications
Chapter WM

2.11 Corporation and Curb Stops:

- A. Corporation stops shall be manufactured by the **Mueller Company**, or approved equivalent, and shall have a tapered **Mueller or Ford** thread inlet (or their equivalent) and compression outlet. All $\frac{3}{4}$ inch and 1 inch corporation stops shall be **Mueller Catalog Number H-15008 or Ford Model F1000G** or an approved equivalent. All 1 $\frac{1}{2}$ inches and 2 inch Corporation stops shall be **Mueller Catalog Number 15013 or Ford Model FB 1000G** or an approved equivalent.
Curb stops for water service connections shall have a compression connection on one end and an inside I.P.T. on the other end. Water service curb stops shall be **Mueller Catalog Number H-15172, Mueller Catalog number B-25170 or Ford Catalog number B41 Series** or approved equivalent. Ball style curb stops shall include integral lock wings.
- B. Curb stops for 2 inch blow-off assemblies shall have inside I.P.T. on both ends. They shall be **Mueller Catalog number H-10291, Ford Catalog number B11-777 or Mueller Catalog number B-20200** or approved equivalent.

2.12 Fire Hydrants:

- A. All fire hydrants shall conform to the requirements of **AWWA C 502** for 150 psi working pressure. Hydrants shall be the compression type, closing with line pressure. The valve opening shall not be less than 4 $\frac{1}{2}$ inches.
- B. In any case, no fire hydrant shall be placed on water mains smaller than 6-inch diameter.
- C. In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and inexpensive restoration without digging or cutting off the water.
- D. The means for attaching the barrel to the standpipe shall permit 360 degree rotation.
- E. Hydrants shall be fully bronze mounted with all working parts of bronze. Valve seat ring shall be bronze and shall screw into a bronze retainer.
- F. All working parts, including the seat ring shall be removable through the top without disturbing the barrel of the hydrant.
The operating nut shall match those on existing hydrants. The operating threads shall be totally enclosed in an operating chamber separated from the hydrant barrel by a rubber O-ring stem seal and lubricated by grease or an oil

City of Flowery Branch
Standard and Specifications
Chapter WM

reservoir. A stop nut shall be positioned in the top operating mechanism of the hydrant so that the valve stem cannot contact the bottom of the shoe when the hydrant is fully open.

- G. Minimum depth of bury shall be 4.5 feet. Extension sections shall be furnished where necessary to bring hydrant to the proper elevation. Extensions shall be installed in accordance with manufacturer's recommendations. The centerline of the 2 ½ inch connections shall be a minimum of 18 inches above finished grade.
- H. Hydrants shall be a non-freezing design and provided with a simple, positive and automatic drain which shall be fully closed whenever the main valve is opened.
- I. Hose and pumper connections shall be breech-locked, pinned or threaded and pinned to seal them into the hydrant barrel. Each hydrant shall have two (2) 2 ½ inch hose connections and one (1) 4 ½ inch pumper connection, all with **National Standard** threads and each equipped with cap and non-kinking chain.
- J. All outside surfaces of the barrel above grade shall be painted silver with enamel equal to Koppers Glamortex 501.
- K. Fire hydrants shall be **Mueller A 421 M.J., M&H Style 129 M.J.** or approved equivalent.

2.13

Valve Boxes:

All valve boxes and valve box risers shall be cast or ductile iron. Valve boxes shall be two piece heavy roadway types with inside diameter of barrel not less than 5 inches. Valve covers shall weigh a minimum of 13 pounds. They shall be the extension type with screw type adjustment and with flared base. The minimum thickness of metal shall be 3/16 inch. The word "water" shall be cast on the cover. The boxes shall be of such length as will be adapted without full extension, to the depth of cover required over the pipe at the valve location. All valve boxes and valve box risers **shall be manufactured in USA only.**

2.14

Retainer Glands:

- A. Retainer glands shall be ductile iron and shall be manufactured in the United States. All retainer glands on the Project shall be the product of a single manufacturer.

City of Flowery Branch
Standard and Specifications
Chapter WM

B. Retainer glands shall be provided at all mechanical joints, including fittings, Valves, Hydrants and other locations as shown on the Drawings or as directed by the City of Flowery Branch.

C. Retainer glands shall be one of the following types:

- i. Set Screw Type: Set screw type retainer glands shall be **ACIPCO A 90857, EBAA Iron Series 100, Union Foundry Figure 176, Tyler** or approved equivalent. Compact/Lightweight retainer glands shall not be allowed. The minimum working pressure and minimum weight, excluding set screws and gasket material, shall be as follows:

<u>Retainer Gland Size</u> <u>(Inches)</u>	<u>Minimum Working Pressure</u> <u>(PSI)</u>	<u>Minimum Weight</u> <u>(Pounds)</u>
4	350	6.0
6	350	11.8
8	250	16.0
12	250	24.8
16	200	50.0
20	200	72.5
24	150	85.0

- ii. Wedge Type: Wedge type retainer glands shall be **MEGALUG, Series 1100 as manufactured by EBAA Iron, Inc.,** or approved equivalent.

2.15 Locator Wire:

A. Locator wire shall be **Number 12 AWG** solid plastic coated copper wire.

2.16 Casing Pipe:

A. The steel casing pipe shall be manufactured from steel conforming to **ASTM A 139, Grade B** and be new and unused. Minimum size and thickness shall be as follows:

Under Highways

<u>Pipe Diameter (Inches)</u>	<u>Casing Diameter (Inches)</u>	<u>Wall Thickness (Inches)</u>
6	12	0.250
8	16	0.250
10	16	0.250
12	18	0.375
14	22	0.500

City of Flowery Branch
Standard and Specifications
Chapter WM

<u>Pipe Diameter (Inches)</u>	<u>Casing Diameter (Inches)</u>	<u>Wall Thickness (Inches)</u>
16	24	0.500
18	30	0.500
20	30	0.500
24	36	0.500
30	42	0.500

Under Railroads

<u>Pipe Diameter (Inches)</u>	<u>Casing Diameter (Inches)</u>	<u>Wall Thickness (Inches)</u>
6	14	0.250
8	18	0.375
10	20	-
12	22	AS DETERMINED
14	24	BY
16	30	RAILROAD
18	30	-
20	32	-
24	32	-
30	42	-

- B. The materials for casings under State Highways shall be in accordance with the **Georgia Department of Transportation Standard Specifications for the Construction of Roads and Bridges**, latest edition. It shall be the Contractor's responsibility to determine the exact requirements of the **Georgia Department of Transportation**. If there is a conflict between these Specifications and the Georgia Department of Transportation Specifications the letter shall take precedent.

2.17 Stainless Steel Casing Spacers:

- A. Spacers shall be bolt on style with a two piece shell made from T-304 stainless steel of a minimum 14 gauge thickness. The shell shall be lined with a ribbed P.V.C. sheet of a 0.090 inch thickness that overlaps the edges. Runners, made from **UHMW** polymer, shall be attached to risers at appropriate positions to properly locate the carrier within the casing and to ease installation. Risers shall be made from T-304 stainless steel of a minimum 14 gauge thickness and shall be attached to the shell by MIG welding. All welds shall be fully passivated. All fasteners shall be made from T-304 stainless steel. Casing spacers shall be **Model CCS as manufactured by Cascade Waterworks Manufactured Company of Yorkville, Illinois**, or approved equivalent.

2.18 Bedding Material:

- A. Embedment materials shall be angular graded crushed stone, ¼ inch to ¾ inch in size with no more than 5% passing a number 8 standard sieve in accordance with Class 1 materials as defined in **ASTM D2321 Section 5.1.1.**

2.19 Concrete Thrust Block:

- A. Concrete shall have a compressive strength of not less than 3000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5 inches. For job mixed concrete, submit the concrete mix design for approval. Ready mixed concrete shall be mixed and transported in accordance with **ASTM C 94.** Reinforcing steel shall conform to the requirements of **ASTM A 615, Grade 60.**

2.20 Meter Boxes:

- A. Meter boxes shall be constructed of cast iron or plastic.
- B. Meter box covers shall be cast iron.
- C. If plastic boxes are provided, they shall be high density polyethylene.
- D. Water meter boxes are to be twelve (12) inches by eighteen (18) inches with touch read holes in lids.
- E. Meter boxes and covers shall be manufactured in the **USA only.**

2.21 Materials for Structures:

- A. Provide materials for construction of manholes and other structures in accordance with the following:
 - a. Precast concrete sections shall meet the requirements of ASTM C 478. The minimum compressive strength of the concrete in precast sections shall be 4,000 psi. The minimum shell thickness shall be one twelfth of the inside diameter of the riser or the largest cone diameter.
 - b. Precast manhole cones shall be the eccentric type.
 - c. Seal joints between precast sections by means of rubber O-ring gaskets or flexible butyl rubber sealant. Butyl rubber sealants shall meet the requirements of **AASHTO M198.** Sealant shall be preformed type with a minimum nominal diameter of 1 inch. Butyl rubber sealant shall be equal to **Kent Seal number 2 or Concrete Sealants CS 202.**
 - d. Brick shall be whole and hard burned, conforming to **ASTM C 32 Grade MS.** Mortar shall be made of 1 part Portland cement and 2

City of Flowery Branch
Standard and Specifications
Chapter WM

parts clean sharp sand. Cement shall be Type 1 and shall conform to **ASTM C 150**. Sand shall meet **ASTM C 53**.

- e. Cast iron manhole frames and covers shall meet the requirements of **ASTM A 48 for Class 30** gray iron and all applicable local standards. All castings shall be tough, close grained, and smooth and free from blow holes, blisters, shrinkage, strains, cracks, cold shots and other imperfections. No casting will be accepted that weighs less than 95% of the design weight. Shop drawings must indicate the design weight and provide sufficient dimensions to permit checking. All castings shall be thoroughly cleaned in the shop. Frames and covers shall have machined horizontal bearing surfaces.

B. Manhole frames and covers shall be equal to the following:

<u>Type</u>	<u>Design Weight</u>	<u>Manufacturer's Reference</u>
Traffic	408	East Jordan Iron Works Catalog No. 1730A, 1731Z or U.S. Foundry Catalog No. 362

- C. Watertight type traffic frames and covers shall have the same weight and dimensions as those specified in Paragraph 2.19 (B).
- D. All manhole covers shall bear the standard "Flowery Branch Pattern" and shall have the word "Water" cast in the top.
- E. Manhole steps of polypropylene molded around a steel rod equal to products of M.A. Industries shall be used.
- F. Preformed rubber boots and fasteners equal to those manufactured by **Kor-N-Seal or Press Seal Gasket Corporation** shall be provided in the pipe openings in precast manhole sections.
- G. All grout shall be non-metallic, non-shrink type. Cement shall be Type III. Grout shall meet the following requirements:

<u>Criteria</u>	<u>Test Method</u>	<u>Result</u>
Workability	ASTM C-191	Initial set time not less than 60 minutes
Compressive Strength	ASTIM C-109 (restrained Condition)	1 day- 3000 psi
Shrinkage	ASTM C-827 and CRD 588	No shrinkage after placement or shrinkage after set

The Contractor shall furnish independent laboratory test results as evidence of full compliance with these requirements. Grout shall be mixed and placed in accordance with the recommendations of ACI, and the grout manufacturer's published recommendations.

Part 3- Execution

3.01 Pipeline Installation:

- A. Proper and suitable tools and appliances for safe and convenient handling and lying of pipe and fittings shall be used. Great care shall be taken to prevent the pipe coating from being damaged, particularly cement linings on the inside of the pipes and fittings. Any damage shall be remedied as directed.
- B. All pipe and fittings shall be carefully examined by the Contractor for defects just before lying and no pipe or fittings shall be laid which is defective. If any defective pipe or fitting is discovered after having been laid, it shall be removed and replaced in a satisfactory manner with a sound pipe or fitting by the Contractor at his own expense.
- C. No pipe shall be laid in water. The contractor will be required to operator pumps, if necessary, to remove water (whether from ground or surface sources) from the trench while pipe is being laid and joints are being made. When work is not in progress the ends of the pipe shall be closed to prevent water or other foreign material from entering the pipe. Valves installed on existing mains shall be kept closed until after the line is tested, disinfected and accepted for service.
- D. Pipe laid in trenches shall be laid true to line and grade on a firm and even bearing for its full length at depths and grades as indicated. Adequate precautions shall be taken to prevent floatation of pipelines prior to backfilling. Installation of ductile iron pipe in underground pressure piping systems shall conform to the requirements of **AWWA C600**. Excavation of trenches and backfilling around pipes shall conform to the requirements of the section entitled "Excavation, Trenching and Backfilling" of these Specifications.
- E. All water mains shall have a minimum of 48 inches of cover above the top of the pipe or 48 inches below edge of pavement, whichever is greater. All water mains 12 inches and larger shall have a minimum of 60 inches below edge of pavement, whichever is greater unless otherwise indicated by the City. Watermains shall be placed in the back 5 feet of City Rights-of-Way as applicable.
- F. Water mains shall maintain a minimum of 10 feet edge to edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right-of-way and provide the 10 feet separation, the separation may be reduced provided the bottom of the water main is a minimum of 18 inches above the top of the sewer. If neither of these two separation criteria is possible, the water main shall be installed

City of Flowery Branch
Standard and Specifications
Chapter WM

below the sewer with a minimum vertical separation of 18 inches. Where waterline cross under gravity sewer lines, encase sewer line fully in concrete for at least ten (10) feet on each side of the crossing. Lay water line which cross sewer force main and invert siphons at least two (2) feet above the sewer lines; when joints in the sewer lines are closer than three (3) feet horizontally from the water line, encase these joints in concrete. Do not lay water line in the same trench with gas lines, fuel lines, or electric wiring. No water main shall pass through or come in contact with any part of a sanitary sewer manhole.

- G. All elbows, tees, branches, crosses and reducers in pressure piping systems shall be adequately restrained against thrust. Underground pressure piping containing unharnessed push-on or mechanical joints or expansion joints shall be restrained by thrust blocks. The Contractor may use forms or earth walls to mold the thrust blocks. When earth walls are used, they shall be cut true to shape and all excess earth removed. The work shall be conducted so that no loose earth will become mixed with the concrete. At the end of 24 hours, damp earth may be placed over the concrete to retain moisture.
- H. All lumps, blisters, excess coating, dirt and other objectionable substances shall be removed from the bells and spigots. Bells and spigots shall be wiped clean and dry. Bells shall be centered in the trench and spigots driven home.
- I. The Contractor shall keep a transit and appurtenances on the job to be used for laying out the angles required for making bends and other works of this nature.
- J. Bends, valves and other points where deemed necessary shall be blocked and harnessed to resist thrust. This shall be accomplished by methods and means approved by the City. All forms used to form concrete for blocking shall be removed before backfilling. All fire hydrants shall be harnessed as directed by the City and concrete blocking will required to resist the thrust on fire hydrants. All stress points and ends of mains shall be inspected before backfilling.
- K. Blow-off valves shall be installed at terminus of all dead end mains. Method of installation shall be approved by the City. Refer to Section Six- Standard Details for 2 inch blow-off details.
- L. Whenever pipe requires cutting to fir the lines or install fittings, the work shall be done in such a manner as to leave a smooth end at right angles to the axis of the pipe. Special care shall be exercised to guard against breaking or splitting of the existing piping.
- M. All cutting of ductile iron pipe shall be done with a cutting saw. All burrs shall be removed from the inside and outside edges of all cut pipes.

City of Flowery Branch
Standard and Specifications
Chapter WM

N. Mechanical joints and restrained joints shall be made in strict accordance with the pipe manufacturer's instructions. The gaskets and follower rings shall be kept clean and carefully centered in the bell with the bolts and bolt holes always parallel with the center line of the pipe. The coating and lining of the pipe shall not be damaged. The nuts on all bolts shall be started and tightened evenly around the entire circumference of the pipe. No one nut shall be tightened more than ½ turn tighter than the remainder of the nuts of the joint. When the joint is complete, the follower ring shall be equal distance from (parallel with) the face of the bell. Bolts shall not be over stressed and shall be tightened just enough to compress the gasket sufficient to prevent leakage. Just prior to assembly, the gasket shall be cleaned of all foreign material and shall be brushed with soapy water just before slipping the gasket over the spigot and into the bell of the pipes. The joint shall be in straight alignment during assembly. Any deflection required shall be made after assembly but before tightening bolts. Bolts shall be tightened with torque wrenches with the following torque loads applied:

<u>Bolt Size</u>	<u>Range of Torque</u> (Foot Pounds)
5/8 inch	45-60
¾ inch	75-90
1 inch	100-120
1 ¼ inch	120-150

O. Push on type joints shall be made in strict accordance with the pipe manufacturer's instructions. All joints shall be completely "belled-up" and all spigots shall be "home". The gasket seat in the socket, the gasket and the plain end of the pipe to be entered shall be wiped clean before assembly. After the gasket has been inserted into the gasket recess, a thin film of lubricant shall be applied to the inside surface of the gasket and to the outside surface of the spigot end of the pipe to be jointed. After lubricating, the end of the pipe shall not be allowed to touch the bottom or side of the trench causing dirt to adhere to the joint surface. When pipe is cut in the field, the cut end of the pipe shall be beveled with a file or grinder. The joint shall be in straight alignment while pushing the pipe to make assembly. Any deflection required shall be made after the joint is assembled.

P. Set screw type retainer glands shall be installed in strict accordance with the fitting manufacturer's instructions. After making up the mechanical joint as hereinbefore specified, the set screws shall be run down until they are in firm contact with the pipe. The set screws shall then be tightened once completely around the joint to approximately 40 foot pounds torque. Finally, the set screws shall be tightened twice completely around the joint to the following torques:

City of Flowery Branch
Standard and Specifications
Chapter WM

3" thru 12" glands – 80 foot pounds
14" thru 24" glands – 65 foot pounds

- Q. Wedge type retainer glands shall be installed in strict accordance with the manufacturer's instructions.
- R. Retainer gland joints shall be made in straight alignment and any deflection required shall be made before tightening the joint bolts or set screws.
- S. Deflection of ductile iron pipe at joints for long radius curves or for avoiding obstacles shall be permitted only upon approval of the City.
- T. Where deflection of joints is permitted, such deflection shall be made in accordance with and shall not exceed limits provided in Section 9b.5 and Section 9c.4 as applicable, of the **AWWA C600**.

3.02

Connections to Water Mains:

- A. Make connections to existing pipe lines with tapping sleeves and valves, unless specifically shown otherwise on the Drawings.
- B. Location: Before laying pipe, locate the points of connection to existing water mains and uncover as necessary for the City to confirm the nature of the connection to be made.
- C. Interruption of Services: Make connections to existing water mains only when system operations permit. Operate existing valves only with specific authorization and direct supervision of the City.
- D. Tapping Sleeves:
 - a. Prior to attaching the sleeve, the pipe shall be thoroughly cleaned, utilizing a brush and rag, as required.
 - b. Before performing field machine cut, the water tightness of the sleeve assembly shall be pressure tested. The interior of the assembly shall be pressure tested. The interior of the assembly shall be filled with water. An air compressor shall be attached, which will be inducing a test pressure as specified in this section. No leakage shall be permitted for a period of five minutes.
 - c. After attaching the sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall

City of Flowery Branch
Standard and Specifications
Chapter WM

be swabbed or sprayed with a one percent hypochlorite solution.

- E. Connecting to Existing Side Street Mains:
- a. Before taking existing side street mains out of service, taps for air removal shall be made at each high point along the section of existing main to be temporarily taken out of service. With the City's approval at each location, existing service lines may be used to expel air.
 - b. Close service line curb stops along the section or sections that will be dewatered and close all connecting main valves.
 - c. Take existing main out of service, cut and complete connection as detailed on the Drawings.
 - d. Open appropriate valve and after expelling all air, return existing main to service and re-open all service line curb stops.
 - e. At all taps to remove air, install brass cap on corporation stop, backfill, and replace pavement where required.

3.03 Hydrant Installation:

- A. Prior to installation, inspect all hydrants for direction of opening, nozzle threading, operating nut and cap dimensions, tightness of pressure-containing bolting, cleanliness of inlet elbow, handling damage and cracks. Defective hydrants shall be corrected or held for inspection by the Engineer.
- B. All hydrants shall stand plumb and shall have their nozzles parallel with or at right angles to the roadway, with pumper nozzle facing the roadway, except that hydrants having two-hose nozzles 90 degrees apart shall be set with each nozzle facing the roadway at an angle of 45 degrees.
- C. Hydrants shall be set to the established grade, with the centerline of the lowest nozzle at least 12 inches above the ground or as directed by the City.
- D. Each hydrant shall be connected to the main with a 6 inch branch controlled by an independent 6 inch valve.

City of Flowery Branch
Standard and Specifications
Chapter WM

- E. Hydrants shall be located as shown on the Drawings or as directed by the City.
- F. Fire hydrants shall be installed at property line not to exceed 5 feet maximum of unless approved by the City.

3.04 Valve and Fitting Installation:

- A. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be replaced before being installed.
- B. Valves, fittings, plugs and caps shall be set and joined to the pipe in the manner specified in Section 4.01 except that 12 inch and larger valves shall be provided with special support, such as #57 crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.
- C. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. Extension stems shall be installed where depth of bury places the operating nut in excess of 30 inches beneath finish grade. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the City.
- D. If valve boxes are installed concurrently with valves, the Contractor shall be responsible for maintaining valve boxes until the project is complete. All lost or damaged valve boxes shall be replaced by the Contractor, at the Contractor's own expense.
- E. A concrete pad shall be required around each valve box, the top flush with the cover as detailed on the Drawings. Precast valve pads will be allowed where approved by the City. Precast pads shall not be used on slopes or in ditches. If precast pads are used, the space between the valve box and the opening in the pad shall be filled with grout.

City of Flowery Branch
Standard and Specifications
Chapter WM

- F. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.
- G. Where main valves are shown on the Drawings adjacent to fire hydrants tees or intersection tees, install the valves no more than four feet from the tee unless shown or specified otherwise.
- H. Non-restrained and push-on joints shall not be installed within 15 feet of restrained joints at valves or fittings, unless shown otherwise on the Drawings or approved by the City.

3.05

Jack and Bore:

- A. The Contractor shall provide to the City, for approval, a detailed plan for the methods proposed for the construction of the casing. These plans shall include the methods proposed for groundwater control and face protection.
- B. In general, jack and bore operations shall conform to the requirements of the Georgia Department of Transportation as presented in their Standard Specifications for the Construction of Roads and Bridges, latest edition. If a conflict between these Specifications and the Georgia Department of Transportation Specifications exists, the more stringent Specifications shall govern.
- C. Install the steel casing pipe by the dry boring method. Bore the hole and install the casing through the soil simultaneously by a cutting head on a continuous auger mounted inside the casing pipe. Fully weld lengths of casing pipe to the preceding section in accordance with AWS recommended procedures. After the boring and installation of the casing is complete, install a cleaning plug on the rig and clean the casing.
- D. After construction of the casing is complete, and has been accepted, install the pipeline in accordance with the detailed Drawings and/or the Specifications.
- E. Check the alignment and grade of the casing and prepare plan for approval to set the carrier pipe at proper alignment, grade and elevation. The carrier pipe shall be supported by stainless steel casing spacers to preclude movement within the casing. One spacer shall be placed not more than two feet from each end of the casing. Subsequent spacers shall be placed at 6 foot to 10 foot intervals within the casing.

City of Flowery Branch
Standard and Specifications
Chapter WM

- F. Seal the ends of the casing with 4 inch brick walls, plastered with Portland cement mortar and waterproofed with asphalt roofing cement or Link-Seal Model PL or approved equal.
- G. Provide all necessary bracing, bulkheads, and shields to ensure complete safety to all traffic at all times during the work. Perform the work in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it. Begin the boring operation in a pit, sheeted and shored as necessary and begin at and proceed from one end. Observe all applicable requirements of Georgia Department of Transportation regulations. Conduct the operations in such a manner that all work will be performed below the level of the roadbed. Coordinate and schedule all of the work with the Georgia Department of Transportation.
- H. Complete all boring work at one particular location before boring work is started at another location.
- I. If the casing installation work is being conducted in an unsafe manner or in a manner detrimental to the over-passing roadway or to the safety of the traveling public, all operations of boring shall cease until the necessary corrections have been made. In the event that distress occurs to the roadway due to the boring; the Contractor shall be required to submit a plan to repair the roadway. The plan must be acceptable to the Georgia Department of Transportation and the City of Flowery Branch.

3.06

Free Boring:

- A. The Contractor may construct a driveway crossing by the free bore method, in lieu of making a pavement cut, where indicated on the drawings and approved by the City. The free bore method shall be accomplished by the dry auger boring method without jetting, sluicing, or wet boring.
- B. The diameter of the free bore shall not exceed the pipe bell outside diameter or the pipe barrel outside diameter plus 1 inch, whichever is greater.
- C. Free boring is allowable only under residential driveways. Free boring is not allowed under commercial driveways or any roadways except when the pipe diameter is 4 inches or less.
- D. The Contractor shall be responsible for any settlement of the roadway caused by the free bore construction activities.

- E. If the Contractor elects to free bore and an acceptable installation does not result for any reason, the Contractor shall install a casing pipe by the bore and jack method.

3.07 Double Check Backflow Preventer:

- A. A double check backflow preventer shall be provided immediately downstream from the customer's water meter. The backflow preventer shall be housed in a separate meter box or vault.
- B. One and ½ inch and smaller Preventers require a minimum of 6 inches below, 8 inches behind, 8 inches in front of and 3 inches above the highest point on the device or its valves.
- C. Two inch and larger Preventers require a minimum of 12 inches below, 12 inches behind, 24 inches in front of and 3 inches above the highest point on the device or its shut off valves.
- D. All backflow devices must be in-line re-buildable.
- E. A minimum of 6 inches between the pit walls and the large device's valves and 3 inches between the pit walls and the valves on the small devices is required.
- F. The dimensions given in B through D above assume a standard "shallow" installation. If the depth exceeds 12 inches to the top of the device the other dimensions will need to be increased accordingly and be approved by the City.

3.08 Double Detector Check Valve Assemblies:

- A. A double detector check valve assembly shall be installed in all fire mains and fire sprinkler service lines as close to the City main as is possible. The backflow prevention assembly shall be housed in an appropriately sized vault.
- B. Typically, a minimum of 12 inches below, 12 inches behind, 24 inches in front of and 3 inches above the highest point on the device or its shut off valve is required.
- C. A minimum of 6 inches shall be provided between the pit walls and the outside edge of the devices' shut off valves.
- D. The dimensions given in A thru C above assumes a standard "shallow" installation. If the depth exceeds 12 inches to the top of the

City of Flowery Branch
Standard and Specifications
Chapter WM

device the other dimensions will need to be increased accordingly and be approved by the City.

3.09 Water Meters and Service Lines:

- A. After the water main has been installed, tested and disinfected, water service connections shall be installed. A water service connection shall consist of a corporation tapped into the main, a copper service line to a lockable curb stop inside an approved water meter box, a meter and meter set fittings.
- B. All service lines crossing under existing pavement shall be installed by boring. All service line taps shall be made with City pressure on the main and any visible leaks shall be repaired. After each meter service has been completed, the entire assembly shall be flushed to remove any foreign matter. All service lines shall have a minimum bury depth of 36 inches under ditches and shoulders and 48 inches under the roadway.

3.10 Valve Markers:

- A. A continuous or properly spliced **Number 12 AWG** solid plastic coated copper wire shall be placed along all 2 inch PVC pipe installations.
- B. The locator wire shall run from the break-way flange of the last fire hydrant to the galvanized pipe portions of the blow off assemblies and terminate in meter box.
- C. Care shall be taken during backfilling to prevent damaging or cutting of the locator wire.
- D. All splices shall be made by using copper wire “U” bolt assemblies and then wrapping with electrical tape.
- E. Wire shall be wrapped around pipe such that at least four (4) “wraps” are produced per length of pipe.
- F. In lieu of “wrapping”, the tracer wire may be strung along the top of pipe provided it is taped to the pipe every 5 feet to insure proper positioning during backfilling.

3.11 Valve Markers:

- A. Markers shall be installed with the top of the marker protruding 12 to 18 inches above the ground surface. Valve markers shall be located

City of Flowery Branch
Standard and Specifications
Chapter WM

in a suitable location approved by the Public Utilities Department Engineering Inspector during construction.

- B. A marker shall be located within 20 feet or less from all in-line valves and/or tapping valves. One marker may be used to reference the location of more than one valve provided the valves are within 20 feet of the marker. Valve marker is not required on fire hydrant valve. No marker is to be installed within three feet of direct line of operation of a fire hydrant. Valve marker shall be installed in ditch line being in direct line with water main.
- C. The brass disc shall be stamped with the distance between the valve and marker. The marker shall be installed such that the disc faces the valve.

3.12 Field Pressure Testing:

- A. After the pipe has been installed, the complete pipe shall be subjected to a hydrostatic pressure test.
- B. Except as hereinafter allowed, the line shall be tested in sections not to exceed the distance from one line valve to the next adjacent line valve. Testing two sections through an open intermediate valve will not be allowed unless adjacent line valves are less than 300 feet apart. In no case will leakage from two or more adjacent sections be “averaged” to determine that the total section meets the leakage test. Each section of line or valved section meets the leakage test. Each section of line or valved section of the line shall be tested as follows:
 - a. At all high points, where air release valves or fire hydrants have not been installed, the Contractor shall install corporation cocks to expel the air as the pipe is slowly being filled with water. After the pressure and disinfecting tests have been completed, the corporation cocks shall be capped with brass caps and left in place. The location of said corporation cocks shall be marked on record drawings with dimensions measured from three (3) permanent structures or by survey grade GPS.
 - b. A test pump shall be installed at the low point of the section being tested and the pipe shall be slowly filled with water.
 - c. After expelling all air at the high point, the corporation cocks shall be closed and the pressure increased to 250 psi at the

City of Flowery Branch
Standard and Specifications
Chapter WM

test pump location. The test pressure shall be maintained within 5 psi for the duration of the test.

- d. The volume of water required by the test pump to maintain this excess pressure, which will represent the leakage, shall not exceed 0.14 gallons per hour per inch diameter per 1000 feet of pipe.
- e. Excess pressure and leakage test shall be successfully conducted for not less than 2 consecutive hours. Provide an accurate pressure gauge with graduation not greater than 5 psi.
- f. The Contractor shall, at his own expense, locate and make repairs as necessary until the leakage is within the specified allowance.
- g. All visible leaks shall be repaired regardless of the amount of leakage. The Contractor shall furnish all labor, equipment and material necessary to conduct tests, and shall furnish and install all temporary plugs and valves necessary to isolate the test sections. Water for test purposes will be furnished by the City of Flowery Branch.

3.13 Disinfecting Pipelines:

- A. After successfully pressure testing each pipeline section, disinfect in accordance with **AWWA C 651** for the continuous-feed method and these specifications.
- B. Chlorination:
 - a. Apply chlorine solution into the new water main. Retain chlorinated water for minimum of 24 hours.
 - b. After 24 hours, the owner shall assist the contractor in obtaining samples at every outlet. Samples of water shall contain at least 25 milligrams per liter free chlorine. Re-chlorinated if required results are not obtained on all samples.
 - c. Provide the owner a minimum 24 hours notice to take samples. Weekends and recognized holidays shall not be included as part of the 24 hour notice.

City of Flowery Branch
Standard and Specifications
Chapter WM

- C. Disposal of chlorinated water: Reduce chlorine residual of disinfection water to less than 1 milligram per liter if discharged directly to a body of water, or to less than 2 milligrams per liter if discharged onto the ground prior to disposal. Treat water with sulfur dioxide or other reducing chemicals to neutralize chlorine residual. Flush all lines until residual are equal to existing system.

- D. Bacteriological Testing: After final flushing and before the main is placed into service, the owner shall assist the contractor in collecting samples from the line to have tested for bacteriological quality. Testing shall be performed at a laboratory certified by the State of Georgia. Re-chlorinate lines until the required results are obtained. Provide the owner a minimum 24 hour notice to take samples. Weekends and recognized holidays shall not be included as part of the 24 hour notice. Contractor shall open all valves being a part of said system being tested upon approval of bacteriological testing.

3.14 Guarantee Against Taste, Odor or Color:

- A. The Contractor shall guarantee for a period of one year against taste, odor or color caused by pipe lining materials. The Contractor shall at his own expense provide all necessary treatment to counteract any taste, odor or color. Bonafide complaints of taste, odor or color in the area served by the new mains shall be deemed caused by pipe lining materials.

3.15 Back Flow Devices:

- A. All ¾ inch back flow prevention devices need to be inline repairable.
- B. All other devices need to be sized according to line size.
- C. All vaults have to be of size and specifications for back flow devices.

END OF SECTION

**Section Two
Reuse Water Mains**

- 2.01 Reuse Mains: See Specifications for Construction of Non-Potable Reuse Water Line**

END OF SECTION

**Section Three
Sanitary Sewerage Systems**

Part 1- General

1.01

Scope

- A. The Contractor shall furnish all materials (unless otherwise agreed upon), labor and equipment necessary to construct the sewers, and appurtenances indicated or shown on the drawings. The work shall include all necessary diking, pumping, bailing, draining, flushing, testing and erosion and sedimentation control. These specifications cover water mains and water service connections complete.
- B. The Contractor shall so arrange his work as to cause a minimum of interference with pedestrian and vehicular traffic and to protect and maintain power and telephone lines, gas and water piping, fences, building, drainage pipes and other structures, all as specified.
- C. The lines and grade of the sewer and the position of all manholes and other appurtenances are as shown on the drawings. The grade line as shown means the invert, or bottom of the inside of the pipe or manhole. The work shall be laid out by the Contractor using bench marks and the other control points.
- D. The Contractor shall be responsible for removing all water from excavations and trenches whether from surface or ground sources.
- E. Changes to the Standard Specifications for Sanitary Sewers may be made by the City at any time
- F. The Contractor shall guarantee all materials and workmanship for a period of one (1) year from the date of final acceptance of the work. Per stipulations as stated in Section 3.A of Ordinance No. 404, if during this period any material or workmanship, etc., proves defective, the Developer or Contractor shall repair same to the satisfaction of the City of Flowery Branch at their own cost and expense.
- G. In order to be sure that the developer, owner, contractor, or any combination thereof, can actually perform and will actually perform the warranty required under this ordinance, the developer, owner, or contractor, or any combination thereof, shall agree to and provide either a guaranty agreement, a surety agreement, an escrow agreement, a cash bond, a letter of credit or other acceptable financial instrument, that obligates the warranting party to correct any defects in design, materials or workmanship during the 12 month period, and

City of Flowery Branch
Standard and Specifications
Chapter WWM

obligates a sum for said repairs during the period of at least equal to 20% of the cost of constructing and installing said line or lines. Said guaranty agreement, surety agreement, escrow agreement, cash bond, letter of credit or other financial instrument, shall be reviewed and approved by the City Attorney, prior to acceptance. If an issue arises as to the amount of costs that are to be warranted under said financial instrument, then the City Engineer shall provide an estimated cost that shall be used as the basis for said agreements.

- H. Changes to the Standard Specifications for Sewer may be made by the City at any time.

1.02

Related Work:

- A. Section Four: Excavation, Trenching and Backfilling
- B. Section Five: Site Preparation, Restoration and Related Work.

1.03

Applicable Specifications and Standards:

- A. The latest editions of the following specifications, standards and publications setting minimum requirements for quality, safety and performance of work and materials form a part of this specification as though fully repeated herein:
 - a. ASTM American Society of Testing Materials
 - b. ANSI American National Standards Institute

1.04

Record Drawings

- A. The Contractor shall be responsible for maintaining a set of the approved design drawings which have been marked to reflect as-built conditions. These "record drawings" shall be kept at the site during working hours and shall be made available to the City Inspector upon request.
- B. The record drawings shall show the as constructed locations of (but not be limited to) all manholes, stub-outs, service materials, cleanouts air release valves, etc.
- C. Final acceptance of sewer construction will not be granted until as-built drawings have been received by the City.
- D. Appurtenance locations shall be dimensioned to three (3) permanent fixtures or objects.

City of Flowery Branch
Standard and Specifications
Chapter WWM

Part 2- Materials

2.01

General:

- A. Materials to be incorporated into the work shall be new and unused, and shall conform to all applicable requirements of these specifications. Submittal and approval of all materials, shop drawings or samples shall be in conformance with these specifications. Any materials installed prior to approval by the City, will be subject to rejection, and will be removed at the Contractor's expense.
- B. All pipes have to have a minimum of 48" of cover.
- C. All sanitary sewer lines have to be ductile iron piping (DIP).
- D. All service lines in right of way have to be 6 inches or larger.
- E. Only services lines may be polyvinyl chloride (PVC) unless specified by the City of Flowery Branch or other authority.

2.02

Ductile Iron Pipe:

- A. Ductile iron pipe shall be utilized for all sewage force mains, stream crossings, highway crossings and other applications and where indicated or specified. All pipes shall be furnished in nominal lengths of 18 to 20 feet.
 - 1. Ductile iron pipe shall conform to AWWA C 151 and shall be thickness Class 50 or pressure Class 350 unless otherwise specified or shown on the Drawings. Flanged pipe shall be minimum Class 53. Pipe and fittings shall be cement lined in accordance with AWWA C 104 or must have a corrosion resistant inside coating which will also meet EPD corrosion resistant standards. Fittings shall conform to AWWA C 110 with rated working pressure of 250 psi. Pipe and fittings shall be furnished with a bituminous outside coating.
 - 2. Unless shown or specified otherwise, joints shall be push-on type for pipe and standard mechanical joints for fittings. Joints shall conform to AWWA C 111. Flanged joints shall conform to AWWA C 115.
 - 3. Acceptance will be on the basis of inspection and the manufacturer's written certification that the pipe was

City of Flowery Branch
Standard and Specifications
Chapter WWM

- 4. manufactured and tested in accordance with the applicable standards.

2.03 Polyvinyl Chloride Sewer Pipe (Sanitary Service Lines Only):

- A. Polyvinyl chloride (PVC) service sanitary sewer pipe shall be integral bell rubber ring gasket joint pipe. The pipe and its joints shall meet the following minimum specifications.
 - i. The pipe shall be produced to meet or exceed ASTM D 3034 SDR 35 standard.
 - ii. The PVC compound shall be produced in accordance with ASTM D 1784.
 - iii. Pipe joint shall be tested in accordance with ASTM D 3132.

2.04 Detection Tape:

- A. Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Sanitary Sewerage Systems, Safety Green, "Caution: Sewer Line Buried Below." Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be permanently printed with no surface printing allowed. Tape width shall be minimum 2 inches when buried less than 10 inches below the surface. Tape width shall be minimum 3 inches when buried greater than 10 inches and less than 20 inches. Detection tape shall be equal to Lineguard Type III Detectable or Allen Systems Detectatape.

2.05 Casing Pipe:

- A. The steel casing pipe shall be manufactured from steel conforming to ASTM A 39, Grade B. Size and thickness shall be as follows:

<u>Pipe Diameter (inches)</u>	<u>Under Highways</u> <u>Casing Diameter (inches)</u>	<u>Wall Thickness (inches)</u>
6	12	0.250
8	16	0.250
10	16	0.250
12	18	0.375
14	22	0.500
15	24	0.500
16	24	0.050
18	30	0.500

City of Flowery Branch
Standard and Specifications
Chapter WWM

<u>Pipe Diameter (inches)</u>	<u>Casing Diameter (inches)</u>	<u>Wall Thickness (inches)</u>
20	30	0.500
24	36	0.500
30	42	0.500

Under Railroads

<u>Pipe Diameter (inches)</u>	<u>Casing Diameter (inches)</u>	<u>Wall Thickness (inches)</u>
6	14	0.250
8	18	0.375
10	20	-
12	22	AS DETERMINED
14	24	BY
15	30	RAILROAD
16	30	-
18	30	-
20	32	-
24	32	-
30	42	-

- B. The materials for casing under State Highways shall be in accordance with the Georgia Department of Transportation Standard Specifications for the Construction of Roads and Bridges, latest edition. It shall be the Contractor's responsibility to determine the exact requirements of the Georgia Department of Transportation. If a conflict is found, the more stringent Specification will prevail.

2.06

Stainless Steel Casing Spacers:

- A. Spacers shall be bolt on style with a two piece shell made from T-304 stainless steel of a minimum 14 gauge thickness. The shell shall be lined with a ribbed PVC sheet of a 0.090" thickness that overlaps the edges. Runners, made from UHMW polymer, shall be attached to risers at appropriate positions to properly locate the carrier within the casing and to ease installation. Risers shall be made from T-304 stainless steel of a minimum 14 gauge thickness and shall be attached to the shell by MIG welding. All welds shall be fully passivated. All fasteners shall be made from T-304 stainless steel. Casing spacers shall be Model CCS as manufactured by Cascade Waterworks Manufacturing Company of Yorkville, Illinois or approved equivalent.

2.07

Materials For Manholes:

- A. Provide materials for construction of manholes in accordance with the following:

City of Flowery Branch
Standard and Specifications
Chapter WWM

- i. Precast concrete sections shall meet the requirements of ASTM C 478. The minimum compressive strength of the concrete in precast sections shall be 4,000 psi. The minimum
 - ii. shell thickness shall be one twelfth of the inside diameter of the riser or the largest cone diameter.
 - iii. Precast manhole sections shall be the eccentric type.
 - iv. Seal joints between precast sections by means of rubber O-ring gaskets or flexible butyl rubber sealant. Butyl rubber sealants shall meet the requirements of AASHTO M 198. Sealant shall be pre-formed type with a minimum nominal diameter of 1 inch. Butyl rubber sealant shall be equal to Kent Seal number 2 or Concrete Sealants CS 202.
- B. Brick shall be whole and hard burned, conforming to ASTM C 32 Grade MS. Mortar shall be made of 1 part Portland cement and 2 parts clean sharp sand. Cement shall be Type 1 and shall conform to ASTM C 150. Sand shall meet ASTM C 53.
- C. Cast iron manhole frames and covers shall meet the requirements of ASTM A 48 for Class 30 gray iron and all applicable local standards. All castings shall be tough, close grained, and smooth and free from blow holes, blisters, shrinkage, stains, cracks, cold shots and other imperfections. No casting will be accepted which weighs less than 95% of the design weight. Shop drawings must indicate the design weight and provide sufficient dimensions to permit checking. All castings shall be thoroughly cleaned in the shop.

- i. Manhole frames and covers shall be equal to the following:

<u>Type</u>	<u>Design Weight</u>	<u>Manufacturer's Reference</u>
Traffic	335	East Jordan Iron Works Catalog No. 1730A, 1731Z or U.S. Foundry Catalog No. 362

- ii. Watertight traffic type frames and covers shall have the same weight and dimensions as those specified in Paragraph 2.08C (1).
- iii. All manhole covers shall bear the standard "Flowery Branch Pattern" and have the words "Sanitary Sewer" cast in the top.

City of Flowery Branch
Standard and Specifications
Chapter WWM

- D. Plastic steps: Manhole steps of polypropylene molded around a steel rod equal to products of M.A. Industries shall be used.
- E. Rubber Boots: Provide preformed rubber boots and fasteners equal to those manufactured by Kor-N-Seal of Press Seal Gasket Corporation.
- F. All grout shall be non-metallic, non-shrink type. Cement shall be Type III. Grout shall meet the following requirements:

<u>Criteria</u>	<u>Test Method</u>	<u>Result</u>
Workability	ASTM C 191	Initial set time not less than 60 minutes
Compressive Strength	ASTIM C 109 (restrained condition)	1 day- 3000 psi
Shrinkage	ASTM C 827 and CRD 588	No shrinkage after placement or no shrinkage after set

- G. The Contractor shall furnish independent laboratory test results as evidence of full compliance with these requirements.
- H. Grout shall be mixed and placed in accordance with the recommendations of ACI, and the grout manufacturer's published recommendations.

2.08

Adaptor Donuts & Couplings:

- B. Adaptor donuts shall be polyvinyl chloride (PVC), compressible seals designed for sealing joints between sewer pipes of different sizes and/or dissimilar materials. Adaptors shall provide a positive seal against infiltration and exfiltration and remain leak proof and root proof up to 4.3 psi. Donuts shall be equal to products of Fernco and shall be installed in accordance with the manufacturer's recommendations.
- C. Adaptor couplings shall be elastomeric plastic sleeves designed to connect pipes of dissimilar materials. Adaptor couplings shall provide a positive seal against infiltration and exfiltration and remain leak proof and root proof up to 10 psi. The adaptor manufacturer shall provide stainless steel clamps and other required accessories. Couplings shall be equal to products of Fernco and shall be installed in accordance with the manufacturer's recommendations.

2.09

Bedding Materials:

- A. Bedding materials shall be crushed stone unless shown or specified otherwise.

City of Flowery Branch
Standard and Specifications
Chapter WWM

- i. Crushed stone bedding material shall meet the requirements of Georgia Department of Transportation Specification 800.01 for number 57 stone, Group II (quartzite granite).

2.10

Concrete for Pipe Encasement, Encasement Collars and Force Main Blocking:

- A. Concrete shall have compression strength of not less than 3000 psi. with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5 inches. For job mixed concrete, submit the concrete mix design for approval. Mix and transport ready-mixed concrete in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A615, grade 60.
- B. All bends, tees and/or any place where concrete is to cover pipes, plastic is to be wrapped over the pipes first and must be inspected before cover is applied.

2.11

Air Release and Air Vacuum Valves:

- A. Air Release Valves (Type 1): Valves shall be automatic air release valves designed to allow escape of air under pressure and close water-tight when liquid enters the valve. The valve shall have a maximum orifice diameter of 5/16 inch. The valve body shall be cast iron, designed to facilitate disassembly for cleaning and maintenance. The float shall be stainless steel; the valve seat and all working parts shall be of corrosion resistant materials. Valves shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without dismantling the valve. Valves shall be recommended by the manufacturer for wastewater service. Air release valves shall be equal to APCO Valve Corporation, Val-Matic or G.A. Industries.
- B. Combination Air Valves (Type II): Combination air valves shall consist of an air valve tapped into the body of an air and vacuum valve. Valves shall conform to the following:
 - i. Automatic Air and Vacuum Valves: Valves shall be automatic air and vacuum valves designed to allow escape of air, close water-tight when liquid enters the valve and allow air to enter in the event of a vacuum. The valve body shall be cast iron, designed to facilitate disassembly for cleaning and maintenance. The float shall be stainless steel; the valve seat and all working parts shall be of corrosion resistant materials. Valves shall be equipped with the necessary attachments,

City of Flowery Branch
Standard and Specifications
Chapter WWM

including valves, quick disconnect couplings and hose, to permit back flushing after installation without dismantling the valve. Valves shall be recommended by the manufacturer for wastewater service. Air and vacuum valves shall be equal to APCO Valve Corporation, Val-Matic or G.A. Industries.

- ii. Air Release Valves: Valves shall be automatic air release valves designed to allow escape of air under pressure and close water-tight when liquid enters the valve. Valve shall have a 2 inch NPT inlet and a maximum orifice diameter of 5/16 inch. The valve body shall be cast iron, designed to facilitate disassembly for cleaning and maintenance. The float shall be stainless steel; the valve seat and all working parts shall be of corrosion resistant materials. Valves shall be equipped with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without dismantling the valve. Valves shall be recommended by the manufacturer for wastewater service. Air release valves shall be equal to APCO Valve Corporation, Val-Matic or G.A. Industries. Single Body Valve: In lieu of (1) or (2) above, a single body, double orifice, sewage combination valve may be used. Materials of construction, orifice size, venting capacity and accessories shall meet the requirements of (1) and (2) above. Single body, double orifice valve shall be equal to APCO Valve Corporation.

PART 3-EXECUTION

3.01

Installing Pipe:

- A. Utmost care shall be exercised in loading and unloading pipe, fittings and accessories, in order to avoid shock or damage to the material. Lifting shall be by hoist, fork lift or front end loader. Dropping will not be permitted. Pipe shall be distributed along or near the trench location. The Contractor shall be responsible for the safe handling of all materials, and no damaged materials shall be used.
- B. Bedding for sanitary sewers shall be Class B or greater.
- C. The pipe and fittings must be so laid in the trench that after the sewer is completed all small permissible defects in the pipe are at the top of the sewer, and so that the interior surface shall conform accurately to the grade and alignment. Pipe laying shall be done so as to disturb as little as possible the pipe previously laid, and unless otherwise directed the pipe shall be laid up grade between manholes. Before

City of Flowery Branch Standard and Specifications Chapter WWM

laying, the pipe shall be wiped clean of all dirt and foreign matter, and the joining surfaces of bells and spigots shall be clean and dry.

- D. As the work progresses, the interior of the pipes shall be carefully freed of all dirt and superfluous material of every description. A filled bag or other approved type of follower shall be used and shall be pulled through the line immediately after each joint is made in order to remove any joint material and debris that may be left on the inside of the pipe. If a bag type follower is used, a new one shall be provided for each day.
- E. Before being placed in the trench, each section of pipe shall be carefully examined for defects and the inside of the pipe shall be swabbed clean. The bottom of the trench shall be so shaped that the pipe will have a bearing on the earth along its entire length. The pipe shall not rest on native trench rock at any point (see Section 3.01.J).
- F. Ductile iron sewer pipe shall be laid to the line and grade of the sewer where it crosses above a stream, ravine or branch. Each joint shall be supported by a concrete pier. On each side of the body of water a four foot by four foot blocking is required unless a greater amount is deemed necessary.
- G. All pipelines are intended to be straight between manholes, and a circle of light shall be visible from one end to the other. Broken or cracked pipe shall be replaced with sound pipe, and any deposit, protruding joint compound, cement or packing shall be removed and the barrel of the sewer left clean for its entire length. All sewers shall be cleaned to remove all mud and debris prior to testing.
- H. Minimum slope for 8-inch and larger gravity sanitary sewer pipe shall be 0.5% and the maximum slope shall be 15%.
- I. When work is suspended or at night, the open ends of all pipe lines shall be promptly closed over in such a manner as will prevent the entrance of dirt, mud, animals or other objectionable matter.
- J. All sewers shall be bedded. Compact stone bedding material by tamping or slicing with a flat bed shovel. Prepare the trench bottom to support the pipe uniformly throughout its length. Provide bell holes to relieve pipe bells of all loads. If the trench is excavated to excessive width or depth, provide the next better class of bedding. Ductile iron pipe shall be installed where trench bottom consist of fill material. Bedding under pipe and manholes shall be compacted to a minimum of 85% of the maximum Standard Proctor density, unless shown or

City of Flowery Branch Standard and Specifications Chapter WWM

specified otherwise. Lay all gravity sewer pipes with minimum of Class "C" bedding unless shown or specified otherwise.

i. The various classes of bedding to be installed are as follows:

1. Class "A": Excavate the trench to a depth of $\frac{1}{4}$ the nominal diameter of the pipe below grade and lay the pipe to line and grade on concrete block. Place concrete to the full width of the trench and to a height of $\frac{1}{4}$ the outside diameter of the pipe above the invert.
2. Class "B": Excavate the bottom of the trench flat at the minimum depth directed below the bottom of the pipe barrel. Place and compact bedding material to the proper grade. Bedding shall then be carefully placed by hand and compacted to provide full support under and up to the centerline of the pipe.
3. Class "C": Excavate the bottom of the trench flat at the minimum depth directed below the bottom of the pipe barrel. Place and compact bedding material to the proper grade. Bedding shall then be carefully placed by hand and compacted to provide full support under and up to a height of $\frac{1}{4}$ the outside diameter of the pipe above the invert.

K. Water mains shall maintain a minimum 10 feet edge to edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right-of-way and provide the 10 feet separation; the separation may be reduced provided the bottom of the water main is a minimum of 18 inches above the top of the sewer. Should neither of these two separation criteria be possible, then the water main shall be installed below the sewer with a minimum vertical separation of 18 inches. If waterlines cross under gravity sewer lines, then encase the sewer line fully in concrete for a distance of at least 10 feet on each side of the crossing. Lay waterline which crosses sewer force mains and inverted siphons at least 2 feet above these sewer lines. When joints in the sewer lines are closer than 3 feet horizontally from the water line, and then encase these joints in concrete. Do not lay waterline in the same trench with gas lines, fuel lines or electric wiring. No water main shall pass through or come in contact with any part of a sanitary sewer manhole.

3.02

Jack and Bore:

- A. The Contractor shall provide to the City, for approval, a detailed plan for the methods proposed for the construction of the casing. These plans shall include the methods proposed for groundwater control and face protection.
- B. In general, jack and bore operations shall conform to the requirements of Georgia Department of Transportation as presented in their Standard Specifications for the Construction of Roads and Bridges, latest edition. If a conflict between these specifications and the Georgia Department of Transportation specifications exists, the Department of Transportation specifications shall govern.
- C. Install the steel casing pipe by the dry boring method. Bore the hole and install the casing through the soil simultaneously by a cutting head on a continuous auger mounted inside the casing pipe. Fully weld lengths of casing pipe to the preceding section in accordance with AWS recommended procedures. After the boring and installation of the casing is complete, install a cleaning plug on the rig and clean the casing.
- D. After construction of the casing is complete, and has been accepted, install the pipeline in accordance with the detailed Drawings and/or the Specifications.
- E. Check the alignment and grade of the casing and submit a plan for approval to set the carrier pipe at proper alignment, grade and elevation. The carrier pipe shall be ductile iron and be supported by stainless steel casing spacers strapped to the pipe barrel, or some similar arrangement to preclude movement within the casing. One spacer shall be placed not more than 2 feet from each end of the casing. Subsequent spacers shall be placed not more than 2 feet from each end of the casing. Subsequent spacers shall be placed at 6 to 10 foot intervals within the casing. One spacer shall be placed on the spigot end of each segment at the line marking the limit of insertion into the bell of the joint so that the spacer pushes the joint and relieves compression within the joint. Subsequent spacers shall be placed at 6 foot intervals.
- F. Seal the ends of the casing with 4 inch brick walls, plastered with Portland cement mortar and waterproofed with asphaltic roofing cement or Link-Seal Model PL or approved equal.

City of Flowery Branch
Standard and Specifications
Chapter WWM

- G. All gravity sewer installations not utilizing stainless steel skids shall have the void between carrier and pipe casing filled with grout. Prior to grouting, the carrier pipe within the casing shall be pressure tested and then filled with water to prevent floatation. Grout shall be pumped through a pipe, gradually filling the void (between casing and carrier pipe) from the lower end to the upper end by slowly withdrawing the pipe as the void is filled.
- H. Provide all necessary bracing, bulkheads, and shields to ensure complete safety to all traffic at all times during the work. Perform the work in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it. Begin the boring operation in a pit, sheeted and shored as necessary and begin at and proceed from one end. Observe all applicable requirements of Georgia Department of Transportation regulations. Conduct the operations in such a manner that all work will be performed below the level of the roadbed. Coordinate and schedule all of the work with the Georgia Department of Transportation.
- I. Complete all boring work at one particular location before boring work is started at another location.
- J. If, in the opinion of the City or Georgia Department of Transportation the casing installation work is being conducted in an unsafe manner or in a manner detrimental to the over passing roadway or to the safety of the traveling public, all operations of boring shall cease until the necessary corrections have been made. In the event that distress occurs to the roadway due to the boring, the Contractor shall be required to submit a plan to repair the roadway. The plan must be acceptable to Department of Transportation and the City of Flowery Branch.

3.03

Manhole Installation:

- A. The excavation for manholes shall be sufficient to leave 12 inches in the clear between their outer surface and the embankment or the timber sheathing. Manholes shall be constructed where directed, or at the locations and in accordance with the details shown on the plans, and shall be of the Precast concrete type. Excavation in excess of the depths required for manholes shall be corrected by pouring a sub-foundation of 2500 psi concrete.
- B. A Precast base section shall be installed on a firm stabilized foundation so prepared to prevent settlement and misalignment. Pipe

City of Flowery Branch
Standard and Specifications
Chapter WWM

openings shall be exactly aligned with the pipe entering and leaving the manhole.

- C. Rubber ring joints shall be carefully made in accordance with the manufacturer's instructions and generally in the following manner. Bells shall be wiped clean, be free of all dirt or other matter, and liberally lubricated for receiving the spigot ends. The gasket groove and gasket shall be well cleaned and lubricated prior to placing.
- D. Inverts may be formed directly in the concrete of the manhole base; be built up of brickwork and mortar; consist of half tile laid in the concrete base; or be constructed by lying full section sewer pipe straight through the manhole and cutting out the top half after the concrete base is constructed and sufficiently set. Inverts shall have a minimum of two (2) tenths of a foot drop from the incoming to the outgoing pipe.
- E. Cast iron frames and covers shall be set in a bed of mortar and aligned to fit the top section of the manhole. If the difference in the desired top of the manhole elevation and the existing elevation is greater than 12 inches, then concrete grade rings in combination with brick and mortar shall be used to adjust the top to finished grade. Adjustment of the frame and cover with brick and mortar only shall be limited to a maximum of 12 inches. If the frame and cover is cast into the precast cone section, then adjustment shall be accomplished with concrete grade rings only.

The cast iron frame for the manhole cover shall be set at the elevation and anchored to the masonry. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted to conform to the exact slope, crown and grade of the adjacent pavement.

- F. Manholes on sewers not within streets or alleys shall have the top of cover 12 to 18 inches above the surrounding ground surface or as indicated on the drawings.
- G. Pipeline connections to manholes shall be made with rubber boots.

3.04

Drop Manholes:

- A. Where the vertical distance between incoming and outgoing sewers exceed 2 feet, an outside drop connection shall be constructed as shown herein.

3.05

Service Pipe:

- A. Service line laterals shall be connected to the collection system by full line wyes or tees on new sewers and service sables when connecting to existing sewers. Service lines shall not protrude inside the barrel of the sewer main. Service line connections to manholes shall be kept to an absolute minimum.
- B. Service connections shall be connected to the public sewer where shown on the plans or where directed by the City of Flowery Branch Public Utilities Inspector. The wyes or tees shall branch as detailed

with the branch sitting at an angle of 45 degrees to the horizontal. Service pipe shall be 6 inches in diameter.
- C. The workmanship for the service connection shall be equal to that specified for the main sewers. The minimum slope for service laterals shall be 1.0%.
- D. A sanitary sewer cleanout shall be constructed at the point at which City of Flowery Branch maintenance terminates. This point shall be the right of way line, the property line, or the easement line whichever is applicable.
- E. Service lateral and cleanout pipe materials shall be either SDR 26 polyvinyl chloride (PVC) pipe or Ductile Iron Pipe (DIP). If the cleanout is located in a driveway, parking area, etc., then the pipe materials shall be ductile iron.
- F. All cleanout plugs shall be made of brass and shall be placed at grade.

3.06

Sewage Force Mains:

- A. All sewage force mains shall be ductile iron pipe, Class 50 with Polybond Plus or Protecto 401 interior coating. the corrosion resistant inside coating shall meet EPD corrosion resistant standards.
- B. Before being placed in the trench, each section of pipe shall be carefully examined for defects and the inside of the pipe shall be swabbed clean. The bottom of the trench shall be so shaped that the pipe will have a bearing on earth along its entire length, except at the joints. The pipe shall not rest on rock at any point.
- C. The force mains shall be placed in the indicated locations or where shown on the drawings. It must be kept clean and open ends plugged

City of Flowery Branch
Standard and Specifications
Chapter WWM

when pipe laying is not in progress. The inside of the pipe and bell and spigot shall be cleaned before jointing.

- D. The force main shall be laid on a continuous up-grade to avoid air pockets. An air relief valve must be installed at the peak when a downgrade cannot be avoided. The actual location of the high points shall be confirmed using a surveyor's level.
- E. Upon completion, the force main shall be tested to at least 150 psi. All joints shall be inspected under this pressure and any leakage or seepage shall be corrected.
- F. The force main discharge shall be at the highest point in the force main unless specifically approved by the City of Flowery Branch.

3.07

Air Relief Valves:

- A. Air relief valves shall be provided on the sewage force mains where indicated. Each air relief valve installation shall include the air valve, a gate valve, a discharge elbow, pipe nipples, a connection to the force main and the manhole. Air relief valves shall be installed at the high points of the force mains or the locations indicated. Each valve manhole shall be precast as specified for sewer manholes.

3.08

Sewer Line Testing:

- A. Infiltration Test:
 - a. Infiltration of ground water into sewer lines shall not exceed 100 gallons per inch of diameter per 24 hour day per mile of sewer.
 - b. Sewers shall be tested for infiltration in the following manner: Following a period of heavy rain, a test for infiltration into the sewers shall be made using suitable weirs in manholes selected by the City of Flowery Branch with upstream sewers plugged as directed. Three measurements shall be made at one hour intervals, and the average of three measurements shall be used to compute the amount of infiltration. The City Inspector shall determine whether the ground is sufficiently saturated and whether the amount of rainfall is of sufficient quantity to permit the making of the test. In the event that sufficient rain does not occur before the date set for the final inspection, the Contractor will be required to conduct tests at

City of Flowery Branch
Standard and Specifications
Chapter WWM

any time during the next 90 day period following the final inspection.

B. Exfiltration Test:

- a. When weather conditions will not permit infiltration testing due to low ground water table, exfiltration tests may be used. Leakage, under a 5 feet head, shall not exceed 100 gallons per day per inch of pipe diameter per mile.
- b. The exfiltration test may be required by the City of Flowery Branch in lieu of or in addition to the infiltration test.

C. Air Testing:

- a. After the pipe has been installed and backfilled, the sewer may be tested between manholes by a low pressure air test.
- b. The air test may be required by the City in lieu of or in addition to the infiltration test.
- c. Porous pipe material may be wetted before air testing to minimize loss of air through pipe walls.
- d. The pipe shall be filled with air slowly to a constant pressure of 4.0 psi. The pressure shall then be maintained between 3.5 to 4.0 psi for not less than five minutes.
- e. The sewer passes if the pressure does not drop over 1 pound in the 5 minute test. If the drop is more than 1 pound the necessary repairs must be made and the line retested.
- f. The sewer is acceptable if the loss of air from 4.0 to 3.0 is not less than the time shown in the following table:

<u>Pipe Diameter</u>	<u>Min.</u>	<u>Time Sec.</u>	<u>Pipe Diameter</u>	<u>Min.</u>	<u>Time Sec.</u>
8"	5	57	20"	9	26
10"	5	43	21"	9	50
12"	5	40	24"	11	20
14"	6	36	27"	12	45
D.15 ^A	7	05	30"	14	10
16"	7	33	36"	17	00
18"	8	30			

City of Flowery Branch
Standard and Specifications
Chapter WWM

Lines are to be TV'd for visual inspection by the Contractor with an inspector from the City present. The inspection is to be recorded and a copy of the tape given to the inspector for City records and future reference use.

3.09

Manhole Testing:

- A. 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 the ring. The maximum allowable exfiltration rate is 2 gallons/foot of depth/ 24 hours/foot of manhole diameter.
- B. 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 4 pounds psi shall be drawn and the vacuum pump shut off. With the valves closed, the pressure shall be monitored for a time period of 5 minutes. At the end of the test period. If the vacuum drops no more than 1 pound, the manhole has passed the test. If the vacuum drops more than 1 pound the manhole has failed and the necessary repairs will be made and the manhole retested.
- C. Vacuum test may be done per the requirements of the Inspector.

END OF SECTION

**Section Four
Excavation, Trenching and Backfilling**

Part 1- General

1.01 Scope:

- A. This section covers the excavation, trenching and backfilling for all water mains, sanitary sewers and service laterals up to the point of connection to the building sewer, property line, and right of way or back of curb as applicable.

1.02 Density Tests:

- A. All trenches 12 inches or wider, as measured at the top, that are within roadways, or roadway right of ways, parking areas and areas to be paved shall be tested for conformance to specified compaction requirements.
 - a. These trenches shall be backfilled and compacted to their full depth.
 - b. Tests shall be made within each 400 square feet of trench areas for each one foot of lift above top of conduit. Tests taken in one foot lifts shall be staggered.
 - c. Compaction shall not be less than that of the surrounding areas or 95% of the maximum dry density as determined by the Standard Proctor Test. The top 12 inches shall be compacted to a minimum of 98% of the maximum dry density.
 - d. Backfill within the Georgia Department of Transportation right of way shall meet all requirements as stipulated in the "Utility Accommodation Policy and Standards," as published by the Georgia Department of Transportation.
- B. All trenches 12 inches or wider, as measured at the top, that are not within roadways, or other areas to be paved shall be compacted to not less than that of surrounding areas or 90% of the maximum dry density.

Part 2- Excavation

2.01 Excavation:

- A. The Contractor shall perform all excavation in accordance with the most recent OSHA standards and to the depths required or as shown on drawings. During excavation, materials suitable for backfilling shall be

City of Flowery Branch
Standard and Specifications
Chapter ETB

piled a minimum distance of 2 feet from the banks of the excavation to avoid overloading and to prevent slides and cave-ins. Excavated materials not required for fill or back-fill shall be removed from the site. Unless otherwise indicated or specified, all excavation shall be made by open cut. No tunneling shall be done.

- B. Excavation shall not be carried below the designated level except where special bedding is required due to unforeseen conditions, or is specified or shown on the drawings. Excess excavation below the designated level shall be backfilled with crushed stone and tamped. Excess excavation for manholes and other structures shall be filled with crushed stone or concrete to the required elevation.
- C. Trenches shall be only of sufficient width to provide a free working space on each side of the pipe. To prevent excess pressure on the pipe, the maximum width of pipe trench at the top of the pipe shall not be greater than two feet more than the pipe diameter. If this maximum width is exceeded for water or sewer pipelines, the Contractor shall provide Class A bedding as presented in Section Three. The top portion of the trench above 4 feet shall be excavated with sloping sides in accordance with OSHA standards to any width which will not damage adjoining structures, roadways, pavements, utilities or private property. If it is deemed necessary to excavate trench with vertical sides then OSHA approved shoring and sheeting methods shall be used.
- D. All water mains shall have a minimum of 48 inches of cover above the top of the pipe or 48 inches below edge of pavement, whichever is greater. All water mains 12 inches and larger shall have a minimum of 60 inches of cover above the top of the pipe or 60 inches below the edge of the pavement, whichever is greater unless otherwise indicated by the City of Flowery Branch.
- E. The trench bottom shall be made to conform as near as possible to the shape of the lower third of the pipe. Excavation shall be made for joints of all pipes, and shall be of sufficient depth to permit access to the joints for construction and inspection. In no case shall the joints be used to support the body of the pipe. Bell holes shall be excavated in the trenches so as to relieve pipe bells of all loads, but small enough to insure that support is provided throughout the length of the pipe barrel.
- F. Unstable soil shall be removed and replaced with crushed stone, which shall be tamped.
- G. Ground adjacent to all excavations shall be graded to prevent inflow of water.

City of Flowery Branch
Standard and Specifications
Chapter ETB

- H. The excavation of the trench shall not advance more than 100 feet ahead of the completed pipe work.
- I. The Contractor shall remove any water accumulated during excavation, whether from ground or surface sources.
- J. The Inspector shall be notified immediately upon encountering site conditions at variance to those indicated and any active or inactive utility encountered not indicated on the drawings. No work shall be done to correct or incorporate unforeseen conditions until written instructions are issued.
- K. No trenches will be permitted to be left open overnight, on weekends, or on holidays.

2.02 Rock Excavation:

- A. All rock encountered shall be removed 6 inches below the bottom grade of the trench where pipe is being laid, and the trench built back to the correct grade with suitable select material thoroughly tamped into place, unless the Contractor is specifically directed to place stabilization material. In the event rock excavation is required at the location of structures, the measurements for rock excavation will be limited to the width and depth as discussed in item D. No extra will be allowed for bank slope.
- B. No payment will be made for rock excavation without the measurements of the Inspector at each location. When rock is encountered it shall, at the option of the Contractor, be measured by one of the following methods:
 - a. The rock shall be stripped of earth and the inspector notified and given proper time to measure the rock before blasting.
 - b. With the Inspector present, the Contractor shall employ a track drill or other suitable rock drilling equipment to penetrate the overburden down to solid rock. The top of the rock elevation shall be determined by measuring the depth of the drill bit below the ground surface.
- C. Only natural rock giving a ringing sound and which cannot be excavated with a backhoe having a bucket curling force rated at not less than 18,300 pounds (comparable to Caterpillar Model 215), and occupying an original volume of at least ½ cubic yard. Shale or rotten stone or stratified rock that can be loosened by a pick, or by trenching equipment, shall not be construed as rock.

City of Flowery Branch
Standard and Specifications
Chapter ETB

- D. Rock excavation shall be measured by the Public Utilities Department Engineering Inspector and shall be the average actual length times a depth equal to 6 inches below the grade of the trench and the width shall be considered as 24 inches greater than the nominal diameter of the pipe being laid in the trench where rock is encountered.
- E. Blasting shall be permitted only with written approval of the Probate Judge. Blasting permits for each location shall be required. Blasting shall be done with the precautions specified by the State Fire Marshall.
- F. The Contractor shall notify both the City and County Fire Departments prior to blasting operations.
- G. All blasting operations and all handling, storage and use of blasting materials shall be in strict accordance with Federal, State and local ordinances and regulations and shall be approved by the State Fire Marshall. All blasting shall be performed under the supervision of an experienced blaster having qualifications and experience acceptable to the Probate Judge. Exposed structures shall be protected from the effects of blasts and blasts shall be covered with suitable mats. Blasts shall be restricted to the extent that no appreciable shock will be transmitted to existing structures, pipe lines, sewers, cables or other public or private facilities. The Contractor shall be wholly responsible for any and all personal injury or property damage resulting from blasting. All rock excavation shall be removed and disposed of by the Contractor.

2.03 Sheeting and Shoring:

- A. All excavations shall be properly shored, sheeted and braced or cut back at the proper slope to furnish safe working conditions, to prevent shifting of material, to prevent damage to structures or other work, and to avoid delay to the work, all in compliance with the most recent U.S. Department of Labor Occupational Safety and Health Administration 29CFR part 1926 Occupational Safety and Health Standards-Excavations; Final Rule. Bracing shall be so arranged as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength.
- B. Timber sheet piles shall be sharpened in a manner which will assist in holding them in true alignment during driving and the tops shall be protected with caps or other means to prevent damage by the driving equipment. Any pieces damaged or split below the point to cutoff shall be removed and replaced with undamaged pieces.

City of Flowery Branch
Standard and Specifications
Chapter ETB

- C. Sheet piles shall be carefully located and driven straight and true to the desired elevation with secure interlocking for the entire length. Damaged piling or one with faulty alignment shall be withdrawn and new piling driven properly in its place. Jetting will not be permitted. Excavation shall not be carried in advance of the sheet piling.
- D. In general, sheeting for pipelines shall not be driven below the elevation, the sheeting shall be cut off at the top of the pipe and the remaining sheeting left in place.
- E. Sheeting and bracing shall be removed as the excavation is refilled in such a manner as to avoid caving in of areas or structures. Voids left by withdrawal of the sheeting shall be carefully filled by ramming.

2.04 Backfilling:

- A. No backfilling shall be done over pipelines until all pipes have been inspected and approval received from the Inspector, unless otherwise directed by the City of Flowery Branch.
- B. Trenches shall be backfilled with earth backfill materials placed evenly around and on both sides of the pipe in 6 inches maximum layers and tamped until pipe has cover of not less than 12 inches above top of pipe. The remaining backfill shall be placed evenly in 12 inch layers with compaction of each layer thoroughly to the specified compaction. Water settling shall not be permitted. Any trenches where settlement occurs shall be reopened, refilled and compacted, with the surface restored to the specified grade and compaction, and smoothed off.
- C. Prior to backfilling at manholes, structures and other accessories, all forms, trash and debris shall be removed. Backfill material shall be symmetrical on all in 8 inch maximum layers. Each layer shall be moistened and compacted with tamps.
- D. Where pipes are in a fill section or are projecting into fill sections, ductile iron pipe shall be provided. Where material beneath the pipe is determined by the City to be unstable, then concrete foundation supports at each joint shall be provided. Where pipe is not structurally supported, unstable material shall be removed and trench stabilization provided. A pipe bed shall be constructed of number 57 crushed stone and be compacted to at least 90 % of the maximum dry density, unless otherwise specified. The material shall be placed evenly in 6 inch maximum layers to the proper sub-grade unless otherwise directed by the City. After the trench has been stabilized, normal backfill and compaction operations shall resume as specified herein.

City of Flowery Branch
Standard and Specifications
Chapter ETB

- E. Prior to final acceptance of the pipeline installations, the Contractor shall refill all sunken trenches and excavations to final grade.
- F. Earth backfill shall be free of stone and boulders. Acceptable backfill material may be from excavation or borrowed. No rock will be allowed in the backfill within a distance of 6 inches from the pipe or the ground surface, and rock larger than 6 inches in the greatest dimension will not be permitted in any part of the trench.
- G. Immediately after ductile iron pipe has been jointed, selected backfill material shall be placed in 6 inch layers along each side of the pipe and firmly tamped into place to the pipe centerline elevation. Selected backfill material shall then be placed in 12 inch layers to a depth of 24 inches above the top of the pipe and firmly tamped into place. The remainder of the trench shall be backfilled with suitable material in layers not to exceed 12 inches in thickness and each layer shall be firmly tamped into place with suitable power tamping equipment to 90% of maximum density determined by ASTM D698. Soil testing by an independent testing laboratory approved by the City may be required in areas where it is determined that proper compaction has not been achieved.

2.05 Subsurface Obstructions:

- A. The drawings indicate underground facilities or obstructions that are known to exist according to the best information available to the City. The Contractor, as required by Georgia law, shall call the Utilities Protection Center (UPC) (1-800-282-7411) and those utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site to verify the location of, and possible interference with, the existing utilities, arrange for necessary suspension of service and make arrangements to locate and avoid interference with said utilities. Where these or unforeseen underground utilities are encountered, the location and alignment of the new facilities may be changed to avoid interference, upon written approval from the City.
 - a. Electronic Pipe and Cable Finder: Furnish and have available at all times an electronic pipe detector, in good working order, to locate existing pipe lines or other obstructions.
- B. While excavating, backfilling and laying pipe, care must be taken not to remove, disturb, or injure any existing water, sewer, or gas pipes, or other conduits or structures. If necessary, the Contractor, shall sling, shore up and maintain such structures in operation, and within a reasonable time shall repair any damage done to them. Before final acceptance of the work, he shall return all such structures to original condition.

City of Flowery Branch
Standard and Specifications
Chapter ETB

- C. The Contractor shall give sufficient notice to the interested utility of his intention of removing or disturbing any pipes, conduits, etc., and shall abide by their regulations governing such work. In the event that any subsurface structure becomes broken or damaged in the course of the work, the Contractor shall immediately notify the proper authorities, and shall be responsible for all damage to persons or property caused by such damage.
- D. When pipes or conduits providing services to adjoining buildings are broken during the process of the work, the Contractor shall repair them at once, or if repaired by the utility involved, shall pay the utility any charges for having such repairs made by the utility.
- E. The City will not be liable for any claim made by the Contractor based on underground obstructions being different to that indicated in these contract documents or on the plans.

2.06 Dewatering:

- A. Dewater excavation continuously to maintain a water level two feet below the bottom of the trench.
- B. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water running into the excavation.
- C. There shall be sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavations. Where the pipe line crosses natural drainage channels, the work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the work will be prevented. Provision shall be made for the satisfactory disposal of surface water to prevent damage to public or private property.
- D. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete or backfilling.
- E. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least two feet below the bottom of the trench; Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump two feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operation.

City of Flowery Branch
Standard and Specifications
Chapter ETB

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

END OF SECTION

Section Five
Site Preparation, Restoration and Related Work

Part 1 – General

1.01 Scope of Work:

- A. This section covers all work required to prepare the site for pipeline construction as well as site restoration. Also, included in this section is miscellaneous work required to complete the overall project.
- B. This work includes but is not limited to pavement and sidewalk removal and replacement, erosion and sedimentation control, curb and gutter removal and replacement, grassing and refuse removal.

1.02 Project Photographs:

- A. The Contractor shall provide Project Photographs. Before beginning the work photographs shall be taken of all areas to be disturbed by the Contractor's operation. Said photographs shall be submitted to the City for approval prior to the commencement of any work.

Part 2 – Materials

2.01 Materials:

- A. Materials to be incorporated into the work shall be new and unused, and shall conform to all applicable requirements of these specifications. Any materials installed prior to approval by the City will be subject to rejection, and will be removed at the Contractor's expense.

Asphaltic concrete and related bituminous materials for roadway construction shall conform to the requirements of Georgia Department of Transportation Standard Specifications for the Construction of Roads and Bridges, latest Edition.

- i. Asphaltic concrete shall be Type F. Type E will not be accepted.
- ii. Concrete for concrete pavement shall conform to the requirements for the Georgia Department of Transportation Standard Specifications.
 - 1. Reinforcement for concrete pavement shall also conform to the Department of Transportation Standards.

City of Flowery Branch
Standard and Specifications
Chapter SPR

- B. Grassing and erosion control materials shall conform to the requirements outline by the Georgia Department of Transportation Standard Specifications, latest Edition.
- C. Stone Rip Rap shall be sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall be 2.0 or higher. Rip rap shall have less than 66% wear and tested in accordance with AASHTO T-96. Unless shown or specified otherwise, stone rip rap shall be Type 1 rip rap.
 - a. Type 1 rip rap: The largest pieces shall have a maximum volume of 2 cubic feet. At least 35% of the mass shall be comprised of pieces which weigh 125 pounds or more. The remainder shall be well graded down to the finest sizes. Rock fines shall comprise a maximum of 10% of the total mass. Rock fines are defined as material passing a No. 4 sieve. Rip rap size shall conform to Georgia Department of Transportation Section 805.01 Stone Dumped Rip Rap, Type 1.

Part 3 – Execution

3.01 Clearing and Grubbing:

- A. The location of the work shall be cleared of all trees, growth, debris, stumps and other objectionable matter before trenching. Special care shall be taken not to damage any adjacent or nearby shrubbery, tree, grass, fences, walks, utility lines, drainage structure, paving or other property. The Contractor shall be responsible for such damage and shall replace all such property damaged with equally new property, all to the satisfaction of the property owner. Removal of trees and permanent structures along or in the trench space shall be done by the Contractor, but only as directed. All construction activity shall be confined to the limits of the easements, right-of-way or public right-of-way unless the Contractor obtains legal rights to use adjacent property from the private owners concerned.
- B. The Contractor shall clear all permanent City of Flowery Branch Public Utilities right-of-way and remove obstructions along the pipeline for a sufficient area to provide adequate and safe work space. All debris shall be removed and disposed of by the Contractor.
- C. Where the tree limbs interfere with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility.
- D. All fences adjoining any excavation or embankment that may be damaged or buried shall be carefully removed, stored, and replaced.

City of Flowery Branch
Standard and Specifications
Chapter SPR

- E. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of. Piling and butts of utility poles shall be removed to a minimum depth of 2 feet below the limits of excavation.
- F. Do not cut trees for the performance of the work except as allowed above and as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within 30 days to allow proper watering of the root system. Repair any damaged tree not to be removed over 3 inches in diameter under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the Contractor. No stumps, wood piles, or trash piles will be permitted on the work site.

3.02 Temporary Erosion and Sedimentation:

- A. Temporary erosion and sedimentation controls shall meet the requirements of the Georgia Erosion and Sedimentation Act of 1975 (as amended) and local soil erosion and sedimentation control ordinances. The Contractor shall acquire land disturbance permits from the City and/or County Engineer or other appropriate governing authority, and shall pay any fees for said permits. The Contractor shall be responsible for submitting to the City and/or County sufficient documents such that the City and/or County can acquire approval from the Soil and Water Conservation District. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor. A copy of the local soil erosion and sedimentation control ordinances is available.
- B. Description and working drawings shall indicate controls which will ensure that drainage from job site areas which will be denuded, stripped or modified of its natural existing or artificially established stabilization or protection against erosion shall pass through some type of filter system before being discharged. These areas shall be kept sufficiently moist to control dust.
- C. Silt dams, traps, barriers and appurtenances shall be installed, and shall be maintained in-place until no longer needed, and then removed. Hay bales which deteriorate, and filter stone which becomes dislodged shall be replaced with new materials. Detention ponds, if constructed, shall be maintained in a condition which will ensure that unfiltered water will not leave the pond.
- D. Materials used in temporary erosion and sedimentation control shall meet the following requirements:
 - a. Silt fence shall meet the requirements of Section 171- Temporary Silt Fence of the Department of Transportation, State of Georgia,

City of Flowery Branch
Standard and Specifications
Chapter SPR

Standard Specification, latest edition. Silt fence fabric must be on the Georgia Department of Transportation Qualified Product List.

- b. Hay bales shall be clean, seed free cereal hay type.
 - c. Netting shall be ½ inch, galvanized steel chicken wire mesh. Netting stakes shall be either steel rod not smaller than ½ inch diameter or shall be fir, southern pine or hemlock.
 - d. Filter stone shall be crushed stone conforming to Georgia Department of Transportation Table 800.01H, Size Number 3.
- E. Clean up and grassing operations shall be maintained within 2000 feet of the pipe laying operation and shall occur within seven days after pipe has been installed.
- F. Land disturbance activity shall not commence until the Land Disturbance Permit is issued and erosion control measures are in place.

3.03 Construction Within State Highway, County Roads and City Streets:

- A. All storage of materials, excavation, backfilling, pavement removal and replacement, clean up and grassing shall be in strict accordance with the applicable State, County or City regulations. It shall be the Contractor's responsibility to determine the exact requirements of the authority having jurisdictions over the right-of-way and no extra compensation will be allowed the Contractor for meeting such requirements. No highway, road or street shall be closed to traffic without authorization from the proper authority. The Contractor shall provide suitable lights, signs, barricades and flagmen to insure the safety of pedestrian and vehicle traffic and workmen and to protect the work.
- B. The Contractor shall coordinate the closing of any street at least 72 hours in advance with City of Flowery Branch at 770-967-6371.

Note: Prior approval from the following agencies is required if working within their permitted or maintained right-of-way.

Hall County Central Dispatch	770-536-3132
Hall County Engineer	770-531-6800
City of Flowery Branch Public Works	770-967-2358
City of Flowery Branch Public Utilities	770-967-2151
City of Flowery Branch Police Department	770-967-6336
City of Flowery Branch City Hall	770-967-6371

City of Flowery Branch
Standard and Specifications
Chapter SPR

- C. The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights and other traffic control devices; shall provide qualified flagmen where necessary to direct traffic; shall take all necessary precautions for the protection of the work and the safety of the public.
- D. Construction traffic control devices and their installation shall be in accordance with the Georgia "Manual of Uniform Traffic Control Devices for Streets and Highways".
- E. Placement and removal of construction traffic control devices shall be coordinated with the Department of Transportation, Hall County and/or the City of Flowery Branch a minimum of 48 hours in advance.
- F. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right-of-way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as "Flagman Ahead", shall be removed and replaced when needed. When working within State Highway right-of-ways, provide trained and certified flag people who have completed a training program approved by the Georgia Department of Transportation.
- G. Existing permanent traffic control devices within the construction work zone shall be protected from damage due to construction operations. All damaged traffic control devices requiring temporary relocation due to construction shall be located as near as possible to their original position. Their original position shall be measured from permanent reference points and recorded in a permanent log prior to relocation. Temporary locations shall provide the same visibility to affected traffic as the original position. Relocated permanent traffic control devices shall be reinstalled in their original positions as soon as practical following construction in the affected location.
- H. Construction traffic control devices shall be maintained in good repair, clean and visible to affected traffic for daytime and night time operation. Traffic control devices affected by the construction work zone shall be inspected daily.
- I. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective requirements of the Department of Transportation. Sign panels shall be of durable materials capable of maintaining their color, reflective character and legibility during the period of construction.

3.04 Removing and Replacing Pavement:

- A. Remove existing pavement as necessary for installing the pipe line and appurtenances.
 - a. The Contractor shall replace with like materials at his expense all pavements, walks, and driveways, removed or damaged in connection with the work. Pavement repairs shall be smooth and unnoticeable and of the same elevation as the existing paving. In the removal of pavement, the Contractor shall salvage all sound and undamaged materials and store them at a convenient location for reuse in pavement replacements. Any additional new rock, concrete, asphalt or other replacement materials shall in all cases conform to the City's specifications. Pavement replacement materials shall be furnished by the Contractor.
 - b. Before removing any pavement, mark the pavement neatly paralleling pipelines and existing street lines. Space the marks the width of the trench.
 - c. Saw cut asphalt pavement along the marks using a rotary saw or other suitable tool. Break concrete pavement along the marks by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.
 - d. Do not pull pavement with machines until completely broken and separated from pavement to remain.
 - e. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement. No additional payment will be made for removing and replacing damaged adjacent pavement.
 - f. Remove and replace sidewalks disturbed by construction for their full width and to the nearest undisturbed joint.
 - g. Remove and replace or tunnel under any curb disturbed by construction to the nearest undisturbed joint.
- B. Upon completion of backfilling and consolidation of the backfill, arrange to have the compaction tested by an independent testing laboratory approved by the City of Flowery Branch. After compaction testing has been satisfactorily completed, replace all pavements, sidewalks and curbs removed. Gravel roads and drives shall meet the requirements for graded aggregate sub-base.

City of Flowery Branch
Standard and Specifications
Chapter SPR

- a. Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. Obtain agency approval of pavement restorations before requesting final payment.
 - b. Obtain the City's approval of restoration of pavement not the responsibility of a regulatory agency such as private roads and drives.
 - c. Complete pavement restoration as soon as possible after backfilling.
 - d. Prior to replacing pavement, Make a final cut in the pavement 12 inches back from the edge of the previous cut line. Make the cut using a rotary saw. Remove pavement and base material to a depth of 10 inches below finished grade. Construct an 8 inch thick concrete (3000 psi) bridge the full width of the pavement cut (i.e....trench width plus 24 inches). Apply tack coat and 2 inches of type F asphalt when concrete has cured.
 - e. Replace all street roadway pavement, driveways, sidewalks, and curbs with the same material and to the same dimensions as existing.
 - f. Should any pavement restoration or repairs fail or settle during the life of the Contract, including the bonded period, promptly restore or repair defects.
- C. Concrete pavement removal and replacement shall conform to the applicable sections of the Georgia Department of Transportation "Standard Specifications for the Construction of Roads and Bridges", latest edition.

3.05 Railroad Crossings:

- A. Railroad crossings shall be made in accordance with all requirements of the affected railroad. It will be the Contractor's responsibility to obtain all requirements from the railroads and furnish all labor and materials required to fulfill such requirements. The Contractor shall furnish and install the casing under the tracks with whatever material and with whatever methods and under whatever regulations are required by the railroads.

3.06 Stream and Ditch Crossing:

- A. At all points where banks of streams or drainage ditches are disturbed by excavation or where natural vegetation is removed, carefully compact backfill and place rip rap to prevent subsequent settlement and erosion.
- B. Place rip rap a distance of not less than 10 feet upstream and downstream or 10 feet each side of the stream in any disturbed area. Extend rip rap from 1

City of Flowery Branch
Standard and Specifications
Chapter SPR

foot below stream bed to top of bank. Place to conform to the natural slope of the stream bank.

- C. The requirements of this section apply equally to construction along side a stream or drainage ditch as well as crossing a stream or drainage ditch.
- D. Imbed stone rip rap by hand so as to form a compact layer at least 12 inches thick. Place rip rap in such a way that the smaller stones are not segregated but evenly distributed. Place chinking stones in the crevices between the larger stones so that a dense, well graded mass is produced.

3.07 Cleaning and Maintenance:

- A. All surplus materials, tools, and temporary structures shall be removed by the Contractor. The site of construction shall be left clean, to the satisfaction of the City.
- B. After the work is acceptable as a whole, the Contractor shall maintain the surface of the unpaved trenches, adjacent curbs, sidewalks, gutters, shoulders, street paving, shrubbery, fences, sod, grass and other disturbed surfaces for a period of 60 days thereafter.
- C. Should any trenches in or outside paved areas settle below grade, they shall be promptly built back by the Contractor, who shall furnish select backfill material for this purpose.
- D. All material and labor required for such maintenance and/or repairs shall be furnished by the Contractor and the work shall be done in a manner satisfactory to the City. If it becomes necessary for the City to make any repair service to pipe, settling areas, or paving, cost plus 25% shall be charged to the Contractor.
- E. The Contractor shall be responsible for a period of one year for faulty workmanship and materials.

3.08 Grassing:

- A. The Contractor shall furnish all materials for and properly restore to the satisfaction of the City, all ground surfaces irrespective of the type, which may be disturbed in the progress of the work.
- B. This work shall include in general but without limitation, the spreading of topsoil, seeding, fertilizing and mulching required to restore disturbed areas as necessary for the proper completion of the work as may be required, directed or as specified herein. On all "sod" type lawns and other improved,

City of Flowery Branch
Standard and Specifications
Chapter SPR

well established grass areas, the sod/grass shall be carefully removed kept alive and replaced after the backfilling is finished. The Contractor shall also remove all spoil from such areas as quickly as possible after the excavation is backfilled, and he shall leave the premises in as good of condition as before undertaking the work. It is the intent of these Specifications to place seed over all disturbed areas, to place topsoil and seed where established lawn areas existed prior to construction, and to provide for sod removal/replacement.

- C. The requirements of the Georgia Department of Transportation “Standard Specifications for the Construction of Roads and Bridges”, latest edition, shall apply insofar as they are applicable.
- D. When directed, areas to be seeded shall be covered with a layer of topsoil where topsoil has been disturbed by the pipe laying operation. The topsoil shall be of sufficient thickness that when spread and compacted, a minimum of 4 inches will be available. Furnish natural topsoil of a good condition and tillable structure. Obtain topsoil as borrow from an outside source and from piles of uniform texture, drainage, and other characteristics so as to constitute a homogeneous soil meeting the requirements of the Department of Transportation, and approved by the City. No existing materials may be reused in this work unless approved. Furnish topsoil free from objectionable materials such as hard clods, stiff clay, sods, hardpan, partially disintegrated stone, or other materials that are not integrally a natural component of good agricultural soils and which are harmful to or unnecessary for successful plant growth. Do not place topsoil containing frost or in muddy condition.
- E. Seeding shall be performed using a properly proportioned mixture of inoculated seed approved for use in Zone One as detailed in the Department of Transportation’s Standard Specifications. Seeding shall only be permitted during the planting season listed for Zone One. All seeded areas shall be uniformly mulched immediately after seeding.
- F. Replace existing grassed areas with grass of similar characteristics and appearance as a minimum the Specifications requirements included herein. Areas not previously grassed shall be seeded with Bermuda grass according to the planting schedule and requirement outlined in the Georgia Department of Transportation Standard Specifications.
- G. The sub-grade for the areas to be seeded shall be brought to a uniform grade, free of stones larger than 1 inch. Where topsoil is required, the topsoil shall be uniformly graded, trimmed and raked free from unsuitable material, ridges, bumps or depressions. Over this area, spread agricultural lime at the rate of 40 pounds per 1000 square feet, and spread fertilizer uniformly on the surface of the ground at the rate of 1500 pounds per acre. Mix the lime and

City of Flowery Branch
Standard and Specifications
Chapter SPR

fertilizer uniformly into the top 4 inches of the soil by suitable harrows, rotary tillers or other approved equipment.

- H. On all well established and "sod" type lawns, the sod/grass shall be cut into rolls, carefully removed, kept watered and alive and replaced after backfilling has been properly completed.
- I. The Contractor shall be responsible for maintaining all seeded areas including mowing, watering and reseeding defective areas until a satisfactory stand of grass is accomplished and final acceptance of the work by the City is obtained. Areas showing evidence of settlement or loss of topsoil shall be rebuilt and reseeded as required.

3.09 Temporary Toilet Accommodations:

- A. If deemed necessary by the City, temporary toilet facilities shall be set up to meet all City, County and State regulations.

3.10 Disposal of Refuse:

The refuse resulting from clearing and grubbing and all other operations shall be hauled to a disposal site secured by the Contractor and shall be disposed of in accordance with all requirements of Federal, State, County and Municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property except with written consent of the property owner. In no case shall material be left on the project, shoved onto abutting private properties, or buried in the project.

- a. Burning on the project site shall not be permitted.

END OF SECTION

**Section Six
Pump Stations**

Part 1- General

1.01

Scope:

- A. The Contractor shall furnish all materials (unless otherwise agreed upon), labor and equipment necessary to construct the sewers, and appurtenances indicated or shown on the drawings. The work shall include all necessary diking, pumping, bailing, draining, flushing, testing and erosion and sedimentation control.
- B. The Contractor shall so arrange his work as to cause a minimum of interference with pedestrian and vehicular traffic and to protect and maintain power and telephone lines, gas and water piping, fences, building, drainage pipes and other structures, all as specified.
- C. The lines and grade of the sewer and the position of all manholes and other appurtenances are as shown on the drawings. The grade line as shown means the invert, or bottom of the inside of the pipe or manhole. The work shall be laid out by the Contractor using bench marks and the other control points.
- D. The Contractor shall be responsible for removing all water from excavations and trenches whether from surface or ground sources.
- E. Lift stations will only be permitted on a case by case basis or when gravity sewer is unavailable to the property, or as determined by the City.
- F. Changes to the Standard Specifications for Sanitary Sewers may be made by the City at any time

1.02

Related Work:

- A. Section Three: Sanitary Sewerage Systems.
- B. Section Four: Excavation, Trenching and Backfilling.
- C. Section Five: Site Preparation, Restoration and Related Work.

1.03 Applicable Specifications and Standards:

- A. The latest editions of the following specifications, standards and publications setting minimum requirements for quality, safety and performance of work and materials form a part of this specification as though fully repeated herein:
 - a. ASTM American Society of Testing Materials
 - b. ANSI American National Standards Institute

1.04 Record Drawings

- A. The Contractor shall be responsible for maintaining a set of the approved design drawings which have been marked to reflect as-built conditions. These “record drawings” shall be kept at the site during working hours and shall be made available to the City Inspector upon request.
- B. The record drawings shall show the as constructed locations of (but not be limited to) all manholes, stub-outs, service materials, cleanouts air release valves, etc.
- C. Appurtenance locations shall be dimensioned to three (3) permanent fixtures or objects.

Part 2 - Execution

2.01 Specifications

The developer shall furnish, install and dedicate to the City the entire lift station/force main system. The system will be designed by the developer's engineer (Professional Engineer registered in the State of Georgia). The design must be reviewed and approved by the City's Engineer.

The engineer shall locate the lift station to drain the largest possible sub-basin. The City will investigate the service impact associated with future City needs within the sub-basin, and the potential installation of additional force mains required to serve the sub-basin that will drain to the lift station. If, in the City's opinion, an additional or larger force main(s) is to be installed concurrently with the developer's project, the engineer will design and the City's Engineer must approve the design of said additional mains. Where

City of Flowery Branch
Standard and Specifications
Chapter PS

practical, all of the force mains will be installed in parallel and in the same ditch.

Pump Stations shall meet the following requirements:

Pump station located above the 100-year flood plain.
Furnish pump head calculations and system curve.
Furnish automatic alternation of pumps to prolong life.
Cables into or out of the wet well sealed watertight.
Install three-phase voltage monitors on main power feed with output alarm relay.
Install fused disconnect on main power feed.
Furnish wet well buoyancy calculation based on a groundwater level approximately at grade level.

Pump Stations with a capacity less than 750 G.P.M. shall be one of the following:

- a. Submersible pumps:
 - (1) Flygt
 - (2) Yeomans
 - (3) KSB
- b. All pumps must be supplied with a certified pump test curve from the manufacturer.
- c. Gorman-Rupp self-priming centrifugals will only be allowed on a case-by-case basis when other pumps are not available.
- d. All pumps must be able to pass a 3" solid.

Site Layout

- a. A buffer may be required around each lift station site. The City, at its discretion, may require a buffer dependent on the proximity of structures, type of development, size of pump station, or other factors which may indicate a need for additional buffer. Typically, this buffer is required in residential subdivisions, and shall be indicated on the final plat. In addition, a permanent easement, dedicated to the City, shall be provided to include the required fenced in area, which an additional 6-inches extending beyond the fence on all sides. A permanent 20 ft access easement, dedicated to the City, shall be provided as well.

City of Flowery Branch
Standard and Specifications
Chapter PS

- b. Earth slopes around the pump station created by "fill" that are steeper than 3 to 1 must be stabilized with "rip-rap." All fill slopes shall be compacted to not less than 95% of maximum density. A certified letter of compaction shall be provided to the inspector prior to final inspection.
- c. A minimum 4" concrete pad (15' x 15' minimum) shall have 5% fall away from the wet well in all directions. Concrete must extend 6" past all fence posts the full perimeter. Reinforcing steel shall be used in the slab. Asphalt is not acceptable for the pad.
- d. Driveway
 - 1. All pump station sites shall be provided with a paved access road on a permanent easement dedicated to the City minimum 12-foot width concrete or asphalt paving is acceptable.
 - 2. If an access road is over 50' in length, a vehicle turnaround will be required. For access roads less than 50', a required turnaround will be determined on a case-by-case basis. Access road and vehicle turnaround area to be paved shall be 12-foot minimum width. All turnarounds shall be 20-foot outside the fence, 16-foot deep with 15-foot radius to the driveway. Concrete or asphalt is acceptable.
- e. Site plan shall show finished grade contour lines (2' intervals) in and around lift station and access road. Spot elevations shall be provided on station pad to show proper drainage.
- f. Site plan shall show all existing and proposed utilities. All utility meters must be properly mounted outside a fenced station. If gas is required gas pipe must be buried underground.
- g. Water meter shall be set at the right of way.
- h. A copper potable water service with an acceptable double check valve backflow prevention device must be provided. A frost-proof yard hydrant with 50' of 1" water hose with brass nozzle must be installed.
- i. Provide site lighting.
- j. Fenced areas for all stations are to be a minimum 30' x 30'. Fences are to be installed using 8-foot high #4 chain link wire with top rails and bottom tension wires; 3 strands of barbed wire at the top on angled extension arms; posts in 3-feet of concrete spaced 10-feet apart. A 2' length of chain that can be locked

City of Flowery Branch
Standard and Specifications
Chapter PS

with#2 Master lock must be provided.

(1) Provide a 14' wide gate on 4" diameter posts.

k. All ground surface not intended to be paved within pump station fenced area, shall be covered with a minimum 4 inches of graded aggregate base. Graded aggregate base to be per Georgia Department of Transportation specifications.

l. Spare parts

(1) Provide spare air and vacuum relief valve for force main (if applicable).

(2) Provide two extra sets of seals per model of pump, two sets of wear rings, one vacuum pump, five float switches, and one motor starter.

(3) Provide one spare fuse of each type used.

m. Wet well/Check Valve Vault

(1) The wet well shall be sized to prevent excessive cycling of the pumps. Starts shall be limited to one start per ten minutes unless otherwise recommended by the pump manufacturer. Size shall be as recommended by the pump supplier and shall be a minimum of 8-feet in diameter.

(2) Hatch doors shall be sized by the pump supplier to allow adequate clearance to easily remove the pumps. Hatches shall be aluminum with stainless steel hardware suitable for 150 lb. per sq. ft. loading. Provide cylinders to prevent hatch from slamming shut and safety netting.

(3) Check valve vaults for all stations shall be 6' x 6' precast concrete with (1) 48" x 48" double leaf aluminum hatch for 4" and 6" piping. Vault size shall be 8' x 8' for piping 8-inch and above.

(4) Storage shall be provided above the high-level alarm equal to three (3) hour at design flow. Storage volume is calculated to be that volume between the high-level alarm and the lowest point of overflow (including basement elevations regardless of backflow valves in service lines). Said storage may consist of any

City of Flowery Branch
Standard and Specifications
Chapter PS

combination of line capacity, manhole capacity, and wet well volume. No corrugated metal pipe may be utilized for storage.

- (5) Swing check valves:
 - (a) Val-Matic Swing Flex
 - (b) GA Industries, Inc., Mars, PA
 - (c) American Darling
 - (d) Or approved equal
- (6) All pump stations shall have a plug valve and capped tee installed on the force main to allow for emergency connection by portable pumps. Plug valve shall be no less than 3' outside the pump station. A valve key shall be provided to the Authority.
- (7) All piping in the wet well and check valve vault is to be flanged pipe to flanged pipe. No Uni-flange or Mega-flange types will be allowed. Solid sleeve flex joint shall be used between the wet well and valve vault.
- (8) Floats and probes shall be installed at the closest accessible location.
- (9) Steps are to be removed and grouted from wet well and check valve vault before station is accepted by the Authority.
- (10) Wet well and discharge manholes are to be fiberglass or to be coated with a bitumastic coating or approved equal.
- (11) All pump stations shall comply with NFPA 820.

n. Electrical Specifications

- (1) Three-phase power shall be provided for all pumps. No phase converters or single-phase power allowed. The power source may be 208 voltage, 240 voltage or 480 voltage.
- (2) All conduit shall be galvanized rigid conduit or MMC with threaded couplings. No threadless couplings shall be allowed.
- (3) No conduit runs or junction boxes are to be installed inside or on top of wet well. Splicing of cables inside the wet well will not be permitted. (4) When main fused disconnect switch or main circuit breaker is used, it shall meet the following requirements:

City of Flowery Branch Standard and Specifications Chapter PS

- a. Be of a type that can be locked in the on or off position.
 - b. The switch shall be U.L. listed for service entrance.
 - c. The enclosure shall be stainless steel.
 - d. The switch must be mounted inside the fenced area of the station.
- (5) Pump stations shall have factory installed six digit non-resettable elapsed time meters to show individual pump running time to the 1/10th of an hour. A similar elapsed time meter shall be included to indicate simultaneous operation of pumps to the 1/10th of an hour.
- (6) All control wiring shall be stranded. No solid wire shall be allowed.
- (7) Pump control panel enclosure shall be NEMA-4X stainless steel.
- (8) Provide one RJ-11 telephone jack in the control panel.
- (9) A surge suppressor shall be provided at the power service entrance. The surge suppressor shall have voltage characteristics to match the power service.
- (a) The surge suppressor shall be in NEMA-4X enclosure and shall provide line to line, line to neutral, line to ground and neutral to ground protection modes as applicable for the power service.
 - (b) The surge suppressor shall be provided with a disconnect. Minimum surge current rating shall be 100KA per phase per NEMA LS-1. The surge suppression system shall be duty cycle tested to survive 20KV, 10KA, IEEE C62.41 category surge current with less than 5% degradation of clamping voltage. The surge suppressor shall have minimum repetitive surge capacity of 2500 impulses per mode and 5000 impulses per phase. Status indicating lights and form 'C' dry alarm contacts shall be provided.
 - (c) The surge suppressor shall be U.L. listed and labeled under UL1449 and UL1283. Acceptable manufacturers are:

City of Flowery Branch
Standard and Specifications
Chapter PS

- [1] Liebert
- [2] Current Technologies
- [3] United Power

- o. All pump stations must be provided with back-up power. This back-up power can be provided by independent dual power feed or diesel generators.
- p. Generator Specifications
 - (1) Generator shall be furnished with a one year service contract which covers all labor and material costs for normal maintenance and emergency repairs.
 - (2) The standby generator shall be rated for continuous standby duty for the stations full load demand. The generator shall be sized to run all pumps simultaneously with staggered startups or as indicated in the drawings. The engine-generator set shall be rated for continuous standby duty operating in an ambient temperature of 40 degree C. The set shall have a standby power capacity sufficient to operate all pumps simultaneously with staggered startups and pump station auxiliary loads at 0.80 power factor, and shall operate at a speed not to exceed 1,800 rpm. It shall be rated 480/277 volt, as indicated, 3-phase, 4-wire, 60 Hertz
 - (3) Voltage regulation from no load to rated load shall be within plus or minus 4 percent of rated voltage for units up to and including 25 kw and within plus or minus 3 percent of rated voltage for units rated 30 kw or higher.
 - (4) The frequency regulation shall not exceed 3-Hertz from no load to rated load. Frequency variation shall not exceed plus or minus 0.3 Hertz for constant loads from no load to rated load.
 - (5) Instantaneous voltage dip for all possible sequences of load application and motor starting for loads described in conditions of service shall not exceed 20 percent of nominal voltage.
 - (6) The generator and associated appurtenances shall be housed in a weatherproof sound attenuated enclosure. Quiet site soundproofing shall be provided to reduce noise to 73 db at a distance of 23 feet (7 meters) for diesel powered generators.
 - (7) Generator insulation shall be Class B or F. Temperature rise shall be in accordance with NEMA Standard MG I for continuous duty at all output ratings.
 - (8) Voltage regulator shall be an automatic, temperature compensated, solid state type with a manual adjustment range of plus or minus 5 percent of

City of Flowery Branch
Standard and Specifications
Chapter PS

rated voltage. Exciter shall be a solid-state, static type or brushless rotating type utilizing rotating diode rectifiers. Minimum rating of exciter shall be according to NEMA Std. MG-1.

- (9) Generator lead terminal box shall be of ample size to accept and terminate connecting cables as indicated on the drawings. Generator leads shall be furnished with terminal connectors suitable for the customers connecting cables.
- (10) The engine shall be heavy-duty compression-ignition, cold-starting diesel type arranged for direct connection to an alternating current generator. It shall be a current model of a type in a regular production by a manufacturer regularly engaged in building this type of diesel engine. Engine shall have at least a published intermittent brake horsepower rating at specified generator speed required by generator at rated full load output and shall operate without undue heating, vibration, or wear. Engine shall operate satisfactorily on No. 2 diesel fuel.
- (11) Battery charger shall be automatic, two rate type providing for equalizing charge and continuous taper charging. Output characteristics shall match requirements of battery furnished. Provide charger suitable for operation on 120 volt, single-phase, 60-Hertz current to be rated not less than 6-amp direct current. Furnish battery charger with following features:
- Direct current voltage regulation: plus or minus 2 percent for variations in line voltage of plus or minus 10 percent.
 - Direct current voltmeter and direct current ammeter, each with suitable scales.
 - Automatic current limiting to prevent overloading due to engine cranking, shorted output or reversed battery connections.
 - Equalize charge rate with manually set timer.
 - Integral protection to prevent battery discharge through charger on loss of alternating current line voltage.
- Terminal block with terminals for all external connections.
- (12) The entire standby generator set shall have a five year warranty period from the date of commissioning.
- (13) Outdoor weather-protective housing with critical grade exhaust muffler shall be installed. The housing shall have hinged side access doors and a rear control door. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color. Vibration isolators as recommended by the generator set manufacturer shall be provided. The generator must be mounted far enough away from obstructions to allow all doors to be opened 90°. All conduits shall be installed underground.

City of Flowery Branch
Standard and Specifications
Chapter PS

- (14) Generator shall be supplied with all auxiliary systems necessary for operation (i.e. batteries, battery charger, block heater, convenience receptacle, enclosure light, motorized dampers etc.). The auxiliary system shall be powered from load center with adequately sized 480 1 208 1 120 V transformer, installed in the enclosure.
- (15) Generator control panel shall be mounted with vibration isolators on the unit. Instruments shall be of direct-reading type, factory mounted and factory connected. Instruments shall be accurate within 3 percent. Provide panel with the following instruments gauges, features and alarms:
- Three position MANUAL-OFF-AUTO switch.
 - Manual starting switch.
 - Emergency shutdown switch
 - Full automatic starting from pilot device initiating start when normal power fails. Automatic cranking shall be interrupted cycle type not affected by ambient temperature with overall time limit. A total of five cranking cycles shall automatically shut down engine after a time delay
 - Automatic shutdown devices with manual reset and individual indicating lights for: low oil pressure, high coolant temperature, engine over-speed, failure of engine to start. Auxiliary contacts on all aforementioned shutdown devices to operate a remote generator failure alarm.
 - Gauges and instruments shall include: Fuel gauge, Running time meter, Lubricating oil gauge, Coolant temperature gauge, Voltmeter, and Amp-meter
- (16) The standby power system shall include an automatic transfer switch according to UL 1008. Transfer switch shall be rated for 100% of full load and shall have short circuit current rating as indicated. Switch shall be provided with indicators for all phases of operation and be equipped with a fully programmable timer for exercising the equipment. Provide silver plated load contacts with arcing tips and arc extinguishing devices. Provide the transfer switch with an internal manual operator, with the same transfer speed as the electrical operator.
- (17) Provide the automatic transfer switch with the following features:
- a. Full phase relay protection with three voltage sensing relays.
 - b. Starting and load transfer to alternate source on a drop to 80 percent on any phase of normal voltage or 1 Hz frequency drop. Retransfer of load to normal source when voltage of all phases is restored to 90-95 percent.

City of Flowery Branch
Standard and Specifications
Chapter PS

- c. Transfer to standby generator when generator voltage and frequency are 90 percent of rated values
 - d. Adjustable time delay, 0 to 2 minutes, on transfer from alternate to normal.
 - a. After transfer to the normal source, engine generator to run for adjustable time period to 0 to 5 minutes before shutdown.
- (18) Generator shall be load tested at 100% full load on site for a period of four hours using resistive load banks. Notify the Authority inspector prior to test, and provide certification letter from the manufacturer. Perform functional transfer tests simulating loss and return of utility power.
- (19) Three complete sets of O&M manuals and keys shall be provided for generator and automatic transfer switch.
- (20) Generator control system must include a programmable control device (exerciser) to allow automatic start-up and test functions. Test functions can be programmed for daily, weekly or monthly testing. Connections for remote monitoring of function and failure must be provided.
- (21) Pump stations are required to have continuous standby power. Generators shall be diesel powered with 100 gallons minimum fuel storage capacity or 24-hour operating time, which ever is greater. Fuel storage shall be accomplished by the use of corrosion-resistant double wall sub-base fuel tank only; no underground storage will be allowed. A leak detection device shall be provided in *the* interstitial space for sensing fuel leakage. The device contact shall be connected to the generator control panel terminals for telemetry.
- (22) Generators can be obtained from the following manufacturers:
 - (a) Cummins – Onan
 - (b) Kohler
 - (c) approved equal
- (23) Generator manufacturer will provide a 60-month comprehensive warranty to include parts and labor.
- (24) Provide the manufacturer recommended set of spare parts for the generator and the automatic transfer switch. These shall include but shall not be limited to: one filter for each system, two spare injectors, fuel injection pump, one fuse of each rating, and two indicating lights of each type. Pack spare parts in suitable boxes, bearing label of the content and the equipment for which it is intended.
- (25) Transfer switches shall be in NEMA-4 X enclosure and shall be supplied by the generator manufacturer. Acceptable manufacturers are:
 - (1) Cummins-Onan

City of Flowery Branch
Standard and Specifications
Chapter PS

(2) ASCO

- (26) A generator ground grid must be provided and connected to the pump station grounding system.

q. Monitoring system

- (1) Provide pump station with auto-dialer monitoring system in a NEMA 4X rated, stainless steel, wall mounted enclosure complete with mounting hardware. Provide conduit stub for future telemetry connection.

END OF SECTION

Section Seven
Standard Details

General

- A. The following standard details have been included to expand upon and clarify the preceding written specifications.
- B. Engineers, Architects, Land Surveyors and other design professionals are encouraged to include these details on their drawings as required.

END OF SECTION

City of Flowery Branch
Standard and Specifications
Chapter FOG

**Section Eight
Fog, Oils, Grease**

Part 1 - General

Scope:

- a) These regulations are designed to prevent blockages and overflows of sewer system resulting from discharges of FOG into the City of Flowery Branch sewer system and to specify appropriate FOG discharge requirements for all facilities emitting FOG.
- b) The City of Flowery Branch has authority over sizing, location, maintenance, and material of grease traps and/or interceptors located within the City of Flowery Branch and/or discharge into the City of Flowery Branch sanitary sewer system.
- c) These regulations shall apply to the direct or indirect discharge of all wastewater or waste containing FOG discharged into the City of Flowery Branch sewer system and/or private wastewater systems, including septic tanks.
- d) These regulations establish quantity and quality standards on all wastewater and/or waste discharges containing FOG; which may alone or collectively cause or contribute to FOG accumulation in the sewer system causing or potentially causing or contributing to the occurrence of sanitary sewer overflows and blockages.
- e) All installations shall conform to all stipulations as outlined in the Flowery Branch Fats, Oils, Grease Ordinance that are not mentioned in this section.

Definitions

Architectural or historical restrictions means a building or structure in the City of Flowery Branch that has special historical or esthetic interest or value as determined by the Historic Preservation Commission and as located within the Flowery Branch Local Historic District.

Backflow means a reversal of normal flow in a system caused by a negative pressure (vacuum or partial vacuum) in the supply piping or other condition that reverses the normal direction of flow.

Baffle means a retention wall three quarter (3/4) the length of the chamber nearer to the outlet.

Best Management Practices means a schedule of activities, a prohibition of practices, maintenance procedures, and other management practices to prevent or reduce the introduction of fats, oils, and greases into the sewer system. These

practices may vary by site, but produce the same reductions in fats, oils, and greases in the sewer system.

Change in Operations means any change in the ownership, food types, or operational procedures of a food service establishment.

City means the City of Flowery Branch, Georgia.

Compliance Inspector means a person authorized by the City of Flowery Branch to inspect any existing or proposed wastewater generation, conveyance, processing, and or disposal facilities.

Extreme economic hardship means a cost to comply with the requirements of these regulations that exceeds fifty thousand (\$50,000) dollars.

Fats, Oils, and Greases (FOG) means any substance such as a vegetable or animal product that is used in, or is a by-product of, the food preparation process, that turns or may turn viscous or solidifies or may solidify with a change in temperature or other conditions.

FOG Control Program means to reduce and/or control the discharge of fats, oils, and grease into the sewer system by educating and regulating food service establishments located in the City of Flowery Branch or establishments located outside the City of Flowery Branch but which discharge FOG.

FOG Interceptor means a multi-compartment device that is constructed in different sizes and is generally required to be located underground between a food service establishment and the connection to the sewer system. These devices primarily use gravity to separate FOG from the wastewater as it moves from one compartment to the next. These devices must be cleaned, maintained, and have the FOG removed and disposed of in a proper manner on regular intervals to be effective.

FOG Manifest means a document that the Georgia State permitted transporter must provide to the FOG generator as proof of services rendered.

FOG Wastewater Discharge Permit means a permit issued by the City of Flowery Branch authorizing the food service establishment or generator to discharge wastewater into the City of Flowery Branch facilities or into the sewer system.

Fixtures means a pot sink, pre-rinse sink, vegetable sink, meat sink, mop sink, soup kettles, wok stations, floor drains, automatic hood wash units, garbage disposals, trash compactors, dishwashers, and any other similarly functioning plumbing fixtures.

Flow means volume of wastewater moving in a certain direction.

Flow Control Device means a mechanism installed to control flow of hydraulic levels of FOG into an interceptor.

Food Service Establishment (FSE) means any person who prepares and/or packages food or beverage for sale or consumption, on or off site, with the exception of private residences so long as the private residence is not used to prepare or package food or beverage for sale. Food service establishments include but are not limited to, food courts, food manufacturers, food packagers, restaurants, catering services, bar/tavern, cafeterias, soda fountains, institutions both public and private, mobile food vehicles (coach), wing trailers, diners, grocery stores, bakeries, coffee shops, ice cream shops, lounges, hospitals, hotels, nursing homes, churches, schools, daycare center, and all other food service establishments not listed above either fixed or mobile as are or may hereafter be recognized by the health department and/or the state department of agriculture.

Fresh Air System Fixtures means a system that provides free circulation of air, which will prevent contamination from back flow or back siphonage, e.g., compartment sinks, dishwashers, floor drains, meat sinks, vegetable sinks, wok stations, mop sinks, etc.

Generator means any person including those outside the jurisdictional limits of the City of Flowery Branch who contributes, causes, or permits the contribution or discharge of wastewater into sewers within the City of Flowery Branch boundaries.

Georgia State Permitted Transporter means a transporter as that term is defined by O.C.G.A. 12-15-20 and as may hereinafter be amended.

Governing Body or Authority means the City of Flowery Branch City Council.

Grease trap means an inside mechanism no less than one hundred (100) pounds and no more than three hundred (300) pounds in size, with baffle and flow control installed before the master trap.

Hot Flushing means a situation prohibited in the City of Flowery Branch that occurs when the FOG interceptor is too close to a hot water using device so the water does not cool sufficiently in the interceptor to allow the FOG to coagulate and float to the top and FOG is instead carried out to the sewer system.

Limited food preparation establishment means an establishment that is engaged only in reheating or serving of ready to eat food products and as a result, discharges wastewater containing less than one hundred (100) mg/l of FOG per operating business day. A limited food preparation establishment does not include any operation that changes the form, flavor, or consistency of food.

New Construction means any structure, planned or under construction, where a sewer connection permit is required by law or regulation but has not been issued by the City of Flowery Branch.

Non-hazardous Manifest means a receipt that is retained by the generator of wastes for disposing of FOG, liquids, or other wastes as required by the City of Flowery Branch.

Plumbing Drainage Institute Rating means interceptors that are tested, rated, and certified in conformance with Standard Plumbing Drainage Institute and by the Plumbing and Drainage Institute.

Public Works Director means the Public Works Director of the City of Flowery Branch Public Works Department.

Regulatory Agencies means those agencies having regulatory jurisdiction over the operations of the City of Flowery Branch including, but not limited to: the United States Environmental Protection Agency, Region IV, Georgia and Washington, DC (EPA); the Georgia Department of Natural Resources (DNR); the Georgia Division of Public Health; the Georgia Environmental Protection Division (EPD); or any regulatory agency or body as may be established by federal, state, or local law.

Remodeling or remodeled means a physical change or operational change in a structure that requires an issuance of or revision to a business license or a building permit.

Septic Tank means a hollow chambered tank without a baffle, T's, and flow control to restrict FOG from entering the City's sewer system.

Shovel Inspection means a FOG Compliance Inspector who uses a shovel to determine the condition of the FOG interceptor.

Sludge means any solid, semi-solid or liquid decant, supernate or supernate from a manufacturing process, utility service, or pretreatment facility.

Sludge Judge Inspection means a test in which the FOG Compliance Inspector uses an instrument, usually a clear hollow plastic tube, to pull and measure a core sample from the FOG interceptor to determine its condition.

Standard Plumbing Drainage Institute - PDI-G101 means a comprehensive engineering and testing program developed to establish flow rates and FOG holding capacity for uniform rating of FOG interceptors.

Total Solids means the sum of suspended and dissolved solids within a sample.

Twenty-five Percent (25%) Rule means the requirement for FOG interceptors to be maintained such that the combined FOG solids accumulation does not exceed twenty-five (25) percent of the design hydraulic capacity of the FOG interceptor.

Visual Inspection means an in-person observation by a Compliance Inspector to determine if a shovel inspection and/or a sludge judge inspection is necessary to determine the condition of the FOG interceptor.

Waste means sewage and any and all other waste substances, liquid, solid, or gaseous, associated with human habitation or of human or animal nature intended for disposal.

Wastewater constituents and characteristics means the individual chemical, physical, and/or bacteriological parameters, including volume and flow rate, and such other parameters, that serve to define, classify, or measure the quality and quantity of wastewater.

Design Criteria:

- (a) Outdoor grease interceptors shall not have a capacity of less than 1,500 gallons nor exceed a capacity of 3,000 gallons. No matter what the calculated capacity using the following formulas, the minimum interceptor size shall be 1,500 gallons. If the calculated capacity using one of the following formulas exceeds 3,000 gallons, then multiple units in series shall be installed. The size of a grease interceptor shall be approximated by the following methods and grease interceptor size shall be the larger of the two results.

- a. Interceptor Capacity (gallons) = (S) × (25) × (Hr/12)

S = Number of Seats

Hr = Maximum hours of daily operation (include preparation & clean up)

- b. Interceptor Capacity (gallons) = (Sum of fixture flows) × (20)

Type of Fixture	Flow Rate (gpm)
Restaurant hand sink	15
Pre-rinse sink	15
Single-compartment sink	20
Double-compartment sink	25
Two double-compartment sinks	35
Dishwasher up to 30 gallons	15
Dishwasher up to 50 gallons	25
Dishwasher up to 100 gallons	40
Other fixture	Manufacturer peak

- (b) Under-sink or in-line grease interceptor requirements shall meet Plumbing and Drainage Institute Standard PDI-G101:

Type of Fixture	Flow Rate (gpm)	Grease Retention Capacity (lbs)
Restaurant hand sink	15	30
Pre-rinse sink	15	30
Single-compartment sink	20	40
Double-compartment sink	25	50

Two double-compartment sinks	35	70
Dishwasher up to 30 gallons	15	30
Dishwasher up to 50 gallons	25	50
Dishwasher up to 100 gallons	40	80
Other fixture	Manufacturer peak	GPM x 2

- (c) Grease interceptor designs represent minimum standards for normal usage. Installations with heavier usage require more stringent measures for which the user is responsible and shall pay the costs to provide additional measures if required by the director. City reserves the right to evaluate interceptor sizing on an individual basis for facilities with special conditions, such as highly variable flows, high levels of grease discharge, or other unusual situations that are not adequately addressed by the formula.

Part 2- Execution

2.01 Requirements for Interceptor and Specific Plumbing Connections

- (a) All food service establishments shall only introduce pre-treated wastewater acceptable to the City of Flowery Branch, under the requirements and standards established herein before discharging, directly or indirectly, into the City of Flowery Branch sewer system.
- (b) No more than 100 mg/L of FOG shall be discharged per operating business day. The FOG generator shall bear all of the expense of proving compliance with the 100 mg/L threshold.
- (c) Any food service establishment required to provide FOG pre-treatment shall install, operate, and maintain an appropriately designed and adequately sized FOG interceptor that has been approved by the Public Works Director or designee.
- (d) The testing procedures for waste constituents and characteristics shall be as provided in 40 CFR 136 (Code of Federal Regulations).
- (e) FOG interceptors shall be connected to the food service establishment's lateral sewer line after all fixtures which may introduce FOG have been connected and shall have fresh air connected, as defined in these regulations. Fresh air fixtures include but are not limited to sinks, dishwashers, garbage disposals, automatic hood wash units, floor drains in food preparation and storage areas, and any other fixtures, which have a potential to introduce FOG. Wastewater from sanitary sewer fixtures and other similar fixtures shall not be introduced into the FOG interceptor.
- (f) FOG interceptors shall not be connected to septic tanks.
- (g) All food service establishments that have dumpster pad/trash compactor drains on site and are connected to the sewer system shall have a separate interceptor (no less than one thousand five hundred (1,500) gallons in size) installed and

functioning at all times. The sloping area to the outside drain and the drain shall be covered either by the dumpster/compactor or a canopy to prevent inflow and infiltration of rainwater.

- (h) Any drains that lead to the sewer system including but not limited to trench drains, enclosed dock drains, carwash drains, elevator drains, and other similar types of drains shall have an oil water debris interceptor of no less than one thousand five hundred (1,500) gallons and no more than three thousand (3,000) gallons in capacity.

2.02

Fog Interceptor

(a) All interior FOG Interceptors shall:

- (1) Be a minimum of one hundred (100) pounds in capacity as defined by the Plumbing Drainage Institute;
- (2) Be made of corrosion-resistant coated metal;
- (3) Be properly sized based on the results of an inspection and FOG Evaluation;
- (4) Contain properly installed and functioning baffle walls and other flow control devices necessary to achieve the appropriate retention time;
- (5) Have at least a thirty (30) minute interior retention time before gray water is discharged into the sewer system;
- (6) tie all of the fresh air fixtures to the FOG interceptor;
- (7) have 15-foot distance between the FOG interceptor and the last fresh air fixture and have a proper flow control device;
- (8) Have a temperature of discharge entering the interior FOG interceptor that does not exceed one hundred and forty (140) degrees Fahrenheit; and,
- (9) Be plumbing drainage institute rated, be accessible for inspection, and be installed in accordance with the manufacturer's specifications by a licensed plumber and not a representative and/or an apprentice of the licensed plumber.

(b) All exterior FOG Interceptors shall:

- (1) Be a minimum of one thousand five hundred (1,500) gallons in capacity;
- (2) Be properly sized based on the results of an inspection and FOG evaluation;
- (3) Be constructed of re-enforced materials suitable for load bearing and water tight to prevent inflow and infiltration;
- (4) be pre-cast with a minimum of three thousand (3,000) psi concrete per applicable American Society for Testing and Materials standards with four (4) to seven (7) percent air entrapment;

- (5) Have an invert elevation of the inlet between three (3) inches to six (6) inches above the invert elevation of the outlet;
 - (6) contain a properly installed and functioning baffle wall and other flow control devices necessary to achieve an adequate time for FOG to properly separate but not to exceed twenty four (24) hours;
 - (7) Contain inlet and outlet T's made of Schedule 40 PVC piping and at a (ninety) 90 degree angle with a minimum diameter of the inlet and outlet piping to be six (6) inches;
 - (8) Include the outlet T six (6) inches from the manhole cover;
 - (9) Include T piping of the inlet and outlet that is within eighteen (18) inches of the bottom and at least five (5) inches above the static liquid level of the tank;
 - (10) Have the FOG interceptor set level on a consolidated, stable base so that no settling or tipping of the FOG interceptor can occur;
 - (11) connect all of the fresh air fixtures to the FOG interceptor;
 - (12) Have the outlet discharge line from the FOG interceptor directly connected to a sewer line tapped into the collection main;
 - (13) have solid manhole covers to prevent inflow and infiltration;
 - (14) Have two (2) or more manholes for entry to each chamber of hydraulic liquid mass;
 - (15) be accessible for inspections and have no permanent or temporary structure or container placed directly over the FOG interceptor or installed in areas subject to traffic; and
 - (16) Be installed by a licensed plumber.
- (c) The contents of any fryer oil containers shall not be mixed with any other FOG interceptor waste or any other non-toxic or toxic substances.

END OF SECTION

Appendix

City of Flowery Branch
Standard and Specifications
Appendix

Section Eight

Related Offices

City of Flowery Branch
City Hall
5517 Main Street
Post Office Box 757
Flowery Branch, GA 30542
(770) 967-6371

Hall County Engineer
300 Green Street
(Administration Building)
P.O. Box 1435
Gainesville, GA 30503
(770) 531-6800

Gainesville Public Utilities Collection and
Distribution
1006 South Bradford Street Extension
(Bradford Street Facility)
P.O. Box 2496
Gainesville, GA 30503
(770) 535-6880

Hall County Planning Department
440 Prior Street SE
P.O. Drawer 1435
Gainesville, GA 30501
(770) 531-6809

Gainesville Planning Department
311 Henry Ward Way
P.O. Box 2496
Gainesville, GA 30503
(770) 531-6570

Hall County Fire Marshall
731 East Crescent Drive
(Fire Station #7)
P.O. Drawer 1435
Gainesville, GA 30503
(770) 531-6838

Gainesville Engineering & Public Works
300 Green Street
(Administration Building)
P.O. Box 2496
Gainesville, GA 30503
(770) 535-6882

City of Oakwood
(Oakwood City Hall)
P.O. Box 99
Oakwood, GA 30566
(770) 534-2365

Georgia Department of Transportation-
Utilities Engineering
2505 Athens Highway
P.O. Box 1057
Gainesville, GA 30503
(770) 532-5510

City of Flowery Branch
Standard and Specifications
Appendix

Referenced Codes and Standards

ASTM: American Society for Testing and Materials

1916 Race Street
Philadelphia, Pennsylvania 19103

- D2241 Poly (Vinyl Chloride) (PVC) Plastic Pipe
- D1784 Rigid Poly(Vinyl Chloride) (PVC) Compounds & Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- D3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- A139 Specifications for Electrical Fusion Arc Welded Steel Pipe(NPS 4 and over)
- D2321 Underground installation of flexible thermoplastic sewer pipe
- C94 Specifications for Ready Mix Concrete
- A615 Deformed and plain billet steel bars for concrete reinforcement
- C478 Precast reinforced concrete manhole sections
- C32 Sewer and Manhole brick (made from clay or shell)
- C150 Portland Cement
- C53 (Changed to C911) Quick Lime, hydrated Lime & Limestone for Chemical use
- A48 Gray Iron Casting
- C191 Test Method for time setting of hydraulic cement vacant needle
- C109 Test method for compressive strength of hydraulic cement mortars (using 2 inch or 50 mm cube specimens)
- C827 Test Method for change in height on early ages of cylindrical specimens from cementitious mixtures
- D3034 Specifications for PSM Poly Vinyl Chloride Sewer Pipe and Fittings
- D3132 Test Method for Solubility Range and Resins and Polymers
- A74 Specifications for Cast Iron Soil Pipe and Fittings
- C564 Rubber Gaskets for Cast Iron Soil Pipe and Fittings
- A328 Specifications for Steel Sheet Piling
- A502 Specifications for Steel Structural Rivets
- A36 Specifications for Structural Steel
- D698 Test Method for Moisture density relations of soils and soil aggregates, mixtures using 5.5 pounds rammer and 12 inch drop
- B88 Specifications for Seamless Copper Water Tube

ANSI: American National Standards Institute

1430 Broadway
New York, NY 10018

- B 17.2 Woodruff Keys and Key Seats
- B 1.1 Uniside Inch Screw Threads (UN and UNR Thread Form)
- B 16.26 Cast Copper Alloy Fittings for Flair Copper Tubes
- B 16.18 Cast Copper Alloy Solder Joint Pressure Fittings

City of Flowery Branch
Standard and Specifications
Appendix

AWWA: American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235

- C104/A21.4 American National Standard for Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water
- C110/A21.10 American National Standard for Ductile Iron and Gray-Iron Fittings, 3 inch through 48 inch, for Water and Other Liquids
- C111/A21.11 American National Standard for Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
- C504 Rubber Seated Butterfly Valves
- C506 Backflow Prevention Devices- Reduced Pressure Principle and Double Check Valve Types
- C502 Dry Barrel Fire Hydrants
- C600 Installation of Ductile-Iron Water Mains and their Appurtenances
- C651 Disinfecting Water Mains (Includes addendum C651a-90)
- C151/A21.51 American National Standard for the Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds for Water or Other Liquids

AASHTO: American Association of State Highway and Transportation Officials
444 North Capitol Street, N.W.
Suite 225
Washington, D.C. 20001

- M-198 Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Water Type Gaskets
-

FCCCHR of USA: Foundry of Cross Connection Control and Hydraulic Research of the University of California

AWS: American Welding Society
550 N.W. Lejeune Road
P.O. Box 351040
Miami, FL 33125

Alternate Materials
Submittal Procedure

Although an effort is made to keep the construction materials and installation procedures specified herein up to date, of the highest quality, and assure that materials are readily available, substitutions may be necessary from time to time.

Substitutions will be considered upon submission of shop drawings and other pertinent information by the Contractor to the City. Any Contractor intending to furnish material or use installation procedures other than as specified is cautioned to verify the items/procedures proposed to be furnished will perform the same functions and have the same capabilities as those specified.

Shop drawing submittals shall include catalog cuts, manufacturer's certifications and warranties, listings of other installations with contact persons, and historical overview of the product and/or procedure.

Approval of the Public Utilities Department is dependent on the City's determination that the product/procedure proposed is essentially equal in function, performance, quality of manufacture, ease of maintenance, reliability, service life, and other criteria to that on which the design is based.

The City will endeavor to render a determination within two (2) weeks from completion of submission.

END OF SECTION