

SECTION

3

Design and Construction Standards for Water and Sanitary Sewer

A. WATER AND SANITARY SEWER

1. Applicability

This section shall apply to all current and potential users of the City of Austell Public Works including users outside the City who, by contract or agreement with the City, utilize the services of the City of Austell Public Works. Except as otherwise provided herein, the City of Austell Public Works Director or his/her designated representative shall administer, implement, and enforce the provisions of this section. Please refer to the Standard Details section for additional specifications for Water and Sanitary Sewer design and construction.

2. Objectives

The objectives set forth in this section are to:

- Provide a clear and concise description of the City of Austell Public Works standards for water and sanitary sewer system design and construction.
- Provide guidance to developers and their engineers to facilitate compliance with said standards.
- Furnish standards, which will create development of a quality water and sanitary sewer infrastructure.

3. Service Requirements

At the conceptual stage of a project, the owner and/or developer shall submit a request to the City of Austell Public Works of the availability of water and sanitary sewer capacity for the project. The request should include, but not be limited to, the location of the project, the size of the development, and the type of service.

The owner and/or developer shall identify the immediate needs for services as well as ultimate needs based on information made available from the City of Austell Public Works and other City agencies/departments/divisions.

City of Austell Public Works personnel shall evaluate the impact of the requested service upon the water distribution system and the sanitary sewer system and shall make a determination regarding the availability of services.

For all new developments, fire flow tests are required. Developers will be required to purchase a flow test for each project involving water infrastructure or fire protection construction. The flow test must be performed by the City of Austell Public Works to

determine the quantity of water available to the proposed development. Results of the flow test must be indicated on the development plans.

4. General Design Criteria

a. Water Service Above 1,150 Foot Mean Sea Level

All commercial, institutional, multi-family, or residential subdivisions proposed above sea level elevation of 1,150 feet will require a special design study and submitted to the City of Austell Public Works for approval. This study must be completed and approved by the City of Austell Public Works prior to any development plans being submitted for the plan review process.

b. Line Extension Requirements

If it is required to extend a water and/or sanitary sewer main for a development, the developer must extend it the full length of the property's improved frontage. The size of the extension will be at least the size of the existing main and may be larger as directed by the City of Austell Public Works or fire protection requirements.

Sanitary Sewer: Developers are required to extend sanitary sewer service to their proposed development if the development can be connected to existing sanitary sewer by gravity flow and no further construction of planned sanitary sewers by the City of Austell Public Works downstream of the proposed development is anticipated. The diameter of the extension will be at least eight inches or larger as directed by the City of Austell Public Works.

Sanitary sewer must be extended through a proposed development for a distance of up to 100 feet past the front building line and easements granted for future extensions necessary to serve future development beyond the development boundary.

If an existing water main or sanitary sewer line must be extended to serve a particular development, the developer would be required to pay all initial costs for the extension.

Construction of dry sanitary sewer and septic tanks may be required under some circumstances if construction of planned sanitary sewers by the City of Austell Public Works downstream of the proposed development is anticipated.

c. Street Cuts

All major street crossings should be bored and cased per the City of Austell Public Works and/or the Georgia Department of Transportation regulations.

If a bore cannot be made, the City of Austell Public Works or the Georgia Department of Transportation may permit a street cut.

d. Standard Drawings

Installation of water mains and related water appurtenances, sanitary sewer lines, and related sanitary sewer appurtenances shall be in accordance with applicable standard design drawings.

e. Creek Crossing

All creek crossings will be constructed in “DRY” conditions created by the contractor to prevent downstream silting. The contractor will submit a written proposal or schematic to the City of Austell Public Works as to the construction method proposed for the creek crossing. Proposals may include temporarily rerouting the creek with approved piping or temporarily damming the creek while pumping around the construction area.

f. Cased Bores

For water line installations in casing, blocking or skids will be placed under the carrier pipe prior to inserting pipe into the casing. Skids will be formed with pressure treated lumber and attached to the pipe with metal bands. Skid spacing will not exceed ten feet on center.

For installations involving gravity sanitary sewer lines, manufactured casing spaces will be used to maintain proper line and grade of the carrier pipe. Spacer spacing will not exceed ten (10) feet on center. Spacers will be equal to Model 4810 stainless steel Casing Chocks as manufactured by Power Seal.

B. WATER**Applicability**

To provide adequate water flow and pressure to the citizens of the City of Austell for domestic usage and fire protection.

1. Design Criteria and Standards**a. Fire Flow Test**

A fire flow test must be conducted on the existing water line, for any new development, prior to submitting design drawings for approvals, to determine the adequacy of water supply for the project. Utilization of a fire flow test by more than one project is prohibited. In general, a fire flow test may not be required in areas known to have sufficient flow and pressure as determined by a prior test conducted by the City of Austell Public Works.

The test shall consist of a fire hydrant flow test and a 24-hour flow and pressure test.

Test information furnished by the City of Austell Public Works or developers' engineer(s) shall consist of:

- Static Pressure and GPM Flow
- Residual Pressure and GPM flow
- Projected flow in GPM at 20 PSI
- 24-hour pressure chart (for commercial sites)
- Actual Pressure flow in GPM
- Site map including fire hydrant locations

Fire flow test results must be included in the water plans prior to approval of the plan by the City of Austell Public Works. The City of Austell Public Works may require a 24 hour pressure chart recording. Fire flow test must not be more than (6) months old at the time of first submittal to the plan review process.

Water supply must meet fire flow and domestic requirements for the service area. If adequate supplies are not available, construction will be contingent upon approval of a design study and plan submitted by the owner.

The City of Austell Public Works will run the fire flow test at the developer's cost. A registered professional engineer registered in the State of Georgia may perform this test for the developer; however, the test information outlined in the third bullet above must be furnished and certified.

b. Fire Flow Requirements

Minimum flow in gallons per minute at 20 PSI by the duration in minutes by type of development is required to be as follows:

Multi-family, commercial and institutional: 1,200 GPM for 30 minutes

Residential: 1,000 GPM for 30 minutes

c. Spacing of Fire Hydrants

- Multi-Family, Commercial, and Institutional: Fire hydrants shall be spaced not more than 300 feet apart.
- Single Family: Single family residential developments shall have a maximum fire hydrant distance of 500 feet from the hydrant to the most distant building served by that hydrant.

d. Location of Fire Hydrants

- Fire Hydrants on City Roads: Fire hydrants on existing City roads shall be located between the edge of the right-of-way and the water lines.
- Fire Hydrants on New Streets: Fire hydrants on new streets shall be located between the curbing and the water line.

e. Fire Main Size

- Multi-family, Commercial and Institutional: Water mains shall be a minimum of eight inches.
- Single Family: Water mains shall be a minimum of six inches.

f. Location of Water Mains and Appurtenances

- Existing City Roads: On existing City roads, water lines shall be located two feet from the edge of pavement with a minimum depth of 42 inches.
- Water Lines on New Streets: Water lines in new streets shall be located five feet from the back of the curb with a minimum depth of 42 inches.
- Service for all new developments: There will be a dual feed from two separate mains for all new subdivisions in City where practical and deemed necessary.
- Service Laterals: Service laterals shall be located as per Standard Details with a minimum depth of 42 inches within the right-of-way and shallowing to a depth of 18 inches at the water meter location.
- Water Meters: Water meters shall be located at the edge of the street right-of-way per City Standards. Water meters shall be located at the edge of the street right-of-way or utility easement per City Standards and permanently marked in the curb with a “W”.
- Water Valves: Water valves at intersections shall be located as per City Standards. Valve location will be permanently marked in the curb with a “V”.
- Dead End Lines: A gate valve and a minimum of two joints of mechanical pipe joints shall be provided at the end of all lines where extension is proposed or anticipated for phased developments.

g. Water Inspection

Hydrostatic pressure and leakage tests shall conform to the Water and Sanitary Sewer Standard Details of this document, the exception that the contractor shall furnish all gauges, meters, pressure pumps, and other equipment needed to test the line. The pressure gauge used for testing shall be laboratory calibrated suitable for the test pressure required.

The pressure required for the field hydrostatic pressure test shall be 150% of the maximum operating pressure of the section, or the pressure class of the pipe, whichever is greater. The contractor shall provide temporary plugs and blocking necessary to maintain the required test pressure. Corporation cocks at least 3/4 inches in diameter, pipe riser, and angle globe valves may be required at each pipe dead-end and high point in order to bleed air from the line. Duration of the pressure test shall be at least two hours. The cost of these items shall be included as a part of the testing.

A record of successful pressure testing results will be provided by the contractor to the City of Austell Public Works inspector at the time of observing the leakage testing.

The leakage test shall be a separate test at the maximum operating pressure as determined by the owner following the pressure test and shall be of not less than two hours duration. All exposed pipes, fittings, valves, and joints will be carefully examined during the tests and all leaks evident at the surface shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves, and accessories shall be removed and replaced.

C. SANITARY SEWER

Applicability

The purpose of this section is to provide guidance on how the city proposes to furnish sanitary sewer service to all new developments.

1. Design Criteria and Standards

a. System Design

1. Sanitary sewer system should be designed for the estimated tributary population. Tributary population is considered to be all areas upstream of the discharge point of the system being designed. Sanitary sewers will be designed to the uppermost property line of the development being served and extended up to 100' from the front property line.
2. New sanitary sewer systems shall be designed to accommodate peaked sewage flow plus anticipated maximum infiltration/inflow levels under open channel flow conditions. The pipe diameter and slope shall be selected to obtain the greatest practical velocities to minimize settling problems.

b. Design Standards

1. No sanitary sewer lines less than 8 inches in diameter may be installed. Service laterals shall be a minimum of six inches in diameter in the public right-of-way or easement. Service lateral location will be permanently marked in the curb. The service end of the lateral shall be worked with a two-inch diameter PVC pipe positioned at the depth of the lateral and extending at least two feet above grade.
2. No sanitary sewer collector less than eight inches in diameter may be installed. Service laterals in the public right-of-way or sanitary sewer easement shall be a minimum of six inches in diameter. Service lateral locations shall be permanently marked in the curb and installed by the developer according to the approved detail entitled "Sanitary Sewer Service Lateral".
3. Manhole spacing should not exceed 300 linear feet. A variance to exceed these lengths shall be documented and submitted for review by the Director of the City of Austell Public Works or his/her designee.
4. Sanitary sewer easements shall be a minimum of 20 feet wide.
5. No permanent structures shall be constructed within ten feet of the edge of a permanent easement on front and rear setbacks or within two feet on side setbacks.
6. No lift stations will be permitted unless they are to be owned and operated privately. The City of Austell will not accept any lift stations for maintenance.
7. Depth of sanitary sewer lines should not exceed 18 feet within a street and a maximum of 25 feet off-street. A variance to exceed these "depths" shall be documented and submitted for review by the Director of the City of Austell Public Works or his/her designee.
8. Manholes below the 100-year flood elevations shall have bolt-down, water-tight rings, and covers pre-cast into the manhole cone.
9. All manhole adjusting rings used on manholes in the streets will be metal.
10. All utility manholes on right-of-way will be flush with the ground elevation.
11. Manhole joints shall be sealed with an approved sealant to prevent infiltration and inflow.
12. Inside drops with proper design are required at all manholes where the drop is greater than three feet.

13. Minimum angle between influent and effluent sanitary sewer lines at a manhole shall be 90°.
14. The maximum slope for a sanitary sewer line shall be 20%. All 20% sanitary sewers shall be ductile iron pipe with concrete collar walls at every joint or alternate restraining system provided by the design professional. Slopes less than 20% are preferred and drop connections for 20% slopes are prohibited unless designed by a registered Professional Engineer and approved by the Director of the City of Austell Public Works or his/her designee.
15. The minimum slope for a sanitary sewer line will be selected to maintain a minimum velocity in the pipe, when flowing full, of 2.5 feet per second. The velocity shall be calculated using the Manning formula with an “n” factor of 0.013. Slopes greater than the minimum are desirable and will be required if site specific conditions permit. Slopes less than minimum will be considered on a case by case basis and will be approved by the Director of the City of Austell Public Works or his/her designee.
16. Ductile iron pipe shall be required under the following circumstances:
 - When a sanitary sewer line has a cover of less than three feet.
 - When a sanitary sewer line crosses a storm sewer line with less than two feet of clearance.
 - When a sanitary sewer line passes laterally within one foot of a storm sewer line.
 - When a sanitary line is to have in excess of 18 feet of fill.
 - When a sanitary sewer line is at the maximum slope of 20%.
 - When a sanitary sewer is less than six feet under a street.
 - When a sanitary sewer line crosses a creek.
 - All drop connections in manholes unless otherwise approved by the Director of the City of Austell Public Works or his/her designee.
 - When a sanitary sewer line is in a “side setback” location (for example, where a structure could be built as close as two feet from the easement).
17. When practical, when ductile iron pipe is required it should be used the entire length between manholes to avoid transition couplings. However, transitions may be used using HARCO or equal adapters.

18. Both vertical and horizontal alignments shall be reviewed with the City of Austell Public Works prior to finalization.
19. All oil and grease, water, and solids separators (grease traps) required in this provision shall have a capacity and design in compliance with the following equations:

- Restaurants

$$(S) \times (25) \times HR / (12) \times (LF) = \text{Capacity in Gallons}$$

S = Number of seats in dining area

HR = Number of Hours open

LF = Loading Factor - 1.00 Recreational Areas

0.80 Main Highways

0.50 Other Highways

- Hospitals, nursing homes, other type commercial kitchens with varied seating capacity

$$(M) \times (5) \times (LF) = \text{Capacity in Gallons}$$

M = Meals per day

LF = Loading Factor - 1.0 with dishwasher

0.5 without dishwasher

- i. Except that no grease trap shall be smaller than 750 gallons, no single separator shall be larger than 3,000 gallons. Where requirements exceed 3,000 gallons, multiple units shall be used. In cases of certain fast food restaurants or establishments with a potential to discharge large quantities of grease and oil, capacity requirements greater than 25 gallons per seat may be required. Pre-packaged or manufactured grease traps may be approved by the control authority with proper engineering and application review.
- ii. For restaurants, other eating establishments, or commercial food preparation establishments: all exterior grease interceptors used in conjunction with restaurants, other eating establishments, or commercial food preparation establishments shall be sized in accordance with City of Austell Public Works or Cobb County Water System Specifications approved by the City of Austell Mayor and City Council or the Cobb County Board of Commissioners. Interior mechanical grease traps may be used for existing buildings or in conjunction with “tenant finish” permits when sizing requirements are established and certified by a plumbing engineer and with the City of Austell Public Works’ acknowledgement that an upgrade to an exterior trap may be required if

the unit fails to comply with the maximum grease discharge limit of 150 milligrams per liter.

- iii. All grease traps will be provided with a sampling manhole or port between the trap and the City sanitary sewer connection. This sampling manhole will be above the sanitary sewer connection.
- iv. Compacted crushed stone bedding is required when sanitary sewer pipe is placed in rocky areas, wet areas, soft and spongy areas, and in many clay soils of the City, or at a depth greater than 15 feet. The pipe shall be bedded in compacted crushed stone the full width of the trench with a minimum of six inches below the pipe and extend up to the mid-point (springline) of the pipe.
- v. The following requirements apply when bedding PVC pipe. Compacted crushed stone bedding is required when bedding PVC sanitary sewer pipe. The pipe shall be bedded in compacted crushed stone the full width of the trench with a minimum of six inches below the pipe and extend up to the mid-point (springline) of the pipe.
- vi. Alternately, the developer's professional engineer may certify that the site native soil is compatible and suitable for use as PVC pipe bedding material, hereafter called "select backfill material." This certification shall be stamped by the developer's professional engineer or professional geotechnical engineer.

20. **Sanitary Sewer Inspection**

The contractor shall air test all gravity sanitary sewer lines following completion of construction and pipe cleaning. PVC pipe must pass a 5% deflection test using a mandrel. Contractor shall furnish all necessary equipment and materials for testing and shall be performed consistent with the requirements in the Water and Sanitary Sewer Specifications of this document.

All sanitary sewer lines shall be televised and a film of the inspection made and submitted to the City of Austell Public Works before the final plat is signed and again before the final acceptance of the sanitary sewer lines.

Prior to televising the mains, the mains shall be flushed with water so that sags are apparent. The owner or developer shall be responsible for coordinating the CCTV inspection with the City of Austell Public Works. Any faulty pipe noted such as sagged pipes, broken pipes, bad joints, etc., will be dug up and will be corrected. Internal grouting to repair new lines will not be allowed. After correction of the discrepancies, the line will be re-televised

If the test section fails to meet the infiltration and/or air test requirements, the owner or contractor shall determine the source(s) of leakage, make necessary repairs, and retest the test section.

A record of the low pressure air testing will be provided to the City of Austell Public Works inspector at the final sanitary sewer construction inspection. The record should include the line segment identification, initial air pressure, time interval allowed, the final air pressure, date of test, and name of the person in charge of testing.

At the time of the final sanitary sewer construction inspection, the newly installed sanitary sewer system will be separated from the existing system by installing plugs in accordance with City of Austell Public Works Standard Operating Procedures. These plugs will remain in place until the successful completion of the post paving inspection.

C. MATERIAL SPECIFICATIONS

Water

1. Scope of Work

- a. The owner and/or contractor shall supply all labor, equipment, materials, and incidentals necessary to install and test all water supply piping and appurtenances as specified.
- b. Work shall include, but not be limited to, all excavation, backfilling, sheeting, slope protection, drainage, concrete work, rip-rap, grading, and all other work necessary to complete the construction, installation, and testing of the pipe.

2. Qualifications

The pipe and fittings shall be designed, constructed, and installed in accordance with these Specifications as applicable.

3. Submittals and Testing

- a. The contractor shall submit to the owner a list of materials to be furnished prior to start of construction.
- b. Submit shop drawings to the owner and to the City of Austell Public Works.

4. Inspection

All pipe and fittings installed may be inspected by the City of Austell Public Works at the site of manufacture for compliance with these specifications.

5. Connection to Work by Others or Existing Lines

For existing lines or lines installed under other contracts to which piping must connect, the Contractor shall expose buried lines to confirm or determine end connection details, pipe material and diameter, and furnish and install appropriate piping, and make proper connections. Design shall include the requirements of the Water Design Standards.

D. PRODUCTS

General

1. Materials

All materials shall be of standard manufactured design that the manufacturer recommends for the service intended in accordance with AWWA or ASTM Standard Specifications.

- a. All pipe and appurtenances shall be of the size shown on the drawings and all equipment of the same type shall be from one manufacturer.
- b. Pipe materials shall be as follows:
 - Mains, 6" and larger, ductile iron
 - Mains, smaller than 6", ductile iron or galvanized steel
 - Service lines, 3/4" - 1", copper

2. Ductile Iron Pipe and Fittings

- a. Ductile iron pipe shall meet the following requirements and be as specified hereinafter.
- b. Ductile iron pipe shall be of the centrifugally cast type, either in metal or cast molds, and shall conform to ANSI A21. 51 or AWWA C151. Ductile iron shall have a minimum tensile strength of 60,000 PSI with minimum yield strength of 42,000 PSI, pressure rated at a minimum of 350 PSI and have a minimal wall thickness of 1/4" unless field conditions determine that a heavier wall thickness is required. The pressure rating and manufacture date shall be shown on each piece. All pipes shall be furnished complete with all necessary glands, joint materials including rubber gasket lubricant, bolts, nuts, etc. Pipe furnished shall be manufactured by U. S. Pipe and Foundry; American Cast Iron Pipe; or equal in industry standard lengths.

3. Fittings and Joints

All ductile iron joints used in the project, unless otherwise noted, shall be push-on joint or as specified and shall meet the requirements of ANSI Specifications A 21. 11 or AWWA C111, latest revisions.

Fittings: All ductile iron pipe fittings shall be of ductile iron or cast iron and shall be of a standard design for use with the pipe purchased under these specifications. Fittings shall conform to the following applicable specification:

Mechanical Joint fittings: Fittings with rubber gasket joints shall conform to ANSI Specification A 21. 11. Bolts shall be low alloys, high strength, equal to “Acipally”, “Usalloy”, or “Corten” bolts.

4. Other Materials

The proper number of gaskets, bolts, and all necessary joint materials, plus one extra gasket for every 50 joints or fraction thereof, shall be furnished with the pipefittings.

- a. Pipe and fittings shall have a cement mortar lining and a bituminous seal coat on the inside in accordance with ANSI A21. 4 and be coated on the exterior with a 1. 0 mils thick bituminous coat in accordance with ANSI A21. 51. A ceramic coating shall be substituted for the cement mortar lining where shown on the drawings.
- b. Polyethylene Encasement: Where indicated on the drawings, the Contractor shall provide a polyethylene encasement over pipe, fittings, and valves. The material, installation, and workmanship shall conform to applicable sections of ANSI Standard A21. 5. Installation shall be employed using flat tube polyethylene.

5. Galvanized Steel Pipe

- a. All galvanized steel pipes shall meet the requirements of ASTM Standard Specification for Welded Seamless Steel Pipe, Serial Designation A 53, latest revision. Galvanized steel pipe shall be Schedule 40 and marked for identification. The fittings shall be beaded of galvanized, cast, or malleable iron, standard weight. All pipe and fittings shall have sound, well-fitting threads.
- b. When cast iron companion flanges are required to connect alloy steel piping to cast iron piping or in alloy steel pipe larger than two inches in diameter in lieu of unions, such flanges shall be furnished, drilled, and tapped.

6. Copper Pipe

All copper pipes shall conform to Federal Specifications WW-T-799, Type “K” as a minimum with plain ends and lengths standardized at 12 feet.

7. Copper Tubing

All copper tubing shall conform to ASTM Designation B88 for the Type “K” Soft Temper and AWWA 7S-CR Type “K” and may be used in 20-foot straight lengths or 60/100-foot coils. Copper tubing shall be installed from the meter to the structure. No other types will be approved or accepted.

8. Gate Valves

All valves 3” to 16” in diameter shall be gate valves conforming to the requirements of AWWA Specification C-500. Sizes smaller than three inches shall meet Federal Specification WW-V-54, Class “A”, rated for 200 PSI working pressure. Gate valves shall be as manufactured by Dresser, Mueller, Darling, Clow Corporation, Kennedy, Walworth, or similar approved equal.

9. Butterfly Valves

All valves 16” and larger shall be butterfly valves of the tight closing, rubber-seat type and shall conform to the requirements of AWWA Specification C-504 for Class 150 B and as further specified herein. The butterfly valves shall be of the rubber-seat types that are securely fastened to the valve body. No metal-to-metal seating surfaces shall be permitted. Valves shall be bubble-tight at rated pressures with flow in either direction, and shall be satisfactory for applications involving throttling service and/or frequent operation and for applications involving valve operation after long periods of inactivity. Butterfly valves shall be as manufactured by BIF Industries, Henry Pratt Company, Dresser, or similar approved equal.

10. Air/Vacuum Release Valves

The valves shall have a cast iron body, cover and baffle, stainless steel float, bronze water diffuser, and Buna-N seat with threaded fittings. The valves shall be manufactured by GA Industries, APCO Valve and Primer Corporation, or equal.

11. Corporation Stops

Corporation stops shall be all brass or bronze suitable for 200 PSI operating pressure and similar to Mueller Company H-10046 or Hays 5200.

12. Valve Boxes

Valve boxes shall be cast iron two or three piece with cast iron covers. The barrel shall be one or two-piece, screw type, having 5 1/4” shaft. Covers shall have “WATER” cast into the top.

13. Flexible Couplings

Flexible couplings shall be Catalog Number 411-160002 as manufactured by Smith-Blair, Style Number 38, as manufactured by Dresser Manufacturing Company or equal.

14. Fire Hydrants

- a. Fire hydrants shall conform to AWWA C502-85 for dry-barrel fire hydrants. Hydrants shall be traffic types with safety flange, which allows the valve to remain closed when the hydrant is broken or damaged above or near grade level. The design of hydrant shall be of the compression type with main valves and “O” ring seal between the operating nut and the bonnet. Hydrant color shall be silver.
- b. Hydrant inlet shall be 6”, mechanical joint with harnessing lugs. Hydrant main valve opening shall be 5 1/4”. Valve seats shall be bronze to bronze.
- c. Operating nut shall be solid pentagon, 1 1/2” measured flat at point (31/32 on side). Operating nut shall turn counter clockwise to open.
- d. Hydrant shall have two 2 1/2” diameters and one 4 1/2” diameter nozzles. Nozzle threads shall be the standard adopted by NBFU. Nozzles shall all have gasket caps fitted with chain.
- e. The following fire hydrants are approved for installation in the City of Austell:

<u>Manufacturer</u>	<u>Model</u>
American AVK	Models 2700 and 2780
American-Darling	B-62B
Clow	Medallion
Kennedy	K81-A
M&H	Models 129 and 929
Mueller	Centurion and Improved
U. S.	M-94

Materials shall conform to AWWA Standard C-502, latest revision.

15. Curb Stops

Curb stops shall be of bronze construction with tee handle operator. Curb stops shall be Hays 5060 or approved equal.

16. Tapping Sleeves

Tapping sleeves shall be Class 250 pipe for 200 PSI cold water working pressure. Sleeves shall be M & H Figure Number 74-M, Mueller Number H-615, or approved equal.

17. Tapping Saddles

Double Strap Saddles: Saddles shall be either Smith Blair 313 Double Strap or Superior Style 32.

18. Adapters and Unions

Copper female iron pipe adapters shall be Hays 5600 CF or approved equal in Mueller. Copper by copper unions shall be Hays 5615 CF or approved equal in Mueller. Copper by male iron pipe adapters shall be Hays 5605 or equal in Mueller.

E. EXECUTION

General

Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired by the owner or developer.

Pipe and fittings shall be subjected to a careful inspection just prior to being laid or installed. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.

Unless specifically indicated otherwise, underground piping shall slope uniformly between joints.

When constructing piping, owner or contractor shall exercise extreme care to protect all existing underground utilities, and all existing structures from damage.

1. Installation

Pipe and fittings shall be installed using bedding, as shown on the drawings and in accordance with requirements of AWWA Standard Specifications except as otherwise provided herein. A firm, even bearing throughout the length of the pipe shall be constructed by tamping selected material at the sides of the pipe up to the spring line. **BLOCKING SUPPORTS WILL NOT BE PERMITTED.** Bell holes shall be hand excavated to insure uniform bearing along the pipe barrel.

All pipes shall be sound and clean before laying. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by manufacturer.

When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end. Lining shall be undamaged.

Push-on joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

Joints at fittings, and where designated on the drawings and/or as specified, shall be in accordance with the "Notes on Method of Installation" under ANSI Specification A21. 11 and the instructions of the manufacturer. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber gasket with soapy water before assembly.

Unless otherwise noted, underground piping shall be push-on.

All fittings and other appurtenances needed upon the pipelines shall be set and jointed as indicated on the drawings or as required by the manufacturer.

The Contractor shall arrange, if requested, for the pipe manufacturer to furnish information and supervise the installation of at least the first five push-on joints.

The owner or contractor shall carefully regulate his equipment and construction operations such that the loading of the pipe does not exceed the loads for which the pipe is designed and manufactured. Any pipe damaged during construction operations shall be replaced at the Contractor's expense.

All piping shall be properly and adequately supported. Supports shall be provided as indicated on the drawings. If the method of support is not indicated on the drawings, piping shall be supported as directed by the City of Austell Public Works.

The proper number of gaskets and all necessary joint materials, plus one extra gasket for every 50 joints or fraction thereof, shall be furnished with the pipe and fittings.

Pipe embedment shall conform to manufacturer's recommendations. Bedding and backfill for pipe shall be as shown on the drawings.

2. Pipe Supports and Thrust Blocks

All piping shall be properly and adequately supported. Concrete piers and pads shall be provided as indicated on the drawings. If the method of support is not indicated on the drawings, exposed piping shall be supported as directed by the City of Austell Public Works.

Longitudinal thrust along pressurized pipelines at bends, tees, reducers, and caps/plugs shall be counteracted by enough weight of concrete to counterbalance the vertical and horizontal thrust forces.

Joints shall be protected by felt roofing paper prior to placing concrete thrust block.

Bearing area of thrust blocks shall be adequate to prevent any movement of the fitting and shall be of the size and dimensions as shown on the drawings.

Concrete for thrust blocking shall be 3,000 PSI minimum. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts, or nuts, or interfere with the removal of any joint. Wooden side forms shall be provided for thrust blocks.

Restrained joints shall be used as shown on the drawings. Thrust blocks shall be used at all other locations or as directed by the City of Austell Public Works.

3. Pressure and Leakage Tests of Underground Pressure Piping

Hydrostatic pressure and leakage tests shall conform with Section 4 of AWWA C600 Specification with the exception that the Contractor shall furnish all gauges, meters, pressure pumps, and other equipment needed to test the line. The pressure gauge used for testing shall be laboratory calibrated suitable for the test pressure required.

The pressure required for the field hydrostatic pressure test shall be 150% of the maximum operating pressure of the section, or the pressure class of the pipe, whichever is greater. The owner or contractor shall provide temporary plugs and blocking necessary to maintain the required test pressure. Corporation cocks at least 3/4" in diameter, pipe riser, and angle globe valves shall be provided at each pipe dead-end and high point in order to bleed air from the line. Duration of pressure test shall be at least two hours. The cost of these items shall be included as a part of testing.

A record of successful pressure testing results will be provided by the Contractor to the City of Austell Public Works inspector at the time of observing the leakage testing.

The leakage test shall be a separate test at the maximum operating pressure as determined by the City of Austell Public Works following the pressure test and shall be of not less than two hours duration. All exposed pipes, fittings, valves, and joints will be carefully examined during the tests and all leaks evident at the surface shall be repaired and leakage eliminated regardless of total leakage as shown by test. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves, and accessories shall be removed and replaced. The pipelines shall be tested in such sections as may be directed by the City of Austell Public Works by shutting valves or installing temporary plugs as required. The line shall be filled with water and all air removed and the test pressure shall be maintained in the pipe for the entire test period by means of a force pump to be furnished by the owner or contractor. Accurate means shall be provided for measuring the water required to maintain this pressure. The amount of water required is a measure of the leakage.

The amount of leakage, which will be permitted, shall be in accordance with AWWA C600 Standards for all pressure lines. No pipe installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133200}$$

“L” is the allowable leakage, in gallons per hour; “S” is the length of pipe tested, in feet; “D” is the nominal diameter of the pipe, in inches; and “P” is the average test pressure during the leakage test, in pounds per square inch gauge.

The owner or contractor may backfill the trench before the lines are tested, if desired, but shall open up the trench at its own expense to repair any leaks.

The owner or contractor must submit his plan for testing to the City of Austell Public Works for review at least three days before starting the test. The owner or contractor shall remove and adequately dispose of all temporary blocking material and equipment after completion and acceptance of the field hydrostatic test, unless otherwise directed by the City of Austell Public Works. Any damage to the pipe coating shall be repaired by the owner or contractor. Lines shall be totally free and clean prior to final acceptance.

4. **Cleaning Mains**

At the conclusion of the work, the owner or contractor shall thoroughly clean the new pipe line by flushing with water or other means to remove all dirt, stones, pieces of wood, or other materials, which may have entered during the construction period. If obstructions remain after this cleaning, they shall be removed.

5. **Disinfection**

Upon completion of the pressure and leakage test, the section of pipe to be disinfected shall be initially flushed using potable water. Flushing shall be accomplished at a minimum velocity of 2.5 feet per second and shall continue until the water runs clear.

Disinfection shall be accomplished by the continuous feed chlorination method in accordance with AWWA C601. The following steps shall be employed:

- a. Begin filling main at a constant, measured rate with potable water. As water first flows in, begin adding chlorine at a point no more than ten feet from the beginning of the new main.
- b. Add chlorine at a rate to attain a 25 mg/l chlorine concentration. The acceptable method is by preparing a 1% solution with sodium hypochlorite or calcium hypochlorite. The required amount of chlorine to produce a 25 mg/l concentration in 100 feet of pipe is as follows:

Pipe Diameter	100% Chlorine (Pound)	1% Chlorine Solutions (Gallon)
4	.013	0.16
6	.030	0.36
8	.054	0.65
10	.085	1.02
12	.120	1.44
16	.217	2.60
18	.275	3.30
20	.339	4.06
24	.488	5.85

- c. Continue adding chlorine at a rate to attain a minimum concentration of 25 mg/l. Measure the rate at regular intervals as given in AWWA M12 or with a high range test kit. Chlorine application shall continue until the entire main is filled.
- d. The chlorinated water shall be retained in the water main for a minimum of 24 hours. At the end of the 24-hour period, the water in all portions of the main shall have minimum chlorine residual of 10 mg/l.
- e. The heavily chlorinated water shall be flushed in a manner, which is not detrimental to the environment. The method proposed shall be submitted to and approved by the Owner prior to discharge. Final flushing shall continue until the chlorine residual is less than two mg/l.
- f. Owner or contractor shall coordinate sampling with the Cobb City-Marietta Water Authority no earlier than 16 hours after final flushing. The Cobb City-Marietta Water Authority will obtain bacteriological samples for testing.

If bacteriological test results are unsatisfactory, the main shall either be flushed with potable water or re-disinfected by the owner or contractor, as directed by the City of Austell Public Works, prior to obtaining additional samples. Satisfactory bacteriological test results shall be obtained prior to placing the new main in service.

6. Sanitary Sewer

a. Scope of Work

The owner and/or contractor shall supply all labor, equipment, materials, and incidentals necessary to install and test all piping and appurtenances as specified.

Work shall include, but not be limited, to all excavation, backfilling, sheeting, slope protection, drainage, concrete work, rip-rap, grading, and all other work necessary to complete the construction, installation, and testing of the pipe.

b. Qualifications

The pipe and fittings shall be designed, constructed, and installed in accordance with these specifications as applicable.

c. Submittals and Testing

If required, the owner or contractor shall submit to the City of Austell Public Works a list of materials to be furnished prior to the start of construction. Drawings must be submitted to the City of Austell Public Works, as required.

d. Inspection

All pipe and fittings to be installed may be inspected by the City of Austell at the site of manufacture for compliance with these specifications.

e. Connection to Work by Others or Existing Lines

For existing lines or lines installed under other contracts, to which piping of this contract must connect, the owner or contractor shall expose buried lines to confirm or determine end connection details, pipe material and diameter, furnish and install appropriate piping, and make proper connections. The design shall include the requirements of section C, Sanitary Sewer Design and Construction.

7. Products

a. Ductile Iron Pipe and Fittings

Ductile iron pipe shall meet the following requirements and be as specified hereinafter:

1. Ductile iron pipe shall be of the centrifugally cast type, either in metal or cast molds, and shall conform to ANSI A21. 51 or AWWA C151. Ductile iron shall have a minimum tensile strength of 60,000 PSI with minimum yield strength of 42,000 PSI. Thickness of pipe to be supplied shall be as required under Table 50. 12 AWWA C150 (ANSI 21. 51), and not less than ¼” wall thickness. All pipes shall be furnished complete with all necessary glands, joint materials, including rubber gaskets lubricant, bolts, nuts, etc. Pipe furnished shall be as manufactured by U. S. Pipe and Foundry; American Cast Iron Pipe; James B. Clow and Sons; or equal in industry standard lengths.
2. All ductile iron joints used in the project, unless otherwise noted, shall be push-on or as specified and shall meet the requirements of ANSI Specifications A 21. 11 or AWWA C111, latest revisions.

Fittings:

1. All ductile iron pipe fittings shall be ductile iron or cast iron and shall be of a standard design for use with the pipe purchased under these Specifications. Fittings shall conform to the following applicable specification:

Push-on fittings: Fittings with rubber gasket joints shall conform to ANSI Specification A 21. 11.

2. The proper number of gaskets and all necessary joint materials, plus one extra gasket for every 50 joints or fraction thereof, shall be furnished with the pipe fittings.
Pipe and fittings shall have a cement mortar lining and a bituminous seal coat on the inside in accordance with ANSI A21. 4 and be coated on the exterior with a 1. 0 mils thick bituminous coat in accordance with ANSI A21. 51. A ceramic coating shall be substituted for the cement mortar lining where shown on the drawings.

Polyethylene Encasement:

Where indicated on the drawings, the owner or contractor shall provide a polyethylene encasement over pipe, fittings, and valves. The material, installation, and workmanship shall conform to applicable sections of ANSI Standard A21. 5. Installation shall be employed using flat tube polyethylene.

8. SDR-35 Polyvinyl Chloride Pipe and Fittings**Polyvinyl Chloride (PVC) Pipe for Gravity Sanitary Sewers:**

Class-rated PVC pipe and accessories, where shown or as specified on the drawings, shall meet extra strength minimum of SDR-35 of the requirements of ASTM D 3034-73 for 4” through 15” and ASTM F 679 for 18” through 27”. Pipe shall be furnished in industry standard lengths. Pipe and accessories shall bear the NSF mark indicating its class, pipe size, manufacturer’s name, AWWA and/or ASTM Specification number, working pressure, and production code. Pipe and couplings shall be made from Class 12454-A or Class 12454-B virgin compound, as designed in ASTM D1784.

Joints:

The PVC joints for pipe 4” in diameter and greater shall be of the push-on type. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket. The gasket and annular recess shall be designed and shaped so that the gasket is locked in place against displacement as the joint is assembled. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75°F in each joint per

length of pipe. The bell shall consist of an integral wall section with a solid cross-section electrometric ring, which shall meet requirements of ASTM D2869. The thickened bell section shall be designed to be at least as strong as the pipe wall.

Pipe shall be joined by gasket bell-and-spigot joints.

9. **Ribbed (Open Profile) Polyvinyl Chloride Pipe and Fittings**

Ribbed (Open Profile) Polyvinyl Chloride (PVC) Pipe for Gravity Sanitary Sewers:

Class-rated PVC pipe and accessories where shown or as specified on the drawings, shall meet the requirements of ASTM F-794-89a and UNI-BELL Uni-B-9 for 8" through 30". The pipe shall be homogeneous and have a smooth interior with a solid cross-sectional rib exterior. Exterior ribs shall be open profile and perpendicular to the axis of the pipe. Pipe shall be green in color and furnished in industry standard lengths. Each length of pipe shall be marked indicating its size, manufacturer's name, product type, PVC cell classification, ASTM F-794-89a, and date of manufacture.

Joints:

The PVC joints for pipe four inches in diameter and greater shall be of the push-on type. The push-on joint shall be a single rubber gasket joint designed to be assembled by the positioning of a continuous, molded rubber ring gasket in an annular recess in the pipe of fitting socket and the forcing of the plain end of the entering pipe into the socket. The gasket and annular recess shall be designed and shaped so that the gasket is locked in place against displacement as the joint is assembled. The rubber ring joint shall be designed for thermal expansion or contraction with a total temperature change of at least 75°F in each joint per length of pipe. The thickened bell section shall be designed to be at least as strong as the pipe wall.

Pipe shall be joined by gasket bell-and-spigot joints.

10. **Pre-stressed Concrete Cylinder (PCC) Pipe**

Pipe shall be steel-cylinder type conforming to the requirements of AWWA C301 for Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids.

Design Conditions: All PCC pipes shall be suitable for a minimum working pressure of 100 PSI, be capable of withstanding a hydrostatic test pressure of 150 PSI, and be capable of withstanding a pressure of 250 PSI without exceeding 75% of the minimum ultimate strength of the wire wrap (P_L). Earth loads are for use with Marston formula. All pipes shall have supporting strengths based on the following design criteria:

<u>Category</u>	<u>Design Criteria</u>
Working Pressure and Surge Allowance	125 PSI
Safety Factor	2.0
Total Internal Design Pressure (P _L)	150 PSI
Weight of Earth	120 pounds per cubic foot
Trench Width	Pipe outside diameter plus 2'6"
Trench Bedding Factor	1.3 (Type 2 as shown in AWWA M-9)
Impact Factor	1.5 x live load
Live Load	H-20 Loading (AASHTO)
Depth of Cover	As shown on the drawings

The date of manufacture and the mark of trademark of the manufacturer shall be clearly marked on the pipe barrel in a manner acceptable to the design consultant. The markings shall be at the bell end of the pipe. Pipe shall not be shipped until the finished pipe coating has been cured for a minimum of 12 hours at a minimum temperature of 90°F. In addition, no pipe shall be shipped before two days after the finished pipe coating curing, including repairs.

All pre-stressed concrete cylinder pipes shall be circumferentially pre-stressed reinforced concrete pipe with a steel cylinder and wire reinforcement and internal diameter as shown on the drawings. Core and coating thickness shall be specified in Section 3 of the above AWWA Specifications.

The pipe manufacturer shall furnish all fittings and special pieces required for closures, curves, bends, branches, manholes, air valves, blow-offs, and connection to main line valves and other pipe necessary for installing the complete piping system shown on the drawings. Maximum laying length will depend upon the ability of the contractor to handle pipe in deep sheeted trenches while conforming to trench width requirements and maintaining the integrity of the sheeting, where required, and avoiding disturbances to the adjacent ground. The laying length of the pipe, for various sizes, shall be subject to the approval of the design professional.

The pipe manufacturer shall supply all necessary clamps, diaphragms, and steel bands for grouting all joints.

Joint rings shall be all steel of the bell and spigot self-centering type and as otherwise specified in Section 3.3 of AWWA Specification C-301. All fittings shall have restrained (harnessed) joints. Additional restrained joints shall be provided as needed to withstand specified test pressures.

The rubber gasket shall be in accordance with Section 3 of the above referenced AWWA Specifications and shall be designed and manufactured so that the completed joint will withstand the hydrostatic test pressure of 150 psi. Joints shall be designed to be watertight under all conditions of service.

Specials and fittings shall be in accordance with Section 4 of the AWWA Specification C-301, type "A" or type "B".

11. Reinforced Concrete Pipe

Except as otherwise specified herein or as indicated on the drawings, pipe shall conform to ASTM Standard Specifications for Reinforced Concrete Culvert, Storm Drain, and Sanitary Sewer Pipe, Designation C76, Class III Wall B. Reinforcement shall be full circular cage. Neither elliptical nor quadrant reinforcement will be allowed.

The pipe shall be clearly marked as required by ASTM C76 in a manner acceptable to the owner.

Piping shall have a minimum laying length of approximately 8 feet, except for closure and other special pieces as approved by the City of Austell Public Works.

Joints for concrete pipe shall be the tongue and groove-type joint with provisions for using a round rubber "O" ring gasket in a recess in the spigot end of the pipe. The bevel on the bell of the pipe shall be between $1\frac{1}{2}^\circ$ and $2\frac{1}{2}^\circ$ and the annular open space at the gasket when the joint is made up and pipes are centered and in line shall not exceed $\frac{3}{16}$ ". The faces of pipe in contact with the gasket shall be true and free of irregularities.

- a. The round rubber "O" ring gaskets shall conform to ASTM C443 Specifications for Joints for Circular Concrete Sanitary Sewer and Culvert Pipe using Rubber Gaskets.
- b. The manufacturer shall supply test data and affidavits showing compliance with these requirements. Tests shall have been conducted within six months of the start of manufacture of the pipe.
- c. The gaskets shall be designed and manufactured so the completed joint will withstand an internal water pressure in excess of 15 psi for a period of ten minutes without showing any leakage by the gasket or displacement of it, see ASTM C443.

12. Glass Fiber Reinforced Thermosetting Resin Pipe

Glass fiber reinforced thermosetting resin pipe (RTRP) and fittings shall meet all requirements of AWWA C950, Type II - centrifugally cast, Grade Z - RTRP polyester. Pipe shall be furnished in nominal 20-foot lengths marked with AWWA specification number, size, type and grade, pressure class, manufacturer's mark and identity code, and date of manufacture. The pipe shall have interior corrosion liner of non-reinforced thermoset polyester resin with a minimum thickness of 0.04 inches. The pipe and fittings shall be rated and fittings shall be rated for 150 psi working pressure.

The pipe and fittings shall be joined by gasket bell-and-spigot or coupling joints. As required, joints shall be restrained with steel harnessing lugs and draw bolts.

13. High Density Polyethylene Pipe

High density polyethylene (HDPE) pipe shall be made of high density, high molecular weight polyethylene pipe material meeting the requirements of Type III, Class C, Category 5, Grade P34, as defined by ASTM D1248 Standard Specification for Polyethylene Plastics Molding and Extrusion Materials. Pipe shall be rated for 150 psi working pressure. Pipe shall be furnished in nominal 20-foot lengths marked with ASTM specification number, size, type and grade, pressure class, manufacturer's mark and identity code, and date of manufacture.

Pipe shall be joined by gasket bell-and-spigot joints.

F. EXECUTION

General

Care shall be taken in loading, transporting, and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe or fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the City of Austell Public Works.

Pipe and fittings shall be subjected to a careful inspection just prior to being laid or installed. If any defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid shall conform to the lines and grades required.

Unless specifically indicated otherwise, underground piping shall slope uniformly between joints.

Contractor shall exercise extreme care when constructing piping to protect all existing underground utilities and all existing structures from damage.

1. Installation

Pipe and fittings shall be installed using bedding, as shown on the drawings and in accordance with requirements of AWWA Standard Specifications, except as otherwise provided herein. A firm even bearing throughout the length of the pipe shall be constructed by tamping selected material at the sides of the pipe up to the springline. **BLOCKING WILL NOT BE PERMITTED.** Bell holes shall be hand excavated to insure uniform bearing along the pipe barrel.

All pipes shall be sound and clean before installing. When installing is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by manufacturer.

When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a bell shall be beveled to conform to the manufactured spigot end. Lining shall be undamaged.

Push-on joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe is to be aligned with the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

Joints at fittings, and where designated on the drawings and/or as specified, shall be in accordance with the "Notes on Method of Installation" under ANSI Specification A21.11 and the instructions of the manufacturer. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber gasket with soapy water before assembly.

Unless otherwise noted, underground piping shall be push-on.

All fittings and other appurtenances needed upon the pipelines shall be set and jointed as indicated on the drawings or as required by the manufacturer.

The Contractor shall arrange, if requested, for the pipe manufacturer to furnish information and supervise the installation of at least the first five push-on joints.

The Contractor shall carefully regulate his equipment and construction operations such that the loading of the pipe does not exceed the loads for which the pipe is designed and manufactured. Any pipe damaged during construction operations shall be replaced at the Contractor's expense.

All piping shall be properly and adequately supported. Supports shall be provided as indicated on the drawings. If the method of support is not indicated on the drawings, piping shall be supported as directed by the design consultant.

The proper number of gaskets and all necessary joint materials, plus one extra gasket for every 50 joints or fraction thereof, shall be furnished with the pipe and fittings.

Pipe embedment shall conform to manufacturer's recommendations. Bedding and backfill for pipe shall be as specified herein and/or shown on the drawings.

2. Bedding of Sanitary Sewer Pipe

Unless otherwise indicated, bedding for all sanitary sewer pipes shall be Class B (Detail 02730-1). Class B bedding shall be defined as that method of bedding trench conduits in which the conduit is set in thoroughly tamped, compacted, granular materials placed to the trench width B and up to the centerline of the conduit. The remainder of the conduit is entirely surrounded to a height of at least one foot above its top by densely

compacted backfill carefully placed by hand to completely fill all spaces above and adjacent to the conduit.

3. Testing of Underground Gravity Sanitary Sewers

Infiltration of groundwater into sanitary sewer line shall not exceed 25 gallons per day per inch-mile of diameter per mile of sanitary sewer.

Contractor shall air test all gravity lines following completion of construction and pipe cleaning. Contractor shall furnish all necessary equipment and materials for testing including but not limited to pressure gauges, plugs, pumps, bulkheads, miscellaneous piping, etc. The following procedures shall be used:

- a. The owner or contractor shall select a test section and isolate the test section with required plugs, bulkheads, etc.
- b. The owner or contractor shall pressurize the test section to 3.5 psi greater than the average backpressure of groundwater around the sanitary sewer (add 0.43 psi to test pressure for each vertical foot that the groundwater is above the top of the pipe).
- c. Allow three minutes for the pressure to stabilize.
- d. The pressure shall not decrease more than 0.5 psi during the time periods shown below:

Pipe Diameter (Inches)	Time
4	2 minutes 32 seconds
6	3 minutes 50 seconds
8	5 minutes 06 seconds
10	6 minutes 22 seconds
12	7 minutes 39 seconds

Subject to the approval of the City of Austell Public Works, an exfiltration test may be used to test the gravity sanitary sewer. The maximum allowable exfiltration shall be 350 gal/day per inch of diameter per mile when subjected to a test pressure of 10' of water head, or the pressure from filling manholes to their top, whichever is less.

If the test section fails to meet the infiltration and/or air test requirements, the Contractor shall determine the source(s) of leakage, make necessary repairs, and retest the test section all at no additional expense to the Owner.

A record of the low pressure air testing will be provided to the City of Austell Public Works inspector at the final sanitary sewer construction inspection. The record should include the line segment identification, initial air pressure, time

interval allowed, and the final air pressure, date of test, and name of the person in charge of testing.

4. Cleaning Mains

At the conclusion of the work, the Contractor shall thoroughly clean the new pipeline.