Butts County, et al. Water & Sewer Authority

STANDARDS FOR DESIGN
AND
CONSTRUCTION SPECIFICATIONS

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TABLE OF CONTENTS

STANDARDS FOR DESIGN

AND

CONSTRUCTION SPECIFICATIONS

FOR

WATER DISTRIBUTION

PREFACE: This Guideline and Standards Book contains information to assist planners and engineers with the design and construction of water facilities. The Butts County, et al. Water & Sewer Authority's intent is to ensure uniformity of design concepts, formats, methodologies, procedures, construction materials, types of equipment and quality of work products. These standards have been produced and adopted to encourage exceptional quality while using current technology for all Butts County, et al. Water & Sewer Authority facilities.

These Guidelines and Standards are not a substitute for good Engineering. Sound judgment must be exercised in all applications to create quality and cost efficient facilities.

Developers must follow the procedures outlined in Section 90-41 of the Water Ordinance for Butts County to obtain approval for any extensions not initiated by the Authority.

I. GENERAL:

A Applicable Standards:

Supply all products and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), National Sanitation Foundation, American National Standards Institution (ANSI), Butts County, et al. Water & Sewer Authority (MWA) Cross Connection Control and Backflow Prevention Policy, or other recognized standards. Latest revisions of all standards are applicable. If requested by the Authority, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.

B. Substitutions:

Whenever a product is identified in the Specifications by reference to manufacturer's or vendor's names, catalog numbers, etc., the Contractor/Developer may freely choose from these referenced products which ones he wishes to provide.

Any item or product other than those so designated shall be considered a substitution. The Contractor/Developer shall obtain prior approval for an approved equal from the Authority for all substitutions.

C. Warranty:

Water distribution systems installed by Contractors/Developers which are accepted by the Authority for ownership, operation and maintenance shall be warranted and guaranteed for a period of one year from the date of final acceptance that the completed system is free from all defects due to faulty products or workmanship, and that the Contractor/Developer shall make such corrections as may be necessary by reason of such defects upon notice by the Authority. Contractors/Developers must provide proof that all bills relating to construction have been paid prior to final acceptance by the Authority.

Contractors/Developers must provide a maintenance bond or letter of credit for 100% of the construction cost of the system for a period of one year to begin on the date of written acceptance by the Authority, or as evidenced by the Authority's signature on a final plat in the case of new developments. Prior to the end of the one-year period, the Authority will perform an additional inspection. A final list of deficiencies will be sent to the Contractor/Developer for immediate correction. Release of bond or letter of credit will not be made until all deficiencies have been corrected.

F. System Ownership:

Any water system tied to or served from a water supply already owned, maintained, or operated by the Authority will become the property of the Authority and will be maintained by the Authority after the specified developer maintenance period and final

acceptance.

G. Qualifications for Installers:

Installers of water system expansions must be a utility contractor licensed in Georgia and approved by the Authority prior to the beginning of any work. This requirement will apply to all subcontractors who install water or sewer utilities. Contractors who perform substandard work may be disallowed from any future work on projects which will become owned by the Authority.

Minimum insurance requirements are as follows:

(1) Worker's Compensation-statutory limits

(2) Contractors General Liability –Comprehensive General Liability (including Premises – Operations; Independent Contractors' Protection; Products and completed Operations; Broad Form Property Damage and Owners Protective Liability):

Bodily Injury:
$1,000,000 Each Occurrence
$1,000,000 Annual Aggregate, Products and Completed Operations

Property Damage:
$1,000,000 Each Occurrence
$1,000,000 Annual Aggregate

Property Damage liability insurance shall provide Explosion, Collapse and Underground coverages where applicable.

Personal Injury, with employment exclusion deleted
$1,000,000 Annual Aggregate

(3) Comprehensive Automobile Liability

Bodily Injury:
$1,000,000 Each Person
$1,000,000 Each Accident

Property Damage:
$1,000,000 Each Occurrence

The Contractor must provide certificate of coverage to Authority to show: 1. Limits as shown, 2. 30-day cancellation notice, and 3.Authority as additional insured.

H. Easements and Rights of Way:

Water distribution systems installed by a Contractor/Developer, which are accepted by the Authority for ownership, operation and maintenance shall be installed in either dedicated road rights of way or utility easements.

Utility easements shall be properly executed and recorded. The easements shall be cleared of all structures, trees, shrubs, brush, logs, upturned stumps and roots of downed trees and similar items.

No permanent structure shall be built on the easement. Non-structural encroachments such as fences, landscaping, etc. can be installed on the permanent easements, but the Owner shall obtain a written permission of the Authority before the installation of such encroachments.

The standard minimum easement width will comply with the Butts County Utility Placement Standards in subdivisions where applicable, and will normally be twenty feet (20') in width otherwise.

II. DESIGN CRITERIA:

A. Instantaneous Water Demand for Residential Areas

Residential water supply for domestic use shall be in accordance with the following table and a minimum pressure of twenty (20) psi.

Total Number of Residences or Units Served	GPM Per Residence Or Unit	Total Number of Residences or Units Served	GPM Per Residence
5	8.0	90	2.1
10	5.0	100	2.0
20	4.3	150	1.6
30	3.8	200	1.3
40	3.4	300	1.2
50	3.0	400	0.9
60	2.7	500	0.8
70	2.5	750	0.6
80	2.2	1,000	0.5

Exceptions may be made when deemed necessary by the Department. Demand for other than residential to be determined for each specific development using published or actual data from reliable sources for the type of facility in question.

B. Minimum Water Main Sizes

Water mains less than 6 inches in diameter will not be allowed within the Authority's water distribution system, except: 1. in the end loop of residential cul de sacs, or 2. on minor extensions where the furthest customer is no more than 500 feet from a fire hydrant **and** there is no potential for extension of the line in the future.

Required sizes may be larger depending on the size required to meet the demand of the proposed development. The Authority may require a larger pipe size if payment is made by the Authority for the difference in cost either in cash or in Capital Recovery Fee equivalents.

C. Valve Placement:

Valves are to be placed at street intersections and on each smaller main as it leaves other larger mains. In commercial, residential and industrial locations, all tees and crosses are all valved on all sides.

Valves shall be placed at both ends of the crossing:

1. Under a multi-lane road, creek and railroad tracks.
2. When crossing a bridge.

Maximum spacing of valves along a water main shall be no more than 2500 feet.

D. Fire Hydrant Location:

All fire hydrants shall be located on the backside of the ditch area, usually one foot within the right-of-way. Fire hydrants, or blow-offs, are also required at the end of all water mains. On new water main construction, the spacing between fire hydrants shall be no more than the distance shown for development types as follows: 500' apart for single family residential developments, multi family residential developments, and mobile home parks; 400' apart for industrial /commercial developments, and 750' apart for existing county roads.

Hydrants shall be furnished with a mechanical joint shoe connection to the spigot of the 6-inch hydrant lead or mj anchor coupling. A fire hydrant tee shall be installed on the main. The fire hydrant valve shall be directly connected to the tee and to the hydrant lead or mj anchor coupling.

Standard depth of bury shall be 3.5 feet. Provide extension section where necessary for vertical installation and in accordance with manufacturer's recommendations.

See Typical Fire Hydrant Setting Detail Drawing.

E. Fire Protection

Minimum flow rate at 25 psi residual pressure by type of development is as follows:

1.One and two family dwellings not exceeding two stories in height (excluding basement) Source: ISO Fire Suppression Rate Schedule Guidelines.

Side Yard Setback	Distance Between Buildings	Needed Fire Flow (gpm)
Greater than 50	>100	500
Greater than 15, but less than or equal to 50	31-100	750
Greater than 5 ft., but less than or equal to 15 ft.	11-30	1000
Less than or equal to 5 ft.	10' or less	1500

2. All other dwelling units and commercial and industrial facilities:

i. Needed fire flow shall be calculated in accordance with the ISO Fire Suppression Rating Schedule Guidelines or other applicable codes in force at the time.

ii. Calculations and analysis shall be presented to verify needed fire flow.

iii. Analysis shall consider the following factors:

Construction factor
Occupancy factor
Exposure factor
Communication factor

3. Maximum fire flow that will be provided on a calculated "needed fire flow" basis by the Authority shall be 1000 gpm.

4. When the calculated needed fire flow is greater than 1000 gpm, the developer shall consider ways to reduce the requirements. Options as outlined in ISO Guideline include:

i. Reduction in building size
ii. Change in construction materials
iii. Change in spacing between buildings
iv. Install approved firewalls
v. Install approved sprinkler system in accordance with NFPA Guidelines
vi. Construct on-site fire protection facilities that would not be owned, operated and maintained by the Department.

5. Higher needed fire flow can be allowed in special districts as designated by the Department in which the water system is designed to provide higher flows. Example would be an industrial corridor or park.
6.

F. Service Laterals and Connections

Service laterals shall be located with a minimum bury equal to that of the main line within the right of way and shallowing to a bury of 18 inches at the water meter location. See Service Connection for New Subdivision Detail Drawing.

Service connection stubs will be required on all new development to be accepted by the Authority for ownership and operation.

G. Temporary Line Ends

A gate valve and a minimum of 36 (2 coupler joints) feet of pipe shall be provided at the end of all lines for phased developments. Lines shall be plugged at the ends and shall have temporary thrust blocking or other approved means of restraint.

III. CONSTRUCTION DRAWINGS:

The term construction drawings shall mean drawings, prints, descriptive literature, test reports, samples, calculations, schedules, material lists and information and items of similar meaning.

A. Submittals Required:

The Contractor/Developer shall furnish to the Authority for initial review: three (3) paper sets of plans and one (1) digital set of plans in .dwg format. The paper drawings shall be submitted on a 24 inch x 36 inch paper and drawn to a one inch to a (50) ft horizontal and (10) ft vertical scale.

These plans must carry the stamp of a registered engineer or other registered professional licensed and authorized in the State of Georgia and duly qualified and capable of designing water systems and computing pressures and flows in said systems.

Additional information, such as special drawings, schedules, descriptive literature for all manufactured or fabricated products, calculations and curves, shall be provided as specifically requested by the Authority.

B. Authority's Review:

All submittals will be reviewed, stamped, and dated by the Authority before they are returned to the Contractor/Developer. This will be in either digital or paper format, as determined by the Authority.

Acceptable submittals will be approved in writing with one paper or digital copy returned to the Contractor/Developer and the remaining copies retained by the Authority.

Submittals requiring corrections before being acceptable will be so noted. Submittals must be resubmitted for final review and approval prior to installation or use.

No part of the approval process is intended to relieve the developer of the responsibility to comply with minimum standards of the Georgia Department of Natural Resources, Georgia Department of Transporation, Butts County Government, or other appropriate agencies.

C. Drawings Used During Construction:

Drawings or other submittals not bearing the Authority's approval notation cannot be issued to subcontractors or utilized for construction purposes. The Contractor/Developer will maintain at the job site a complete set of construction drawings bearing the Authority's approval.

D. “As-Built” Drawings:

The Contractor/Developer must submit one "red-lined" set of construction plans after the completion of construction for the Authority's preparation of final "as-built drawings". In lieu of "red-lined" construction plans, the Contractor/Developer is encouraged to provide the plans revised to "as-built" status in digital .dwg format.

The "red-lined" or "as-built" plans shall include the following information for the water portion of a project: exact location of water mains, fire hydrants, valves, bends, width of easements, and any pertinent information. All water mains (type, size) including gate valves, hydrants, blow offs, water meters, curb stops, shall be located and tied to Georgia State Plane Coordinates.

IV. INSPECTION OF WORK

A. Pre-construction Conference Required

No work can begin on any water infrastructure project until a pre-construction conference has been held with appropriate Authority staff. At this meeting the Contractor/Developer will agree upon a schedule for coordination of construction and inspections and will document that the Authority's requirements for construction will be followed.

B. Inspection During Installation

Any water installation project will be subject to regular inspection during construction to insure compliance with approved construction plans and specifications. The Authority's designated inspector will have the right to stop work in progress that being carried out in accordance to approved plans and specifications. The installation must be disinfected and tested as per the requirements laid out in these standards. A final construction inspection will be made upon completion of all work. Any deficiencies must be corrected prior to initiation of water service to the project.

V. MATERIALS:

All materials used which come into contact with drinking water during its distribution shall not adversely affect drinking water quality and public health and must be certified for conformance with American National Standards Institute/National Sanitation Foundation Standard 61 (ANSI/NSF Standard 61). Any pipe, solder, or flux which is used in the installation or repair of the water distribution system shall be lead free with not more than 8.0% lead in pipes and fittings and not more than 0.2% lead in solders and flux.

All pipe, fittings, valves, tapping sleeves, hydrants and all other materials required for completion of the work must comply with the following:

A. Pipe:

Water main materials may be PVC or Ductile Iron in sizes up to 12 inches. Ductile iron shall be required in all sizes larger than 12 inches and in the following locations:

a. Over/under all cross drains
b. Under all stream crossings
c. Under all pavement when not in steel casing
d. At all locations specified by the Authority

Laying lengths may be either 18 or 20 foot lengths. Joints shall be push-on type for pipe and standard mechanical or flanged joints for fittings. Push-on and mechanical joints shall conform to ANSI/AWWA C111/A21.11. Restrained joint pipe (RJP) shall be either the bolted joint type, or modified push-on type with joint restrained using ductile iron components.

Acceptance will be on the basis of the Authority's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with applicable standards.

Water mains less than 6 inches in diameter will not be allowed within the Butts County, et al. Water & Sewer Authority's water distribution system, except: 1. in residential cul de sacs, or 2. on minor extensions where the furthest customer is no more than 500 feet from a fire hydrant **and** there is no potential for extension of the line in the future.

(1) Ductile Iron Pipe (DIP)

Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51 (latest) with single rubber gasket joints in accordance with AWWA C111 (lastest). Pipe shall be Pressure Class 350 minimum. Pipe and fittings shall be cement lined in accordance with ANSI/AWWA - C104/A21.4. Fittings shall conform to ANSI/AWWA C110/A21.0 or ANSI/AWWA C153/A21.53 with rated working pressure of 350 psi. Pipe and fittings shall be furnished with a bituminous outside coating.

(2) Polyvinyl Chloride (PVC) Pipe

PVC Pipe in sizes from 6-12 inches may be “Ultra Blue” Molecular Oriented Polyvinyl Chloride (PVCO) meeting the requirements of AWWA C909C909-02: Pressure Class 150, (preferred); or C900 PVC Class 150 SDR 18.

For 2 inch PVC pipe the standards shall be ASTM 2241, SDR 21, 200 psi.

B. Gate Valves (GV):

(1) Valves (2”-12”) shall be mechanical joint end, resilient seated, ductile iron body, bronze mounted, non-rising stem with O-ring seals and open left. The valve shall be designed for a water working pressure of 200 psi and a test pressure of 400 psi, and shall be designed for installing in a vertical position. This valve shall conform to the lateral Revision of AWWA C-509, for "Ordinary Water Works Service", and shall be American Series 2500 or an approved equal from Mueller or M&H/Clow.

(2) Valves (14" and larger) shall be mechanical joint end, resilient seated, ductile iron body, bronze mounted, non-rising stem with O-ring stem seals and open left. The valve shall be designed for water working pressure of 150 psi and a test pressure of 300 psi. The valve shall be designed for horizontal installation and equipped with bevel gearing, gear case, tracks, rollers, scrapers and by-pass valves. The valve shall conform to AWWA standard specification C-509, latest revision for "Ordinary Water Works Service" and shall American Series 2500, or an approved equal from Mueller or M&H/Clow.

(3) Valve Boxes (VB):

All valves shall be equipped with valve boxes. Valve boxes shall be two-piece heavy roadway type with a 5 ¼” shaft. The valve boxes shall be adjustable to 6" up or down from the nominal required cover over the pipe. Provide a 4 inch thick, 24 inch square concrete pad around the valve box. This must be placed at grade.

(4) Tapping Sleeves and Valves (TS &V)

All tapping sleeves shall be Fabricated Stainless Steel and shall conform to the following specifications: Body: 18-8 type 304 s.s. flange CF 8 cast stainless steel equivalent to 18-8 type 304 s.s. with ANSI 150 lb drilling; recessed for tapping valve per MSS-SP-60. Bolts: Type 304 s.s. Branch outlet: Heavy s.s. pipe. Gasket: Full circumferential gasket compounded for use with water, salt solutions, mild acids, bases and sewage. Approved models include JCM 432 (all stainless) and JCM 462 (stainless with carbon steel flange), or other approved equal.

Tapping valves shall be gate valves furnished in accordance with specifications shown above with flanged connection to the tapping sleeve and mj connection to the branch pipe.

(5) Tapping Saddles

PVC Pipe

Sizes less than 10": Bronze single band, Ford S90, Mueller H-13000, McDonald 3801 only.

Sizes 10" & up: Stainless steel single band, Smith-Blair 317, or approved equal.

Ductile Iron Pipe

Double strap, Smith-Blair 313, or approved equal

OR

Double Band, Smith-Blair 317, or approved equal.

C. Backflow Preventers:

(1) General:

Backflow preventers shall be selected on the basis of impurities involved and the type of cross connection and shall be approved by the Butts County, et al. Water & Sewer Authority.

(2) Approval of Devices:

The backflow preventers shall be certified by the American Society of Sanitary Engineers, as having been tested by a nationally recognized laboratory in accordance with applicable ASSE Standards. Each device shall bear the ASSE seal of approval and shall be individually factory tested.

(3) Specifications and Installation of Devices:

(a) Dual check backflow preventers (3/4 inch and 1 inch) are allowed for residential and other small, non-hazardous applications. These shall have bronze body with two compact checks, a meter union, and "o" ring seals shall be installed at the downstream side of residential water meters to prevent backflow of polluted water into potable water supply. The device shall be installed within the service meter box below grade. A positive shut-off valve and a union shall be installed on downstream side of the device, also within the meter box.

The device shall meet or exceed the requirements of ANSI/ASSE.
Approved models include Watts 7 series, Combraco 40-3S5-4A, Ford

HHS-31-323, and Mueller H 14212.

Backflow preventers in this size range are available for purchase from the Authority at the time of tap or meter purchase by the consumer.

(b) Double check valve assembly backflow preventer (1 inch, 1 ½ inch and 2 inch) are required for applications where non-toxic foreign materials may enter system. (Examples include restaurants and commercial swimming pools.) Strainer may be required. These shall have brass bodies with replaceable seats, ball valve test cocks, and bronze strainers. The device shall be installed directly on the downstream side of all residential water meters to prevent backflow of polluted water into potable water supply. This device shall not be buried, but may be installed in a the meter vault, or an adjacent pit, below grade, provided ball valve test cocks fitted with brass plugs are used, it should also include a positive shutoff valve installed on the downstream side of the device, and shall be equipped with three (3) leak proof test cocks.

The device shall meet or exceed the requirements of ASSE, AWWA or USCFCC Manual for Cross Connection Control. Approved models include Watts 709, Watts 007, Hersey No. 2, or equal.

(c) Double check valve backflow preventer assembly (2 ½ inches, 3 inches, 4 inches, 6 inches, 8 inches and 10 inches) are required for applications where non-toxic foreign materials may enter system. (Examples include restaurants and commercial swimming pools.) Strainer may be required. These shall have bronze bodies (2 ½" and 3 inches) epoxy coated. Cast iron or ductile iron (4 to 10 inches) body bronze seats, and stainless steel internal parts. The device shall be installed on the downstream side of all water meters to prevent backflow or polluted water to potable water supply. This device shall not be buried, but may be installed in a the meter vault, or an adjacent pit, below grade, provided ball valve test cocks fitted with brass plugs are used, it should also include a positive shutoff valve installed on the downstream side of the device, and shall be equipped with three (3) leak proof test cocks.

The device shall meet or exceed the requirements of ASSE, AWWA or USCFCC Manual of cross connection control.

(d) Reduced Pressure Zone Backflow Preventer (RPZ):

The RPZ backflow preventer shall be installed at the property line for a service that is considered as "hazardous" to prevent the backsiphonage and back pressure backflow of contaminated water into the potable water supply. (Examples include processing plants, laboratories, car washes, and gas stations.)

Shall have bronze body (3/4 inch through 2 inches) of epoxy coated cast iron body (2 inches and above), stainless steel springs. This device shall be installed in a vault, above ground with positive drainage. The device shall consist of a pressure differential valve located in a zone between two tightly closing shut off valve (resilient seated) before and after the device, test cocks, protective strainer upstream of No. 1 Gate Valve. The device shall meet or exceed the requirements of AWWA or ASSE.

(f) Reduced Pressure Zone Detector Double Check Valve Assembly:

A reduced pressure principle detector double check valve assembly shall be used to prevent the reverse flow of fire protection system substances (glycerin, wetting agents, water of non-potable quality) from being pumped or siphoned into the potable water line.
This device can detect leaks, and provides a detection point for unauthorized use.

The unit shall have fused epoxy coated cast iron body, removable bronze sheets, stainless steel internal parts, maximum flow at low pressure drop with a 5/8" x 3/4" record all by-pass meter.

The unit shall be a complete assembly, including UL listed OS & Y shut-off valves with FM approval, including an auxiliary line consisting of an approved backflow preventer and a water meter. The device shall meet the basic requirements of AWWA or USCFCC Manual for cross connection control.

D. Corporation Stops:

Corporation stops shall be ball type made of bronze conforming to ASTM B61 or B62; and shall be rated at 300 psi. Ends shall be grip joint. Threaded ends for inlet and outlet of corporation stops shall conform to AWWA C800; coupling shall conform to ANSI B16.26. Approved models include Mueller H-15008, Ford F1000 or AY McDonald 4701.

E. Fire Hydrants (FH):

All fire hydrants shall conform to the requirements of AWWA C502 for 150 psi working pressure. Hydrants shall be the compression type, closing with line pressure. The valve opening shall not be less than 4 1/2 inches. All valves shall open left.

In the event of a traffic accident, the hydrant barrel shall break away from the standpipe at a point above grade and in a manner which will prevent damage to the barrel and stem, preclude opening of the valve, and permit rapid and inexpensive restoration without digging or cutting off the water.

The means for attaching the barrel to the standpipe shall permit facing the hydrant a

minimum of eight different directions.

All working parts, including the seat ring shall be removable through the top without disturbing the barrel of the hydrant. The operating nut shall match those on the existing hydrants. The operating threads shall be totally enclosed in an operating chamber separated from the hydrant barrel by a rubber o-ring stem seal and lubricated by a grease or oil reservoir. A stop nut shall be positioned in the top operating mechanism so that the valve cannot contact the bottom of the shoe when fully open.

Hydrant shall be a non-freezing design and provided with a simple, positive and automatic drain which shall be fully closed whenever the main valve is opened.

All outside surfaces of the barrel above grade shall be factory painted with Koppers Glamortex 501 enamel, or approved equal, in white color.

Hydrants shall be Mueller Super Centurion 250 (4 ½"), Dresser M & H 129-01 (4 ½") l, American Flow Control 73-1 (4 ½") , or AVK 2780 (4 ½"); factory painted white.

See Typical Fire Hydrant Setting Detail Drawing.

VI. HANDLING MATERIALS:

A. Unloading:

Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification.

B. Handling:

Handle pipe, fittings, valves and accessories carefully to prevent shock or damage. Handle pipe by rolling on skids, forklift, or front loader. Do not use material damaged in handling. Damaged material will not be accepted for installation, and shall be removed and replaced with acceptable materials at the contractors' expense.

C. Distribution:

Distribute and place pipe and materials without interference to traffic. Do not string pipe more than 1,000 feet beyond the area where pipe is being laid. Do not obstruct drainage ditches.

D. Storage:

Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.

VII. EXCAVATION:

Installation of Ductile-Iron Water Mains and their Appurtenances shall be per AWWA C600 (Latest Edition) and Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fitting for Water shall be per AWWA C605 (Latest Edition), if not otherwise stated.

A. GENERAL

Excavate all materials encountered, including rock, and dispose of excess excavated material not required for backfilling. Perform all excavation in accordance with applicable local, state, and federal regulations, including Occupational Safety and Health Act of 1970 (PL 91-596), as amended.

Pipe trenches shall be straight and true to grade and in the location shown on the plans. The bottom of the trenches shall be hand dressed so that the pipe has an even bearing on solid undisturbed earth throughout its entire length between bell, or coupling holes.

All pipes shall be laid straight, true to line, and grade. Bell and coupling holes shall be dug in the trench and the pipe shall have a continuous bearing with the trench bottom between bell or coupling holes. No shimming or blocking up of the pipe shall be allowed. When the work is not going on, all pipe openings shall be securely closed by the insertion of the proper size plug so that dirt and debris will not be washed into the pipe in case of rain.

At changes in direction, at tees and caps, all pipe shall be securely blocked with concrete. The concrete shall be Class "B" having a compressive strength of not less than 3,000 psi at 28 days. See Detail drawings 02666-7 & 02666-8.

In making joints the spigot end of the pipe and the inside of the bell shall be thoroughly cleaned and the gasket inspected to see that it is properly placed; lubricant shall be applied to the spigot end of the pipe and it shall be inserted into the bell of the adjoining pipe to the stop mark on the pipe.

All trenches shall be of sufficient width to provide ample working space on each side of the pipe for maintaining a straight line of pipe, and bell or coupling hole of sufficient size to allow making perfect joints shall be provided at all joints.

At points of interference with storm sewers and cross drains, pipe will be run under the conflicting utility if the minimum cover cannot be maintained by going over the top of the pipe.

In laying pipe across watercourses, railroad crossings, or depressions of any kind, the minimum depth here specified shall be maintained at the bottom of the depression.

All excavated material shall be so placed so as not to interfere with public travel on the streets and highways along which the lines are laid.

All water mains shall be laid with a minimum of 4 feet of cover unless otherwise approved by the Department. In no case shall mains be laid with less than 24" cover. All service lines shall be laid with a minimum of 18" cover including through existing or proposed ditch sections.

B. ROCK

All material shall be considered as rock, which cannot be excavated except by drilling, blasting, or wedging. It shall consist of undercomposed stone in solid ledges or of boulders of not less than one-half cubic yard. It shall be excavated to a depth of six inches below grade line, and the bottom of the trench brought back to grade by a suitable filling of selected earth thoroughly tamped in place.

Blasting must be performed by a certified and bonded contractor. Conduct blasting operations in accordance with all existing ordinances and regulations. Protect all structures from the effects of the blast. Repair any resulting damage.

Do not use excavated rock as backfill material. Dispose of rock which is surplus or not suitable for use as rip rap.

Rock excavation by blasting shall be at least 100 feet in advance of pipe laying.

Before blasting, the Contractor shall cover the excavation with mats in such manner as to protect the adjacent property Owners from damage. The Contractor will be held responsible for all damage done.

C. WATER AND SEWER LINE SEPARATION

Separation shall comply with the provisions as outlined in the 1990 Edition of the Recommended Standards for Wastewater Facilities; "10 State Standards".

1. Horizontal Separation

Sewers shall be laid at least 10 feet horizontally from any existing or proposed water main. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten-foot separation, the Engineer may allow deviation on a case-by-case basis. Such deviation may allow installation of the sewer closer to a water main, provided that the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sewer and at an elevation so the bottom of the water main is at least 18 inches above the top of the sewer.

2. Crossings

Sewers crossing water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. The crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided

for the sewer to prevent damage to the water main.

3. Special Conditions

When it is impossible to obtain proper vertical separation, the sewer shall be constructed with one joint of ductile iron pipe centered over the sanitary sewer, and shall be pressure tested to assure water tightness prior to backfilling. Pipe may be required to be encased in concrete.

VIII. CONSTRUCTION ALONG HIGHWAY, STREETS AND ROADWAY:

Install pipe lines and accessories along highways, streets, roadways in accordance with the applicable regulations of the Georgia Department of Transportation with reference to construction operations, safety, traffic control, road maintenance and repair.

A. Protection of Traffic:

Provide and maintain suitable signs, barricades and lights for protection of traffic. Replace all highway signs removed for construction as soon as possible. Do not close or block any highway, street, or roadway without first obtaining permission from the proper authorities.

B. Construction Operations:

Perform all work along highways, streets and roadways to least interfere with traffic.

(1) Stripping:

Where the pipe line is laid along road shoulders, strip and stockpile all sod, topsoil and other material suitable for shoulder restoration.

(2) Trenching, Laying and Backfilling:

Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.

(3) Shaping:

Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod and any other materials removed from shoulders.

(4) Saw cut all driveway, paved parking areas, paved roadways and paved sidewalks.

C. Excavated Materials:

Do not place excavated material along highways, streets and roadways in a manner which obstructs traffic. Sweep all scattered excavated material off of the pavement.

D. Drainage Structures:

Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material and free to drain at all times.

E. Maintaining Highways, Streets, Roadways and Driveways:

Maintain streets, highways and roadways in suitable condition for movement of traffic until completion and final acceptance of the work. Use steel running plate to maintain traffic until pavement replacement is completed.

Repair all driveways that are cut or damaged immediately. Maintain them in a suitable condition for use until completion and final acceptance of the work.

F. Existing Underground Utilities and Obstruction:

It is the responsibility of the Contractor/Developer to locate all existing utilities along the path of his construction. Drawings shall indicate underground utilities or obstructions that are known to exist. Where these or unforeseen underground utilities are encountered, the location and alignment of the water main may be changed, upon written approval of the Authority, to avoid interference. It is the responsibility of the Contractor to contact the Utilities Protection Centers, Inc. ("Call Before You Dig" - 1-800-282-7411) prior to the start of any excavation or construction.

IX. LAYING AND JOINTING PIPE AND FITTINGS:

Lay all pipe fittings to accurately conform to the lines and grades approved by the Authority as follows:

A. Handling:

Use suitable tools and equipment to handle and lay pipe, preventing damage to the pipe and the cement lining. Examine all pipes carefully for cracks and other defects as it is laid. Do not lay pipe or other materials which are known to be defective. Lower pipe, fittings, valves and accessories into the trench by suitable means. Do not drop or dump pipe or accessories into the trench.

Clean pipe and fittings thoroughly before laying. Keep the pipe line clean until final acceptance.

If any pipe or other material is discovered to be defective or damaged after being laid, remove and replace it.

B. Alignment and Gradient:

Lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. Do not deflect any joint more than 2/3 the maximum deflection recommended by the manufacturer.

Maintain a transit and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.

C. Expediting of Work:

Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying and jointing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe, close the end with a mechanical joint plug.

D. Laying Pipe in Trenches:

Lay the pipe with solid bearing throughout its length.

(1) Earth Trenches:

Grade the bottom of the trench to a true line. Lay the pipe in clean bedding

material, free of rock, organics and other unsuitable materials.

(2) Rock Trenches:

Bed the pipe in at least six inches of granular bedding material. Backfill with the same material to at least six inches above the pipe.

(3) Wet Trenches:

Do not lay pipe in water. Provide dewatering equipment to maintain a ground water level below the bottom of the pipe while pipe is being laid.

(4) Pipe Joints:

Joints shall be made in accordance with the manufacturer's recommendations.

(5) Cutting:

Cut ductile iron pipe using an abrasive wheel saw. Remove all burrs and smooth the end before jointing.

F. Connections to Existing Pipelines:

Before laying pipe, the Contractor/Developer shall locate the points of connection to existing pipe lines and uncover as necessary for the Authority or an approved contractor to confirm the nature of the connection to be made. The Authority or Contractor shall furnish materials and make the connection to all existing pipe lines. The Contractor/Developer will be charged with a connection fee to cover the expenses of the Authority, only if Authority makes tap.

X. THRUST RESTRAINT:

Provide restraint at all points where hydraulic thrust may develop.

A. Retainer Glands:

Install retainer glands on all fittings, valves and related piping as designated by the Authority. Retainer glands shall be ACIPCO A 90857 or an approved equal.

B. Threaded Rod:

Zinc plated 3/4 inch all threaded rods with USS course thread shall be used where it is required to restrain joints.

C. Concrete Blocking:

Provide concrete blocking for all other bends, tees, valves, and other points where thrust may develop, or as directed by the Engineer. Retainer glands, including mega-lug retainers, may be used in lieu of concrete blocking, as approved by the Engineer. See Thrust Block Detail Drawing.

Concrete for blocking shall have a compressive strength of not less than 3000 psi, with not less than 5.5 bags of cement per cubic yard and a slump between 3 and 5 inches. For job mixed concrete, submit the concrete mix design for approval by the Authority. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C94. Reinforcing steel shall conform to the requirements of ASTM A 615, grade 40.

Form and pour concrete blocking at fittings as shown on the Typical Blocking Detail in Appendix A and as directed by the Authority. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation

D. Restrained Joints:

Restrained joints type pipe such as American Lock Ring, or Lok-Fast, or an approval equal may be used in accordance with manufacturer's recommendation.

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XI. BACKFILLING:

Backfill and compact to prevent settlement and displacement of the pipe.

A. Material:

Backfill trenches with earth only. Do not use rock excavated from trenches in the backfill. If necessary, furnish suitable earth material to backfill the trench.

B. Backfill:

Place backfill material in the bottom of the trench and up to two feet above the pipe in 6-inch layers. Compact with two hand operated air hammers with tamping feet, one on each side of the pipe, operated simultaneously.

Backfill above, shall be compacted as follows:

(1) In 6-inch layers, if using light power tamping equipment, such as a "jumping jack".

(2) In two foot layers, if using heavy tamping equipment, such as hammer with tamping feet.

C. Backfill Under Roads:

Backfill under roads shall be compacted to 95% up to top 2' below grade and 98% for top of the maximum dry density as determined by the Standard Proctor Compaction Test (ASTM D698).

D. Settlement:

If trenches settle, refill and grade the surface to conform to the adjacent surface.

E. Compaction:

The backfill in all the trenches shall be compacted as stated herein: shall be 100 percent of the maximum dry-density as determined by Standard Proctor Compaction Test (ASTM D698) for the base material under the pavement. The top (24) inches of backfill shall be compacted to a minimum of (98) percent of the maximum dry density. It shall be 95% outside the pavement but within the road right-of-way and 85% outside road right-of-way. The testing agency shall run as a minimum (1) Proctor for each type of soil encountered or could use "Family of Curves Method - GHD - 67" as approved and utilized by the Georgia Department of Transportation and the U. S. Army Corps of Engineers.

During the backfilling, loose lifts shall not exceed (8) inches in thickness. Field density determination (compaction tests) should be made a minimum of one (1) test per 250 to 300 linear feet per two (2) compacted vertical feet. This is a minimum requirement for all

the areas. Additional tests may be required for special conditions such as in streets and other critical areas as desired by the Engineer. The range of moisture contents should be maintained within plus or minus three (3) percent of the optimum moisture content as determined in accordance with GHD - 67.

XII. REMOVING AND REPLACING PAVEMENT:

A. Removing Pavement: Remove existing pavement as necessary for installing the pipeline and appurtenances.

(1) Marking:

Before removing any pavement, mark the pavement neatly paralleling pipe lines and exiting street lines. Space the marks the width of the trench.

(2) Breaking:

Break asphalt pavement along the marks using jack hammers or other suitable tools. Break concrete pavement along the marks by use of jack hammers or by scoring with a rotary saw and breaking below the score by the use of jack hammers or other suitable tools.

(3) Machine Pulling:

Do not pull pavement with machines until completely broken and separated from pavement to remain.

(4) Damage to Adjacent Pavement:

Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.

(5) Sidewalk:

Remove and replace sidewalks for their full width.

(6) Curbs:

Remove and replace or tunnel under any curb encountered.

B. Replacing Pavement:

Upon completion of backfilling and consolidation of the backfill, arrange to have the compaction tested by an independent testing laboratory approved by the Authority. After compaction testing has been satisfactorily completed, replace all pavements, sidewalks and curbs removed.

(1) Materials:

Place material for pavement replacement to dimensions shown on the Drawings. Typical replacement details are included in Appendix A.

(a) Graded Aggregate Sub-Base:

Furnish graded aggregate sub-base in two sizes of such gradation that when combined in approximately equal quantities, the resulting mixture is well graded from coarse to fine, meeting the gradation requirements of Section 816 of the State Highway Department of Georgia Standard Specifications.

(b) Black Base:

The base for all paved roadways shall conform to the requirements of the Georgia State Highway Department Specifications for the Black Base (Hot Mix). Use a Pug Mill Rotary Drum type mixer with minimum capacity of not less than 50 tons per hour for asphalt production. Apply and compact the base in two courses by asphalt spreader equipment of design and operation approved by the Authority. After compaction, the black base shall be smooth and true to established profiles and Sections.

(c) Surface Course:

The surface course for all pavement, including Paint or tack coat when required by the Authority, shall conform to the requirements of the Georgia State Highway Department Specifications for Asphaltic Concrete, Section 400, Type "E" (Modified Top). Produce surface course in an asphalt plant of the same type as noted above for Black Base. Apply and compact the surface course in a manner approved by the Authority. Immediately correct any high, low or defective areas by cutting out the course, replacing with fresh hot mix, and immediately compacting to conform and thoroughly bond to the surrounding area.

(d) Concrete:

Provide concrete and reinforcing for concrete pavement in accordance with the requirements of Georgia State Highway Department Specifications for Portland Concrete Pavement, Section 430.

(2) Supervision and Approval:

Pavement restoration shall meet the requirements of the regulatory agency responsible for the pavement. Obtain agency approval of pavement restorations before requesting final inspection. Obtain the Authority's approval for restoration of pavement such as private roads and drives.

Complete pavement restoration as soon as possible after backfilling.

(3) Replacement:

Prior to replacing pavement, make a final cut in concrete pavement nine inches back from the edge of damaged pavement. Make the cut using a rotary saw. Remove asphalt pavement nine inches back from the edge of damaged pavement using jack hammers or other suitable tools.

Replace all street and roadway pavement as shown on the Drawings. Replace driveways, sidewalks, and curbs with the same material and to the same dimensions as existing.

(4) Failure of Pavement:

Should any pavement restoration or repairs fail or settle during the life of the contract, including the bonded and warranty period, promptly restore or repair defects.

XIII. BORING:

Furnish and install pipe casing and install the pipe line therein in accordance with the drawings and the following specifications:

A. General:

Where groundwater is encountered, operate well points or drainage systems in the vicinity of the casing to prevent the accumulation of ground water in the casing.

B. Pipe Casing:

Furnish all material and equipment and perform all labor required to install steel pipe casing at locations indicated on the Drawings and as specified.

(1) Boring:

The steel casing pipe shall be Schedule 30 steel pipe manufactured from steel plate having minimum yield strength of 35,000 PSI. The steel plate shall also meet the chemical requirements of ASTM A36. Size and thickness shall be as follows:

UNDER RAILROADS

Pipe Dia. In.	Casing Dia In.	Wall Thickness In.
6	14	0.250
8	18	0.250
10	20	0.281
12	22	0.312
14	24	0.344
16	30	0.406
18	30	0.406
20	32	0.469
24	36	0.469
30	42	0.500

UNDER HIGHWAYS

Pipe Dia In.	Casing Dia In.	Wall Thickness In.
6	12	0.250
8	16	0.250
10	16	0.250
12	18	0.250
14	22	0.250
16	24	0.250
18	30	0.312
20	30	0.312
24	36	0.375
30	42	0.375

C. Installation of Pipe in Casing:

After installation of the casing is complete, install the pipe line by a method which has received prior approval of the Authority. The carrier pipe shall be supported at each joint or as recommended by the manufacturer. All stainless steel casing spacers as manufactured by Cascade or approved equivalent shall be used.

XIV. STREAM AND DITCH CROSSING:

At all points where banks of steams or drainage ditches are disturbed by excavation or where natural vegetation is removed, carefully compact backfill and place rip rap or an approved erosion control fabric where applicable to prevent subsequent settlement and erosion.

This requirement applies equally to construction alongside a stream or drainage ditch as well as crossing stream or drainage ditch. Place rip rap a distance of not less than 10 feet upstream and 10 feet downstream from any disturbed area. Extend rip rap from 1 foot below streambed to top of bank. Place to conform with the natural slope of the stream bank. Use only one method, either (a) or (b), throughout the job.

A. Stone Rip Rap:

Use sound, tough, durable stones resistant to the action of air and water. Slabby or shaley pieces will not be acceptable. Specific gravity shall be 2.0 or higher.

Maximum weight of individual stones shall be 50 pounds. The maximum allowable dimension for an individual stone is 24 inches. The minimum allowable dimension for an individual stone is 6 inches. At least 50% of the stones shall have a minimum dimension of 12 inches. A geotextile fabric shall be placed over the entire ditch and extend outward on either side a minimum of 10 feet.

Rip rap shall be placed on a (6) inch layer of soil, crushed stone, or sand overlaying the fabric. Rip rap shall be placed with its top elevation conforming with the finished grade or the natural existing slope of the stream bank and stream bottom. The stone shall be dropped no more than three feet during construction.

Embed stone rip rap by hand so as to form a compact layer at least 12 inches thick. Place rip rap in such a way that the smaller stones are not segregated but evenly distributed. Place chinking stones in the crevices between the larger stones so that a dense, well graded mass is produced.

B. Sand-Cement Bag Rip Rap:

Use cement sacks or burlap bags having a capacity of from 1 to 2 cubic feet. Do not use bags previously used for sugar or chemicals. Fill bags with a mixture of one part Portland Cement to five parts sand.

Embed bags by hand to form a compact layer at least 12 inches thick. Place with overlapping joints. The finished surface shall not deviate from that specified by more than 3 inches at any point.

C. When the depth of cover on the pipe at the bottom of the creek is less than 24 inches, encase the pipe with concrete. The width and depth shall be a minimum of pipe OD+16" or as directed by the Engineer.

XV. TESTING:

When a length of pipe approved by the Authority is ready for testing, fill the line with water, bleed out all air and make a leakage test.

A. Preparation:

Provide a test pump, an accurate water meter, and all other accessories required to make the test. Provide a corporation stop at each high point on the pipe to bleed off air. Provide and remove all temporary bulkheads, plugs, and flanges required to perform the pressure test.

B. Test Pressure and Leakage: (According to AWWA C600)

Test the pipeline at 200 psi measured at the highest point. Leakage shall not exceed 0.12 gallons per hour per inch diameter per thousand feet. Test for a minimum of two hours.

The gate valve when tested at the rated working pressure or at a minimum of 200 psi shall show no leakage through the metal or at flange joints.

If leaks are detected, locate, repair and retest. If results are not totally satisfactory, the Authority may require additional testing.

C. Existing Valves:

Do not operate valves in the existing system without the specific authorization and direct supervision of the Authority.

D. Tapping Sleeve and Tapping Valves:

All tapping sleeves and tapping valves shall be air tested to a pressure of 200 psi prior to making the tap into an existing main. Any leaks shall be detected by applying a soap solution to all sealing surfaces. The seal and the valve shall be adjusted and retested as necessary until no leaks are observed. After the sleeve and valve have been tested satisfactorily, the existing main can be tapped. All testing and tapping shall be done in the presence of a representative of the Authority.

XVI. DISINFECTION OF WATER MAINS:

All new water mains shall be disinfected before they are placed in service. All water mains taken out of service for inspection, repair or other activities that might lead to contamination of water shall be disinfected before they are returned to service. Disinfection of the new mains and the disposal of the heavily chlorinated water, following the disinfection, shall be accomplished in accordance with the latest edition of AWWA Standard C651.

After pressure testing, and all necessary repairs have been made, the lines shall be flushed clean, and clean water containing not less than 25 parts per million of chlorine shall be placed in the lines and allowed to stand for 24 hours. The heavily chlorinated water must not be disposed in a manner that will harm the environment. The "tablet method" of disinfection, which consists of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water when installation is complete, is not allowed.

When water lines are repaired they may be disinfected as indicated above, or for minor jobs, all exposed infrastructure will be swabbed with a solution of water containing not less than 25 parts per million of chlorine.

DISINFECTION TABULATION CHART

SIZE OF PIPE	GALLONS/100 LF	DRY OUNCES 70% HTH TO ADD PER 100 LF PIPE
4"	71	½
6"	160	1
8"	289	1-1/2
10"	446	2-1/2
12"	639	3-1/2
16"	1126	6
18"	1425	8

The chlorine shall be introduced in such manner as to get an even distribution over the whole section of the line being disinfected. After 24 hours, the lines shall be flushed until the chlorine content is not more than 2.0 parts per million and samples taken at various points along the line as directed by the Authority. Provisions shall be made to de-chlorinate or to contain the highly chlorinated water that is to be flushed from the main. Highly chlorinated water shall not be discharged to State waters including highway or roadway ditches.

These samples shall be delivered to an EPD approved laboratory, and if the samples show evidence of total coliform contamination upon testing, the above procedure of disinfections shall be repeated until approved samples are obtained. No connections shall be made to the existing system until all of the samples have been tested approved and accepted by the Authority Manager. Provide copies of all test results including the laboratory chain of custody forms properly executed.

ACRONYMS

Abbreviation	Meaning
ACIPCO	American Cast Iron Pipe Company
ANSI	American National Standards Institute
ASSE	American Society of Sanitary Engineers
ASSHTO	American Association of State Highway
ASTM	American Society for Testing & Materials
AWS	American Welding Society
AWWA	American Water Works Association
BCWSA	Butts County, et al. Water & Sewer Authority
CF	Cubic Feet
CFM	Cubic Feet Per Minute
CTU	Central Terminal Unit
DDC	Double Detector Check Valve
DIA	Diameter
DIP	Ductile Iron Pipe
DOT	Department of Transportation
FH	Fire Hydrant
FM	Force Main
GV	Gate Valve
HP	Horse Power
HZ	Hertz
I/C	Integrated Circuit
I/O	Instrumentation Operation
IN	Inch
MG/L	Milligrams Per Liter
MJ	Mechanical Joint
NEMA	National Electrical Manufacturers Assn.
OHSA	Occupational Safety and Health Administration
PLC	Programmable Logic Controller
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride
RJP	Restrained Joint Pipe
RPM	Rotation per Minute
RPZ	Reduced Pressure Zone
RTU	Remote Terminal Unit
SDR	Standard Thermoplastic Pipe Dimension Ratio
TS & V	Tapping Sleeve and Valve
UL	Underwriters Laboratory
USCFCC	University of Southern California
USCS	Unified Soil Classification System
USF	U S Foundry
USS	U S Steel
VAC	Vacuum
VB	Valve Box
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant