

**\$15.00**

**CITY PUBLIC WORKS  
POLICIES AND SPECIFICATIONS MANUAL  
ESTABLISHED BY ORDINANCE  
OCTOBER 24, 1998**

For technical references and details,  
see the City's  
"Basis of Design and Technical Specifications"

CITY OF ST. MARYS  
St. Marys, Georgia



Adopted by  
CITY COUNCIL

September 20, 1983

Readopted as corrected  
October 4, 1983

Revised and adopted by Ordinance  
October 24, 1988

Revised and adopted  
February 14, 2000

Adopted: Jerry Brandon, Mayor

**CITY OF ST. MARYS  
PUBLIC WORKS  
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Date of Preparation:	August 11, 1983
Date of Adoption:	September 20, 1983
Revision Date:	August 18, 1999
Revised and Adopted by Ordinance:	
Effective as of Date of Adoption	

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## PART A

### PURPOSE

WHEREAS, on the \_\_\_ day of \_\_\_\_\_, 19\_\_\_, the City Council enacted and adopted an ordinance entitled "City Public Works Policies and Specifications"; and

WHEREAS, Section 2 A. of the ordinance sets forth certain policies relating to the extension of the City's water and sewer system to areas of the City not previously served by the City; and

WHEREAS, Section 2 A.1. of the said ordinance states that "all extensions of the City water and sewer system to a site not fronting along an existing main and requiring service from the system, shall be the sole responsibility of the party or parties desiring the service"; and

WHEREAS, Section 2. A.4. provides that "under certain conditions where water and sewer system extension provide access to previously uninhabited property and the extending party request(s) (sic) reimbursement or participation by the City, the following policy will apply. The City of St. Marys will not participate in the cost in any manner including credit of tap or impact fee, nor shall it act as an agent to the extending party to collect any assessments to the property owner"; and

WHEREAS, the Mayor and the City Council have determined that the amendment of the aforesaid provisions of the Ordinance is necessary in order to foster industrial and commercial development within the City and in order for the City to meet certain contractual obligations it has heretofore incurred with various developers; and

WHEREAS, the Mayor and the Council have determined that the amendment of Section 2 A.1. and 2 A.4. is in the best interest of the City and its residents;

#### I. SCOPE

This manual amends and supplements the following publications:

- St. Marys Subdivision Regulations
- St. Marys Zoning Regulations
- Master Drainage Study for Camden County
- St. Marys Land Use Plan

Extensions of the water and sewer system made under the Community Impact Assistance program will be in accordance with an adopted plan. Should this or similar projects provide service to vacant land, it should be considered incidental and not in violation of this policy.

After the completion of any project, a Record set of drawings shall be submitted to the City accurately depicting the work performed. See Section VIII, "Record Drawing Checklist".

## II. POLICIES

### A. Water and Sewer System

1. All extension of the City water and sewer system to a site not fronting along an existing main and requiring service from the system, shall be the sole responsibility of the party or parties desiring the service unless the Council shall enact an ordinance expressly and specifically exempting a particular project from the effect of the aforesaid policy statement. Such an ordinance shall specifically state the obligation so incurred by the City and shall expressly state the cost and expense to be incurred by the City as a result of the construction of such extension.
2. This policy shall apply to all extensions along existing streets as well as proposed streets.
3. All design and construction of extensions to the system must be in accordance with the applicable section of the Basis of Design and Technical Specification Section of this manual.
4. Under certain conditions where water and sewer system extensions provide access to previously uninhabitable property and the extending party request reimbursement or participation by the City, the following policy will apply. The City of St. Marys will not participate in the cost in any manner including credit of tap or impact fee, nor shall it act as an agent to the extending party to collect any assessment to property owner except in those instances in which the Council, by ordinance, has specifically enacted a provision permitting such practice, and at the time of the passage of such ordinance there existed a specific and detailed contract setting forth the obligation, cost and liabilities of the City, which contract was expressly approved by a majority vote of the council; and only if such ordinance specifically provides for the payment of a deposit

sufficient to reimburse the City for its expenditures if the City is required by such ordinance to construct such water and sewer extensions in advance of the payment of tap or impact fees.

5. Taps to the City's water and sewer system shall be purchased at prevailing rates and the tap made within twelve (12) months of purchase. If the tap is not completed within the twelve (12) months, any difference in the existing tap and/or impact fee and the original amount paid must be paid prior to installation of the tap.
6. Taps purchased are not transferable and must be site specific.
7. All extensions to the system must be inspected by a City representative. The City of St. Marys Public Works Superintendent will be responsible for permitting any extensions, and the inspecting and accepting of installations.
8. It shall be the policy of the City of St. Marys Public Works Department to NOT set any water meters in any development, residential or commercial, until the project has been completed to a point that is deemed of a satisfactory nature and poses no danger to the Public in general. This point of completion shall, at minimum, be completion of the water system, sanitary sewer system, and drainage system and all appurtenances. In no instance should the above minimum criteria be construed as all that is necessary to occupy the development.

B. Drainage Facilities

1. All drainage improvements required for the development of properties shall be the responsibility of the landowner. This policy applies to the on site as well as off site improvements required for improvement to private property.
2. Any improvements made to the property that would adversely effect downstream drainage structures or cause flooding of lands will not be allowed.
3. All design and construction of drainage improvements shall be in accordance with the applicable standards of the basis of design and technical specifications section of this manual.

4. Under no conditions shall the City of St. Marys participate in either on site or off site drainage structures for new developments or in areas where dedicated drainage easements do not exist. If in the past, drainage areas have been maintained by City forces without easement, the owner will be required to dedicate adequate easement to continue maintenance of the structure.
5. All proposed installations must be approved prior to construction and inspected upon completion. The City of St. Marys Superintendent of Public Works will be responsible for permitting the installation, and inspecting and accepting the installation.

C. Streets

1. Extension of existing and/or proposed streets to or through private property shall be the sole responsibility of the landowner. This includes any clearing, grubbing, grading, paving and appurtenant improvements.
2. Streets either existing or proposed not presently maintained by the City shall not be accepted for maintenance by the City unless all drainage and paving is completed in accordance with the specifications section of this manual.
3. All design and construction of streets shall be in accordance with the applicable sections of the basis of design and technical specifications section of this manual.
4. All extensions shall be permitted and inspected by the City Superintendent of Public Works. The Superintendent of Public Works will inspect and accept the street.
5. Driveway permits will be required for all street access requests. The Superintendent of Public Works will issue driveway permits after compliance with subparagraphs 6, 7, and 8.
6. All driveways and curb cuts shall conform to the requirements of Section 703 of the St. Marys Zoning Ordinance as well as the Americans with Disabilities Act. Property owners requesting driveway permits must submit a detailed drawing showing the distance requirements of Section 703, the proposed under driveway drainage structure, and any proposed utility installation in the driveway.

7. All driveways and curb cuts, except R-1 residential areas, shall have curb and gutter installed at the street intersection. A minimum radius of 25' in each direction, from the point of intersection will be required. Where the access intersects a State Highway, the minimum design standards established by the Georgia Department of Transportation shall prevail.
8. The City further reserves the right to require the installation of acceleration and deceleration lanes in nonresidential driveways. Furthermore, when the property requiring a driveway is bounded on two sides by public access, the City shall have the right to limit access to one or both streets.

D. Refuse and Dry Trash (Residential Only)

1. Tree surgeon, landscape service, or similar businesses shall dispose of clippings, limbs or debris collected to a proper site at their expense. This material should not be placed on the street for City to pick up per Code of Ordinances, Chapter 78.
2. The City of St. Marys Public Works Department shall, in accordance with current fee schedules, provide dry trash and refuse pick up to the residents of the City of St. Marys.
3. The refuse to be picked up should be placed at the curb in an orderly manner in containers provided by the City.
4. Dry trash or any single item should be of a size that would allow a single person to lift the item onto the truck. Any limbs or portion of trees should be cut up in length of not more than eight feet and must be less than three (3) inches in diameter. Only limbs from trimming, pruning or storm damage will be picked up. Limbs placed for pickup shall not be from tree removal or land clearing.
5. Public Works Department should be notified when the piles are in place, at which time the pick up fee will be paid, receipt obtained and pick up scheduled.
6. No piles of tree stumps, logs, or trees, larger than 8' long by 4' wide will be picked up.

7. The City of St. Marys Public Works Department shall pickup, remove, and dispose of machinery, and other large metal objects only upon the advance notification and request of residents of the City. The Public Works Department shall provide such pickup service for a fee to be paid by the resident requesting such service. The fee for such service, along with such other rules and regulations necessary to implement such service shall be set and promulgated by the City Manager with the consent and approval of the City Council.
- E. Street Lights
1. The City of St. Marys shall require street lights to be installed prior to final acceptance of the subdivision. Quantity and location shall be at the discretion of the City of St. Marys. This shall include installation of light, pole, and all appurtenances. These lights will then become part of the dedicated right-of-way and be maintained by the City of St. Marys.
  2. Commercial, industrial and multi-family projects shall provide and maintain their own lighting systems with no monetary involvement from the City.

**END OF PART A  
PURPOSE**

## PART B

### BASIS OF DESIGN AND TECHNICAL SPECIFICATIONS

#### I. WATER DISTRIBUTION SYSTEM

##### PART I GENERAL

##### 1.1 REFERENCE STANDARDS

###### A. American Waterworks Association (AWWA):

C500	Gate Valves 3" through 48" for Water
C600	Installation of Cast Iron Water Mains
C601	Disinfecting Water Mains
C800	Threads for Underground Service Line Fittings
C502	Dry-Barrel Fire Hydrants
C900	4" Through 12" PVC Pipe

###### B. American National Standards Institute (ANSI):

A21.4	Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
A21.10	Gray-Iron and Ductile Iron Fittings, 3" - 48" for Water and other Liquids
A21.11	Rubber Gasket Joints for Ductile Iron Pressure Pipe Fittings
A21.51	Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or other Liquids

###### C. American Society of Testing Materials (ASTM):

A47	Malleable Iron Castings
A48	Gray Iron Castings

B88	Seamless Copper Water Tube
D1784	Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds
D2239	Polyethylene (PE) Plastic Pipe (SDR-PR)
D2241	Poly Vinyl Chloride (PVC) Plastic Pipe (SDR-PR and Class T)
D3139	Joints for Plastic Pressure Pipe Using Flexible Elastomeric Seals

- D. Rule for Safe Drinking Water, Georgia Environmental Protection Division (EPD): Chapter 391-3-5
- E. All materials must be certified as meeting National Sanitation Foundation (NSF) Standard 61 for potable water.

## 1.2 BASIS OF DESIGN

All water system design will be in accordance with accepted criteria of the Georgia Environmental Protection Division. Specific reference should be "Ten States Standards for Water Works" and "American Water Works Association Standards". All designs are subject to review by the City of St. Marys and the Georgia Environmental Protection Division.

## 1.3 SUBMITTALS

- A. Two copies of manufacturer's standard drawings and catalog cuts of the following items shall be submitted for approval by the City Engineer:
  - 1. Pipe
  - 2. Fittings
  - 3. Joints and Couplings
  - 4. Hydrants

#### 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Materials delivered to site shall be inspected for damage, unloaded and stored with the minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and rubber gaskets under cover and protect from exposure to direct sunlight. Store materials above ground. Interior of pipe and fittings shall be kept free of dirt and debris.
- B. Pipe, fittings, valves, hydrants and other accessories shall be handled to insure delivery to the point of installation in sound undamaged condition. If coatings or linings of pipe or fittings are damaged, such pipe or fittings shall be removed from the site and new materials furnished at no extra cost to the City of St. Marys. Pipe shall not be left in the sunlight, but shall be protected from exposure to direct sunlight.

#### PART 2 PRODUCTS

##### 2.1 POLYVINYL CHLORIDE PIPE (PVC)

- A. Polyvinyl chloride water main pipe shall conform to Designation ASTM D-2241 and shall consist of Type I, Grade I PVC compound conforming to ASTM D-1784. All pipe shall be minimum Class 160-SDR 26. The standard laying length shall be 20-ft. +/- 1 in. PVC pipe with diameters less than or equal to 3 in. shall be Schedule 40 and connected with Schedule 80 fittings. Solvent cemented joints are not allowed for buried pipes.
- B. Pipe shall have integral bell and spigot joints. Provisions shall be made for contraction and expansion at each joint with an elastomeric ring. Threaded or solvent welded type joints shall not be used on pipe of 3" or greater. Bell end pipe and couplings with elastomeric gaskets shall meet the requirements of ASTM D-3139.
- C. The Contractor shall install a continuous run of plastic metallic tape above the top of the PVC pipe at 18 to 24 inches below finished grade. Tape shall be suitable for detection with metal pipe location equipment, labeled to identify contents of pipe, and brightly colored to contrast with the soil. In addition to the tape, the contractor shall install a continuous run of tracer wire attached to pipe. On pipe runs greater than 500' this tracer wire shall be attached to a 2" galvanized pipe with a 180 degree bend at top extending 36" above grade for connection to locator equipment.

- D. Pipe shall carry National Sanitation Foundation (NSF) seal, and be factory marked with manufacturer's identification, pipe size, material and pressure rating.

## 2.2 DUCTILE IRON PIPE

- A. Ductile iron pipe shall conform with the requirements of ANSI Standard A21.51 and shall be of the thickness classes shown below:

NORMAL PIPE DIAMETER (INCHES)	THICKNESS CLASS
4	51
6	50
8	50
10	50
12	50
16	50
18	50
24	52

Class designations for the various classes of pipe shall be painted on the outside of each joint of pipe. Weights shall be conspicuously painted in white on each joint of pipe after the bituminous coating has hardened.

- B. All joints shall have the same pressure rating as the pipe with which it is used. Joints shall be rubber gasketed push on or mechanical joint. Joints shall meet the requirements of ANSI A21.11.
- C. Pipe shall have cement mortar lining in accordance with ANSI A21.4.
- D. Pipe shall be coated inside and out with a one mil thick bituminous coating conforming to ANSI A21.4.

## 2.3 GALVANIZED STEEL PIPE

This pipe and fittings shall conform to the requirements of ASTM A120. The pipe shall be "Standard Weight", unless otherwise specified.

## 2.4 COPPER PIPE OR TUBING

This pipe shall conform to the requirements of ASTM B88, Type K.

## 2.5 PLASTIC TUBING

- A. Plastic pipe shall conform to all the requirements of the "Specifications for Polyethylene (PE) Plastic Pipe (ADR-PR)", as they apply to ASTM D-2239-SDR 7-PE 3408. All plastic tubing shall be sized similar to copper tubing.
- B. The hydrostatic design stress shall be 630 psi for water at 23 degrees centigrade (73.4 degrees F) and 500 psi for water at 37.8 degrees C (100 degrees F).
- C. The polyethylene extrusion compound from which the pipe is extruded shall meet the requirements of Type III, Grade 3, Class C material as described in "Specifications for Polyethylene Moulding and Extrusion Materials", ASTM D-1248, except that melt index shall be determined under a higher temperature than any of the conditions as listed in Section 6 (b) of "Method of Test for Measuring Flow Rates of Thermoplastic by Extrusion Plastometer", ASTM D-1238. The test condition shall be the same as for conditions J, except that the temperature shall be 310 degrees C (590 degrees F), with a load of 12-5 kilograms. Under these conditions, the resin shall extrude at a maximum rate of 0.25 grams per ten (10) minutes. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other defects. The pipe shall be uniform in color, capacity, density and other physical properties.
- D. The size, the type of plastic pipe material, material, dimension ratio, commercial standards with which the pipe complies, the manufacturer's name and the National Sanitation Foundation (NSF) seal of approval shall be conspicuously marked on the outside of the pipe at intervals of not more than five (5) feet.

## 2.6 FITTINGS

- A. Ductile iron mechanical joint fittings shall conform to the requirements of ANSI A21.10. The fittings shall be of the lightest class conforming to the pressure rating of the pipe lines in which they are installed, in no case shall the fittings be lighter than Class 200.
- B. Fittings for galvanized steel pipe shall be malleable iron conforming to ANSI B16.3 except the nipples and couplings shall be the same material as the pipe. All fittings shall be hot-dip galvanized in accordance with ASTM A120.

- C. The mechanical joints shall meet requirements of ANSI A21.11 and shall have the same pressure rating as the fitting of which it is a part. All mechanical joints to be installed using Megalug glands (or approved equal) and shall meet manufacturer installation requirements and torques.
- D. Fittings shall be coated inside and out with one mil thick bituminous coating conforming to ANSI A21.4.

## 2.7 VALVES

- A. All valves 2" in diameter and smaller shall be constructed of brass or bronze except that the hand wheel that shall be of malleable iron construction with screwed ends. All valves 2-1/2" in diameter and larger shall have flanged ends for interior service and mechanical joints for buried service unless otherwise approved. They shall be iron body, bronze mounted, except that in the smaller sizes the valves may be all bronze.
- B. Gate Valves:
  - 1. Gate valves smaller than three inches shall meet the requirements of Fed. Spec. WW-V-54, Class 54, Class A, 125 pounds.
  - 2. Gate valves three inches and larger shall have non-rising stems and shall meet the requirements of AWWA Standard C500. Valves for lighter pressure than the AWWA Standard shall meet the requirements of the above specifications except that the requirements for metal thicknesses and strengths and structural designs shall be adjusted as required to meet hydrostatic test pressures not less than 200 psi.
  - 3. All gate valves shall have standard stuffing box seals. Bonnet bolts, studs and nuts shall be cadmium plated. Seating devices shall be bronze to iron or bronze to bronze. The glands shall be bronze to bronze bushed. Gland bolts and nuts shall be bronze.
  - 4. All gate valves 2-1/2" in diameter and larger shall be of the double disc type. All gate valves two inches in diameter and smaller shall be of the double disc or the solid wedge type.
  - 5. Valves to have two inch square operating nut, with the exception that gate valves in altitude valve pits and other similar installations shall have hand wheels.

6. Valves buried in ground or located in vaults or structures shall have suitable extensions for socket operation with top of operating nut located six inches below finished grades.

## 2.8 HYDRANTS

- A. All fire hydrants shall conform to AWWA C502.
- B. All fire hydrants shall have a 6" mechanical joint inlet connection and be equipped with a 5-1/4 inch valve, two 2-1/2 inch hose nozzles and one 4-1/2 inch pumper connection, all with ANSI (National) standard threads. Operating nuts shall be 1-1/2 inch, pentagon type.
- C. All fire hydrants shall be designed for 150 psi working pressure and 300 psi test pressure.
- D. All fire hydrants shall be equipped with "O" ring type stem seals.
- E. All fire hydrants shall be designed so that clockwise rotation of the stem closes the valve and counterclockwise rotation opens the valve. Hydrant covers shall have the word "OPEN" and an arrow showing the proper rotation of the operating nut cast in or permanently attached.
- F. An independent drain shall be provided, completely draining the hydrant after use. The drain shall be activated to the open position by the closing of the hydrant valve. The drain rod shall be easily cleaned. The drain shall have a protective shield integral with the hydrant base to minimize clogging and prevent undermining.
- G. All working parts of the hydrant shall be easily removed for inspection or servicing without digging or the use of hoists or derricks or special tools. The hydrant cover and standpipe shall be removable without requiring the water to be shut off.
- H. Each fire hydrant shall be equipped with a ground line mounted breakaway flange and cast iron safety stem coupling specially designed so that upon sustaining severe impact the hydrant will shear off at the ground line without loss of water in the main.
- I. All fire hydrants shall be Mueller standard, M&H, or equal as approved by the City Engineer.

PART 3 EXECUTION

3.1 PIPE INSTALLATION

- A. PVC pipe shall be installed in accordance with the Uni-Bell Plastic Pipe Association guide for installation of polyvinyl chloride plastic pipe for municipal water main distribution system and the printed recommendations of the-manufacturer.
- B. Ductile iron pipe shall be installed in accordance with AWWA C600.
- C. Pipe line alignment and gradient shall be straight, or shall follow true curves as near as practicable. Curvature in pipe lines, where required, shall be well within the allowable laying radius, horizontal and vertical.
- D. Excavation, cleaning, laying, jointing and backfilling shall follow as closely as is possible so as to progress the work. In no case shall pipe be left in the trench overnight without completing the jointing. The completed pipeline shall not be left exposed in the trench unnecessarily, and the Contractor shall backfill and compact the trench as soon as is possible after laying and jointing is completed.
- E. Each day at the close of work, and at all times when laying is not in progress, the exposed end of the pipe line in the trench shall be closed with a head or barrier of wood or metal. If at any time it becomes necessary to cover the end of any uncompleted pipeline with backfill, the end of that pipe shall be closed with a mechanical joint plug.
- F. The Contractor shall keep exposed ends of pipe properly plugged during laying to prevent dirt and other materials from entering the line and shall also, before the system is accepted, thoroughly clean all lines.
- G. Thrust Blocks or restrained joints shall be provided as specified in AWWA C600. All exposed pipes, valves, hydrants, etc. shall be securely strapped and all ends and bends braced.
- H. Mechanical joints shall be made only by experienced mechanics. Sockets and spigots shall be washed with soapy water before slipping gland and gasket over spigot. The spigot shall be inserted in the socket full depth. The gasket shall be brushed with soapy water, and pushed into position making sure the gasket is evenly seated in the socket. The gland shall then be properly positioned for compressing the gasket. All bolts and nuts

and bolts shall be kept clean and wet with soapy water until each joint is completed.

- I. All water services shall be properly marked above ground with PVC pipe painted blue. Additional markings shall be stamped in the curb or marked on the edge of paving with an approved permanent marker capable of being located by a magnetic locator, such as a nail with cap, if no curb is present.
- J. Water main shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer, storm sewer, or sewer manhole. Water mains crossing house sewers, storm sewers or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main (which should be on top) and the top of the sewer. At the crossings, one full length of water pipe shall be so located that both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.
- K. When local conditions prevent a vertical separation of 18 inches between water and sewer lines, the sewer passing over or under water mains shall be constructed of materials and joints that are equivalent to water main standards of construction and shall be pressure tested to assure water-tightness prior to backfilling.

### 3.2 FIRE HYDRANT INSTALLATION

- A. All fire hydrants shall have a 36-inch minimum pipe cover provided for the branch supply line and the nozzles located a minimum of 18 inches above finished grade.
- B. Each fire hydrant shall be set on a concrete foundation at least 18 inches square and 6 inches thick and shall be blocked against the end of the trench with concrete and anchored.
- C. Hydrant drainage shall be provided by installing around the hydrant at least 7 cubic feet of gravel or crushed stone below the top of the hydrant supply pipe.
- D. All hydrants shall be installed plumb. Hydrants shall have hose nozzles parallel with, and the pumper nozzle perpendicular to, the curb line. Hydrants located behind curbs where sidewalks extend close to, or abut, the curb shall be set so that pumper or hose nozzle caps will be a minimum of 6 inches and a maximum of 12 inches from the gutter face of

the curb. Where set between the curb and the sidewalk, or between the sidewalk and property line, no portion of the hydrant or nozzle cap shall be within 6 inches of the sidewalk.

- E. Immediately before installation of a hydrant, the following operations shall be performed:
  - 1. The hydrant shall be thoroughly inspected.
  - 2. The hydrant interior shall be thoroughly cleaned.
  - 3. The hydrant shall be opened and closed to determine that all parts are in proper working order, with valves seating properly and the drain valve operating freely.
- F. There should be a minimum clearance of five (5) feet around the hydrant.

### 3.5 HYDROSTATIC TEST

- A. Upon completion of backfilling operations and not less than seven (7) days after the last concrete blocking anchor has been poured; the pipe system shall be subjected to a hydrostatic test.
- B. The system shall be filled with water and all air expelled.
- C. The Contractor shall pressurize the system to 150% of the design pressure or 150 lbs., whichever is greater, measured at the low point in the system.
- D. The test pressure shall be maintained for two hours.
- E. If the pressure cannot be maintained, the cause shall be determined, corrected, and test repeated until successful.

### 3.4 LEAKAGE TEST

- A. Following the pressure test, the system shall be subjected to a leakage test.
- B. Leakage shall be defined as the quantity of water that must be supplied into the pipe to maintain the design working pressure after all air in the pipeline has been expelled and the pipe has been filled with water.
- C. Leakage shall not exceed the quantity determined by the formula given below:

$$L = \frac{SD \text{ (Square Root of P)}}{133,200}$$

Where L = allowable leakage in gallons/hr.

S = length of pipe tested in feet.

D = nominal diameter of the pipe inches.

P = average test pressure during leakage test in psig.

- D. If leakage exceeds the allowable rate, leaks shall be found and repaired and the test repeated until successful.

### 3.5 DISINFECTION

- A. Water mains and accessories shall be disinfected, flushed, and disinfection liquid disposed in accordance with "Rules for Safe Drinking Water" as published by the Georgia Environmental Protection Division and in accordance with AWWA C651 "Standard for Disinfecting Water Mains".
- B. The mains shall be flushed before disinfecting by maintaining a velocity of at least 2.5 feet per second for a period of ten minutes.
- C. The continuous feed method may be used for any size main or system where satisfactory quantity and quality water is available. The tablet method shall not be acceptable.
- D. Following disinfection, the system shall be flushed until chlorine concentration is less than 1 milligram per liter.
- E. Bacteriologic Tests:
1. Samples shall be collected and tested for satisfactory microbiological quality of the water prior to placing the lines into service.
  2. Tests shall be performed to detect the presence of coliform organisms on samples taken from the end farthest from the point at which chlorine was introduced into the system and at 1000 feet intervals.
  3. If unsatisfactory samples are produced, disinfection shall be repeated until samples are satisfactory.

4. All testing shall be performed by a Certified Testing Laboratory and paid for by the Contractor.

### 3.6 MISCELLANEOUS NOTES

- A. Minimum water tap size for dwellings.
  1. ¾" for one lot or house on lot.
  2. ¾" for duplex. 1 ½"
  3. 1-1/2" for triplex.
- B. All tracer wire to be mechanically connected at splices.
- C. All tracer wire to be attached to curb stops and brought to top of valve boxes.
- D. All taps to be inspected by the City before being covered up.
- E. All water lines to be looped at cul-de-sacs.
- F. All service taps on existing water lines to be done by the City.
- G. Only potable water will be used to fill all lines for pressure testing.
- H. All water drawn from the City will be metered and billed at appropriate rate set by Council.
- I. Any pipe, solder, or flux used in the installation or repair of water lines must be lead-free. Pipes and fittings must not contain more than 8.0% lead. Solders and flux must not contain more than 0.2% galvanized.
- J. All distribution mains shall be provided with sufficient earth and other suitable cover to prevent freezing. This shall be not less than 30 inches measured about the top of pipe.
- K. All new service connections must be metered.

**END OF SECTION I  
WATER DISTRIBUTION SYSTEM**

## PART B

### BASIS OF DESIGN AND TECHNICAL SPECIFICATIONS

#### II. SANITARY SEWERS

##### PART I GENERAL

##### 1.1 APPLICABLE STANDARDS

###### A. American National Standards Institute (ANSI):

- |        |  |
|--------|--|
| A21.4  | Cement-Mortar Lining for Cast Iron and Ductile-Iron Pipe and Fittings for Water                      |
| A21.6  | Cast Iron Pipe Centrifugally Cast in Metal Molds, for Water or Other Liquids                         |
| A21.11 | Rubber Gasket Joints for Cast Iron and Ductile-Iron Pressure Pipe and Fittings                       |
| A21.51 | Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-lined Molds, for Water or Other Liquids |

###### B. American Society of Testing and Materials (ASTM):

- |       |   |
|-------|---|
| A48   | Gray Iron Castings  |
| C12   | Installing Vitrified Clay Bell and Spigot Pipe  |
| C425  | Compression Joints for Vitrified Clay Bell and Spigot Pipe                            |
| C478  | Precast Reinforced Concrete Manhole Sections  |
| C594  | Compression Coupling for Vitrified Clay Plain-End Pipe                                |
| C700  | Extra Strength and Standard Strength Clay and Perforated Clay Pipe                    |
| D1784 | Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds |

- |       |  |
|-------|--|
| D2241 | Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR and Class T)      |
| D2321 | Underground Installation of Flexible Thermoplastic Sewer Pipe      |
| D2774 | Underground Installation of Thermoplastic Pressure Piping          |
| D3034 | Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings       |
| D3139 | Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals |
| D3212 | Sewer Pipe Joints using Elastomeric Seals                          |
- C. American Water Works Association (AWWA):
- |       |                                       |
|-------|---------------------------------------|
| C-600 | Installation of Cast Iron Water Mains |
|-------|---------------------------------------|

## 1.2 BASIS OF DESIGN

All sewer collection system design will be in accordance with accepted criteria of the Georgia Environmental Protection Division. Specific referenced should be Ten States Standards for Sewage Systems, Gravity Sanitary Sewer Design and Construction and Design of Wastewater and Stormwater Pumping Stations.

## 1.3 SUBMITTALS

- A. Materials and methods of construction used in the sanitary sewer system shall be submitted for approval to the City Engineer.
- B. Two copies of shop drawings shall be submitted for the following:
1. Precast concrete manholes and covers.
  2. Pipe.
- C. Manufacturers standard drawings or catalog cuts applicable to materials included in this section shall be submitted.

#### 1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Contractor shall exercise utmost care at all times in loading and unloading pipe, fittings, specials, and casting in order to avoid damage and shock to the materials. Lifting shall be by hoist or by rolling on skids. Dropping of materials will not be permitted.
- B. Contractor shall be responsible for safe handling and storage of all materials as damaged materials shall not be used in the work. Materials delivered to the site shall be promptly inspected upon arrival. Damaged or defective materials to be immediately removed from the site.
- C. All materials to be stored at least 12 inches above grade. Inside of pipes and fittings shall be kept free of dirt and debris. Rubber gaskets and plastic pipe not used immediately shall be protected from direct sunlight. Manhole units shall be handled with care to avoid chippage or breakage.

#### PART 2 PRODUCTS

##### 2.1 POLYVINYL CHLORIDE PIPE

- A. Polyvinyl Chloride Pipe for gravity sewers shall be 8 inches in diameter or greater and shall be SDR-35 meeting ASTM D 3034 for type PSM Polyvinyl Chloride (PVC) sewer pipe. The joints shall be push-on "O" ring gasket type with integral bell and spigot meeting ASTM 3212. Threaded or solvent welded type shall not be used.
- B. Polyvinyl Chloride pipe for pressure sewers shall be minimum Class 160 SDR26 conforming to ASTM D2241 and consisting of Type 1, Grade I PVC compound meeting ASTM D1784. Joints shall be integral bell and spigot with elastomeric gaskets meeting ASTM 3139. Threaded or solvent weld type joints shall not be used.
- C. Marking: Pipe shall be clearly marked with:
  - 1. Manufacturer's identification
  - 2. Nominal pipe size
  - 3. SDR or pressure rating
- D. The Contractor shall install a continuous run of plasticized metallic tape above the top of PVC pipe used for gravity sewer and force mains at approximately 30" below finished grade. Tape shall be suitable for

detection with metal pipe location equipment, color coded, and labeled to identify contents of pipe and brightly colored to contrast with the soil. In addition to the tape, the contractor shall install a continuous run of tracer wire attached to pipe. On pipe runs greater than 500' this tracer wire shall be attached to a 2" galvanized pipe with a 180 degree bend at top extending 36" above grade for connection to locator equipment. The maximum distance between 2" pipe stubs shall be 500'.

## 2.2 CLAY PIPE

- A. Type: Vitrified, glazed or unglazed, extra strength conforming to ASTM C-700.
- B. Pipe shall be either bell and spigot with compression joints conforming to ASTM C425, or plain end pipe using plastic compression couplings conforming to ASTM C594.

## 2.3 CAST IRON PIPE

- A. Type: Gray or ductile
- B. Joints:
  - 1. Push-on type in accordance with ANSI A21.11.
  - 2. Mechanical joints in accordance with A2 1.1 1.
- C. Gray iron pipe shall conform to ANSI A21.6; shall have an iron strength of not less than 18/40; designed for internal pressure of 100 psi, laying condition B, and 6 feet of cover.
- D. Ductile iron pipe shall conform to ANSI A21.51; designed for laying condition B, and 6 feet of cover.
- E. Pipe to have cement mortar lining in accordance with ANSI A21.4.
- F. Pipe shall have an outside bituminous coating of approximately 1 mil thick.
- G. Pipe shall have a bituminous coating approximately 1 mil thick, which conforms to all appropriate requirements for seal coat in ANSI A21.4.

#### 2.4 PRECAST CONCRETE MANHOLES

- A. Precast concrete sections to be manufactured in accordance with provisions of ASTM C478.
- B. Precast concrete raiser sections to be 48 inches in diameter with minimum wall thickness of 4 inches.
- C. Precast concrete base units to have minimum wall thickness of 5 inches.
- D. Jointing material shall be rubber gasket type conforming to ASTM C443 or plastic material type conforming to ASTM C425.
- E. The manhole should be coated inside and out with an approved bituminous coating.

#### 2.5 MANHOLE FRAMES AND COVERS

- A. Frames and covers to have machined bearing surfaces.
- B. Covers to have checkered top design and labeled CITY OF ST. MARYS SANITARY SEWER.
- C. Combined weight of frames and covers shall be approximately 490 pounds.
- D. Frames shall have a depth of approximately 4 inches and an access opening, of not less than 32 inches.
- E. Covers shall have two pick holes located at edges.
- F. Materials shall conform to ASTM A48 for Class 30 gray iron casting.
- G. In areas where the manhole top may have occasion to be under water, watertight rings and covers will be used.

#### 2.6 MANHOLE STEPS

Manhole steps are prohibited.

## 2.7 LIFT STATIONS

- A. Acceptable Manufacturers: Pumps shall be as manufactured by Flygt Corporation, Hydromatic or approved equal as determined by the City.
- B. Design Conditions must be submitted to the City for review and approval prior to construction.
- C. Equipment and Materials: The pump design shall be such that the pump unit will be automatically and firmly connected to its discharge piping when lowered into place on the mating discharge connection, permanently installed in the wet well. The pump shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be disconnected. For this purpose, there shall be no need for personnel to enter the wet well. Each shall be fitted with a stainless steel cable of adequate strength and length to permit raising and lowering the pump for inspection or removal. A safety cable hook shall be provided for attachment of the cable to a hook at the access level. The pump, with its appurtenances and cable, shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet. All major parts, such as the stator casing, oil casing, sliding bracket, volute and impeller shall be of gray iron. All surfaces coming into contact with sludge shall be protected by a coat of rubber-asphalt paint. All exposed bolts and nuts shall be of stainless steel.

The impeller shall be gray cast iron of non-clog design, capable of handling solids, fibrous material and other matter found in normal sewage applications. The impeller shall be constructed with a long throughlet without acute turns. The impeller shall be dynamically balanced. Static and dynamic balancing operations shall not deform or weaken it. The impeller shall be a slip fit to the shaft. Non-corroding fasteners shall be used. A wear ring system shall be installed to provide efficient sealing between the volute and impeller.

Each pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir having separate, constantly hydrodynamically lubricated lapped seal faces. The seal unit between the pump and oil chamber shall contain one stationary and one positively driven rotating tungsten-carbide ring. The seal unit between the oil sump and motor housing shall contain one positively driven rotating carbon ring. Each interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment, but shall be easily inspected and replaceable. No seal damage shall result from operating the pumping

unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication.

The pump shafts shall be of stainless steel and shall rotate on two permanently lubricated bearings.

A sliding guide bracket shall be an integral part of the pump unit. The volute casing shall have a machined discharge flange to automatically and firmly connect with the cast iron discharge connection, which when bolted to the floor of the sump and discharge line, will receive the pump discharge connecting flange without need of adjustment, fasteners, clamps or similar devices. Installation of the pump unit to the discharge connection shall be the result of a simple linear downward motion of the pump unit guided by no less than two guide bars. No other motion of the pump unit, such as tilting or rotating shall be required.

Lower guide bar holders shall be integral with the discharge connection. A guide bar system shall be installed for each pump, to permit raising and lowering the pump. Guide bars shall be 2 inch stainless steel bar of sufficient length to extend from the lower guide holders on the pump discharge connection to the upper guide.

The pump motor shall be housed in an air filled or oil filled watertight casing and shall have moisture resistant insulation. The motor shall be NEMA Design B and designed for continuous duty. Motors shall be designed for sustaining a minimum of fifteen evenly spaced starts per hour and shall be adequate to operate the pump at every point on the performance curve without exceeding the motor nameplate.

The pump motor cable shall be suitable for submersible pump applications. Each pump motor cable shall be 20 feet longer than the minimum length required to make the necessary connections. The additional length shall be neatly coiled and stored in the wetwell. The motor shall contain the overtemperature and moisture switch for detection of overtemperature and leakage conditions. Cable sizing shall conform to NEC specifications for pump motors and shall be of adequate size to allow motor conversion without replacing the cable. The cable entry water seal design shall be such that it precludes specific torque requirements to insure a watertight and submersible seal. The cable entry junction box and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the motor interior from foreign materials gaining access through the pump top. Temperature and moisture switches shall be provided with sufficient cable length for connection to the control panel.

Each unit shall be provided with an adequately designed cooling system. Thermal radiators integral with the stator housing, cast in one unit, are acceptable. Where water jackets alone or in conjunction with radiators are used, separate circulation shall be provided. Cooling media channels and ports shall be non-clog by virtue of their dimensions. Provisions for external cooling and flushing shall be provided.

- D. Controls: Each lift station installation shall be provided with one automatic control panel equipped with main circuit breaker with external handle, surge protector, lightning arrester, combination across-the-line magnetic starters, electrical alternator, H-O-A pump operation selector switches, run indication lights, extra normally open contacts for remote indication of pump operation, terminal board for connection of level sensors and alarms, temperature and leakage sensor supervision relay (miniCAS) to trip the motor and alarm on over-temperature, and to alarm on leakage detection, 24 volt control circuit transformer, high water alarm light and horn with alarm silencer. All components shall be housed in an appropriate enclosure. Each pump shall be equipped with a main circuit breaker and stop/start controls local to the pump station. These controls shall be housed in a corrosion resistant NEMA 4X stainless steel enclosure. Float cables shall be secured to prevent tangling of the cables.

Liquid level devices, each provided with an adequate length of electrical cable, shall be furnished and installed. A float cable holder shall be installed at the access level. The starting level and stopping level for each pump shall be independently adjustable. The float cables shall be secured to prevent tangling of the cables as the water level rises in the wetwell.

Each pump shall be equipped with a non-resettable elapsed time meter mounted on the front of the control panel enclosure. Meters shall record operating time to tenths of an hour.

Provide automatic alternation of pumps mode. Provide time delays to prevent simultaneous starting of pumps. Retain low water cutoff and other protective devices in hand mode.

Neatly arrange wiring and components and label or code. Provide control diagram and legend on inside of enclosure cover.

- E. Accessories: Furnish and install aluminum access frames, rated for 300 lb./sq. ft., on the influent pump station and grating cover for the effluent pump station. Each complete with hinged and flush locking mechanism, upper guide holder and level sensors cable holder. Frames shall be securely placed, mounted above the pumps.

Frame shall be provided with sliding nut rails to attach the accessories required. Lower guide bar holders shall be integral with the discharge connection. Guide bars shall be stainless steel pipe of the size indicated on drawings. The guide bars shall not support any portion of the weight of the pump.

Furnish stainless steel lifting chain, eye, and wall mounted hook for each pump. Provide two chain grabs for hoist attachment, designed to slip down over the chain and grab the chain at the bottom of the chain for lifting and to release and be removed from the chain without entering the wetwells.

- F. Spare parts furnished for each pump shall include but are not limited to one set of mechanical seals, gaskets and wearing ring.
- G. Painting: Pumps shall be primed and finished at the factory. No field painting shall be required except for touch ups.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. All pipe to be installed in accordance with manufacturer's current printed instructions.
- B. Plastic piping installation shall be in accordance with ASTM D2321 Recommended Practice for non-pressure pipe and ASTM D2774 Recommended Practice for pressure pipe.
- C. Clay pipe installation shall be in accordance with ASTM C12 Recommended Practice.
- D. Cast iron pressure piping shall be installed in accordance with AWWA Standard C600.
- E. Service sewers shall be constructed of same material as the mains.

- F. Sewer line shall not be laid closer than 10 feet horizontally to a water main. Pressure sewer lines shall pass beneath water lines at least 18 inches below the bottom of the water line. Where sanitary sewer lines pass beneath water lines, no joints in the sewer line shall be closer than 3 feet, horizontal distance, from the water line. All joints of the sewer pipe shall be equidistant from the water line at the crossing, of water and sewer lines. The distance shall be measured edge-to-edge.
  
- G. Unusual conditions - When local conditions prevent a horizontal separation of 10 feet, a water main may be laid closer to a storm or sanitary sewer provided that:
  - 1. The bottom of the water main is at least 18 inches above the top of the sewer;
  - 2. Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure watertightness prior to backfilling.
  
- H. Normal conditions - Water mains crossing house sewers, storm sewers or sanitary sewer shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer, whenever possible.
  
- I. Unusual conditions - When local conditions prevent a vertical separation as described in Section H, the following construction shall be used:
  - 1. Sewers passing over or under water mains should be constructed of the materials described in Section G.2.
  - 2. Water mains passing under sewers shall, in addition, be protected by providing:
    - a. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main;
    - b. Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking the water mains;
    - c. That the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.
  
- J. No water main or pipe shall pass through or come into contact with any part of a sewer or sewer manhole.

- K. Pipe laying to proceed up-grade with pipe bells or groove on the upper end. Pipe to be laid with joints close and even, butting all around. Sagging joints will not be tolerated.
- L. Pipe shall be straight and show uniform grade between manholes, laid to line and grade.
- M. True bearing surface shall be given to invert throughout entire length of pipe. Bell holes shall be dug so the pipe barrel will carry the loads. Pipe shall be bedded in undisturbed earth.
- N. Where sewers or force mains are to be connected to existing manholes or other structures, and where no stub or opening has been provided for the connection, the Contractor shall make an opening of minimum diameter through the side wall of the structure for inserting the sewer pipe. After inserting the pipe, the space remaining outside the pipe shall be completely filled with non-shrinking mortar and made watertight.
- O. Lateral connection made to the sewer prior to backfilling shall be laid on a slope not exceeding 2 feet vertical to 1 foot horizontal, and not less than 1/8 inch per foot, in such a manner that the lateral shall have a solid bearing on undisturbed earth as stipulated for pipe sewers. The lateral shall make such a horizontal angle with the sewer line that a proper connection with the wye or tee branch or slant is obtained without trimming the pipe and with no danger of jointing material being forced into the sewer. All laterals shall be closed by means of suitable stoppers or end caps.
- P. Wye or tee branches shall be installed so that the lower lip of the branch is not more than 2 inches below the outside top of the pipe. Tees shall not be installed with the branch vertical. After installation, wye or tee branches shall not be covered with backfill until determination and record has been made of the locations of each with reference to the nearest manhole downstream and the direction in which the wye faces.
- Q. All laterals shall be properly marked at the point where laterals terminate with PVC pipe painted green. Additional markings shall be stamped in the curb or marked on the edge of paving with an approved permanent marker capable of being located by a magnetic locator, such as a nail with cap, if no curb is present.
- R. Tracer wire shall be placed on all gravity and service laterals. Wires shall be connected to manhole rings.

- S. All collection lines shall be provided with sufficient earth and other suitable cover to prevent freezing. This shall be not less than 36 inches measured above the top of pipe.

### 3.2 LEAKAGE TEST

- A. Upon completion of pipe installation, line will be tested for leakage by either infiltration tests or exfiltration tests.
- B. Testing shall be made prior to making connections with other sewers, pipes or drains.
- C. Maximum allowances for infiltration and exfiltration tests shall be 25-gallons/day/ inch diameter/mile of pipe.
- D. Exfiltration test:
  - 1. Conduct test when water table is below invert of pipe.
  - 2. Measure exfiltration by filling a reach of sewer to provide internal pressure and observing either a drop in head or the quantity of water required to maintain the reach in a full condition.
  - 3. Contractor to provide a head of at least 3 feet above the top of the pipe at the upper end of the pipe line being tested.
  - 4. The filled reach of line to stand until the pipe has reached its maximum absorption, but not less than four (4) hours.
  - 5. Reestablish the head after absorption.
  - 6. Measure the amount of water required to maintain established water level during a two-hour test period.
  - 7. Correct any defects if leakage is above the specified maximum.
- E. Infiltration Test:
  - 1. Conduct test when water table is above invert of pipe.
  - 2. Measure infiltration by means of weir or approved devices.
  - 3. Correct any defects if measured quantity is above the specified maximum.

F. Hydrostatic Test For Force Mains:

1. Upon completion of backfilling operations and at least 7 days after the last concrete blocking anchor has been poured, the pipe system shall be subjected to a hydrostatic test.
2. System to be filled with water and measures taken to expel all air.
3. Contractor to pressurize system to 150 percent of the design pressure, measured at the low point in the system.
4. Pressure test to be maintained for 2 hours.
5. If pressure cannot be maintained, the cause shall be determined, corrected and test repeated until successful.

G. Leakage Test For Force Mains:

1. Following the pressure test, the system shall be subject to a leakage test.
2. Leakage shall be defined as the quantity of water that must be supplied into the pipe to maintain the design working pressure after all air in the pipe has been expelled and the pipe has been filled with water.
3. Leakage shall not exceed the quantity determined by the formula given below:

$$L = \frac{SD (\text{Square Root of } P)}{133,200}$$

Where L = allowable leakage in gallon/hr.

S = length of pipe tested in feet.

D = nominal diameter of the pipe inches.

P = average test pressure during leakage test in psig.

4. If leakage exceeds that determined by formula, the leaks shall be found and repaired and the test repeated until successful.

G. Correct all localized or spurting leaks of any volume detected in sewers or in appurtenant structures.

- H. All leaks, defective joints, pipes, and structures, or defective construction shall be promptly corrected at no expense to the City of St. Marys.

### 3.3 CLEANING

Contractor to clean completed system of any debris or obstructions prior to acceptance by Engineer.

### 3.4 TELEVISIONING OF GRAVITY SEWER MAIN

Contractor shall have the sewer line televised and recorded at no cost to the City of St. Marys when deemed necessary by the City. The video should be of a quality that any and all structural defects, such as cracked pipes, rolled gaskets, etc., can be easily identified and located. The video should also contain all pertinent information including but not limited to location, line size, material, starting manhole, direction headed, distance from starting manhole to service connection, and length of line.

### 3.5 INSPECTION PROCEDURES

- A. Upon completion of installation of the gravity sewer system, the City of St. Marys Public Works Department should be notified 24 hours prior to the inspection and lamping of the system. The Contractor is responsible for having the system ready for inspection by having the manhole lids removed and the lines free of all silt and debris. The Contractor shall also supply a ladder for entry into the manholes and a light source of sufficient brightness to illuminate the full interior of the pipe between manholes.
- B. Upon completion of or during the lamping of the sewer system, the entire system will be subjected to a deflection test by pulling a mandrel through the pipes in the system. The mandrel shall be supplied by the Contractor and shall be capable of detecting any deflection exceeding 5 degrees. The mandrel should not pass through excessively deflected pipes or joints. If any deflections are found, the system will be deemed to have failed inspection. The Contractor shall repair the deficiency at no cost to the City, and a new inspection scheduled on the failed portion.
- C. All sewer taps shall be inspected by the City prior to being covered.

### 3.6 INSTALLATION OF LIFT STATIONS

- A. Before ordering any materials or doing any work the Contractor shall verify all measurements concerning the equipment and layout. No extra

compensation shall be allowed for differences existing between actual dimensions and those indicated in the manufacturer's recommendations.

B. Factory Tests

1. The pumps shall be tested at the place of manufacture in accordance with the standards of the Hydraulic Institute for testing of pumps. Each pump shall be tested with the actual drive unit to be furnished on the job. The test reports shall cover the complete range of the pumps and shall contain the information necessary to demonstrate that the units are in conformance with these Specifications. The following shall be recorded for each pump tested.
  - a. TDH vs. capacity.
  - b. Pump efficiency vs. capacity.
  - c. Horsepower vs. capacity.
  - d. Speed of rotation.
2. Six copies of all certified test reports shall be submitted to the City.

C. Installation: The pumps, drives and accessories shall be installed, tested and adjusted and the installation certified in accordance with the manufacturer's requirements.

D. Field Testing

1. Following installation and checkout, the ability of the pumps to operate under actual field conditions without overheating, leakage or excessive wear, vibration, or noise shall be demonstrated to the satisfaction of the City.
2. Before placing installation into service, the pumps shall be run continuously with the motor not submerged for 30 minutes under full load current with no damage resulting to the pump motor. The pumps shall, during this test, produce the designed GPM and TDH condition and experience a heat rise of no more than 45 degrees C above ambient temperature.
3. In the event any of the pumping equipment fails to meet the above test requirements, it shall be modified and retested in accordance with the requirements of this Manual.

4. Each pump's performance shall be documented by obtaining concurrent readings showing motor voltage and amperage, pump suction head and pump discharge head. Such readings shall be documented for at least three pumping conditions. One test shall be at shut-off head. Each power lead to the motor shall be checked for proper current balance.
5. The Contractor shall submit six certified copies of all test results to the City prior to acceptance of the installation.

E. Pump Warranty

The pump manufacturer shall warrant the units supplied against defects in workmanship and materials for a period of five years or 10,000 hours. Warranty shall apply to parts and labor prorated over 60 months. For the first 18 months, 100% parts and labor apply. The warranty shall be in printed form.

**END OF SECTION II  
SANITARY SEWERS**

## PART B

### BASIS OF DESIGN AND TECHNICAL SPECIFICATIONS

#### III. BASE AND PAVING CONSTRUCTION AND REPAIR

##### PART I GENERAL

##### 1.1 APPLICABLE STANDARDS

A. When used in this section, the term "Standard Specifications" shall mean the *Department of Transportation, State of Georgia Standard Specifications For Construction of Roads And Bridges*, current edition, unless amended herein.

B. American Society for Testing and Materials (ASTM):

~~D698~~ Test for, Moisture-Density Relations for Soils  
~~D-1557~~

D1557 Test for, Moisture-Density Relations for Soils

##### 1.2 BASIS OF DESIGN

All street design will be in accordance with the Georgia Department of Transportation standard specifications and design standards.

##### PART 2 PRODUCTS

##### 2.1 MATERIALS

A. Base: The base shall conform to Section 310, Graded Aggregate Construction, of the Standard Specifications.

B. Prime: The prime coat shall be RC-70 and shall conform to Section 412, Bituminous Prime, of the Standard Specifications.

C. Tack Coat: The tack coat shall be asphaltic cement (grade to be determined by engineer) and shall conform to Section 413, Bituminous Tack Coat, of the Standard Specifications.

D. Intermediate Course (Binder): The intermediate course shall be Type B Asphalt Concrete and shall conform with Section 400, Hot Mix Asphaltic Concrete Construction of the Standard Specifications.

- E. Surface Course - Asphalt Plant Mix: The surface course shall be type F asphaltic concrete, Group 1 or 2, 135 lb/sy and shall conform to Section 400 of the Standard Specifications.
- F. Paint: Paint for pavement marking shall be white Traffic Line Paint and shall conform to Section 870, Paint, of the Standard Specifications.
- G. Concrete Curb and Gutter: Shall conform to Section 441 - Concrete Curb, Gutter, Combination Curb and Gutter, Header and Median of the Standard Specifications.

### PART 3 EXECUTION

#### 3.1 COMPACTION

- A. Subgrade: The upper 12 inches of subgrade soils in all cut areas and all fill areas that are to receive new pavements shall be scarified and recompactd until a density equivalent to 98% Modified Proctor maximum dry density in accordance with ASTM ~~D698~~ <sup>D1557</sup> has been obtained.
- B. Base: All base shall have minimum compaction of 100% of the maximum density obtained by the test procedure present in ASTM D1557, Method D (Modified Proctor). The maximum permissible lift thickness shall be 6 inches (compacted).
- C. Moisture Content: Compaction shall be performed only when the moisture content of the soil is within 4% of the optimum moisture content at the time of compaction as determined by ASTM D698. Soils are to be dried prior to compaction by disking and aeration. An Independent Testing Laboratory shall determine if soils are within the optimum moisture content.

#### 3.2 CONSTRUCTION

- A. Preparation of Subgrade: Prior to placing of base and pavements, the construction of all utility lines (water, sewer, power, gas, etc.) which are to be placed under the pavements shall have been completed.
- B. Base: The base course shall be constructed in accordance with Section 310 of the Standard Specifications to the compacted thickness specified (6" minimum).

- C. Prime: The prime coat shall be applied at a rate of 0.25 gallons per square yard and in accordance with Section 412 of the Standard Specifications.
- D. Tack Coat: The tack coat shall be applied at a rate of 0.10 gallons per square yard and in accordance with Section 413 of the Standard Specifications.
- E. Intermediate and Surface Course - Asphalt Plant Mix: The intermediate and surface courses shall be constructed in accordance with Section 400 of the Standard Specifications to the thickness indicated. All thicknesses are compacted.
- F. Painting Centerline Stripe: Contractor shall paint a 4 inch wide broken white paint stripe in the center of all new streets. Broken centerline shall consist of painted segments of 15 feet long with 25 foot unpainted gaps between painted segments per DOT standards for traffic control.
- G. Existing pavement that has pavement markings damaged by this construction shall be repainted.
- H. Concrete Curb and Gutter: Shall be constructed in accordance with Section 441 of the Standard Specification.

### 3.3 TESTING THICKNESS

The City, at their option and expense, shall make as many tests as necessary to determine the average thickness of the base course prior to the placing of the intermediate course. The average thickness of all specimens shall be at least the specified thickness of the base course. In areas where there is a deficiency in the thickness of the base course the intermediate course shall be increased in thickness the amount of the average deficiency of all tests. The intermediate course shall be tested and any deficiency shall be made up in the surface course. If tests show a deficiency of one fourth in the surface course, the Contractor shall be required to place an additional surface course of one inch in thickness.

### 3.4 EXISTING PAVEMENT RESTORATION

- A. Pavement damaged due to construction shall be patched or replaced as directed by the City Engineer.
- B. Pavement damaged by new utility trenches shall be restored as follows:
  - 1. Concrete Pavement Replacement
    - a. Existing pavement shall be removed to a minimum of 12 inches on either side of the trench.
    - b. Granular base material shall be placed to a minimum depth of 6 inches and compacted to 100% maximum dry density following trench backfilling and compaction.
    - c. Depth of concrete pavement replaced shall match the existing pavement or shall be a minimum of 6 inches thick whichever is greater.
    - d. Concrete paving slab shall be reinforced with No. 4 bars spaced 12 inches on center each way. Minimum clear distance from the bottom of the slab to the reinforcing steel shall be 2 inches.
    - e. Joints and finish of the slab shall match existing pavement.
  - 2. Asphalt Pavement Replacement
    - a. Existing pavement shall be removed to a minimum of 12 inches on either side of the trench.
    - b. Granular base material shall be placed to a minimum depth of 6 inches and compacted to 100% maximum dry density following trench backfilling and compaction.
    - c. A 5-inch asphalt surface shall be laid after a tack coat is applied to the bottom and the sides of the area to be patched. The tack coat shall be applied at the rate of 0.10 gallon per square foot and can be either sprayed or brushed on. The patch shall be rolled in both directions with a 5-ton roller.
    - d. Joints and finish shall match existing pavement.

3. Maintenance of Surface

- a. Pavement damage due to settlement of backfill: Repair for a period of one year.

**END OF SECTION III  
BASE AND PAVING CONSTRUCTION AND REPAIR**

## PART B

### BASIS OF DESIGN AND TECHNICAL SPECIFICATIONS

#### IV. STORM DRAINAGE AND APPURTENANCES

##### PART 1 GENERAL

##### 1.1 APPLICABLE STANDARDS

A. Appurtenances shall be constructed in accordance with the referenced Georgia Department of Transportation Standard Drawings.

B. American Society of Testing and Materials (ASTM):

C32	Specification for Sewer and Manhole Brick.
C76	Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
C139	Specifications for Concrete Masonry Units for Construction of Catch Basins and Manholes.
C144	Aggregate for Masonry Mortar.
C270	Mortar for Unit Masonry.
C443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
C478	Specification for Precast Reinforced Concrete Manhole Section.
C536	Test for Continuity of Coatings in Glassed Steel Equipment by Electrical Testing.

##### 1.2 BASIS OF DESIGN

All drainage related design will be in accordance with Camden County Drainage Study, Engineering Handbook prepared by Thomas N. Debo, Ph.D. and with this manual, Public Works Policies and Specifications. In the case of conflicts, design criteria found in this manual shall take precedence.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. Storm Drainage Pipe: Pipe shall be one of the following materials:

1. Reinforced Concrete Pipe shall conform to ASTM Specification C-76 and shall be sized in accordance with Section 1.12. Pipe shall be Class III minimum and as indicated on GA. D.O.T. Standard 1030 D.
2. Corrugated metal pipe shall conform to AASHTO designation M-36, AREA Manual 1-4 requirements for corrugated metal culverts, or Federal Specification QQ-C-806, with the following applicable requirements:
  - a. The outside and inside surfaces of the corrugated metal pipe shall be completely coated with bituminous material with a minimum thickness of 0.05 inch at the crest of the corrugations. Immediately prior to the application of the bituminous coating, the corrugated metal pipe shall be cleaned of all dirt, grease, mill scale, or loose rust and shall be dry.
  - b. The outside and inside surfaces of the corrugated metal pipe shall be completely coated with a pure aluminum coating metallurgically bonded by an alloy layer between the steel and the aluminum. The coating shall be applied at a minimum of 1 oz./sq. ft., 2 mils each side. The weight of aluminum (total both sides) shall be as follows: Minimum check limit triple - spot test = 1.00 oz./sq. ft., minimum check limit single - spot test = 0.90 oz./sq. ft. The aluminized steel pipe shall be Armco Aluminized Steel Type Z or equal.
  - c. In cases where corrugated metal pipe is used, headwalls shall be installed on each end to protect the pipe ends from damage. The headwalls shall comply with applicable sections of the GA. D.O.T. Specifications.
  - d. All rivets shall be placed in the inside valley of the corrugations. The interior coating shall be protected against damage from insertion or removal of struts or tie wires. Lifting lugs, where used, shall be so placed as to facilitate moving the pipe without damage to the exterior coating. All lateral pipe shall be sixteen (16) gage. All

pipe under traffic areas will be twelve (12) or fourteen (14) gage.

3. HDPE Pipe shall conform to AASHTO Designation M 294 and MP 6 Type S or Type D, Federal Highway Administration FP-95, and the U.S. Army Corps of Engineers Standards CEGS-02410 and CEGS-02720.
  - a. Corrugated Polyethylene Pipe shall only be used under pavement areas when a minimum cover of four feet can be maintained, unless approved by City Engineer.
  - b. Corrugated Polyethylene Pipe shall be gasketed bell type coupling system that meets or exceeds the soil-tightness requirements of Section 23, subparagraph 23.3.1.5.4(e) of the AASHTO Standard Specifications for Highway Bridges and rubber O-Ring gaskets that conform to ASTM-F477.
  - c. Extruded pipe and blow molded fittings shall be made of virgin PE compounds which conform with the requirements of class 335420C as defined and described in ASTM D3350, except that the carbon black content shall not exceed 5%.

**B. Pipe Joints:**

1. Joints for concrete pipe shall be one of the following types:
  - a. Bell and spigot with rubber gaskets.
  - b. Tongue and groove with rubber gaskets.
  - c. Tongue and groove with preformed plastic gaskets.
2. Rubber gaskets shall conform to ASTM Specification C443. Only a neutral agent shall be used as lubricant. Preformed Plastic Gaskets shall conform to Federal Specification SS-S-210, Type 1-rope form.
3. Joints in corrugated metal pipe shall be made with standard coupling bands. Coupling bands shall be as specified in Federal Specification WW-P-405, except that connecting angles shall be omitted and circumference of the band shall be such that, when coupled, there will be a 3 inch lap. For tightening each coupling band, four 1/2 inch diameter zinc-coated steel rod hoops with silo lugs shall be provided on riveted pipe the longitudinal seam rivets

which would be under the coupling band shall be omitted and that portion of the seam welded.

- C. Precast Concrete Manhole Sections: ASTM C478, except that manhole ladders shall not be permitted.
- D. Masonry Manholes: Shall be constructed of the following materials:
  - 1. Brick: ASTM C32, Grade MS.
  - 2. Concrete Masonry Units: ASTM C139.
  - 3. Mortar of Masonry: ASTM C270, Type M.
  - 4. Aggregate for Masonry Mortar: ASTM C144.
  - 5. Water: Water for Masonry Mortar shall be fresh, clean and potable.
- E. Metals
  - 1. Frames, Covers, and Grating: Frames, covers, and grating shall conform to ASTM Specification A-536 and shall be of ductile iron.
  - 2. Manholes Steps: Manhole steps will not be permitted.

## 2.2 DELIVERY AND STORAGE

- A. Storm Drainage Pipe: Care shall be exercised in loading and unloading pipe, fittings, specials and castings at all times in order to avoid shock and damage to the materials. Lifting shall be by hoist or by rolling on skids. Dropping will not be permitted. The Contractor shall be responsible for the safe handling of all materials and no damaged materials shall be used in the work. Materials shall be inspected upon arrival at the site, and any damaged or defective materials shall be immediately removed from the site. All materials shall be stored above grade.
- B. Cementitious Materials: Cementitious materials in bags shall be stored in enclosed structures. Floors shall be elevated above the ground a distance sufficient to prevent the absorption of moisture.

- C. Metal Items: Metal items, including reinforcing steel, shall be stored above grade in a manner which will not cause excessive rusting or coating with grease or other objectionable materials.
- D. Aggregates: Aggregates shall be stored on areas to prevent the inclusion of foreign material. Aggregates of different sizes shall be stored in separate piles. Stockpiles of coarse aggregate shall be built in horizontal layers not exceeding 4 feet in depth to minimize segregation. Should the course become segregated, it shall be remixed to conform to the grading requirements.
- E. Brick, Concrete Masonry Units and Precast Concrete Manholes: Brick, concrete masonry units and precast concrete manholes shall be handled with care to avoid chipping and breakage, and shall be stored to protect them from contact with the earth and exposure to the weather, and shall be kept dry until used. Masonry units or precast concrete containing frost or ice shall not be used.

### PART 3 EXECUTION

#### 3.1 DRAINAGE PIPE

- A. Each section of pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used.
- B. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. Pipe shall be laid true to line and grades indicated and shall rest upon the pipe bed for the full length of each section. Runs of pipe shall be laid with outside bells or grooved ends up-grade beginning at the lower end of the pipeline. Pipe having its grade and/or joint disturbed after laying shall be removed, cleaned and relaid.
- C. When pipes are protected by headwalls or connect with drainage structures, the exposed ends of the pipe shall be placed or cut flush with the inside face of the structure. After the pipe is cut the rough edges shall be smoothed up in an approved manner. All pipe shall be laid so that markings are on top and the inner surfaces abut neatly, tightly and smoothly.

- D. All pipe in place shall be observed by the Engineer before being covered and concealed. Contractor shall clear all pipe of silt debris prior to final acceptance.

### 3.2 CORRUGATED METAL PIPE JOINTS

Corrugated metal pipe shall be butted to form a smooth joint; the space between the pipe and coupling bands shall be kept free from dirt and grit so that the corrugations fit snugly. The coupling band, while being tightened, shall be tapped with a softhead mallet of wood, rubber, or plastic to take up slack and insure a tight joint. Coupling band bolts and damaged areas of coupling bands and pipe shall be given a coating of asphalt cement. Pipe on which the asphalt coating has been damaged to such extent that satisfactory field repairs cannot be made will be replaced.

### 3.3 CONCRETE PIPE JOINT

- A. Joint installation shall be in accordance with the manufacturer of the joint material. Surface to receive lubricants, cements, or adhesives shall be clean and dry. Gaskets and jointing materials shall be affixed to the pipe not more than 24 hours prior to the installation of the pipe, and shall be protected from the sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials shall be inspected before installation of the pipe, and any loose or improperly affixed gaskets and jointing materials shall be removed and replaced.
- B. The pipe shall be aligned with the previously installed pipe, and the joint pulled together. If, while making the joint, the gasket or jointing material becomes loose and can be seen through the exterior joint recess when the joint is pulled up to within one inch of closure, the pipe shall be removed and the joint remade.

### 3.4 CORRUGATED POLYETHYLENE PIPE JOINTS

- A. Couplings shall not reduce or impair the overall integrity or function of the pipeline.
- B. Only couplings supplied or recommended by the manufacturer should be used. The proper coupling to be used, either soil tight or water tight, shall be determined by the City Engineer. This decision will be made on a case by case basis.

- C. Couplings shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints. Couplings shall be bell and spigot or split couplings. Split couplings shall engage at least two full corrugations on each pipe section. Stainless steel bolts and nuts shall fasten split couplings.

### 3.5 MASONRY WORK

- A. Mortar for Masonry: Mortar for brick masonry, rubble stone masonry, and for bedding cast iron frames in masonry shall be Type M, conforming to ASTM C270.
- B. Mortar for parging Masonry Walls: Mortar for parging masonry walls below grade shall be Type M, conforming to ASTM C270.
- C. Brickwork: Brick in circular walls shall be laid in all header courses to form full and close mortar joints, ends, and sides in one operation. Vertical joints shall be radial from the center. Brickwork around pipe inlets and outlets shall be built using sufficient mortar to seal the pipe tight in the wall.
- D. Concrete Unit Masonry: Walls shall be constructed in horizontal courses, with vertical joints broken. Units shall be laid in mortar and all joints shall be filled completely with mortar.
- E. Masonry Structures: Masonry structure walls shall be constructed of brick, concrete masonry units or precast concrete structural sections.

### 3.6 PRECAST CONCRETE

Walls shall be constructed on a footing of cast-in-place concrete, except that precast concrete base sections may be used for precast concrete structure risers. Precast base sections shall conform to the applicable requirements for precast risers and tops in made ASTM C478. Mortar that has hardened to the extent that it cannot be made workable without the addition of water shall not be used. Thickness of parging shall be not less than 1/2 inch. No parging will be permitted on the inside of structures. Parging will not be required for precast concrete structures. Joint work inside masonry structures shall be smooth.

### 3.7 METAL WORK

Iron and steel shall be formed to shape and size with sharp lines and angles. Shearing and punching shall produce clean true lines and surfaces. Casting shall

be sound and free from warp, cold shuts, and blowholes that may impair their strength or appearance. Exposed surfaces shall have a smooth finish and sharp well-defined lines and arises. The necessary rabbets, lugs, and brackets shall be provided.

### 3.8 FIELD TEST

- A. A light held in a drainage structure shall show a practically full circle of light through the pipe when viewed from the adjoining end of the line.
- B. Lines under pavement shall be tested for infiltration by means of a suitable weir or other device as directed. When determination of infiltration is not practicable because of dry trench conditions, an ex-infiltration test shall be applied by filling with water so that the hydraulic head will be a least 4 feet above the crown of the upper end of the section being tested. The amount of leakage (infiltration or exfiltration) shall not exceed 500 gallons per inch of diameter per day per mile of pipe. Water for testing shall be furnished by the owner. All water drawn from the City will be metered and billed at the appropriate rate set by the City Council.

## PART 4 DESIGN CRITERIA

### 4.1 Hydrology

- A. The Rational Method may be used for drainage areas up to 100 acres.
- B. Soil Conservation Service (SCS) methods may be used for drainage areas up to 2000 acres.
- C. Other methods may be used for large watersheds (>500 acres) with the approval of the City of St. Marys Public Works Department.
- D. Drainage calculations shall be provided for all developments by a registered professional engineer and shall be signed and stamped by that engineer.

### 4.2 Storm Drains and Culverts

- A. Piped collection systems for public streets (catch basins, inlets, cross drains, and longitudinal piping) shall be designed for the 25-year frequency storm event. Catch basins and inlets shall be spaced so that the spread in the street for the design flow shall not exceed six feet.

- B. Road culverts shall be designed for the 25-year storm event with a minimum size of 18" circular or equivalent. Road culverts shall be reinforced concrete pipe unless otherwise approved by the City of St. Marys Public Works Department.
- C. The minimum full flow velocity in storm drains and culverts shall be 2 fps and a maximum velocity of 10 fps.
- D. All ditches, grades, elevations, and culvert sizes to be shown on plans shall be submitted to the City for approval.

#### 4.3 Storm Water Detention

- A. Storm water detention will be required for all developments, both commercial and residential, when the development will cause an increase in peak rate of runoff by more than 1 cubic feet per second for the 10 year frequency storm event.
- B. Storm water detention facilities shall be designed so that the post development discharge does not exceed the predevelopment discharge for all storm events up to and including the 25-year frequency storm and for all durations.
- C. The detention facility shall be provided with an overflow device or emergency spillway to accommodate the 100-year frequency storm. In cases where an emergency spillway is not provided, the outlet device shall be designed for the 100-year frequency.
- D. The detention facility, including basin, overflow, and outlet device, shall be clearly depicted in plan and cross-section and thoroughly dimensioned on the construction drawings.
- E. All detention facilities shall be owned and maintained by an established homeowner's association, the developer, or owner of the land on which the detention facility is built. At no time will the City of St. Marys accept or maintain such detention facilities. However, in case of an emergency, the City reserves the right to perform any maintenance deemed necessary and then bill the owner of the facility for necessary material, equipment and labor. This may be done at the discretion of the City Public Works Department.

- F. The following are exemptions from the requirements of storm water detention:
1. Agricultural land management activities.
  2. Additions or modifications of existing detached family dwellings.
  3. Developments that do not disturb or alter more than 10,000 square feet of land area.
  4. Developments of property where the runoff resulting from the proposed development enters a federally identified flood zone as established by the Federal Emergency Management Agency without crossing intermediate property. Increase from the uncontrolled runoff must be adequately transmitted through existing storm drain structures downstream of the subject development.

**END OF SECTION IV  
STORM DRAINAGE AND APPURTENANCES**

**PART B**  
**BASIS OF DESIGN AND TECHNICAL SPECIFICATIONS**

**V. RAILWAY AND HIGHWAY PIPE CROSSINGS**

**PART I GENERAL**

**1.1 APPLICABLE STANDARDS**

**A. American Water Works Association (AWWA):**

C 200 Steel Water Pipe, 6 inch and larger.

C 203 Coat-Tar Protective Coatings and linings for Steel Water Pipelines - Enamel and Tape - Hot Applied.

C 206 Field Welding of Steel Water Pipe.

**B. American Railway Engineering Association (AREA):**

1-4-13 Bituminous Coated Corrugated Metal Pipe and Arches.

1-4-19 Jacking Culvert Pipe through Fills.

1-5 Pipelines.

**C. Department of Transportation, State of Georgia, Standard Specifications:**

1. Section 615 - Jacking and Boring Pipe.

**1.2 RAILROAD CROSSINGS**

A. Utility crossings shall be made in strict accordance with the applicable sections of the American Railway Engineering Association Specifications and the specifications of the owner of the railway being crossed. The Railway Engineer shall be notified prior to beginning construction. Construction shall not commence before such permits are acquired.

B. Railroad crossings shall be either carrier pipe encased in a larger bored or jacked casing pipe or as allowed by the Railroad.

C. The developer or property owner shall be responsible for obtaining the permit.

### 1.3 HIGHWAY CROSSINGS

- A. Utility crossings shall be made in strict conformance with all applicable sections of the State Department of Transportation, State of Georgia, Specifications. The district highway Engineer shall be notified prior to beginning construction.
- B. The contractor and/or developer will prepare all the necessary permits prior to beginning construction. Construction shall not commence until all permits are acquired.
- C. Highway crossings shall be by one of the following methods:
  - 1. Boring
  - 2. Jacking
  - 3. Tunneling

## PART 2 EXECUTION

### 2.1 METHODS OF INSTALLATION

- A. Boring or jacking shall be in accordance with AREA 1-4-19 and 1-5, DOT Specification 615 as follows:
  - 1. Bored or jacked installation, approved by the Railroad or DOT Engineer, shall have a bored hole diameter essentially the same as the outside diameter of the encasing pipe plus the protective coating thickness. If the bored hole diameter is greater than the outside diameter of the pipe,, including the thickness of the coating by more than 1 inch, or if voids should develop during the operation and are determined to be detrimental to the work then the voids shall be pressure grouted with an approved mix.
  - 2. The carrier pipe shall be as shown on the plans and approved by the City Engineer. If the carrier pipe is steel without casing then the pipe shall be designed to the maximum continuous length possible, thickness and size according to the application needed. The aforementioned steel shall comply with ASSA C 200 and shall be lined and coated in accordance with AWWA C203, subject to the approval of the City Engineer. Adapters shall be provided between steel pipe and pipe of other materials.

3. All casing pipe shall be steel, fully bituminous coated in accordance with AREA 1-4-13. Metal thickness shall be as follows:

MINIMUM WALL THICKNESS FOR STEEL CASING PIPE

<u>Nominal Thickness (Inches)</u>	<u>Nominal Diameter (Inches)</u>
0.250	18 and under
0.281	20
0.312	22
0.344	24
0.375	26
0.406	28 and 30
0.438	32
0.469	34 and 36
0.500	38, 40 and 42

4. Steel casing pipe shall conform to AWWA C200. Steel casing pipe shall be of maximum length possible for the applications intended and shall be welded in conformance with AWWA Specification C 206. Steel casing pipe shall be at least 2 inches greater than the largest outside diameter of the carrier pipe including bells, lugs, etc., for carrier pipe less than 6 inches in diameter; and at least 4 inches greater for carrier pipe 6 inches and over in diameter.
5. Casing pipe shall be jacked or bored in place with allowances made for lines and gradients of the carrier pipes. After the casing pipe is installed, the carrier pipe shall be installed within it to the exact line and gradient with an approved casing spacer. All joints shall be restrained within the casing pipe as well as the first joint outside of the casing pipe on either end.
6. When the carrier pipe has been installed and securely anchored inside the casing pipe, the ends of the casing shall be plugged with a masonry plug.
7. Construction effort shall not cease when such cessation might tend to harm the total crossing effort. Protective measures shall be taken to protect the railroad and highway as well as the crossing pipe. Pipe work and tunnels shall be protected at the end of each working day against the weather and any other danger.

B. Tunneling

1. Tunneling will not be allowed unless extreme circumstances exist that will not allow other means of crossing.
2. The Contractor must apply for permit to the railroad or DOT and obtain approval from the City Engineer.

**END OF SECTION V  
RAILWAY AND HIGHWAY PIPE CROSSING**

## PART B

### BASIS OF DESIGN AND TECHNICAL SPECIFICATIONS

#### VI. TRENCH EXCAVATION, BACKFILL AND COMPACTION

##### PART 1 GENERAL

##### 1.1 SCOPE

Work under this section shall apply to furnishing all materials, equipment and labor for excavation, trenching and backfilling for utility systems. "Utility system" shall include underground piping and appurtenances for water distribution systems, storm water drains, and sewer collection systems.

##### 1.2 EXISTING UTILITIES

- A. Before opening trenches, the Contractor shall examine all available records and explore for the location of all subsurface pipes, valves or other structures and reference such locations on the surface. (CALL BEFORE YOU DIG! Utilities Protection Center: 1-800-282-7411)
- B. In opening trenches, every effort shall be made not to interfere with these utilities structures. Expose existing piping by hand before excavating by machine. Excavate existing utilities sufficiently in advance of pipe laying to determine crossing arrangement. Slight deviations may be permitted in order to clear such structures. The Contractor shall be entirely responsible for the preservation of all underground or overhead utility lines and structures, such as gas, water, sewer lines, telephone conduit, power lines, etc., and shall replace, adjust or repair, without cost to the City, any such lines damaged or interfered with as a result of their construction.
- C. Schedule work to keep roads and utilities in useable condition; coordinating all operation with the City to avoid inconvenience insofar as practicable.

##### 1.3 EXCAVATED MATERIAL

All material to be excavated shall be classified as earth.

##### 1.4 QUALITY ASSURANCE

- A. All excavation within the rights-of-way of City streets and County, State or Federal roadways, shall be backfilled in accordance with the then

prevailing requirements of the Georgia Department of Transportation, Highway Division.

- B. Reference Standards: Methods of Sampling and Testing of American Association of State Highway and Transportation Officials (AASHTO).

## PART 2 EXECUTION

### 2.1 GENERAL EXCAVATION

- A. The Contractor shall do all excavation of whatever substances encountered to depth shown on plans. Excavated materials not required for fill or backfill shall be removed from the site as directed by the engineer.
- B. Contractor is to provide three (3) foot minimum ground cover over utility.
- C. Excavation for manholes and other accessories to have 12 inches minimum and 24 inches maximum clearance on all sides.
- D. Excavation shall not be carried below the required level.
- E. Where excavation is carried below grades indicated, the contractor shall refill same to the proper grade with compacted earth, or as directed by the design engineer or City engineer.
- F. Banks of trenches shall be vertical unless soil conditions pose danger to personnel or material or conflict with OSHA regulations, in which case the latter will take precedence.
- G. Width of trench shall be 6-inch minimum, 8-inch maximum, on each side of the pipe bell. The bottom of trench for sewers and culverts shall be rounded so that an arc of the circumference equal to 0.6 of the outside diameter of the pipe rests on undisturbed soil.
- H. Bell holes shall be excavated accurately to size by hand.

### 2.2 UNSUITABLE BEARING MATERIALS

Should unsuitable bearing materials be encountered at levels indicated and found to have insufficient bearing values, the City Engineer may order the excavation carried to lower depths.

## 2.3 PIPE BEDDING

- A. The contact between a pipe and the foundation on which it rests is the pipe bedding.
- B. Classes of Bedding: Four (4) classes of bedding to be used for pipes in trenches are described as follows:
  - 1. Class A - Concrete Cradle or Concrete Arch Bedding: This class of bedding may take either of two forms.
    - a. Concrete Cradle - The pipe shall be bedded in a monolithic cradle of plain or reinforced concrete having a minimum thickness of  $\frac{1}{4}$  the inside pipe diameter or a minimum of 4 inches under the barrel and extending up the sides for a height equal to  $\frac{1}{4}$  the outside diameter. The cradle shall have a width at least equal to the outside diameter of the pipe barrel plus 8 inches. Backfill above the cradle and extending to 12 inches above the crown of the pipe shall be compacted carefully.
    - b. Concrete Arch - The pipe shall be embedded in a carefully compacted granular material having a minimum thickness of  $\frac{1}{4}$  the outside diameter between barrel and bottom of trench excavation and extending halfway up the sides of the pipe. The top half of the pipe shall be covered with a monolithic plain or reinforced concrete arch having a minimum thickness of  $\frac{1}{4}$  the inside diameter at the crown and having a minimum width equal to the outside pipe diameter plus 8 inches.
  - 2. Class B - First Class Bedding - Class B bedding may be achieved by either of two construction methods.
    - a. Shaped Bottom with Tamped Backfill. The bottom of the trench excavation shall be shaped to conform to a cylindrical surface with a radius at least 2 inches greater than the radius to the outside of the pipe and with a width sufficient to allow  $\frac{3}{5}$  of the width of the pipe barrel to be bedded in fine granular fill placed in the shaped excavation. Carefully compacted backfill shall be placed at the sides of the pipe to a thickness of at least 12 inches above the top of

- the pipe. Shaped trench bottoms shall be used only with the approval of the City Engineer.
- b. **Compacted Granular Bedding with Tamped Backfill.** The pipe shall be bedded in compacted granular material placed on a flat trench bottom. The granular bedding shall have a minimum thickness of 1/4 the outside pipe diameter and shall extend halfway up the pipe barrel at the sides. The remainder of the side fills and a minimum depth of 12 inches over the top of the pipe shall be filled with carefully compacted material.
3. **Class C - Ordinary Bedding:** Class C ordinary bedding may be achieved by either of two methods:
    - a. **Shaped Bottom.** The pipe shall be bedded with "ordinary" care in an earth foundation formed in the trench bottom by a shaped excavation which will fit the pipe barrel with reasonable closeness for a width of at least 50% of the outside pipe diameter. The side fills and area over the pipe to a minimum depth of 6 inches above the top of the pipe shall be filled with lightly compacted fill. The shaped bottom bedding shall be used only with the approval of the City Engineer.
    - b. **Compacted Granular Bedding with a Tamped Backfill.** The pipe shall be bedded in compacted granular material placed on a flat trench bottom. The granular bedding shall have a minimum thickness of 4 inches under the barrel and shall extend 1/10 to 1/6 of the outside diameter up the pipe barrel at the sides. The remainder of the side fills and to a minimum depth of 6 inches over the tip of the pipe shall be filled with lightly compacted backfill.
  4. Granular pipe bedding material shall be well graded crushed stone or crushed gravel meeting the requirements of ASTM C33, Gradation 67 (3/4 inch to No. 4). A well graded gravel meeting these same requirements can also be used.
  5. Where ledge rock, compact rocky or gravelly soil, or other unyielding foundation material is encountered, the pipes shall be bedded in accordance with the following additions: The hard unyielding material shall be excavated to the elevation of the

bottom of the concrete cradle (Class A bedding) or below the bottom of the pipe and the pipe bell (Class B, C or D bedding), to a depth of at least 6 inches (15 cm). The width of the excavation shall be at least 5/4 the outside diameter of the pipe and it shall be refilled with granular material.

#### 2.4 BRACING AND SHORING

- A. The Contractor shall do all bracing, sheeting and shoring necessary to perform and protect all excavations as required for safety.
- B. All bracing, sheeting and shoring shall be performed in accordance with the Standard Excavation and Grading Code, most recent edition, as produced and published by the Southern Building Code Congress International.

#### 2.5 DEWATERING FOR EXCAVATION

- A. The Contractor shall pump or remove any water accumulated in any excavation area and shall perform all work necessary to keep excavations clear of water while foundations, structures or any masonry are being constructed or while pipe is being laid.
- B. No structure or pipe shall be laid in water, and water shall not be allowed to flow over or rise upon any concrete, masonry, or piping until same has been inspected and the mortar or joint material has cured.
- C. No extra compensation will be allowed for removal of water.
- D. All water pumped or bailed from the trenches or other excavation shall be conveyed in a manner to a point of discharge where it will neither cause a hazard to the public health, nor damage to the public or private property, or to work completed or in progress.

#### 2.6 BACKFILL

- A. The soil at the sides of a pipe and above it is the backfill.
- B. Prior to backfilling any excavation, all piping and structures shall be observed by the Superintendent of Public Works or City Engineer if he so desires.

- C. After pipes have been tested and approved, backfilling shall be done with approved material free from large clods or stones.
- D. Backfill shall be placed in uniform layers, four inches thick, on both sides of the pipe and thoroughly compacted with pneumatic or hand tampers. The backfill shall be brought up uniformly on both sides of the pipe and compacted to an elevation of one foot above the top of the pipe, after which the fill shall be placed in eight-inch lifts.
  - 1. Backfill shall be compacted to not less than 95% of the maximum dry weight per cubic foot as determined by AASHTO Method T-99 (Standard Proctor Test).
  - 2. The top 18 inches of backfill under any paved area shall be compacted to 100% Standard Proctor.
  - 3. Water settling will not be permitted in clay soils. It may be required at the option of the City Engineer in sandy soils.

## 2.7 REPLACING PAVEMENTS

- A. Subgrades shall be compacted with a mechanical tamper.
- B. Concrete pavement to be replaced in accordance with Section III Part 3.4-B-1, "Concrete Pavement Replacement."
- C. Use high-early-strength cement if road is to be opened in less than three (3) days.
- D. Asphalt pavement to be replaced in accordance with Section III Part 3.4-B-2, "Asphalt Pavement Replacement."

### END OF SECTION VI TRENCH, EXCAVATION, BACKFILL AND COMPACTION

## PART B

### BASIS OF DESIGN AND TECHNICAL SPECIFICATIONS

#### VII. EROSION CONTROL

##### PART I GENERAL

##### 1.1 SCOPE

The work specified in this section consists of furnishing, installing and maintaining temporary erosion controls and temporary sedimentation controls as well as establishing final stabilization of the site.

##### 1.2 BASIS OF DESIGN

All erosion and sedimentation control shall be prepared in accordance with the City of St. Marys Erosion and Sedimentation Control Ordinance. The "Manual for Erosion and Sediment Control in Georgia," published by the State Soil and Water Conservation Committee of Georgia, should be used as a reference manual.

##### PART 2 PRODUCTS

##### 2.1 MATERIALS

All erosion and sedimentation control devices shall be in conformance with the current edition of the "Manual For Soil Erosion And Sediment Control In Georgia", published by the Georgia Soil and Water Conservation Commission.

##### PART 3 EXECUTION

##### 3.1 SEDIMENTATION CONTROL

- A. Silt dams, traps, barriers and appurtenances shall be installed and shall be maintained in-place for duration of construction.
- B. Hay bales shall be staked with two (2) 1" x 4" wood stakes per bale driven eighteen (18) inches into the ground and finishing flush with the top of the bale.
  - 1. Install two (2) stakes per bale with the long dimension of the stakes parallel to the long dimension of the bale.
  - 2. Where bales are installed in multiple layers, the bales shall be installed with vertical joints staggered and two (2) 1" x 4" wood

stakes per bale driven through all layers, full from top of bale to eighteen inches into the ground.

- C. Hay bales, which have deteriorated, shall be replaced with new materials.
- D. Erosion and sedimentation controls shall be maintained in a condition, which will retain unfiltered water.
- E. The Contractor shall construct the sedimentation ponds and control devices prior to clearing and grubbing the site to insure complete silt control. When the silt or the debris level is greater than 1 foot above the bottom of the pond, the Contractor shall remove the silt or debris to restore the proper elevation for the bottom of the pond.
- F. The Contractor shall have all erosion and sedimentation control devices in service and operating properly prior to completion and final acceptance of the contract.
- G. All phases of construction must be completed in accordance with the Erosion and Sedimentation Act 12-7-1 et seq., and no water main must be installed on or in close proximity of an abandoned landfill site or any site used for waste disposal.

### 3.2 RESPONSIBILITY

The Contractor shall be solely responsible for insuring that no silt or debris leaves the immediate construction site. Any silt or debris that does leave the immediate site shall be cleaned up and the area disturbed shall be returned to its natural state as directed by the City at the Contractor's expense.

**END OF SECTION VII  
EROSION CONTROL**

## PART B

### BASIS OF DESIGN AND TECHNICAL SPECIFICATIONS

#### VIII. RECORD DRAWING CHECKLIST

##### PART I GENERAL

The following requirements will be applied to each record drawing plan developed for the City of St. Marys. Record drawings shall be prepared in ink by revisions to the original Engineering Plan or a Mylar copy of the original. Record drawings will have the original data lined through and the record drawing data added to the drawing. **At no time will the original data be accepted as the record drawing data.** Each sheet shall be labeled "RECORD DRAWING" in one inch letters and have the appropriate certification block added for signature by a Surveyor or Engineer. The following items shall be required for all record drawings.

##### 1.1 GENERAL RECORD DRAWING REQUIREMENTS

- A. The first sheet of the set will have a vicinity map in the upper right hand corner.
- B. All record drawings for major projects (determined by City Engineer) are required to be 22" x 34". They shall bear the name, address, and telephone number of the firm preparing the drawing and the date the record drawing data is added to the original or mylar via the revision block.
- C. Surveyor's/Engineer's statement (with embossed or wet seal and with original signature on each sheet) shall verify that record drawings reflect the true conditions in the field.
- D. Contractor's statement (with original signature on each sheet) shall verify that all construction specifications and product qualities have been met or exceeded.
- E. "RECORD DRAWING" shall be labeled on each sheet in 1-inch high letters.
- F. Street names shall be on all streets.

- G. If the utility system is to be private (not to be dedicated to local authority), then so state on each sheet.
- H. The location and elevation of the benchmark referenced will be shown on the drawing. If the referenced benchmark is not within the project, then a complete description of location will be provided for future locating.

## 1.2 WATER SYSTEM RECORD DRAWING REQUIREMENTS

- A. Locate valves, fittings, services, and fire hydrants in two directions.
- B. Locations shall be perpendicular to the right-of-way and parallel to the water main.
  - 1. Lot lines may be used to locate water services.
  - 2. Permanent structures that are properly located may also be used.
  - 3. Radial ties are not acceptable.
- C. All horizontal distances shall be shown to the nearest foot. All vertical distances shall be shown to the nearest tenth of a foot.
- D. Show all sizes and types of valves and pipes.
- E. Special detail drawings may be required where installations are not shown on contract drawings for whatever reason or where required for clarity.
- F. Show location and elevations on pipes and fittings where changes in direction occur.
- G. Typical water service installation details with deviations from original plans shall be noted on record drawing drawings.

## 1.3 SANITARY SEWER SYSTEM RECORD DRAWING REQUIREMENTS

- A. All piping, wyes, tees, valves, manholes and special cases shall be located in two directions, in the same manner as water locations.
- B. Horizontal dimensions shall be to the nearest foot. Vertical dimensions shall be to the nearest hundredth of a foot.
- C. Identify runs of gravity (i.e., 300 feet of 8" PVC SDR 35 at 0.4%).

- D. Elevations shall be given for the top of all manhole covers and for all inverts.
- E. Service laterals are to be identified with location of end service or plug (station and offset measured upstream).
- F. Manholes shall be identified by types.

#### 1.4 FORCE MAINS RECORD DRAWING REQUIREMENTS

- A. Locate all valves, fittings, etc. in two directions as above.
- B. Locations of pipe shall be shown at all changes in direction.
- C. Show all sizes and types of valves, fittings, pipe, etc.
- D. Special detail drawings will be required where installations were not as shown on original drawings due to field conditions or where required for clarity.

#### 1.5 PUMP STATION RECORD DRAWING REQUIREMENTS

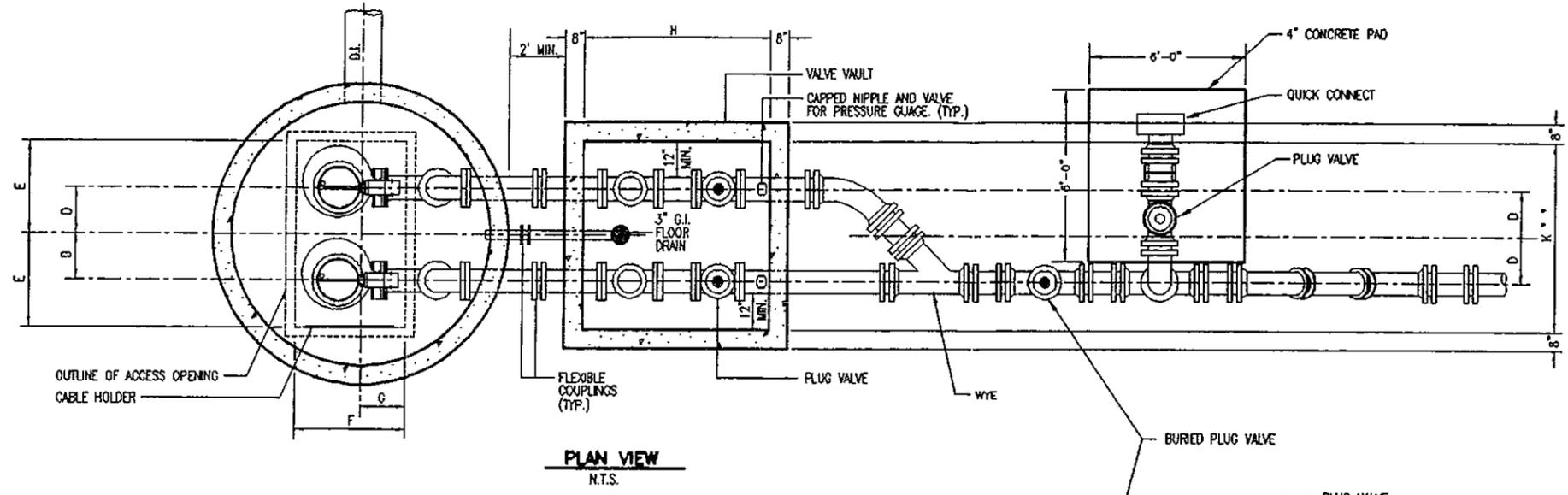
- A. Wetwell size and location shall be shown.
- B. Elevations for top, bottom, inverts, adjacent ground, type, and size of lines and fittings for all lines entering or leaving the wetwell.
- C. All schedules, which show pump, motor and electrical data shall be amended and shall be submitted with wetwell drawings.
- D. All improvements within the pump station boundaries shall be located horizontally and vertically to the nearest tenth of a foot (i.e., valve pit, pump-out, water spigot, wetwell, control panel, bends, fittings, etc.).

#### 1.6 DRAINAGE SYSTEM RECORD DRAWING REQUIREMENTS

- A. All drainage structures shall be located by plus and tie from right-of-way line.
- B. Provide elevations for all drainage structures, top, invert, bottom, etc.
- C. Identify size, material, and slope of all piping.

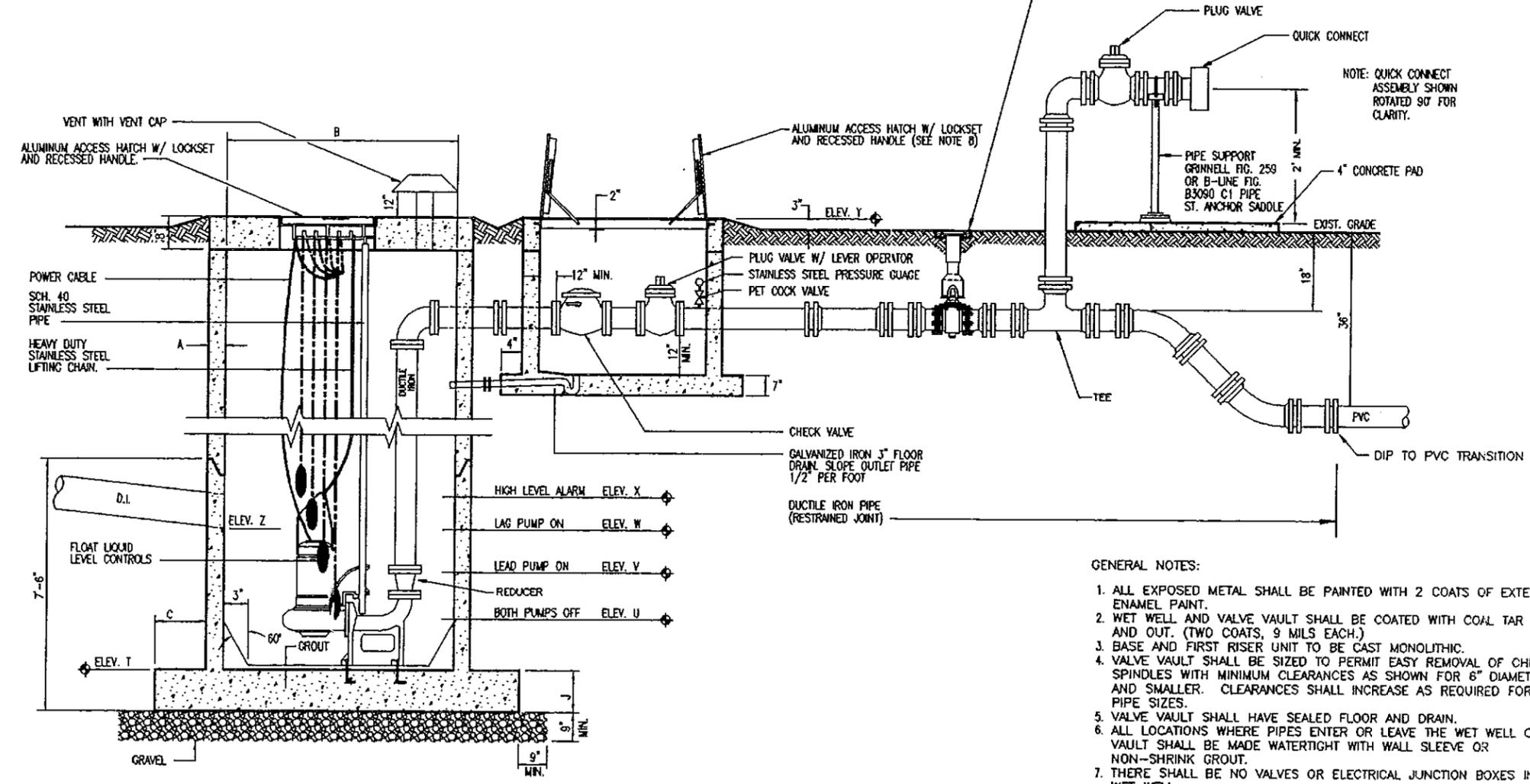
- D. Provide spot elevations, and cross sectional information, as well as slope, on all ditches, canals, etc.
- E. Show all drainage easements and encroachments to those easements on the record drawing drawings.
- F. Record drawing information required on storm water basins shall consist of:
  - 1. Spot elevation on top of bank to confirm minimum design bank elevation;
  - 2. Elevation of water stage at date of record drawing;
  - 3. Elevation of top of control structure, throat, faces, or underdrain;
  - 4. Location of top of bank and existing water edges at time and date of taking elevations;
  - 5. Spot elevation on the bottom of lake if dry or requested by the City Engineer.

**END OF SECTION VIII  
RECORD DRAWING CHECKLIST**



PUMPING STATIONS	DIMENSIONS	ELEV. AT CONST.
DIM A		
DIM B		
DIM C		
DIM D		
DIM E		
DIM F		
DIM G		
DIM H		
DIM J		
DIM K		
ELEV T		
ELEV U		
ELEV V		
ELEV W		
ELEV X		
ELEV Y		
ELEV Z		

\* PER PUMP MANUFACTURERS REQUIREMENT  
NOTE: (X.X) INDICATES ELEVATIONS BELOW DATUM.



**GENERAL NOTES:**

1. ALL EXPOSED METAL SHALL BE PAINTED WITH 2 COATS OF EXTERIOR ENAMEL PAINT.
2. WET WELL AND VALVE VAULT SHALL BE COATED WITH COAL TAR INSIDE AND OUT. (TWO COATS, 9 MILS EACH.)
3. BASE AND FIRST RISER UNIT TO BE CAST MONOLITHIC.
4. VALVE VAULT SHALL BE SIZED TO PERMIT EASY REMOVAL OF CHECK VALVE SPINDLES WITH MINIMUM CLEARANCES AS SHOWN FOR 6" DIAMETER PIPE AND SMALLER. CLEARANCES SHALL INCREASE AS REQUIRED FOR LARGER PIPE SIZES.
5. VALVE VAULT SHALL HAVE SEALED FLOOR AND DRAIN.
6. ALL LOCATIONS WHERE PIPES ENTER OR LEAVE THE WET WELL OR VALVE VAULT SHALL BE MADE WATERTIGHT WITH WALL SLEEVE OR NON-SHRINK GROUT.
7. THERE SHALL BE NO VALVES OR ELECTRICAL JUNCTION BOXES IN WET WELL.
8. WET WELL AND VALVE VAULT COVERS SHALL BE ALUMINUM WITH 316 S.S. HARDWARE AND LOCK BRACKET. SIZE AS REQUIRED BY PUMP MANUFACTURER AND APPROVED BY THE ENGINEER.
9. FLEXIBLE COUPLING SHALL BE SLEEVE TYPE.
10. PUMPS SHALL BE MANUFACTURED BY FLYGT UNLESS OTHERWISE APPROVED BY CITY OF ST. MARYS.
11. OPERATING CONDITIONS SHALL BE REVIEWED AND APPROVED BY CITY OF ST. MARYS.
12. ALL HARDWARE IN WET WELL AND VALVE BOX TO BE STAINLESS STEEL.
13. ALL DIMENSIONS SHALL BE APPROVED BY PUMP MANUFACTURER AND CITY OF ST. MARYS.

**CITY OF ST. MARYS  
CAMDEN COUNTY, GEORGIA  
PUBLIC WORKS MANUAL  
STANDARD LIFT STATION  
LAYOUT**

PROJECT NO.	DATE	REVISION	BY
68-72507			



CAD FILE: 72507.DWG  
 PLOT DATE: 03/03/00  
 PLOT SCALE: 1=1