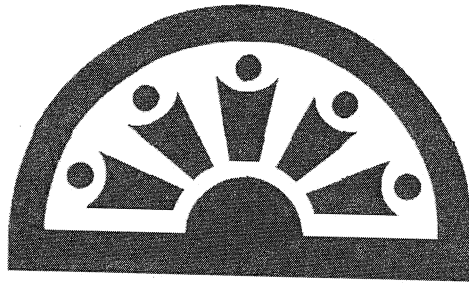


CITY OF



**WEST POINT
WATER SYSTEM**

**STANDARD FOR DESIGN AND
CONSTRUCTION SPECIFICATIONS**

TABLE OF CONTENTS

		PAGE
	PREFACE	1
I.	GENERAL	2
II.	DESIGN CRITERIA	5
III.	DESIGN CAPABILITIES & WATER DEMANDS	8
IV.	CONSTRUCTION DRAWINGS	12
V.	INSPECTION OF WORK	14
VI.	MATERIALS	15
VII.	HANDLING MATERIALS	24
VIII.	EXCAVATION	25
IX.	CONSTRUCTION ALONG HIGHWAY, STREETS & ROADWAYS	28
X.	LAYING & JOINTING PIPE & FITTINGS	30
XI.	THRUST RESTRAINT	32
XII.	BACKFILLING	33
XIII.	REMOVING AND REPLACING PAVEMENT	35
XIV.	BORING	36
XV.	STREAM & DITCH CROSSING	38
XVI.	TESTING	40
XVII.	DISINFECTION OF WATER MAINS	41
XVII.	DISINFECTION OF WATER MAINS	41
XIX.	MARKING TAPE & TRACER WIRE	42

XX	CONSTRUCTION DRAWINGS:	
	SILT FENCE DETAIL	43
	¾" AND 1" AIR RELEASE VALVE ASSEMBLY	44
	2" AIR RELEASE VALVE ASSEMBLIES	45
	¾" AND 1" LONG TAP ASSEMBLIES	46
	¾" AND 1" SHORT TAP ASSEMBLIES	47
	2" LONG TAP ASSEMBLIES	48
	2" SHORT TAP ASSEMBLIES	49
	2" BLOWOFF HYDRANT DETAIL FOR PERMANENT DEAD-END MAINS	50
	TEMPORARY DEAD END ASSEMBLY	51
	FIRE HYDRANT DETAIL	52
	Picture of STORZ Connection on Fire Hydrant	53
	FIRE HYDRANT REFLECTOR DETAIL	54
	GATE VALVE INSTALLATION DETAIL	55
	BUTTERFLY VALVE DETAIL	56
	CASING PIPE AND CONCRETE PROTECTION DETAIL	57
	CONCRETE ENCASEMENT DETAIL	58
	PRE-CAST VAULT TOP VIEW 4" METERS AND LARGER	59
	PRE-CAST VAULT SIDE VIEW 4" METERS AND LARGER	60
	THRUST BLOCKING DETAIL	61
XXI	ACRONYMS	62

STANDARDS FOR DESIGN

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 City of West Point'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 City of West Point Water facilities.

The 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.

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), The City of West Point Cross Connection Control and Backflow Prevention Policy, or other recognized standards. Latest revision of all standards are applicable. If requested by the City, 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 wished 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 City for all substitutions.

C. Warranty:

Water distribution systems installed by Contractor/Developers which are accepted by the City 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 construction have been paid prior to final acceptance by the City.

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 City, or as evidenced by the City's signature on a final plat in the case of new developments. Prior to the end of the one-year period, the City 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.

D. System Ownership:

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

E. Qualification for Installers:

Installers of water system expansions must be a utility contractor licensed in Georgia and approved by the City prior to the beginning of any work. This requirement will apply to all subcontractors who install water or utilities.

Contractors who perform substandard work may be disallowed from any future work on projects which will become owned by the City.

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 coverage 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 City to show:
1. Limits as shown, 2. 30-day cancellation notice, and 3. City as additional insured.

F. Easements and Rights of Way:

Water distribution systems installed by a Contractor/Developer, which are accepted by the City 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 City before the installation of such encroachments. If fences or other structures must be removed for maintenance of water or sewer lines it will be the responsibility of the property owner to reinstall or replace such structures.

The standard minimum easement width will comply with the City of West Point Placement Standards in subdivisions where applicable, and will normally be twenty feet (20') in width otherwise.

II. DESIGN CRITERIA:

A. Minimum Water Main Sizes

Water mains less than six (6) inches in diameter will not be allowed within the City'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 two hundred fifty (250) 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 City may require a larger pipe size if payment is made by the City for the difference in cost either in cash or in Capital Recovery Fee equivalents.

B. 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 shall have valves 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 two thousand (2,000) feet.

C. Fire Hydrant Location:

All fire hydrants shall be located on the backside of the ditch area, usually one (1) 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: five hundred (500') feet apart for single family residential developments, multi-family residential developments, and mobile home parks; three hundred (300') feet apart for industrial/commercial developments, and one thousand (1,000') feet apart for existing county roads.

Hydrants shall be furnished with a mechanical joint shoe connection to the spigot of the six (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. Fire hydrants will have three (3) way connections as follows: two (2) – two and one half (2 ½") inch NST

threaded connections and one (1) – five (5") inch storz connection. All connections must have appropriate caps.

Standard depth of bury shall be four (4) feet. Provide extension section where necessary for vertical installation and in accordance with manufacturer’s recommendations.

D. Fire Hydrant Reflectors

Each fire hydrant must have a blue hydrant reflector placed in the center of the driving lane adjacent to the fire hydrant. See construction drawing details at the rear of this manual.

E. Fire Protection

Minimum flow rate at twenty five (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	Minimum FireFlow (gpm)
Greater than 50	>100	750
Greater than 15, but less than or equal to 50	31-100	750
Greater than 5ft., but less than or equal to 15ft.	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 City 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 in 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 City in which the water system is designed to provide higher flows. Example would be an industrial corridor or park.

F. Service Laterals and Connections

Service laterals shall be located with a minimum bury of eighteen (18") inches.

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

G. Temporary Line Ends

A gate valve and a minimum of 36 (two (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. DESIGN CAPACITIES AND WATER DEMANDS:

An important factor in the planning and design of a water system is an accurate estimate of the quantities of water, which must be supplied to meet water needs. These estimates are pivotal to the entire design including the production of water, pumping, treatment, storage, and the distribution system. Each water system component is designed to meet certain flow requirements and to insure that water will be available at the various water use points throughout the system in adequate quantities to meet demands.

A. Estimating Basic Water Demands:

(1) The various components of a water system are designed to meet specific water flow criteria which are dependent upon the type of water system and the objectives of the system.

(2) Average Daily Demand expresses the quantity of water used in a system in an average day. It is based upon experience from water meter readings in similar water systems over an extended period of time and reflects the normal seasonal and daily variations. For design purposes, it is usually determined by estimating the population or units of housing or other units and multiplying by an average per person or per unit water consumption derived from past experience. The average daily demand will be exceeded on many days (during peak demands), so it is not appropriate to design merely for the average. The greatest amount of water usage in one day or other period of time must be considered.

The following provides a guide for estimating the average daily demand for various types of establishments, in gallons per day per unit. The unit is persons per day unless otherwise indicated. The values are for normal water requirements and do not include special needs or unusual conditions. Additional allowances should be made for fire fighting, lawn watering, swimming pool, industrial or commercial process water and other special uses.

<u>Type of Establishment</u>	<u>Average Daily Use</u> (gallons per day)
This unit is per person unless otherwise stated	
Assisted Living Facilities (Per Room)	100
Assembly Halls (per seat)	2
Barber Shop (Per Chair)	20
Beauty Shop (Per Booth or Bowl)	50
Car Wash (Per Site)	1,500
Churches (Per Member)	1
Convenience Store (Per Bath Room)	125
Day Care Facilities	100
Factories, Sanitary uses, per shift	15-35
Food Service – Restaurants (Per Seat)	20

<u>Type of Establishment cont.</u>	<u>Average Daily Use</u> (gallons per day)
The unit is per person unless otherwise stated	
Food Service-Restaurants (Per Seat) Continued	
- With Bars (Per Seat)	25
- Fast Food (Per Seat)	15
Highway Rest Areas	50
Hotels (2 Persons Per Room)	60
Institutions – Hospital (Per Bed)	150
- Nursing Homes (Per Bed)	150
- Others	75-125
Office Buildings (Per Employee)	15
Laundries, Self Service (Per Machine)	200
Motels (Per Bed)	45
Parks – Day Use (With Flush Toilets)	15
- Mobile Homes (Per Unit)	200
- Travel Trailers (Per Unit)	75
Picnic Areas (With Flush Toilets)	15
Residential Communities	
Single Family Dwelling (Per Person)	100
- Single Family Dwelling (Per House Maximum)	400
- Multi-Family (Per Bedroom)	150
- Rooming House/Tourist Home (Per Bedroom)	100
Resort Motels and Hotels (Per Room)	200
Retail Stores (Per Toilet Room)	200
Schools – Day, No Showers or Cafeteria (Per Student)	15
- Day, With Cafeteria (Per Student)	25
- Day, With Showers and Cafeteria (Per Student)	50
- Residential Types (Per Student)	75-100
Shopping Centers, Per Sq. Ft. Sales Area	1.5
Swimming Pools and Beaches	200
Theaters – Drive-In (Per Car)	3-5
Others (Per Seat)	3

3. Maximum Daily Demand expresses the greatest amount of water a system will use in one day. Small residential water systems may experience that their maximum day is 1.5 to 2 times the average day. However, this ratio may not apply to other water systems. In general, the smaller the water system, the greater the variation between the average and the maximum day.

4. Maximum Hourly Demand expresses the greatest amount of water, which will be used in any hour during the day. This is sometimes referred to as the peak hour demand, although there will be short term peak demand rates lasting for several minutes which will exceed the maximum hourly demand rate. Each type of system exhibits its own maximum hourly and short-term peak demands and the hours of peak occurrence will vary. For example, shopping centers usually

experience hourly peaks in the early afternoon while residential communities may experience two peak hours, about 8:00 a.m. and 6:00 p.m. The maximum hourly demand is often expressed as a ration of the average daily demand, in gallons per minute. Generally speaking, the smaller the water system, the greater the maximum hour rate in respect to the average daily rate. The peak hourly demand at small residential communities may range about 6 to over 10 times the average daily demand.

5. Peak Demand (instantaneous demand) is the maximum amount of water necessary to meet the peak short-term demand rate which may occur several times during a day, usually occurring during the peak hour period. The instantaneous peak may last for several minutes. The rate is particularly important in considering the sizing of the storage tank in a hydropneumatic system. The effective storage capacity is usually designed to meet these short-term peaks. The minimum effective storage volume of pressure tanks, in gallons, shall equal the peak demands, in gallons per minute (gpm), minus the pumping capacity (gmp), multiplied by 20. In the absence of sufficient effective storage to meet peak demands, the wells and pumps must be capable of meeting the peak demands. The smaller the water system, the greater the ratio of the peak demand to the average demand.

Instantaneous (Peak) Demand for Residential Communities	
<u>Number of Connections</u>	<u>Gallons Per Minute</u>
10	40
15	50
20	58
25	66
30	73
35	80
40	85
45	91
50	96
55	101
60	106
70	115
80	124
90	132
100	140
125	160
150	175
175	195
200	205
250	230
300	255
400	295
500	335

Note: It should be noted that fire flow is not included in the definition of average daily and maximum daily demands and should be added if fire protection is desired. Fire flows are usually expressed as gallons per minute to fight fire in a certain duration, and could be designed into a water system for fighting purposes.

Instantaneous (Peak) Demand for Mobile Home Park Water Systems

<u>Number of Connections</u>	<u>Gallons Per Minute</u>
10	25
15	31
20	37
25	42
30	46
35	50
40	54
45	57
50	60
55	64
60	66
70	72
80	78
90	84
100	88
125	100
150	110
200	128
250	145
300	160

Instantaneous (Peak) Demand for Campground & Travel Trailer Water Systems

<u>Number of Connections</u>	<u>Gallons Per Minute</u>
20	25
25	32
40	38
50	43
60	47
80	55
100	60
120	69
140	73
160	80
180	85
200	90
300	110
400	130
600	163

IV. 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 City 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 (1) inch to a fifty (50) feet horizontal and ten (10) feet 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 City.

B. City's Review:

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

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 City.

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 Transportation, City of West Point, or other appropriate agencies.

C. Drawings Used During Construction:

Drawings or other submittals not bearing the City'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 City's approval. When working within any Georgia Department of Transportation right-of-way the plans must also have an approval signature from the Department of Transportation.

D. "As-Built" Drawings:

The Contractor/Developer must submit one (1) "red-lined" set of construction plans after the completion of construction for the City'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.

V. 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 City staff. At this meeting the Contractor/Developer will agree upon a schedule for coordination of construction and inspections and will document that the City'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 City's designated inspector will have the right to stop work in progress that is not 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.

VI. 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 twelve (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 City.

Laying lengths may be either ten (10) or twenty (20) foot lengths. Joint shall be push-on type for pipe and standard mechanical or flanged joints shall conform to ANSI/AWWA C1 1 1/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 City's inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with applicable standards.

Water mains less than six (6) inches in diameter will not allowed within the City of West Point's water distribution system, except: 1. in residential cul de sacs, or 2. on minor extensions where the furthest customer is no more than two hundred fifty (250) 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 C1 1 1 (latest). Pipe shall be Pressure Class 350 minimum. Pipe and fittings shall be cement lined in

accordance with ANSI/AWAA – C104/A21.4. Fittings shall conform to ANSI/AWWA C110/A21.0 or ANSI/AWWA C153/A21.53 with rated working pressure of three hundred fifty (350) psi. Pipe and fittings shall be furnished with bituminous outside coating.

(2) Polyvinyl Chloride (PVC) Pipe

PVC Pipe in sizes from six (6) – twelve (12) inches may be AWWA C900 PVC Class 150 only.

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

B. Gate Valves (GV):

3” – 12” Resilient Wedge Gate Valve Specification

1. The resilient seat gate valves shall fully comply with the latest revision of AWWA C509, and shall also be UL listed and FM approved. The valves shall be tested and certified to ANSI/NSF 61.
2. The valve shall have a 250 psig working pressure.
3. The valve type shall be NRS (non-rising stem) or OS&Y (outside screw & yoke) as specified.
4. The valve shall have an arrow cast on the operating nut or handwheel showing opening direction. The direction of opening shall be Open Left.
5. The NRS valves shall be provided with a 2” square operating nut and OS&Y valves shall be provided with a handwheel. The bolt that attaches the operating nut to the stem shall be recessed into the operating nut so as not to interfere with valve wrench operation.
6. The valves bolts and nuts shall be Type 304 stainless steel.
7. The valve stem shall be made of bronze ASTM B-132 alloy C67600 bar stock material. The stem shall have at least one “anti-friction” thrust washer above and below the stem collar to reduce operating torque. The stem material shall provide a minimum 70,000psi tensile strength with 15% elongation and yield strength of 30,000psi. Valves with cast stems or two piece stem collars are not acceptable.
8. The NRS valves shall have a stuffing box that is o-ring sealed. Two o-rings shall be placed above and one o-ring below the stem thrust collar. The thrust collar shall be factory lubricated. The thrust collar and its lubrication shall be isolated by the o-rings from the waterway and from outside contamination providing permanent lubrication for long term ease of operation. Valves without

stuffing box are unacceptable. Valves without at least three stem o-rings are also unacceptable.

9. The valve body, bonnet, stuffing box, and disc shall be composed of ASTM A-126 Class B grey iron or ASTM A395 or A536 ductile iron. The body and bonnet shall also adhere to the minimum wall thickness as set forth in Table 2, section 4.3.1 of AWWA C509. Wall thickness less than those in table 2 are not acceptable.

10. The valve disc and guide lugs must be fully (100%) encapsulated in SBR ASTM D2000 rubber material. The peel strength shall not be less than 75 pounds per inch. Guide caps of an acetal bearing material shall be placed over solid guide lugs to prevent abrasion and to reduce the operating torque.

11. The valves shall have all internal and external ferrous surfaces coated with a fusion bonded thermosetting powder epoxy coating of 10 mil nominal thickness. The coating shall conform to AWWA C550.

12. The tapping valves shall have an inlet flange conforming to ANSI B16.1 Class 125 for attachment to a tapping sleeve or cross. In addition, the valve inlet flange shall have a machined projection or raised face complying with MSS SP-60 for accurate alignment to the mating recess in the tapping sleeve flange. The seat opening of the tapping valves shall be at least .30" larger than nominal pipe size to permit full diameter cuts.

13. The valves shall be warranted by the manufacturer against defects in materials or workmanship for a period of ten (10) years from date of manufacture. The manufacturing facility for the valves must have current ISO certification.

The NRS valves shall be MUELLER® A2360 series only.

The OS & Y valves shall be MUELLER ® R2360 series only.

The NRS tapping valves shall be MUELLER ® T2360 series only.

Note: Valves 2" and 2-1/2 are not covered under AWWA C-509.

14" – 48" RUBBER SEATED BUTTERFLY VALVE

Groundhog Buried Service Rubber Seated Butterfly Valve Specifications

All butterfly valves shall be manufactured in accordance with the latest revision of AWWA C504 for Class 150B service and comply with the following details:

Valve Bodies

Valve bodies shall be constructed of cast iron ASTM A-126 Class B and conform to AWWA C504 in terms of laying lengths and minimum body shell thickness.

End connections shall be as specified on the plans.

Valve Discs

Valve discs shall also be made from cast iron ASTM A-126 Class B or ASTM A-48 Class 40 in sizes 24" and smaller. Sizes 30" and larger shall be built from ductile iron in conformance to ASTM A-536. Disc shall be furnished with 316 stainless steel seating edge to mate with the rubber seat on the body.

Valve Seat

Valve seat shall be Buna-N rubber located on the valve body. In sizes 20" and smaller, valves shall have bonded seats that meet test procedures outlined in ASTM D-429 Method B. Sizes 24" and larger shall be retained in the valve body by mechanical means without use of metal retainers or other devices located in the flow stream.

Valve Shaft

Valve shafts shall be 18-8 type 304 stainless steel conforming to ASTM A-276. Shaft seals shall be standard self-adjusting split V packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft.

Valve Bearings

Valve bearings shall be sleeve type that are corrosion resistant and self lubricating.

Actuators

Valve actuators shall be fully grease packed and have stops in the open/close position. The actuator shall have a mechanical stop which will withstand an input torque of 450 ft. lbs. against the stop. The traveling nut shall engage alignment grooves in the housing. The actuators shall have a built in packing leak bypass to eliminate possible packing leakage into the actuator housing.

Surfaces

The valve interior and exterior surfaces except for seating shall be coated with two coats of asphalt varnish in accordance with TT-C-494A and AWWA C504.

All internal and/or external surfaces shall be covered with a polyamide cured epoxy coating applied over a sand blasted "new white metal surface" per SSPC-SP10 to a minimum of 6 mils in compliance with AWWA C550.

Valves shall be manufactured by Pratt Valve Co. only.

Valve Boxes (VB): All valves shall be equipped with valve boxes. Valve boxes shall be adjustable to six (6") inches up or down from the nominal required cover over the pipe. Provide a four (4") inch thick, eighteen (18") inch square concrete pad around the valve box. This must be placed at grade.

Tapping Sleeved 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.

Tapping Saddles

PVC Pipe

Sizes less than ten (10") inches: Bronze single band, Ford 590, Mueller H-13000, McDonald 3801 only.

Sizes ten (10") inches & 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 City of West Point Utility Director.

(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 a 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 shutoff 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 ANSUASSE. 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 City at the time of tap or meter purchase by the consumer.

(b) Double check valve assembly backflow preventer (one (1) inch, and two (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 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 (two (2) inches, three (3) inches, four (4) inches, six (6) inches, eight (8) inches, and ten (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 (two and a half (2 ½) inches and three (3) inches) epoxy coated. Cast iron or ductile iron (four (4) to ten (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 meter vault, or 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 USCRCC 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, gas stations, doctor offices, and dental offices).

Shall have bronzed body (three quarter (3/4) inch through two (2) inches) of epoxy coated cast iron body (two (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.

(e) 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, provides a detection point for unauthorized use.

Special Note: This device will be used on large medical facilities. Two devices will be paralleled to prevent water being turned off during testing.

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 complete assembly, including UL listed OS & Y shutoff 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 three hundred (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 Hydrant Specification (5-1/4" Main Valve)

Fire hydrants purchased or installed shall meet or exceed all applicable requirements and tests of ANSI and the latest revisions of AWWA Standard C502. Fire hydrants shall meet all test requirements and be listed by Underwriters Laboratories Inc. Fire hydrants shall meet all test requirements and have full approval of Factory Mutual. Fire hydrants shall meet the following requirements:

1. Fire hydrants shall be rated for a working pressure of 250 Psig.

2. Fire hydrants shall be of the compression type, opening against the pressure and closing with the pressure.
3. Fire hydrants shall have a minimum 5-1/4" main valve opening and a minimum inside barrel diameter (I.D.) of 7" to assure maximum flow.
4. Fire hydrants shall be three-way in design, having one five (5") Storz connection and two 2-1/2" hose nozzle(s). Nozzle thread type shall be NST. Storz nozzles are to be installed at the factory.
5. The bonnet assembly shall provide an oil reservoir to lubricate the stem threads and bearing surfaces each time the hydrant is operated. This lubrication system shall be sealed from the waterway and any external contaminants by use of "o"ring seals. An anti-friction washer shall be in place above the thrust collar to further minimize operating torque.
6. The operating nut shall be a one piece design, manufactured of ASTM 8-584 bronze. It shall be pentagon in shape and the nut dimensions shall be 1-1/4". The operating nut shall be affixed to the bonnet by means of an ASTM B-584 bronze hold down nut.
7. The direction of the opening shall be Open Left. An arrow shall be cast on the bonnet flange to indicate the specified opening direction.
8. Hydrants shall be a "traffic-model" having upper and lower barrels joined at the ground line by a separate and breakable "swivel" flange providing 3600 rotation of upper barrel for proper nozzle facing. The proper ground line shall be cast clearly on the lower barrel and shall provide not less than 18" of clearance from the centerline of the lowest nozzle to the ground.
9. The operating stem shall consist of two pieces, and shall be corrected by a stainless steel safety coupling. The safety coupling shall have an integral internal stop to prevent the coupling from sliding down into the lower barrel when the hydrant is struck.
10. The lower barrel shall be an integrally cast unit. The hydrant bury depth shall be clearly marked on the hydrant lower barrel.
11. Composition of the main valve shall be molded rubber and shall be reversible in design to provide a spare in place. If the main valve is not reversible you are required to ship (1) main valve repair kit with each fire hydrant.
12. Hydrants shall be equipped with (2) two drain valves which drain the barrel when the hydrant is closed and seal shut when the hydrant is opened. These drain valves shall be an integral part of the one piece bronze upper valve plate.

13. The upper valve plate, seat ring and drain ring (shoe bushing) must be ASTM B-584 bronze and work in conjunction to form an all bronze drain way, A minimum of two (2) internal and two (2) external drain openings are required. Drains ported through an iron shoe must be bronze lined.

14. The bronze seat ring shall thread into a bronze drain ring (or shoe bushing) providing a bronze to bronze connection. Seat rings shall be "o" ring pressure sealed.

15. The shoe inlet size and connection type shall be as specified (flanged, Mi, etc.), having ample blocking pads for sturdy setting and the MJ connection must have two strapping lugs to secure the hydrant to piping.

16. The interior of the shoe including the lower valve plate and stem cap nut shall have a protective coating that meets the requirements of AWWA C-550. If a stem cap nut is utilized, it must be locked in place by a stainless steel lock washer or similar non-corrosive device that will prevent the cap nut from backing-off during normal use.

17. All fire hydrant shall be painted Federal Safety Yellow.

18. Hydrants shall be warranted by the manufacturer against defects in materials or workmanship for a period of ten years (10) from the date of manufacture.

19. Hydrants (upper/lower barrel etc.) shall be cast, manufactured, machined, assembled and tested in the USA.

20. Mueller Super Centurion 250 is the only approved fire hydrants. Failure to comply with any of these above requirements is sufficient cause for rejection of proposed hydrants. The city reserves the right to accept only those materials which are in full compliance with these specifications.

VII. 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, valve 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 contractor's /developer's expense.

C. Distribution:

Distribute and place pipe and materials without interference to traffic. Do not obstruct drainage ditches.

D. Storage:

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

VIII. 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 materials 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. 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 concrete. The concrete shall be Class "B" having a compressive strength of not less than three thousand (3,000) psi at 28 days.

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 four (4) feet of cover unless otherwise approved by the City. In no case shall mains be laid with less than twenty four (24") inch cover. All service lines shall be laid with a minimum of eighteen (18") inch 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 (1/2) 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 ten (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 eighteen (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 water main 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 maybe required to be encased in concrete.

IX. 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) 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.

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

(3) Saw cut all driveways, paved parking areas, paved roadways and paved sidewalks that are not being bored.

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.

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 City to avoid interference. It is the responsibility of the Contractor to contact the Utilities Protection Centers.

("Call Before You Dig: - 1-800-282-7411) prior to the start of any excavation or construction.

X. LAYING AND JOINTING PIPE AND FITTINGS:

Lay all pipe fittings to accurately conform to the lines and grades approved by the City 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 piped 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, valve and accessories into the trench by suitable means. Do not drop or dump pipe or accessories into the trench.

Clean pipe 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 (6) inches of granular bedding material. Backfill with the same material to at least six (6) 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 points of connection to existing pipe lines and uncover as necessary for the City or an approved contractor to confirm the nature of the connection to be made. The City 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 City, only if the City makes tap.

XI. THRUST RESTRAINT:

Provide restraint at all points where hydraulic thrust may develop.

A. Retainer Glands:

Install mega lug retaining flanges on all fittings, valves and related piping as designated by the City.

B. Threaded Rod:

Zinc plated $\frac{3}{4}$ 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 City.

Concrete for blocking shall have a compressive strength of not less than three thousand (3,000) psi, with not less than 5.5 bags of cement per cubic yard and a slump between three (3) and five (5) inches. Job 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 the construction drawing detail section of this manual and as directed by the City. 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.

XII. 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 six (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 six (6") inch layers, if using light power tamping equipment, such as a "whacker packer".

(2) In two (2) foot layers, if using heavy tamping equipment, such as a rolling vibrating packer.

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% of the maximum dry-density as determined by Standard Proctor Compaction Test (ASTM D698) for the base material under the pavement. The top twenty four (24) inches of backfill shall be compacted to a minimum of 98% 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.

During the backfilling, loose lifts shall not exceed eight (8) inches in thickness. Field density determination (compaction tests) should be made a minimum of one (1) test per 450 to 500 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.

XIII. 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 existing 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 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 adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damage pavement.

(5) Sidewalk: Remove and replace sidewalks for their full width.

(6) Curbs: Removed and replace or tunnel under any curb encountered.

B. Replacing Pavement:

After compaction testing has been satisfactorily completed, replace all pavements, sidewalks and curbs removed.

XIV. 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.	Casing Dia.	Wall Thickness
In.	In.	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.	Casing Dia.	Wall Thickness
In.	In.	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 City. 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.

XV. STREAM AND DITCH CROSSING:

At all points where banks of streams or drainage ditches are disturbed by excavation or where natural vegetation is removed, carefully compact backfill and place rip rap 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 ten (10) feet upstream and ten (10) feet downstream from any disturbed area. Extend rip rap from one (1') foot below streambed and 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 twenty four (24) inches. The minimum allowable dimension for an individual stone is six (6) inches. At least 50% of the stone shall have a minimum dimension of twelve (12) inches. A geotextile fabric shall be placed over the entire ditch and extend outward on either side a minimum of ten (10) feet.

Rip rap shall be placed on a six (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 (3) feet during construction.

Embed stone rip rap by hand so as to form a compact layer at least twelve (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 one (1) to two (2) cubic feet. Do not use bags previously used for sugar or chemicals. Fill bags with mixture of one part Portland Cement to five parts sand.

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

- C. When the depth of cover on the pipe at the bottom of the creek is less than twenty four (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.

XVI. TESTING:

When a length of pipe approved by the City 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 (1,000) 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 City may require additional testing.

C. Existing Valves:

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

D. Tapping Sleeve and Tapping Valves:

All tapping sleeves and tapping valves shall be air tested to a pressure of 150 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 City.

XVII. 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 C65 1.

After pressure testing, and all necessary repairs have been made, the lines shall be flushed clean, and clean water containing not less than 50 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 minor jobs, all exposed infrastructure will be swabbed with a solution of water containing not less than 50 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"	65	.6 OZ
6"	147	1.4 OZ
8"	260	2.5 OZ
10"	407	3.9 OZ
12"	587	5.6 OZ
16"	1,043	10 OZ
18"	1,321	12.6 OZ

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 City. 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 disinfection 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 Utility Director. Provide copies of all test results including the laboratory chain of custody forms properly executed.

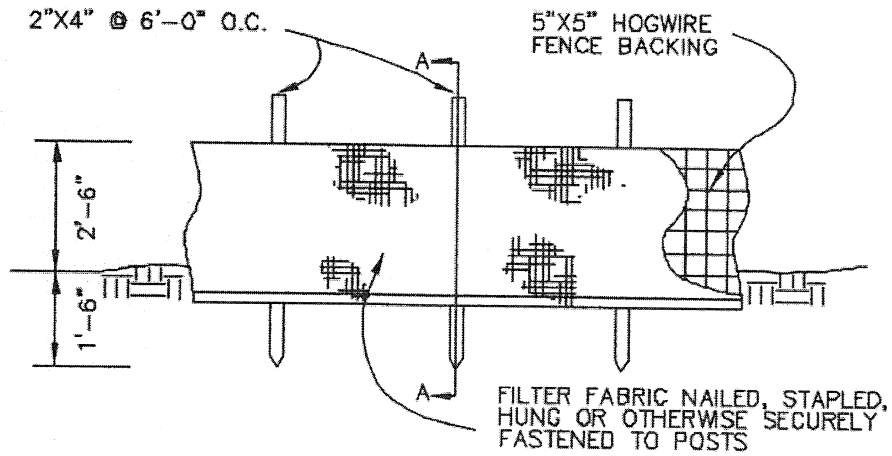
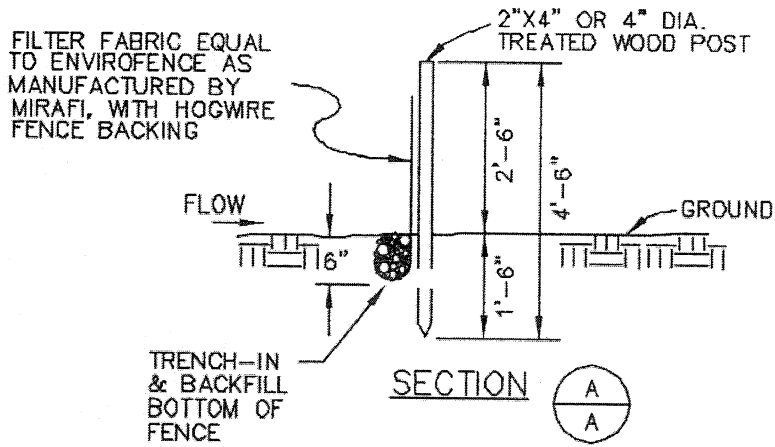
XVIII. DISINFECTION WHEN CUTTING INTO OR REPAIRING EXISTING WATER MAINS:

1. Shall be performed when mains are wholly or partially dewatered;
2. Shall follow the current AWWA C651 Standards, including trench treatment, swabbing with hypochlorite solution, flushing and /or slug chlorination as appropriate;
3. Bacteriological testing shall be performed after the repairs are complete. However, depending upon the circumstances, the water main may be returned to service prior to completion of testing to minimize the time the customers are out of service.
4. Leaks or breaks that are repaired with clamping devices while the mains remain full of water under pressure may require no disinfection.

XIX. MARKING TAPE & TRACER WIRE:

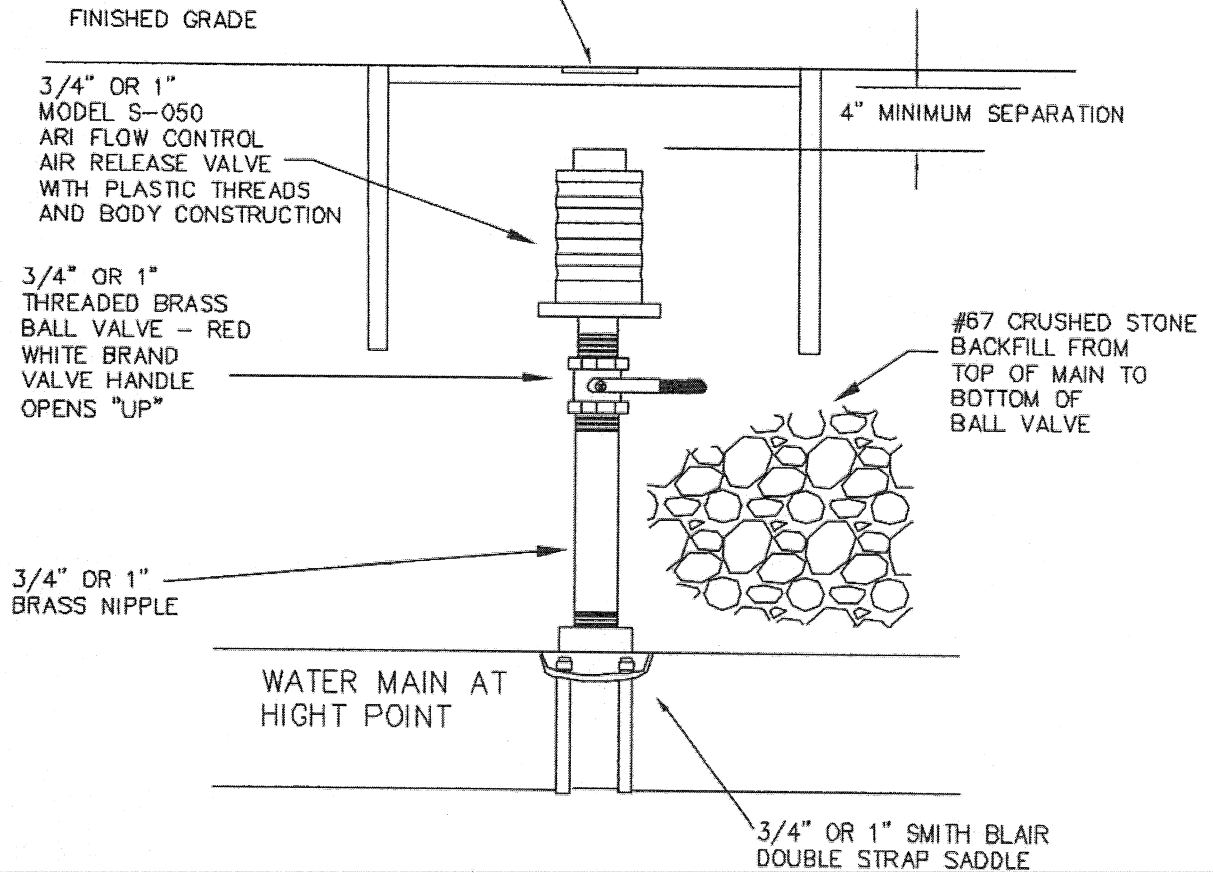
Marking Tape; Backfill shall be carried to a point twelve (12") inches above the top of pipe. Before replacing the remaining backfill, DETECTABLE marking tape imprinted with the words "BURRIED WATER LINE" as manufactured by Blackburn Manufacturing Co., Allen Systems Inc., or equal shall be placed in the ditch for the entire length of pipe installed. Tape shall be three (3") inches in width. Marking tape will be installed even when tracer wires are being used.

Tracer Wire; For all pipe other than ductile iron tracer wire will be installed directly on top of the line. Tracer wire will be taped to the top of the pipe at center line before any backfill is installed. Tracer wire will extend upwards at each and every valve installed on pipe. The tracer wire will extend twelve (12") inches past the top of all valve boxes in order to provide a location for clipping on when locating the pipe line. All tracer wire will be bonded together for the entire length of the pipe and where bonded together tracer wire will be protected from corrosion with rubber weather coating. Minimum size of tracer wire will be # 10 gauge with a protective coating.

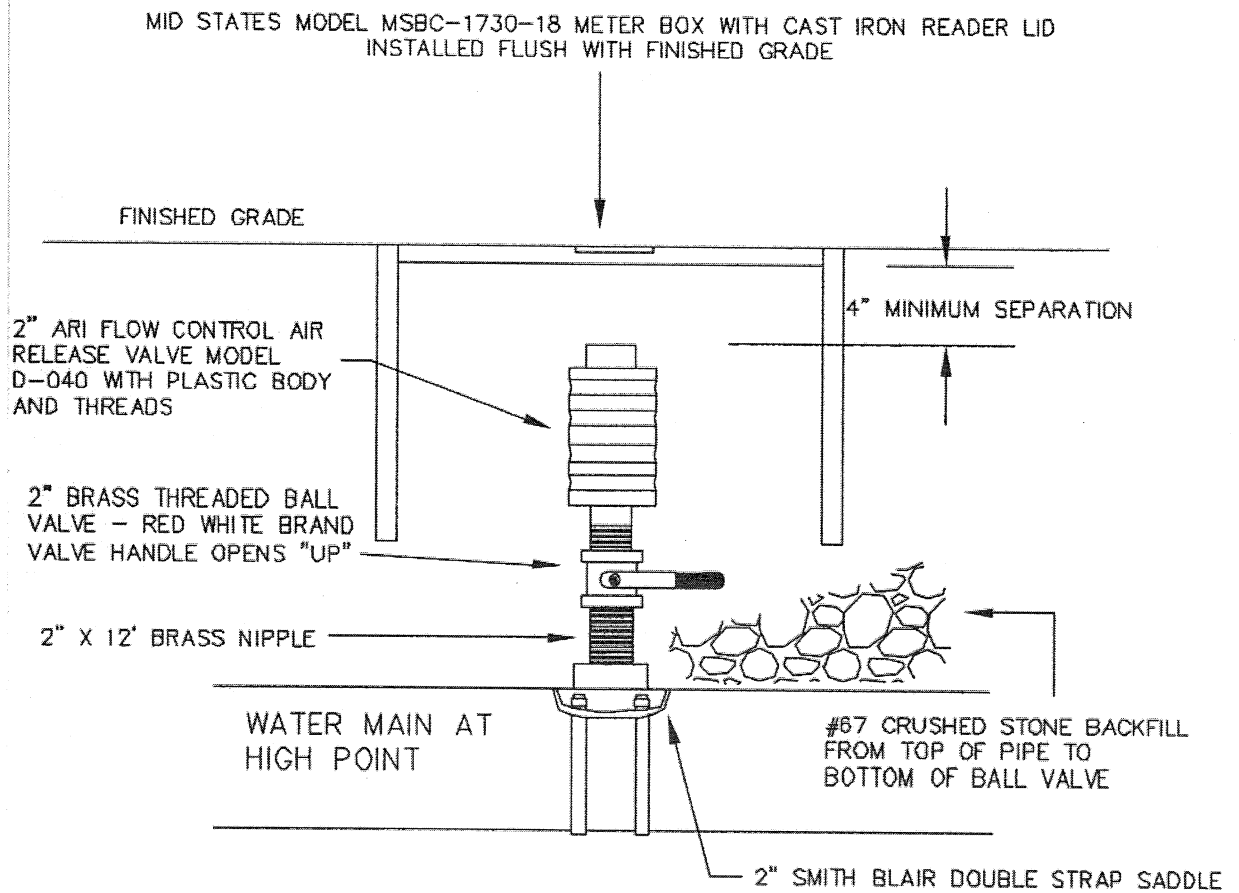


SILT FENCE DETAIL

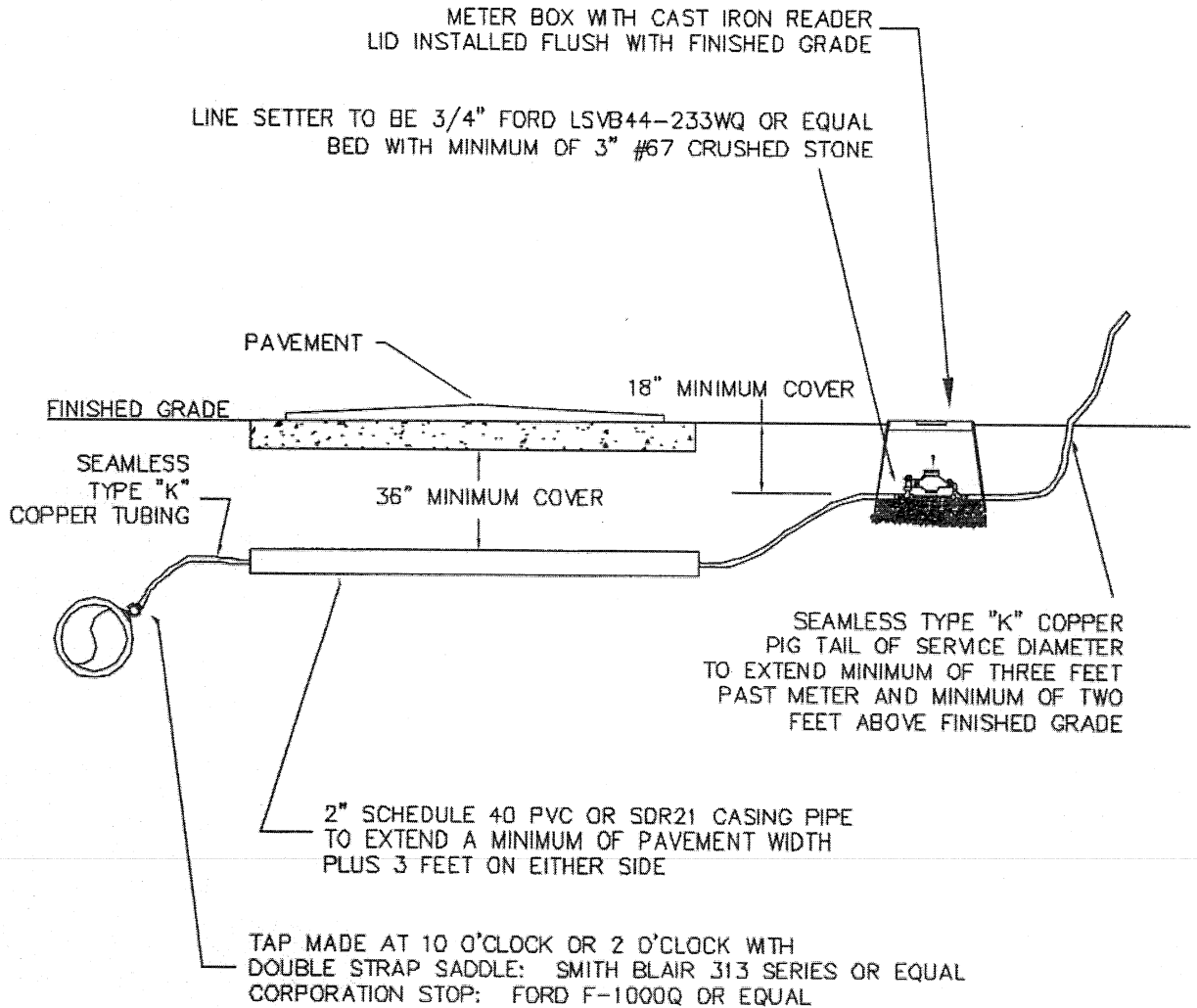
MID STATES MODEL MSBC-1730-18 METER
BOX WITH CAST IRON READER LID
INSTALLED FLUSH WITH FINISHED GRADE



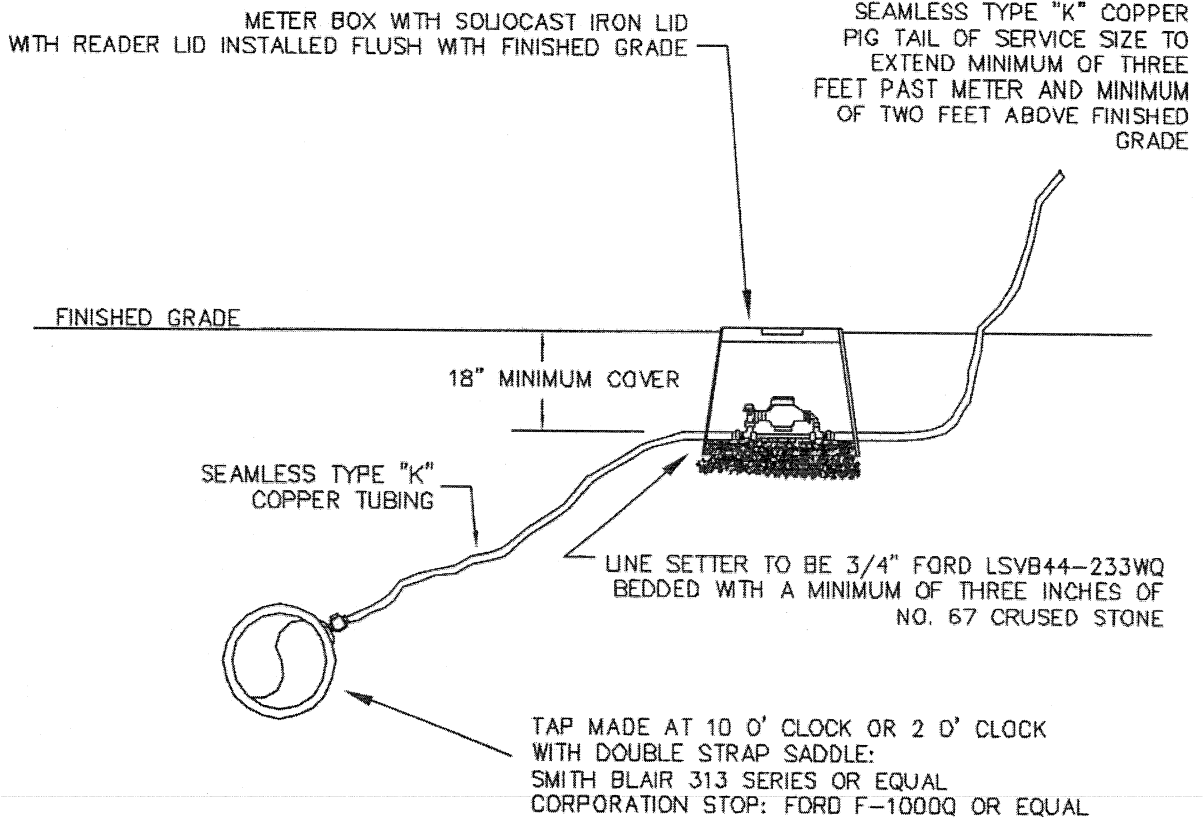
3/4" AND 1" AIR RELEASE VALVE ASSEMBLY



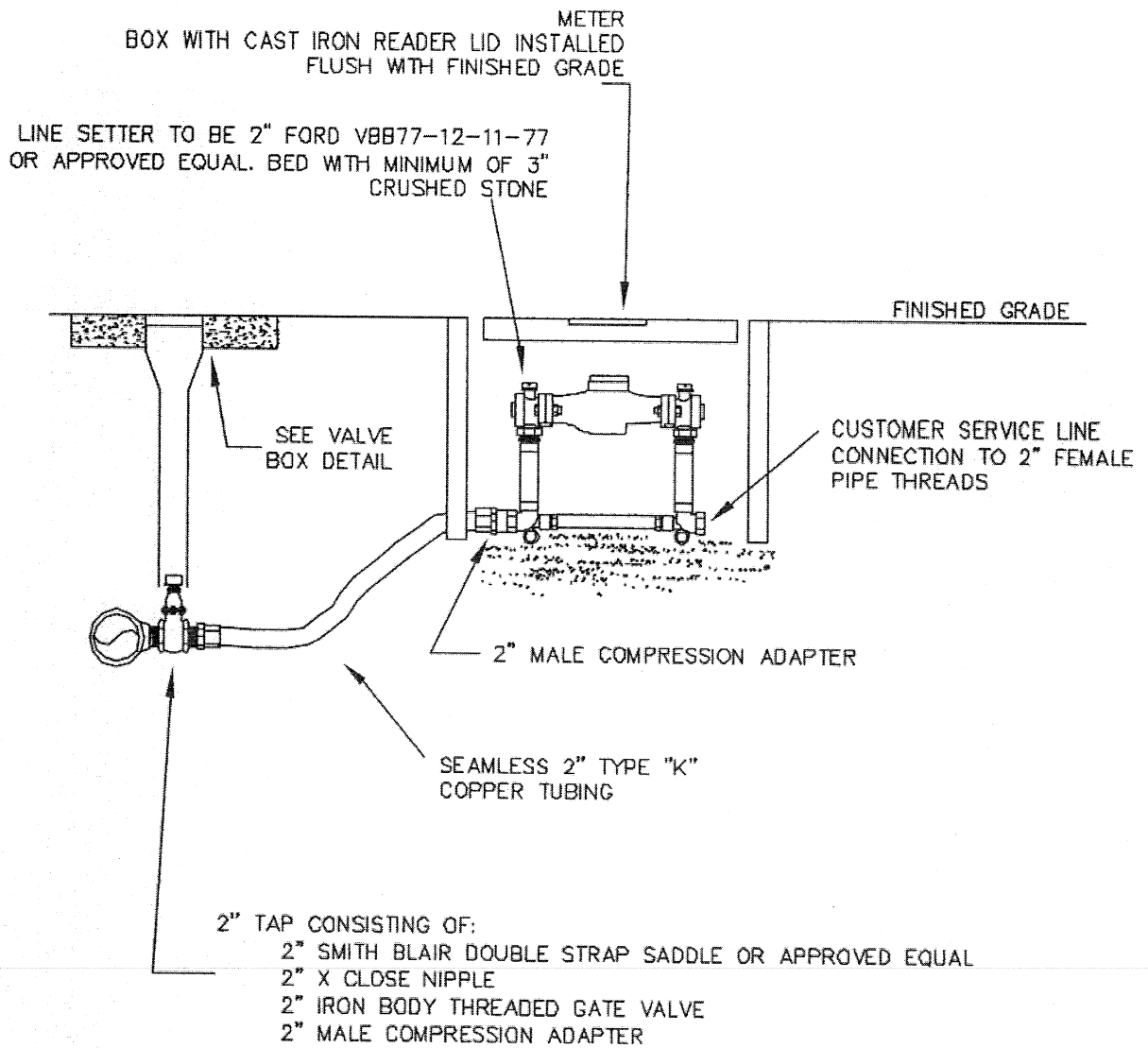
2" AIR RELEASE VALVE ASSEMBLIES



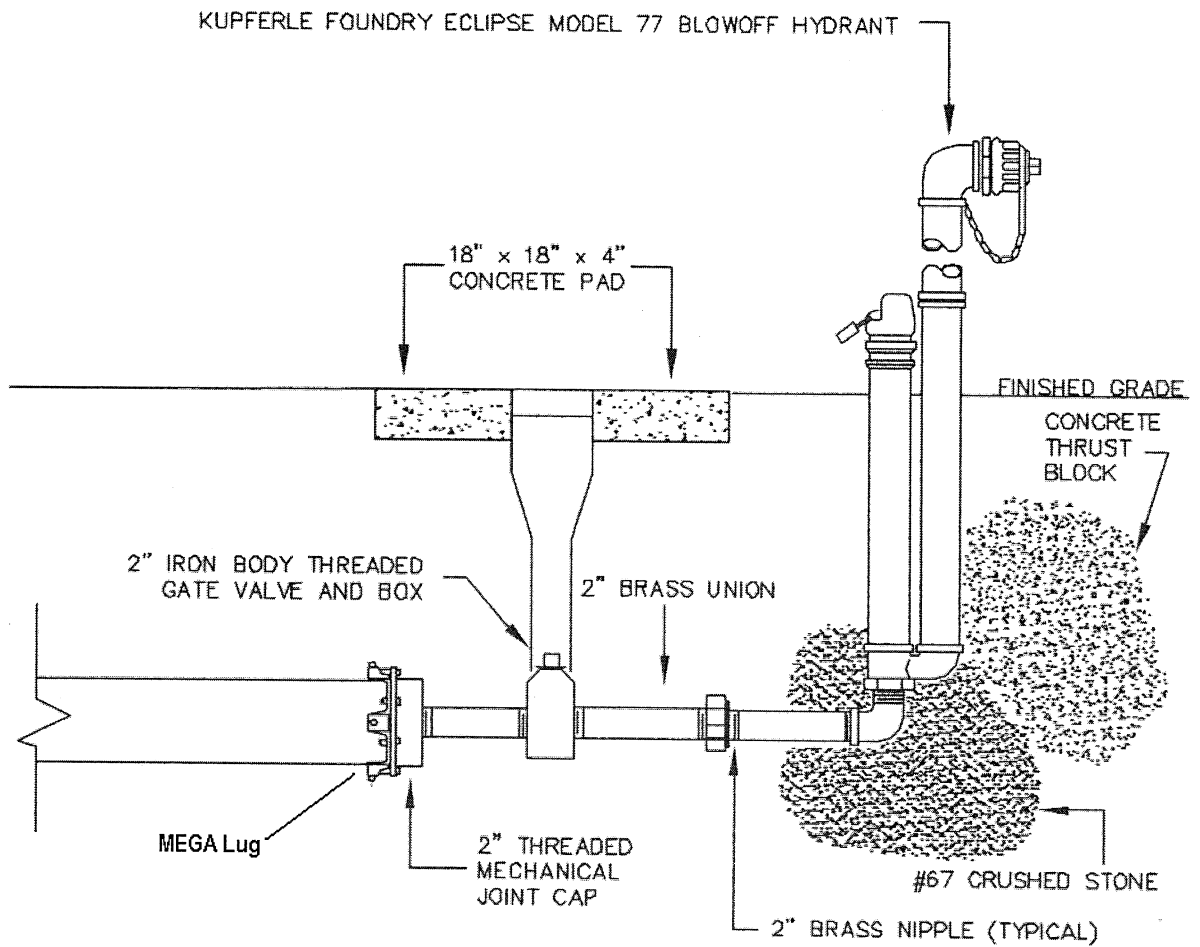
3/4" AND 1" LONG TAP ASSEMBLIES



3/4" AND 1" SHORT TAP ASSEMBLIES

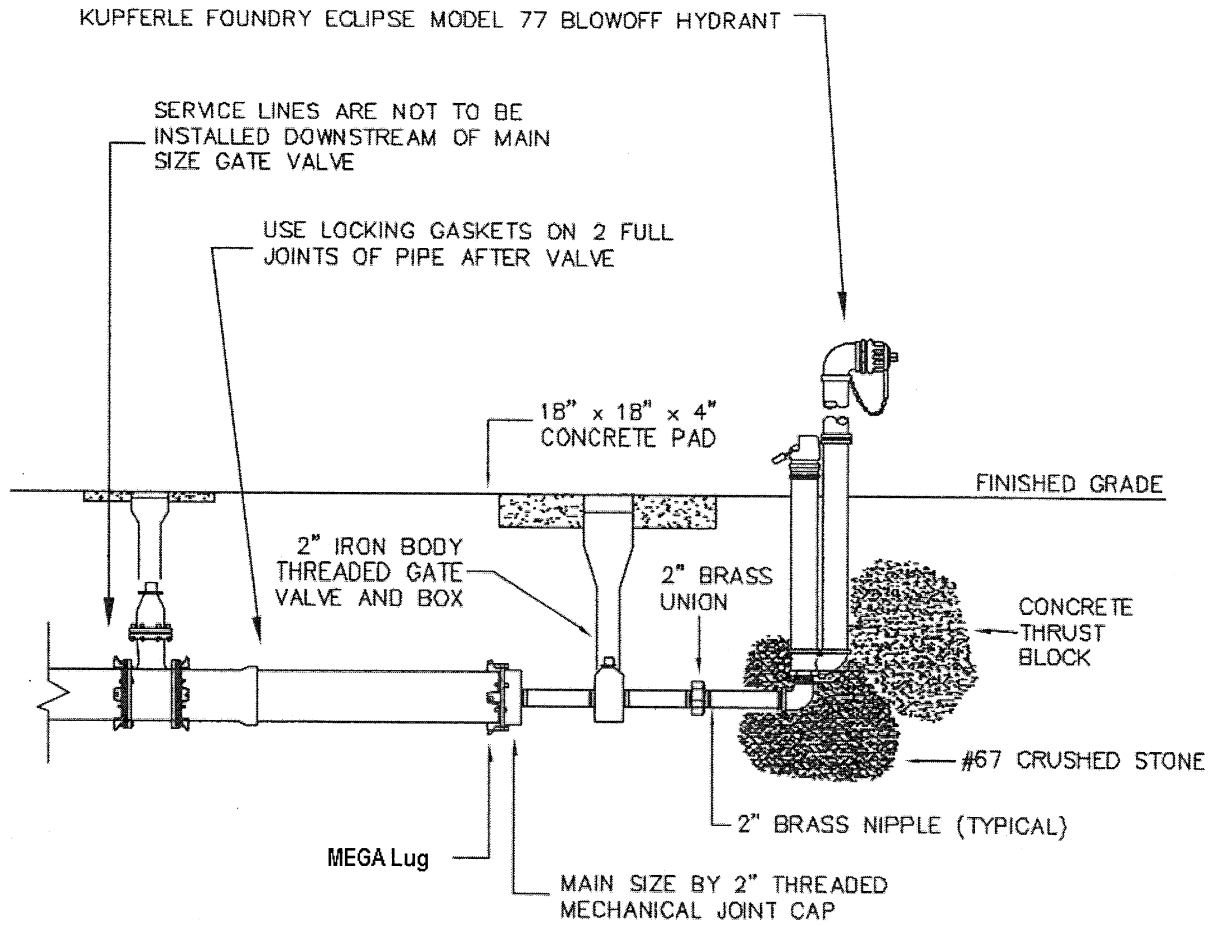


2" SHORT TAP ASSEMBLIES



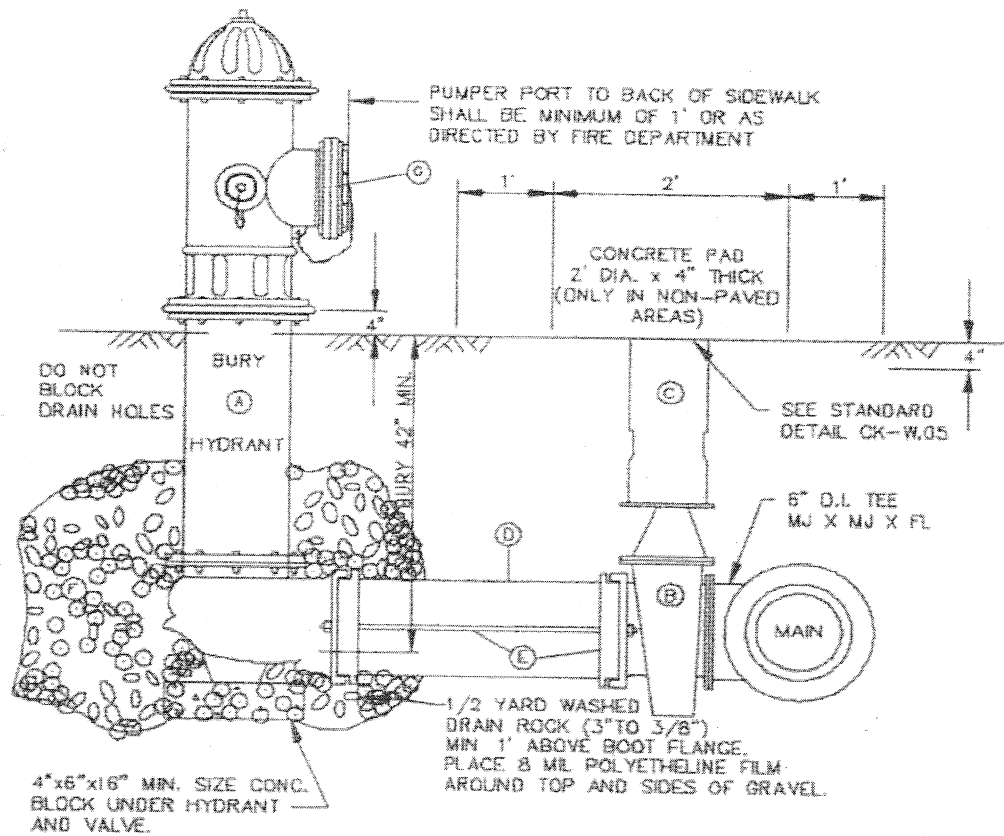
NOTE: ALL BRASS NIPPLES MUST BE 12" IN LENGTH

2" BLOWOFF HYDRANT DETAIL FOR PERMANENT DEAD-END MAINS



NOTE: ALL BRASS FITTINGS MUST BE 12" IN LENGTH

TEMPORARY DEAD END ASSEMBLY



- A. 1-5 1/4" N.Y.O. HYDRANT WITH 2-2 1/2" N.S.T. AND 1-4" PUMPER. SEATTLE STANDARD THREAD-M.J. INLET, WITH LUGS, BRASS TO BRASS SUB-SEAT
- B. 1-AUXILIARY GATE VALVE: 6" AWWA C509, RESILIENT SEAT, "O" RING STEM SEAL, N.J.X.FL. WITH LUGS.
- C. 1-TWO-PIECE CAST IRON VALVE BOX EQUAL TO RICH SEATTLE TYPE #045 WITH RECESSED HANDLE LID.
- D. 1-8" DUCTILE IRON CLASS 52 CEMENT-LINED PIPE, LENGTH TO FIT. WHERE MORE THAN ONE LENGTH OF PIPE IS REQUIRED, CONNECT PIPES WITH MECHANICAL JOINT SLEEVE.
- E. 2 - 3/4" GALVANIZED STEEL SHACKLE RODS, TAR SEALED AFTER ASSEMBLY.
- F. 1/4 CY - 1:3:6: CONCRETE MIX, POUR IN PLACE TO BLOCK. MAINTAIN CLEARANCE FOR BOLTS.
- G. 5" X 4" FEMALE SEATTLE STANDARD THREAD RIGID 5" STORZ ADAPTOR WITH ALL CAPS AND CHAINS OR CABLES. ADAPTOR MATERIAL TO BE ANODIZED ALUMINUM

NOTES:

- 1. FIRE HYDRANT EXTENSION, IF REQUIRED.
- 2. FIRE HYDRANT TO BE PAINTED WITH TWO COATS OF HIGH GLOSS OSHA SAFETY YELLOW ENAMEL PAINT.

