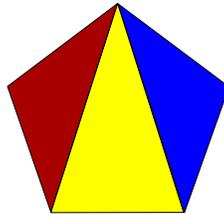


# NEWPORT NEWS WATERWORKS



# DISTRIBUTION STANDARDS FOR MATERIALS & CONSTRUCTION



City of Newport News (Virginia)  
Department of Public Utilities

JULY 2009

Pursuant to Commonwealth of Virginia *Waterworks Regulations*, 12 VAC 5-590-220, this document was approved January 25, 2010 by Daniel B. Horne, P.E., Engineering Field Director, Virginia Department of Health, Office of Drinking Water

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**CITY OF NEWPORT NEWS  
DEPARTMENT OF PUBLIC UTILITIES  
(WATERWORKS)**

FOREWORD

In accordance with the Newport News City Code and the Commonwealth of Virginia Department of Health Waterworks Regulations, it is the responsibility of the Newport News Department of Public Utilities (Waterworks) to use, as well as monitor the use by others, approved materials and methods of construction for water pipelines and to provide drinking water of adequate quantity and quality to its customers. This document was prepared to specify acceptable materials and construction methods to help meet those responsibilities.

The Waterworks instituted its Contractor Certification program as a key element to help support our goal that all water users served by the regional system are supplied with adequate quantities of potable water, and that the water supplied is as healthful as current treatment and distribution techniques allow. No developer, contractor, municipality, or other agency will be permitted to install, modify or repair pipelines or appurtenances which are, or will ultimately become a part of the Waterworks' distribution system, unless the person directly responsible for overseeing the work has demonstrated that he or she has a comprehensive knowledge of the contents of this manual and have passed the Certification Program Test administered by the Waterworks.

This July 2009 edition of the *Waterworks Distribution Standards* demonstrates our commitment to produce a comprehensive and user-friendly document. Within its pages you will find the information regarding materials and methods necessary for a Contractor to provide a complete and acceptable waterline project. The changes made to the previous revision are documented on the following pages; most notable are the improved manner of identifying the embedded drawings, many of which were updated and enhanced; the expanded index; and thoroughness of detail exhibited throughout. We trust you will find these *Standards* beneficial as we work together to provide safe & reliable drinking water for the entire Virginia Peninsula.



Brian L. Ramaley, P.E.  
Director

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# DISTRIBUTION STANDARD

## DESCRIPTION OF CHANGES – JULY 2009 REVISION

The following is a compilation of changes made as a 2009 update to the Newport News Waterworks' Distribution Standards, March 2001 revision:

**GENERAL** The Standards have been updated to correct typographical errors and to refine product descriptions in accordance with changes made by manufacturers. Removed GC Sections 6, 7, 8 & 9 from this document.

Enhanced readability of Standards by adding Section identifier at top of succeeding page for Sections that continue onto a succeeding page.

The following is a detailed list of the changes made and the applicable Section numbers as they appeared in the March 2001 Revision.

### GENERAL CONDITIONS

General	Added numerical references to <i>Definitions</i>
1.2.27 & 1.2.64	Revised definitions for <i>Distribution Main</i> and <i>Transmission Main</i> to include 16" as a distribution main
1.2.39	Added definition of NPT
1.2.51	Added definition of RP Device
1.3	Added BOC (Back Of Curb) to Abbreviations
1.3	Added BP (Backflow Preventer) to Abbreviations
1.3	Added FPT (Female Taper Pipe Thread) to Abbreviations
1.3	Added MPT (Male Taper Pipe Thread) to Abbreviations
1.3	Added NPT (National Taper Pipe Thread) to Abbreviations
1.3	Added RP/RPZ [Reduced Pressure (Zone)] to Abbreviations
1.4	Revised Legend to replace Double Check Detector Assembly with Single Check Detector Assembly

### MATERIAL SPECIFICATIONS

2.2	Replaced " <i>shown</i> " with " <i>indicated</i> "
2.2.A - .G	Added underline to subtitles
2.2.G	Corrected spelling of EBAA Iron Sales and organized approved glands in tabular format. Added Smith-Blair, Sigma & Capital glands.
2.2.H	Added subsection for gaskets...including description for "gripper gaskets"
2.3.A	Deleted statement regarding not using mechanical joint split sleeves
2.4 (general)	Revised wording and rearranged order of paragraphs to enhance legibility and comprehension
2.4.B.1	List of approved steel tapping sleeves was expanded, updated and arranged in tabular format

**DISTRIBUTION STANDARD**  
**DESCRIPTION OF CHANGES – JULY 2009 REVISION**

2.4.C	Added paragraph regarding submittal for approval of sleeves or saddles proposed for tapping concrete pipe
2.4.E	Revised paragraph to require stainless steel fasteners for fabricated steel tapping sleeves, and incorporated into 2.4.B
2.4.F	Deleted paragraph regarding exterior coating for tapping sleeves
2.4.G	Added paragraph for tapping ball valve & service clamp used for 2-inch branch tapping of a CIP or DIP main
3.1	Added bullets in second paragraph to identify valve types by pipe sizes for clarity. Also expanded descriptions of uses of valves.
3.1	Added push-on end connection. Revised wording of required end connections (added Push-On for gate valves & male thread for ball valves)
3.2	Added requirement for stainless steel bolts & nuts. Revised list of approved gate valves
3.2, 3.3 & 3.4	Added tabular layout for identifying approved manufacturers
3.3	Added Cambridge Brass products
3.3	Added MPT x FPT tapping valves and revised table to distinguish between “In-Line” & “Tapping” valves.
3.3.1	Added paragraph for Gil blow-offs
3.3.1.1	Added paragraph for check valves to be installed with blow-offs.
3.4	Added requirement for stainless steel bolts & nuts. Corrected torque terminology/units Revised list of approved butterfly valves (added Pratt)
3.6	Revised to provide detail description of valve stem extensions
3.7.D	Clarified limits of use of riser rings for valve boxes
4.1	Changed normal bury depth from 3.5 to 4 feet. Added definition of bury depth. Added description of private fire hydrants.
4.2	Changed GPM requirements from 1500 to 1000 minimum. Deleted size of internal valve. Modified size of pumper nozzle to include 4 ½” for Williamsburg. Deleted names & model numbers of approved hydrants. Added table to provide easy reference of approved manufacturers, models, and corresponding internal valve sizes. Added requirement for stainless steel bolts & nuts.
4.2	Moved several descriptive items from 4.1 to 4.2 and revised wording for clarity.
4.3	Expanded description of approved connections to allow use of Mueller AquaGrip.
5.3	Added Cambridge Brass corporation stops

**DISTRIBUTION STANDARD**  
**DESCRIPTION OF CHANGES – JULY 2009 REVISION**

5.4	Added Cambridge Brass angle valves
5.5	Added Cambridge Brass service saddles
5.5	Added paragraphs for service saddles on CIP & DIP.
Maint. Bond	Deleted
6.4	Deleted 6.4 <b>Steel Casing Pipe</b> ...requirements are in MS.13.
7.1	Added sentence to prohibit use of fly ash for backfill.
9.11	Updated manufacturer's information for Thorite
11.3	Revised wording to reflect material specifications only
11.4	Revised wording to reflect material specifications only
13.2.1	Revised reference to VDOT Road & Bridge Specifications, and changed minimum wall thickness to agree with VDOT Road & Bridge Specifications [section 232.02 (c) -5]; also clarified where specific thicknesses are required.
13.3	Revised to add RACI spacers
14	Added new Section for ancillary (miscellaneous) items

**CONSTRUCTION STANDARDS**

1.2 & 1.3	Revised subsection titles for disposal
2.12	Changed "workmen" to "workers"
4.1.1	Added sub-section to establish procedure for situations that involve lead-joint fittings & hydrants.
4.6	Revised tables for allowable deflection to cover 18-foot & 20-foot pipe lengths; also added table of allowable deflection with gripper gaskets
4.8	Moved statement on inspection & repair of coating from MS 2.2.E.
4.8	Added requirement for securing tracer wire to PVC pipe.
4.8	Revised wording to clarify requirements for installation of warning tape over PVC pipe
4.11	Revised requirements for joint restraint
4.12	Revised paragraph for installation of ball valves to specify maximum depth
4.12.1	Added paragraph for installation of Gil blow-offs. Clarified requirements for permanent & temporary blow-offs.
4.13	Added fire hydrant access requirement; also revised 4 <sup>th</sup> paragraph to establish rotational orientation of hydrants Added paragraph to establish bury depth requirements and restriction of hydrant extensions
4.16.C	Moved paragraph regarding submittal for approval of sleeves or saddles proposed for tapping of concrete pipe to MS 2.4.C
4.16.E	Added paragraph for tapping of CIP/DIP for PVC branch.
4.17.C.3 & 4	Added 6" size pipe to flushing procedure
4.18.A & C	Specified requirement for backflow preventer to be an RP.

**DISTRIBUTION STANDARD**  
**DESCRIPTION OF CHANGES – JULY 2009 REVISION**

4.19.B	
4.20	Added requirements for submittals
4.21	Expanded description of abandonment requirements and revised abandonment policy.
4.22	Added criteria for casing requirement, and modified installation requirements to include RACI spacers. Added note to specify only mechanical joint pipe within casing. Added paragraph for casing applications other than roadways and railroads.
4.24	Added Section to establish procedure for notification of shut-off. [Revised shut-off notification wording in 4.16 to match 4.24].
5.1.A.5	Deleted references to “angle valve” regarding proposed location of water meter(s)
5.1.A.5.c	Added statement to exclude locating meters in paved areas.
5.3.D	Added subparagraph 1.b for spacing of taps on 2” PVC pipe.
5.3.D.1	Revised spacing of service taps to allow clearance for larger meter boxes.
5.3.H	Changed “minimum” to “normal” for cover for service lines
5.4	Changed “he” to “he/she” and changed “may” to “might”
5.5	Revised wording to include expanded requirements for service saddles. Added paragraph to require service saddles for 1 ½” & 2” taps on DIP & CIP 8” or smaller.
6.3	Changed “local conditions” to “site-specific conditions”
7.4	Deleted redundant statement for compaction in 6” layers.
11	Revised to reflect change from DCDA to SCDA, and expanded this Section to include private fire hydrants, fire suppression systems smaller than 4 inches, domestic water & irrigation systems. Renamed this Section to reflect new function.
12.5	Renamed “Figure 1” as “Chart A” and “Figure 2” as “Chart B”
14	Added new Section to clarify requirements & responsibilities for meter room installations.

**STANDARD DRAWINGS**

Deleted the following drawings:

- W-06E.....Fire Hydrant Setting Adjacent To or In Sidewalk
- W-12A-02...Fire Sprinkler Vault Assembly (table & notes)
- W-12B.....Fire Sprinkler w/o Hydrant
- W-12C.....Fire Sprinkler with Hydrant

**DISTRIBUTION STANDARD**  
**DESCRIPTION OF CHANGES – JULY 2009 REVISION**

Added the following drawings:

- W-03A-2...Vertical Up Offset
- W-04A-2...Tapping Sleeves for 4" or Larger Pipe
- W-05A-1...Typical Ball Valve Setting
- W-05C-1...Dead End Blow-Off Assemblies
- W-05C-2...Restrained Length at Dead End
- W-05C-3...Restrained Length at Transition
- W-09A-1...Typical Casing Installation with RACI Spacers
- W-10A.....Crossing of Cathodically Protected Pipeline
- W-13A.....No. 1 Meter Box & Lid for 5/8" Meter
- W-13B.....No. 2 Meter Box & Lid for 3/4" & 1" Meters
- W-13C.....No. 3 Meter Box & Lid for 1-1/2" & 2" Meters
- W-16C-1...Typical Water Meter Installation of 1-1/2" & 2"

**STANDARD DRAWINGS, REVISED**

In addition to minor changes such as correcting grammatical/spelling errors, changes have been made to the Standard Drawings, as noted below:

W-02A	Deleted Section View identifier; added TEE to size column
W-02B	Deleted Section View identifier; added ANGLE & PIPE to respective columns
W-02C	Added: (1) ANGLE & PIPE to respective columns, (2) rebar in Plan, (3) rebar bending detail, (4) notes 3 & 4, and (5) rebar embedment dimension. Deleted table of Reinforcing Bars
W-02D	Deleted Section View identifier; added ANGLE & PIPE to respective columns; changed PLAN to ELEVATION
W-03A-1	Added DOWN to title; revised restrained lengths & specified restrained lengths in linear feet; added note 5
W093-B	Revised restrained lengths & specified restrained lengths in linear feet; added note 5
W-04A	Deleted in-line 2-inch valve; updated item descriptions
W-04A-1	Deleted in-line 2-inch valve; updated item descriptions; added two views for tapping of existing pipe
W-05C	Deleted obsolete blow-off configuration & dead end restraint detail (now on W-05C-2); enhanced detail of typical blow-off assembly
W-07A	Revised wording to clarify vertical separation requirements
W-09A	Deleted requirement for rods; changed title to reflect specific brand of spacers (Cascade)
W-12A	Replaced views of double-check detector assembly with those of single-check detector assembly; changed title to suit

**DISTRIBUTION STANDARD**  
**DESCRIPTION OF CHANGES – JULY 2009 REVISION**

W-12A-1	Replaced views of vault with detail of single-check detector assembly & parts list
W-15C	Deleted length of pipe added for full-pipe flush and added length of pipe to be exposed above grade; added detail for temporary blow-off for single check detector assembly; changed title accordingly
W-15D	Updated view to illustrate Gil SlimLine blow-off
W-16A	Revised Plan to correctly illustrate location of meters; added curb & gutters in Elevation; changed title to reflect actual application
W-16B	Revised title
W-16C	Removed information related to 1-1/2" & 2" meters (now on W-16C-1); revised title to reflect change in sizes
W-17A	Revised title to identify application

Added Figure Numbers to all Standard Drawings. (All references to Standard Drawings have been revised to also include reference to Figure Numbers.)

Added **List of Figures**.

The **Table of Contents** and the **Index** have been revised to reflect the above changes, as applicable.

*End of Section*

## **DISTRIBUTION STANDARD ADDENDUM 2014**

The following products, configurations, procedures and regulations have been approved for inclusion into the latest revision of the Newport News Waterworks Distribution Standards for Materials and Construction guidebook.

### Items of Interest

- I. Dead End Blow-Off – Kupferle Model #78
- II. Lead Free Brass Fittings – Section add on MS 1.12
- III. Retainer Glands – Tyler Union – TufGrip 1000
- IV. Sleeves and Couplings – Bolted Steel Couplings
- V. Tapping Sleeves and Valves – Tyler Union
- VI. Resilient Seat Gate Valves – Clow Valve
- VII. Rubber Seated Butterfly Valves - Butterfly Valve acquisition

#### **I. Dead End Blow-Off (1/4/2014)**

**Pertains to all Sections and Figures regarding dead end blow-offs  
Kupferle Model #78**

A blow-off known as the #78 Kupferle Mainguard hydrant manufactured by John C. Kupferle Foundry Company has been added to the NNWW distribution materials for construction. The #78 Kupferle Mainguard hydrants will be used as an alternative to the Gil blow-off when needed. The products' inlet will not be of a side inlet but will rather accommodate 'Newport News Waterworks for Materials and Construction Standards' and is noted in the NNWW standards book where applicable. (For further detailed information see 'Index' in back of book.)

#### **II. Lead Free Brass Fittings (1/4/2014)**

**Addition - Section MS 1.12**

In January 2011, the Reduction of Lead in Drinking Water Act was signed into law, which will reduce the allowable lead content of wetted surfaces in drinking water pipes, pipe fittings, and plumbing fixtures; the effective date of implementation is **January 4, 2014**. The products affected by this legislation include all valves, fittings, or fixtures that come into contact with potable water, except those excluded per Federal Public Law 111-380. This includes corporation stops, curb stops, service fittings and couplings, meter valves, meter couplings, copper meter setters and in-setters, meter yoke valves, check valves, backflow valves, and more. Fittings that are noted in the 'Newport News Waterworks Distribution Standards for Materials and Construction' book and mentioned in the act are affected by the "Reduction of Lead in Drinking Water Act" and therefore must be updated and mentioned for the water pipeline installers to adhere. Current

**DISTRIBUTION STANDARD  
ADDENDUM 2014**

inventory of 85-5-5-5 leaded brass becomes obsolete on January 4, 2014. Valves, fittings, or fixtures that contain lead which exceeds the 0.25% weighted average limit for wetted surfaces may no longer be installed. (Please read the “Reduction of Lead in Drinking Water Act” found on the internet under S. 3874 for the entire specifics of the act.) <https://www.govtrack.us/congress/bills/111/s3874/text>

**III. Retainer Glands (1/4/2014)**  
**Pertains to Section 2.2G**  
**‘Tyler-Union – TufGrip Series 1000’**

‘Tyler-Union’ is added under ‘Manufacturer’ and ‘TufGrip Series 1000’ under ‘Brand Name’

**IV. Sleeves & Couplings (1/4/2014)**  
**Pertains to Section MS 2.3 B**  
**Bolted Steel Couplings**

All bolted steel couplings will be epoxy coated and have stainless steel bolts and nuts.

**V. Tapping Sleeves & Valves (1/4/2014)**  
**Pertains to Section MS 2.4 A**  
**‘Tyler Union’**

Additional manufacturer for mechanical joint tapping sleeves includes ‘Tyler Union’.

**VI. Resilient-Seat Gate Valves (1/4/2014)**  
**Pertains to Section MS 3.2**  
**‘Clow Valve’**

The ‘Clow Valve’ product is added under the list for “Manufacturers of approved resilient-seat gate valves”

**VII. Rubber-Seated Butterfly Valves (1/4/2014)**  
**Pertains to Section MS 3.4**  
**‘Val-Matic’ Butterfly Valve acquisition**

As per the Val-Matic memo dated June 11,1999 by the Vice President of Sales/Marketing a butterfly valve known as the “Americian-Darling (American Flow Control) Butterfly Valve Line” has been acquired by Val-Matic and has been named “The Val-Matic American-BFV Butterfly Valve”. Additionally the memo indicates that the valve has a “...seat on disc design, which allows for field

**DISTRIBUTION STANDARD  
ADDENDUM 2014**

adjustment/replacement of the resilient seat. The valve fully meets AWWA Standard C504, the governing standard for municipal Butterfly Valves and has been ANSI/NSF-61 certified for potable water. “ (For more information see <http://www.valmatic.com>)

**VIII. Abbreviations**

Newport News Waterworks .....  
..... NNWW

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# WATERWORKS DISTRIBUTION STANDARDS

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# **GENERAL CONDITIONS**

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# SECTION 1

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## TERMS, DEFINITIONS & ABBREVIATIONS

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In the interpretation of the Contract Documents and the construction operations governed by said documents, the following terms, definitions, and abbreviations, or pronouns in place of them, shall each be construed as defined below, unless otherwise stated:

1.1 **Terms:**

The words “as described”, “as required”, “as permitted”, “as allowed”, or phrases of like import as used herein, shall mean that the direction, requirement, permission, or allowance of the Engineer is intended, and similarly the words “approved”, “reasonable”, “suitable”, “properly”, “satisfactory”, or words of like effect or import, unless otherwise particularly specified herein, shall mean approved, reasonable, suitable, properly, or satisfactory in the judgment of the Engineer.

Command type sentences are used throughout the Contract Documents. In all cases the command expressed or implied is directed to the Contractor.

1.2 **Definitions:**

1.2.1 **Acts of God:** An act of God is to be construed to mean a flood, tornado, hurricane, or other phenomenon of nature of catastrophic proportions or intensity so as to prohibit work.

1.2.2 **Addendum:** A modification of the Contract Documents issued in writing by the City prior to the opening of bids.

1.2.3 **Advertisement, Notice to Bidders:** The public announcement inviting bids for work to be performed or materials to be furnished.

1.2.4 **Agreement:** A standard Contractual Document between the City and a developer/property owner for the extension of water service to a specified business, plant, residence or planned development.

1.2.5 **Approved Equal:** A product, component, or process whose use in or on a particular project is specified as a standard for comparison purposes only. The “equal” product, component, or process shall be the same or better than that named in function, performance, reliability, quality and general configuration. Determination of equality in reference to the product design requirements will be made by the Engineer.

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- 1.2.6 Attorney: The City Attorney as appointed by the Incorporated City of Newport News.
- 1.2.7 Authorized Representative: Any person, persons or firms duly authorized by the City.
- 1.2.8 Backflow: The flow of a liquid substance into the distribution system from a source other than the water treatment plants.
- 1.2.9 Bid: The offer of the bidder to perform work at the prices quoted, submitted on the City's official proposal form, properly signed and guaranteed.
- 1.2.10 Bid Guaranty, Bid Bond: Cash, bond, or cashier's/certified check accompanying the proposal submitted by the bidder as a guaranty that he will enter into Contract with the City for performance for the work if the Contract is awarded to him.
- 1.2.11 Bidder: Any individual, firm, partnership or corporation submitting a proposal in response to the Notice to Bidders calling for bids on the work contemplated.
- 1.2.12 Calendar Day: Any day shown on the calendar beginning and ending at midnight.
- 1.2.13 Change Order: a written order, approved by the City and issued by the Engineer to the Contractor, covering changes in the Contract Documents after award of the Contract.
- 1.2.14 City: The Incorporated City of Newport News, Virginia, acting through its duly authorized officials, officers, employees or representatives.
- 1.2.15 Codes: Applicable local, State and Federal codes, regulations or ordinances under which the work is to be performed.
- 1.2.16 Coliform Bacteria: A group of bacteria predominantly inhabiting the intestines of man or animal but also occasionally found elsewhere. It includes all aerobic and facultative-anaerobic, gram-negative, non-sporeforming bacilli that ferment lactose with production of gas. Also included are all bacteria that produce a dark purplish-green colony with metallic sheen by the membrane filter technique used for coliform identification.
- 1.2.17 Contract: A part of the Contract Documents which stipulates conditions on which the work is agreed to be performed, executed by the City and the Contractor or Developer.

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- 1.2.18 Contract Documents: The written agreement covering the performance of the work, the Notice to Bidders, Special Provisions, Proposals, Plans (Drawings), all Specifications, Addenda, Permits, Contract, Contract Bonds, Change Orders in the course of the work, and any approved revisions made during the performance of the work to any of the above listed documents.
- 1.2.19 Contract Item: A specific unit of work for which a price or basis of payment is provided in the Contract.
- 1.2.20 Contract Price: The total amount of money for which the Contract is awarded.
- 1.2.21 Contractor: Any individual, firm, partnership, corporation or any combination thereof who has entered into a Contract with the City. In case of work being done under permit issued by the City, the permittee shall be construed to be the Contractor.
- 1.2.22 Cross Connection: Any connection or structural arrangement, direct or indirect, to the water distribution system whereby backflow can occur.
- 1.2.23 Department: Refers to the Department of Public Utilities of the Incorporated City of Newport News.
- 1.2.24 Developer: Any individual, firm, partnership, corporation or any combination thereof who has entered into a *WATER MAIN PIPELINE AGREEMENT* with the City.
- 1.2.25 Developer's Contractor: Contractor hired by a developer, at his expense, to install a water line under an extension agreement with the City. The words "Contractor" and "Developer's Contractor" may be used interchangeably under an extension agreement.
- 1.2.26 Director: The duly appointed Director of Public Utilities for the Incorporated City of Newport News or his authorized representatives. The decision of the Director of Public Utilities shall be final.
- 1.2.27 Distribution Main: A water pipeline, generally 2 to 16 inches in diameter, which supplies potable water to a service connection.
- 1.2.28 Disinfection: The destruction or inactivation of pathogenic micro-organisms.

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- 1.2.29        Domestic Usage: Normal family use, including drinking, laundering, bathing, cooking, heating, cleaning, and flushing toilets.
- 1.2.30        Easement: A grant of a right of use of the property by the owner for a specific and limited use.
- 1.2.31        Engineer: The firm or individual designated by the City, whether acting directly or through properly authorized agents, inspectors or representatives of the Engineer, acting within the scope of duties entrusted to them. For projects not involving an engineering firm contracted to the City, the term *engineer* shall refer to the Chief Engineer of the Newport News Department of Public Utilities (Waterworks), and those who are authorized agents, inspectors or representatives of same.
- 1.2.32        Extra Work: An item of work not provided for in the Contract as awarded but determined by the Engineer as essential to the proper completion of the Contract within its intended scope.
- 1.2.33        Inspector: The authorized representative of the Engineer entrusted with making detailed inspections of the work and materials.
- 1.2.34        Latest Revision: Where reference is made to standards in the Technical Specifications, the phrase “latest revision” shall mean the latest published edition prior to the date listed in the “Notice to Bidders” that the Plans, Specifications, Bid Forms and other Contract Documents will be available to Bidders.
- 1.2.35        Labor & Material Payment Bond: The form of security approved by the City, furnished by the Contractor and his surety, to guarantee the payment of all persons supplying labor and materials in the prosecution of the work in accordance with the terms of the Contract Documents.
- 1.2.36        Liquidated Damages: The amount prescribed in the Contract Documents to be paid the City, or to be deducted from any payments due or to become due the Contractor for each day’s delay in completing the whole or any specified portion of the work beyond the time allowed in the Contract Documents.
- 1.2.37        Lump Sum: A method of payment providing for one all inclusive cost for the work or a particular portion of the work.
- 1.2.38        Maintenance Bond: The form of security approved by the City, furnished by the Developer or Contractor and his surety to guarantee materials and workmanship for two years. The amount will be as specified in Contract or water pipeline extension agreement.

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- 1.2.39 NPT: American National Standard Taper Pipe Thread manufactured in accordance with requirements of ANSI B1.20.1. This designation is often used interchangeably with IPS (Iron Pipe Size).
- 1.2.40 Notice: A written communication delivered to the authorized individual, member of the firm or officer of the corporation for which it is intended. In the case of a Contract with two (2) or more persons, firms or corporations, notice to one shall be deemed notice to all, unless otherwise specified in the Contract Documents.
- a. *Notice of Award*: A written notice from the City to the Contractor informing him that the Contract has been awarded to him and that he should begin execution of the Contract Documents.
  - b. *Notice to Proceed*: A written notice to the Contractor from the City, designating the date the Contract term is to begin and the date for final completion of the Contract requirements.
- 1.2.41 Owner: Will have the same meaning as "City" in the Contract Documents.
- 1.2.42 Performance Bond: The form of security approved by the City, furnished by the Contractor and his surety, guaranteeing the complete and faithful performance of all the obligations and conditions placed on the Contractor by the Contract Documents.
- 1.2.43 Plans: The drawings, profiles, cross-sections, working drawings, and supplemental drawings, or reproductions thereof, which show the location, character, dimensions and details of the work to be performed. Plans may either be bound in the same book as the balance of the Contract Documents or bound in separate sets, and are a part of the Contract Documents, regardless of the method of binding. Throughout these documents, the term "plan" is used interchangeably with drawings and construction drawings.
- 1.2.44 Pollution: The presence of any foreign substance (chemical, physical, radiological, or biological) in water that tends to degrade its quality so as to constitute an unnecessary risk or impair the usefulness of the water.
- 1.2.45 Pollution Hazard: A condition through which an aesthetically objectionable or degrading material may enter the waterworks' or a consumer's water system.

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- 1.2.46 Potable Water: Water fit for human consumption and domestic use, normally free of minerals, organic substance, and toxic agents in excess of reasonable amounts.
- 1.2.47 Reference Specifications: Bulletins, standards, rules, methods of analysis or test, codes and specifications of other agencies, engineering societies, or industrial associations referred to in the Contract Documents.
- 1.2.48 Rights-of-Way: A general term denoting land, property or interest therein, acquired for or devoted to public use.
- 1.2.49 Rights-of-Way Official: Individual responsible for the maintenance and activities within a right-of-way for the owner of the right-of-way.
- 1.2.50 Roadway: That portion of the highway included between curbs, gutters, or ditches, intended primarily for vehicular traffic, and including all pertinent appurtenant structures and other features necessary for proper drainage and protection.
- 1.2.51 RP (Reduced Pressure principle backflow preventer): A testable assembly consisting of 2 independently operating, resilient-seated check valves, separated by a zone of reduced pressure and an independent pressure differential relief valve that is below the first check valve, with a resilient-seated shut-off valve at each end, which meets the requirements of American Society of Sanitary Engineers (ASSE) Standard 1013 and is approved by the University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USC FCCCHR). NOTE: The terms RP and RPZ are commonly used interchangeably.
- 1.2.52 Service Connection: The point at which a meter service line is connected to the Distribution main, usually consisting of a corporation or corporation and tapping saddle.
- 1.2.53 Service Line: The pipeline extending from the service connection to the water meter.
- 1.2.54 Sewer: Any sanitary or combined sewer used to convey municipal or industrial waste, but excluding sewers which convey only storm water.
- 1.2.55 Shop Drawings: All drawings, diagrams, illustrations, schedules and other data which are specifically prepared by or for Contractor to illustrate some portion of the work; and illustrations, brochures, standard schedules, performance charts, instructions diagrams and other information prepared by a manufacturer, fabricator, supplier or distributor and submitted by Contractor to illustrate material or equipment for some portion of the work.

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- 1.2.56        Special Conditions: Requirements peculiar to the project and which are not otherwise thoroughly or satisfactorily detailed and set forth in the standard specifications.
- 1.2.57        Standard Plans or Drawings: Details of structures, devices, or instructions adopted by the City as a standard and referred to in the Contract Documents by title or number.
- 1.2.58        Standard Sample: That portion of finished drinking water that is examined for the presence of coliform bacteria.
- 1.2.59        Standard Specifications: The terms, directions, provisions and requirements set forth in the Water Distribution System Standards, together with all subsequent addenda and supplements thereto identified as such.
- 1.2.60        State: The Commonwealth of Virginia.
- 1.2.61        Sub-Contractor: An individual, partnership, firm, corporation, or any acceptable combination thereof, or joint venture to whom the Contractor sublets part of the Contract.
- 1.2.62        Supplemental Specifications: Supplemental specifications are those adopted subsequent to the standard specifications and generally involve alterations and new construction items, or substantial changes in the standard specifications.
- 1.2.63        Surety: Any individual, firm or corporation, authorized to do business in the State, bound with and for the Contractor for the acceptable performance, execution and completion of the work, and for the satisfaction of all obligations incurred.
- 1.2.64        Transmission Main: A water main, generally greater than 16 inches in diameter, which is used to convey water to one or more distribution mains.
- 1.2.65        Unit Price: A Contract item of work providing for payment based on a specified unit of measurement; e.g., linear foot or cubic yard.
- 1.2.66        Utility: Railroad track(s), overhead or underground wire, pipelines, conduits, ducts, or structures owned, operated or maintained in or across public or private rights-of-way or easements.

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1.2.67 **Waterworks:** Includes all structures, equipment, and appurtenances used in the storage, collection, purification, treatment, and distribution of water except the piping and fixtures beyond the water meter at the building where such water is delivered.

1.2.68 **Waterworks Regulations:** Regulations adopted by the Virginia Department of Health (VDH) governing the design, construction, and operation of a waterworks, including standards for potable water quality. All references shall be to the latest edition.

1.2.69 **Work:** That which is proposed to be constructed or performed under the Contract or permit, including the furnishing of all material, labor, tools, machinery and appurtenances necessary to complete the Contract.

1.2.70 **Written Notice:** Written notice shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered to or sent by registered mail to the last business address known to him who gives the notice.

1.3 **Abbreviations:**

The abbreviations herein, together with others in general use, are applicable to these Standard Specifications, to project plans, and other Contract Documents. **NOTE:** Some abbreviations shown with periods are commonly used without periods, and some abbreviations shown without periods are commonly used with periods.

<b><i>Abbreviation</i></b>	<b><i>Word or Words</i></b>
AASHTO	American Association of State and Highway Transportation Officials
ACI	American Concrete Institute
AWG	American Wire Gauge
aband	abandon, abandoned
ABS	Acrylonitrile-Butadiene-Styrene
alt	alternate
AWWA	American Water Works Association
ASTM	American Society for Testing of Materials
bdry	boundary
BP	Backflow Preventer (e.g., RP)
BM	benchmark
BO	Blow Off
BOC	Back Of Curb
C.A.P.	Corrugated Aluminum Pipe

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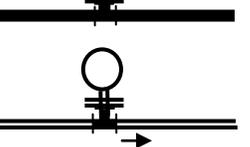
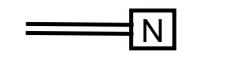
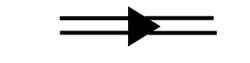
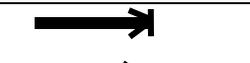
<b>Abbreviation</b>	<b>Word or Words</b>
CBR	California Bearing Ratio
CDI	Curb Drop Inlet
CIP	Cast Iron Pipe
CO	cleanout
conc	concrete
const	construct or construction
CSP	Corrugated Steel Pipe
CY or cu yd	cubic yard
DI	Drop Inlet
DIP	Ductile Iron Pipe
DIPRA	Ductile Iron Pipe Research Association
Dwg	drawing
ESVC	Extra Strength Vitrified Clay
exc	excavation
fig	figure
flg	flange or flanged
FPT	Female Pipe Thread (see NPT)
galv	galvanized
GIP	Galvanized Iron Pipe
gr	grade
GSP	Galvanized Steel Pipe
hdwl	headwall
HGL	Hydraulic Grade Line
horiz	horizontal
hyd	hydrant
inv	invert
IP	Iron Pipe
LF	Linear Foot
LS	Lump Sum
MH	manhole
MJ	Mechanical Joint
MPT	Male Pipe Thread (see NPT)
MSS	Manufacturers Standardization Society
NIC	Not In Contract
NPT	National Standard Taper Pipe Thread
PI	Point of Intersection
PC	Point of Curvature
PRC	Point of Reverse Curvature
PL	Property Line or Pipeline
POC	Point On Curve
P.O.T	Point On Tangent
PT	Point of Tangency
PVC	polyvinyl chloride
pvmnt	pavement

<b>Abbreviation</b>	<b>Word or Words</b>
R or RAD	radius
RCCP	Reinforced Concrete Cylinder Pipe
RCP	Reinforced Concrete Pipe
reinf	reinforce or reinforcement
RR	railroad
R/W or R.O.W	Right Of Way
SCDA	Single-Check Detector Assembly
SDR	Standard Dimension Ratio
spec	specifications
SS	Sanitary Sewer
std	standard
SY or sq yd	Square Yard
tan.	tangent
TC or TOC	Top of Curb
THWN	Thermoplastic Heat & Water Resistant Nylon coated (electrical wire)
TS&V	Tapping Sleeve (or Saddle) & Valve
VAC	Virginia Administrative Code
VDH	Virginia Department of Health
VDOT	Virginia Department Of Transportation

1.4 **Legend:**

Unless otherwise noted, the following symbols are employed to illustrate water pipelines and appurtenances in *plan views* on Newport News Waterworks' Distribution System drawings:

SYMBOL	DEFINITION
	Existing Pipe 6" & larger
	Existing Pipe smaller than 6"
	Proposed Pipe 6" & larger
	Proposed Pipe smaller than 6"
	Abandoned & To Be Abandoned Pipe and Appurtenances [Text identifies if pipe is abandoned or to be abandoned]
	Existing Gate Valve
	Proposed Gate Valve

SYMBOL	DEFINITION
 	<p>Existing Butterfly Valve</p> <p>Proposed Butterfly Valve [small circle/dot to one side indicates location of side gear operator]</p>
 	<p>Existing Tapping Sleeve (or saddle) &amp; Valve</p> <p>Proposed Tapping Sleeve (or saddle) &amp; Valve</p>
 	<p>Existing Fire Hydrant...shown with tee &amp; hydrant branch valve.</p> <p>Proposed Fire Hydrant...shown with tee &amp; hydrant branch valve [Note: if an arrow is part of symbol, it indicates direction steamer/pumper nozzle (front of hydrant) should face]</p>
 	<p>Existing Tee</p> <p>Proposed Tee</p>
 	<p>Existing Bend: 90° (shown), 45°, 22-1/2°, 11-1/4°</p> <p>Proposed Bend: 90° (shown), 45°, 22-1/2°, 11-1/4°</p>
 	<p>Existing Meter (angle valve)</p> <p>Proposed Meter (angle valve)</p>
 	<p>Existing SCDA (Single Check Detector Assembly) with meter</p> <p>Proposed SCDA (Single Check Detector Assembly)</p>
 	<p>Existing Reducer</p> <p>Proposed Reducer</p>
 	<p>Existing Cross</p> <p>Proposed Cross</p>
 	<p>Existing Blow-Off Assembly</p> <p>Proposed Blow-Off Assembly</p>

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**Note:** Valves, fire hydrants, and blow-off assemblies are identified by a letter [or letter & number] within a hexagon...these identifiers correspond to columns in the drawing's data block.

*End Of Section*

## **NOTE:**

General Conditions Sections 2 through 9 (inclusive) are not part of this document. These sections will be included as part of the Construction Contract.

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# **MATERIAL SPECIFICATIONS**

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## SECTION 1

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### QUALITY ASSURANCE

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- 1.1 **General:** This Section governs the furnishing of all materials required to complete the work as shown on the plans or as directed by the Engineer.
- 1.2 **Quality of Materials:** The Contractor shall use only new materials, parts, products and appurtenances in the work which conform to the specified requirements. The Contractor shall determine the kind of work, amount of work and other factors that may be necessary or involved in furnishing the specified products and materials. Materials and products which, after approval, have become unsuitable or unacceptable for use, regardless of cause, will be rejected by the Engineer or Owner and shall not be used.
- 1.3 **Sampling & Testing:** Test of materials will be made by the Contractor in accordance with the methods described or designated in the applicable specifications.

The City reserves the right to require samples and to retest products for compliance with pertinent requirements irrespective of prior certification of the products by the manufacturer thereof as outlined in Sections 7 and 9 of the General Conditions [not included within this document].

- 1.4 **Certification:** For commercial products inclusive of industry standardized products, and in lieu of normal sampling and testing procedures by the Contractor, the Engineer may accept from the Contractor the manufacturer's certification with respect to the product involved, under the conditions set forth in Section 8.2 of the General Conditions [not included within this document].
- 1.5 **Inspection Requirements:** Contractor shall allow access of the Engineer or the Engineer's representatives to all parts of the work and to the plants of producers and fabricators at all times and will furnish them with all reasonable facilities for ascertaining whether or not the work is in accordance with the requirements and intent of the contract documents. The Contractor shall furnish such samples as are customarily required for testing purposes at no expense to the City, unless otherwise specified.
- 1.6 **Storage and Protection of Materials:** Materials shall be stored so as to assure the preservation of their quality and fitness for the work. Stored materials even though approved before storage, will again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the right-of-way or easement may be used for storage purposes and for the placing of the Contractor's materials and equipment, but any additional space required

shall be provided by the Contractor at his expense. The Contractor shall not use private property for storage purposes without written permission of the property owner or lessee. The Contractor shall furnish copies of such written permission to the Engineer.

Materials lost or damaged due to accident, theft, vandalism, or exposure shall be repaired or replaced by the Contractor without additional cost to the Owner.

**Trade Names, Approved Equals or Substitutions:** The identification, by specific manufacturer's brand or product designation, of certain processes, machinery, equipment, or materials is to establish a basis of quality, and is not intended to exclude other manufacturers nor their processes, equipment or material of equal value, utility or merit.

If it is desirable to furnish items of equipment by manufacturers other than those specified, as a suitable substitute after the contract is executed, the Contractor shall secure approval prior to placing a purchase order or furnishing the same.

If the bid includes a list of equipment, materials, or articles for which the Contractor must name the manufacturer at the time of submission of the bid, no substitutions thereof will be permitted after a bid has been accepted without the express consent of the Owner [See Section 8 of the General Conditions (not included within this document)] and in accordance with the following procedure:

- A. Review by Owner: The Owner will consider proposed product substitutions when formal requests are submitted by the Contractor in accordance with this Section.
- B. Required Submittals: Requests for approval of product substitutions shall include, but will not be limited to:
  - 1. Product identification, including name and address of manufacturer.
  - 2. Descriptive literature.
  - 3. Certification of compliance with AWWA, Virginia Department of Health or other recognized standards when applicable.
  - 4. Signed statement of total increase or decrease in cost to the Owner which will result by use of the product proposed.

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1.7. B Trade Names, Approved Equals or Substitutions (continued)

The Owner may require additional data, sample for testing, etc. as deemed appropriate.

- C. Approval or Rejection: The Engineer shall have full authority to approve or reject the use of product substitutions proposed.

1.8 Manufacturers: Total quantities of each type or classification of materials or equipment proposed for use in this project shall be by a single manufacturer.

A manufacturer of items proposed for use in this project shall have been engaged in the manufacture of said items for a continuous period of at least 5 years prior to the date of execution of this Contract.

1.9 Markings: All manufactured or fabricated materials shall be clearly marked for identification. Markings shall include, where applicable:

1. Name or trademark of manufacturer.
2. Size and length dimensions.
3. Class or pressure rating.
4. Identifying marks relating to laying schedules, shop drawings, or contract drawings.

1.10 City-Furnished Materials: Any materials furnished by the City will be delivered or made available to the Contractor at the locations specified or shown. The cost of handling and placing such materials after they are delivered to the Contractor will be considered as included in the contract price for the item in connection with which they are used. The Contractor will be held responsible for all material delivered to the Contractor by the City and deductions will be made from any monies due to make good any shortages, deficiencies, and damages which may occur after such delivery, and for any demurrage charges.

Materials furnished by the City at the request of the Contractor, which are the responsibility of the Contractor to furnish under the terms of his contract, shall be furnished with the City acting as an alternate supplier. The sale of material shall be at the discretion and convenience of the City, and the Contractor shall pay an appropriate amount based on the Owner's cost and handling expenses.

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1.11        ***Shop Drawings:*** Shall be submitted for each item as required by Section 8 of the General Conditions (not included within this document). The information required shall include, as applicable, the following items:

- A.     Detailed drawings, data, and descriptive literature on material.
- B.     Laying schedule with supporting drawings.
- C.     Layout of material referencing stationing and grade lines.
- D.     Methods of installation and equipment to be used.
- E.     Operation and maintenance data.

*End Of Section*

## SECTION 2

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### DUCTILE IRON PIPE & FITTINGS

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- 2.1 **General:** This Section governs the furnishing of all pipe and related materials of the size and type shown on the plans or as directed by the Engineer.

Pipe to be supplied with special locking or flexible type joints, or specially fabricated sections will be specified or detailed on the plans. See other Sections of these specifications as applicable.

Pipe stronger than that specified herein may be furnished at the Contractor's option and at no additional cost to the City, provided such pipe conforms in all other respects to the applicable provisions of these specifications.

The manufacturer and Contractor shall use equipment and methods adequate to protect pipe, joint elements, and coatings from damage during hauling, storage and handling. When there is reasonable doubt as to the structural strength or water tightness of damaged sections, those sections will be rejected and replaced at the Contractor's expense.

- 2.2 **Ductile Iron Pipe:** Pipe shall be furnished in 18-foot or 20-foot laying lengths, with push-on type joints, except where mechanical joint or flanged pipe is indicated on the plans.

Ductile iron pipe shall conform to the requirements of ANSI/AWWA C151/A21.51. Flanged ductile iron pipe shall comply with the requirements of AWWA C115.

- A. **Class of Pipe:**

Ductile iron pipe 16 inches in diameter or greater shall be Class 51.

Ductile iron pipe less than 16 inches in diameter shall be Class 52.

- B. **Lining:** All ductile iron pipe and fittings are to be double thickness cement lined and seal coated in accordance with ANSI/AWWA C104/A21.4.

- C. Joints: All joints shall be mechanical, push-on, or flanged and conforming to ANSI/AWWA C111/A21.11 or ANSI/AWWA C115/A21/15 as applicable. The minimum acceptable pressure rating for all joints shall be 250 psi. All flanges and glands for pipes shall be made of ductile iron. Mechanical Joint bolts of stainless steel or other corrosion control steel alloys shall be used when specifically called for on the plans.
- D. Fittings: All fittings (bends, tees, reducers, etc.) shall be manufactured in accordance with ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53, and shall be either ductile iron or cast iron. The minimum acceptable pressure rating shall be 250 psi. If compact fittings are used then the minimum acceptable pressure rating shall be 350 psi.
- E. Coating: The exterior of all pipe, joints and fittings shall be coated as required by ANSI/AWWA C110/A21.11, C111/A21.11, C115/A21.15, C151/A21.51, or C153/A21.53 as applicable.

Damaged areas of pipe, joints or fittings shall be receive a minimum thickness of 1 mil of a bituminous coating (Pennsbury 32-B-22, Bituminous Black Coating or equivalent).

- F. Polyethylene: Material for pipeline encasement (polywrap) shall conform to the requirements of ANSI/AWWA C105/A21.5; and shall be 8-mil linear low-density (LLD) or 4-mil high-density, cross-laminated (HDCL) polyethylene.
- G. Retainer Glands: All glands shall be cast from high strength ductile iron, employ multiple integral contoured wedges applied by bolts with torque-limiting break-off bolt heads, and shall be compatible with mechanical joint connectors meeting the requirements of ANSI/AWWA C111/A21.11. Retainer glands are to be used on ductile iron pipe only, i.e., not on cast iron. The Aquagrip™ system of restrained fittings by Mueller Company is approved for certain applications. Approved glands are identified below:

## 2.2. G

**Ductile Iron Pipe** (continued)

MANUFACTURER	BRAND NAME
EBAA Iron Sales	Megalug® 1100 series
Ford Meter Box Co.	Uni-Flange® 1400 series
Romac Industries	RomaGrip
Star Pipe Products	Stargrip® 3000 series
Smith-Blair	Cam-Lok™ 111
Sigma Corporation	One-Lok SLD
Capital Industries	EZ-LOK

1. As an option in lieu of retainer glands specified above, joint restraint may be provided by use of MJ FIELD LOK® glands and gaskets as manufactured by U.S. Pipe and Foundry Company.

- H. **Gaskets: Non-restrained joints** (bell type or mechanical joint) shall employ gaskets of synthetic rubber shaped to match the configuration of the gasket socket, and manufactured in accordance with ANSI/AWWA C111/A21.11.

**Restrained joints** (bell type or mechanical joint) shall employ gaskets of synthetic rubber shaped to match the configuration of the gasket socket, with stainless steel locking segments integral in the rubber, and manufactured in accordance with ANSI/AWWA C111/A21.11; such as Fast-Grip® gasket manufactured by American Cast Iron Pipe Company; or Field Lok 350® gaskets, or MJ Field Lok® gaskets (for use with MJ Field Lok® gland – see MS 2.2.G.1) manufactured by U.S. Pipe and Foundry Company; or approved equal.

**Exercise caution to ensure all gaskets are compatible with type of joint and brand of pipe to be installed.**

## 2.3

**Sleeves & Couplings:**

- A. Mechanical joint sleeves shall be solid type, long pattern, of ductile iron manufactured in accordance with ANSI/AWWA C110/A21.10, and with a minimum pressure rating of 250 psi. Glands shall be of ductile iron. Bolts and nuts shall be low-alloy steel except when otherwise specified. Glands, gaskets, bolts, and nuts shall be in accordance with ANSI/AWWA C111/1A21.11.

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2.3. A                    *Sleeves & Couplings*    (continued)

Sleeves should not be machined in order to facilitate use with pipe of a class or type other than that for which the sleeve was intended.

- B.    The use of bolted steel couplings shall be restricted to joining pipes of different outside diameters, joining pipes of dissimilar materials, and joining sections of steel pipe. Ferrous surfaces shall be coated with an epoxy coating. Enamel coatings are not acceptable.

Bolted steel transition couplings shall be Rockwell 413, Dresser style 162, or approved equal.

Bolted steel reducing couplings shall be Rockwell 415, Dresser style 62, or approved equal.

Bolted steel couplings for joining pipes of the same outside diameter shall be Rockwell 411, Dresser style 38, or approved equal.

In those cases where the manufacturer lists 2 or more coupling lengths for a given type, the longer or longest listed length shall be used.

All bolted couplings shall be furnished with a minimum of three (3) bolts.

2.4                    *Tapping Sleeves & Valves:*

- A.    **Cast Iron Pipe:** Existing **cast** iron pipelines shall be tapped by use of split sleeve tapping sleeves with mechanical joint type end seals.

Cast sleeves for tapping cast iron pipe shall be of cast iron meeting ASTM A126 Grade B, or ductile iron meeting ASTM A536 Grade 65-42-12. Cast tapping sleeves for use on cast iron pipe shall be as manufactured by American Darling, Mueller Co., U.S. Pipe, or approved equal.

**B. Ductile Iron Pipe:**

Steel mechanical joint (MJ) sleeves are not approved for use by the Newport News Department of Public Utilities.

**1. Fabricated Steel Tapping Sleeves:**

Taps of at least **one size smaller** than size of existing **ductile** iron pipelines may be by use of fabricated steel tapping sleeves with tap circumscribed by a sealing gasket.

Bolts and nuts for fabricated steel tapping sleeves shall be of 304 (18-8) or 316 stainless steel and shall conform to ANSI/AWWA C111/A21.11.

Body of tapping sleeve shall be carbon steel (ASTM A-36) with fusion applied epoxy coating (AWWA C-213), or stainless steel.

Steel tapping sleeves that are approved by the Department of Public Utilities are identified below:

<b>MANUFACTURER</b>	<b>MODEL or TYPE</b>
Kennedy	Squareseal
Ford Meter Box Co.	FTSC & FTSS
Smith-Blair	622 & 664
JCM Industries	412 & 432
Cascade	CST-EX
Romac Industries	FTS 420 & SST III
Dresser	610 & 630

**2. Cast Iron Tapping Sleeves:**

Taps of the **same size** as existing **ductile** iron pipelines shall be by use of split sleeves tapping sleeves with mechanical joint type end seals. Approved products for this application are as noted for use on cast iron pipe in [Section 2.4.A](#). (Taps of a size smaller than size of existing DIP main may be by use of cast iron or fabricated steel tapping sleeves.)

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2.4. **Tapping Sleeves & Valves** (continued)

- C. **Concrete Pipe:** Tapping saddles for use on steel cylinder concrete pipe shall be subject to individual approval by the Department of Public Utilities prior to use.
- D. Gaskets shall conform to applicable requirements of ANSI/AWWA C111/A21.11, and shall be clearly marked to identify the diameter range for which intended.
- E. Outlet flanges shall be 125-pound drilling per ANSI B16.1, with standard flange counter bore per MSS SP-60.
- F. Valves shall be tapping flange by mechanical joint bell unless shown otherwise on the plans. With the exception of seat rings and body flange, all other features of the valve shall be in accordance with the requirements for valves in [Section 3](#) of the Material Specifications.
- G. Tapping of existing cast or ductile iron pipe for a 2-inch branch may be accomplished by use of a service clamp with a threaded (FPT) boss (make & model to be approved by the Inspector in advance), and a 2-inch tapping ball valve meeting the requirements of [MS 3.3](#). For additional information see Department of Public Utilities Standard Drawing W-04A-1 [[Figure No. 9](#)].

2.5 **Special Fittings:** For applications that require a close-coupled arrangement between two mechanical joint items; a ductile iron, bolt through, positive restraint mechanism such as Infact Corporation's Foster Adaptor, or approved equal, may be used.

2.6 **Tape-Wrapped Ductile Iron Piping:** See Material Specification [Section 12](#) for materials required for corrosion control of ductile iron piping.

*End Of Section*

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## SECTION 3

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### VALVES & VALVE BOXES

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- 3.1 **General:** This section governs the furnishing of all valves as required to complete the work as shown on the plans or as directed by the Engineer.

Valve type corresponds to pipe size as follows:

- Butterfly valves shall be used for mainline (in-line) valve installations on pipe sizes larger than 12 inches.
- Gate valves shall be used for mainline (in-line), tapping, and branch valve installations on pipe sizes 4 inches through 12 inches, inclusive.
- Ball valves shall be used for mainline (in-line) and branch valve installations on 2-inch pipes; and as tapping valves for installation of 2-inch branch pipes from existing mains larger than 2 inches.

All valves 4-inch or larger, for buried service, shall be provided with a 2-inch square operating nut. Valves for installation within meter vaults or mechanical equipment rooms shall be equipped with handwheels.

All valves shall open when turned to the left (counterclockwise), shall be rated for a minimum working pressure of 150 psi, and shall be suitable for buried service (unless installation will be within a facility).

Valve ends shall be (1) flange, (2) mechanical joint, (3) female pipe thread [FPT], (4) male pipe thread [MPT], (5) push-on, or any combination [e.g., MJ x FLG or MPT x FPT] as required to suit piping configuration as shown on the plans. Valves (larger than 2 inches) used with tapping sleeves/saddles shall be in accordance with Material Specifications [Section 2.4.F](#).

Reference Construction Standards [4.12](#) for installation requirements.

- 3.2 **Resilient-Seat Gate Valves:** Gate valves shall conform to AWWA C509 or AWWA C515; shall have an iron body, nonrising bronze or stainless steel stem, rubber encapsulated iron disc, and o-ring seals. Bolts & nuts shall be 304 (18-8) or 316 stainless steel.

Manufacturers of approved resilient-seat gate valves are:

American AVK  
American Flow Control (AFC)  
J & S Valve & Manufacturing  
Kennedy Valve Company (Division of McWane Corporation)  
M & H Valve Company (Division of McWane Corporation)  
Mueller Valve Company  
U.S. Pipe Company

- 3.3 **Ball Valves:** Ball valves shall be full port, of brass or bronze, have o-ring seals and a coated ball, and conform to AWWA C800; shall open/close (open counterclockwise) with 90° rotation (1/4 turn) limited by integral stop and have a tee head operating nut. In-line valves shall be furnished with 2" FPT threads on both ends, and tapping valves shall be furnished with 2" MPT (inlet) x 2" FPT (outlet) threads.

Approved ball valves are:

MANUFACTURER	CATALOG No.	
	In-Line Valve	Tapping Valve
Ford	B11-777	B81-777
Mueller	B-20283	B-20285
McDonald	6101-2	6107-2
Cambridge	202-F7F7	311-M7F7

- 3.3.1 **Blow-Offs:** All blow-off assemblies (other than those specified as temporary) shall consist of a 2-inch Slimline flushing hydrant by Gil Industries with a bronze body ball valve, chrome plated ball & automatic weep; and a bronze check valve fitted to the blow-off inlet with a threaded brass nipple. Bury depth of flushing hydrant shall be as required to ensure installed grade-to-nut dimension is not greater than 18 inches.

- 3.3.1.1 **Check Valves:** Check valves for installation with Gil blow-off assemblies shall be bronze, swing, class 125, Y-pattern with FPT threaded ends, meeting the requirements of MSS-SP-80 type 1; Crane/Stockham figure no. 37, or approved equal.

- 3.4 **Rubber-Seated Butterfly Valves:** Butterfly valves shall conform to AWWA C504. Unless otherwise indicated, butterfly valves shall be shortbody configuration. Bolts & nuts shall be stainless steel

Manual operators shall be of the traveling nut or worm gear type, sealed, gasketed, and lubricated for underground service.

The valve shall be operable with a maximum input of 150 pound-feet on the operating nut, and able to withstand an overload input torque of 450 pound-feet at full open and full closed positions without damage to the operator or valve. The disc shall be capable of holding in any intermediate position without creep or flutter.

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3.4 **Rubber-Seated Butterfly Valves** (continued)

Approved butterfly valves are:

MANUFACTURER	STYLE or NAME
Clow*	4500
Kennedy*	4500
Keystone	Figure 504
M & H*	4500
Mueller	LineSeal III
Pratt	Groundhog

\* Division of McWane Corporation

3.5 **Coatings:** All interior ferrous surfaces of all gate & butterfly valves shall be coated in accordance with ANSI/AWWA C550 using a coating approved by the Virginia Department of Health for contact with potable water and shall not contain lead, coal tar resins, lampblack, carbon black or bituminous materials. The exterior surfaces of all gate & butterfly valves shall receive two coats of a heavy coal tar coating or an asphaltic varnish or the manufacturer's standard exterior coating.

3.6 **Valve Stem Extensions:** An extension of the valve's operating nut shall be furnished when the distance from the operating nut (gate or butterfly valve) to top of valve box frame is greater than 48 inches. Reference [Section 4.12](#) of Construction Standards.

Each extension shall be constructed of 1-1/2" square structural steel [ASTM 513] tubing with a minimum wall thickness of .095"; with a 2-inch square operating nut on the upper end, and a socket on the lower end sized to fit the valve's operating nut. The socket shall have a 1/2"-13 UNC tapped hole centered on one side and a 1/2"-13 UNC stainless steel flat point set screw to securely attach to the valve's operating nut. The extension shall be hot dipped galvanized.

3.7 **Valve Boxes:**

A. Riser: Shall be a vertical length (in accordance with Standard Drawings W-05A [[Figure 12](#)] or W-05A-01 [[Figure 13](#)]) of 12-inch truss pipe (ABS or PVC thermoplastic composite double-walled pipe with lightweight concrete between the concentric walls) in accordance with ASTM D-2680.

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3.7

**Valve Boxes** (continued)

- B. Box: Shall be Newport News No. 2 cast iron valve box unless otherwise noted on the plans. Box frame and lid shall meet the requirements of Standard Drawings W-05B [\[Figure 14\]](#) & W-05B-01 [\[Figure 15\]](#).
- C. The box shall be made of cast iron meeting ASTM A-48 class 30S. Casting shall be dipped in an asphaltic coating.
- D. Valve box riser rings will not be allowed for new installations; only for adjustment of existing valve boxes when approved in advance.

*End Of Section*

## SECTION 4

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### FIRE HYDRANTS

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- 4.1 **General:** This section governs the furnishing of all fire hydrants and appurtenances as required to complete the work as shown on the plans or as directed by the Engineer.

The dome, chains and nozzles shall be painted gloss white. The upper standpipe shall be painted with alkyd gloss enamel, Pittsburgh Paints' "Brilliant Red" (safety red) product no. 7-801, or approved equal.

Normal bury depth [measured between ground line (usually 2 or 3 inches below traffic coupling) and bottom of hydrant shoe] shall be 4 feet. Extension spools to adjust bury depth, in six (6) inch increments, shall be available from six inches to at least 48 inches,

To ensure fire department compatibility, private fire hydrants (i.e., those hydrants that are not owned and maintained by the Department of Public Utilities) shall meet the requirements established by the appropriate jurisdictional authority [e.g., Newport News Fire Dept, Hampton Division of Fire & Rescue, York County Dept of Fire & Life Safety] and Section 4.2.

- 4.2 **Hydrant Standards:** Approved fire hydrants (listed below) shall be of the dry barrel type conforming to AWWA C502, and the following:

MANUFACTURER	MODEL	INTERNAL VALVE
AFC or American Darling	73-5*	4 ¾"
American AVK	Series 2780	5 ¼"
Kennedy	K81A or K81D**	4 ½"
Mueller	Super Centurion	4 ½"
U.S. Pipe	Sentinel 250	4 ½"

\*Darling 73-5 is distinguished by a ductile iron upper barrel and retainer rings for interchangeable nozzles.

\*\* Kennedy K81D designates "dual-rated"; meeting UL/FM and AWWA Standards.

- A. Flow rate shall be a minimum of 1000 gallons per minute with not more than five (5) psi pressure drop through the pumper nozzle.
- B. Each hydrant shall be furnished with three (3) nozzles with National (American) fire hose coupling screw thread: two shall be 2 ½ -inch hose nozzles placed 180 degrees apart, and one shall be a 4-inch (unless otherwise specified) pumper nozzle. Fire hydrants furnished for installation in The City of Williamsburg shall have a pumper nozzle size of 4 ½ inches.

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4.2            **Hydrant Standards** (continued)

- C.    Operating nut and nut of each nozzle cap shall be pentagonal (5-sided) with a flat-to-point nominal dimension of 1.50 inches. Operating nut shall turn counterclockwise (left) to open hydrant.
- D.    The hydrant base shall have a 6-inch mechanical joint bell, designed for connection to a horizontal 6-inch ductile iron pipe hydrant branch with retainer glands.
- E.    The traffic coupling shall allow for 360-degree adjustment of the upper barrel.
- F.    Bolts and nuts securing lower barrel to the base shall be stainless steel.
- G.    Caps shall be furnished with chains and S-hooks.

4.3            **Hydrant Connections:**    Connection of branch pipe to the hydrant shall be use of mechanical joint connection or Mueller AquaGrip connector.

Hydrant connection using the Gradelok grade adjuster to facilitate offset and alignment is acceptable with the 6-inch, 12-inch or 24-inch center-to-center offset designs.

*End Of Section*

## SECTION 5

### SERVICE PIPELINE AND FITTINGS

- 5.1 **General:** This Section governs the materials furnished by the Contractor for installation of service lines.
- 5.2 **Tubing:** All tubing shall be seamless copper, Type "K", soft annealed in coils and suitable for potable water service, in accordance with ASTM B-88-88A and AWWA C-800 (latest revision).
- 5.3 **Corporations Stops:** Corporations shall be full port ball valves of cast brass alloy with AWWA taper ("CC") threaded inlet by copper flare outlet; in sizes 3/4" through 1-1/2", and AWWA taper ("CC") threaded inlet by male pipe (MPT) threaded outlet for 2" size.
- A. Approved corporation stops are manufactured by Ford Meter Box Company, Mueller Company, A.Y. McDonald Manufacturing Company, and Cambridge Brass, and are identified in the following table:

METER SIZE	MANUFACTURERS' CATALOG No.'s			
	FORD	MUELLER	McDONALD	CAMBRIDGE
5/8"	FB600-3	B-25000	4701B	301-A3C
3/4"	FB600-3	B-25000 3/4"	4701B	301-A3C
1"	FB600-4	B-25000 1"	4701B	301-A4C
1-1/2"	FB600-6	B-25000 1-1/2"	4701B	301-A6C
2"	FB400-7	B-2996 2"	3128B 2"	301-A7C

- B. Installation of 2" service pipeline requires a female pipe thread (FPT) by flare coupling (see [CS 5.3.D.6](#)); approved for this application are: Ford C21-77, Mueller H-15450 2", McDonald 4754 2", and Cambridge 117-C7F7)
- 5.4 **Angle Valves:** Angle valves, with padlock wings, shall be full port ball valve of cast bronze with copper flare inlet and male pipe (MPT) threaded outlet for sizes up to and including 1", and flanged outlet for sizes larger than 1".
- A. Approved angle valves are manufactured by Ford Meter Box Company, Mueller Company, A. Y. McDonald Manufacturing Company, and Cambridge Brass, and are identified in the following table:

## 5.4

Angle Valves (continued)

METER SIZE	MANUFACTURERS' CATALOG No.'s			
	FORD	MUELLER	McDONALD	CAMBRIDGE
5/8"	BA92-313W	B-24264 5/8 x 3/4	4602 BY 3/4" x 3/4" x 01	210-C3T3
3/4"	BA92-323W	B-24264 5/8 x 3/4 x 3/4	4602 BY 3/4" x 3/4" x 02	210-C3T3
1"	BA92-444W	B-24264 1	n/a	210-C4T4
1-1/2"	BFA 23-666W	B-24277 1-1/2	4602 B 1-1/2"	n/a
2"	BFA 23-777W	B-24277 2	4602 B 2"	n/a

- 5.5 Service Saddles: All service pipeline taps on **PVC pipe** require installation of brass service saddles of controlled diameter. Approved saddles for this application are: Ford style S70, Mueller S-13420 series, McDonald 3891 series, and Cambridge 800-0238 series.

Service pipeline taps of **1 1/2" or 2" on 8" or 6" ductile iron pipe** require installation of service saddles meeting the following requirements: (a) double-strap (4 threaded fasteners) configuration, (b) stainless steel straps, and (c) ductile iron body coated with either nylon or fusion-bonded plastic; such as Romac style 202N or JCM no. 406, or approved equal.

Service pipeline taps of **1 1/2" or 2" on 8" or smaller cast iron pipe** as well as taps of **1 1/2" or 2" on 4" DIP** require installation of service saddles meeting the following requirements: (a) full-width wrap-around shell ["full-circle"] with 2 threaded fasteners, (b) stainless steel shell & fasteners, and (c) fully passivated shell with rubber gasket; such as Romac style 306, or approved equal.

- 5.6 Special Fittings: "Y" branch connector, with two 1" copper flare inlets and one 2" copper flare outlet, shall be Ford Meter Box Company catalog no. Y22-247.

- 5.6.1.1 Lubricants: Lubrication of items which will penetrate the water pipeline will be by use of products approved for human consumption or labeled as "non-toxic".

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5.6.1.2 **Special Conditions:** Service line lengths greater than 100 feet between the main and a 5/8" or 3/4" meter will require use of 1" copper tubing and an angle valve with 1" inlet (McDonald 4602 BY 1" x 3/4" x 01 for 5/8" meter, and McDonald 4602 BY 1" x 3/4" x 02, or Mueller 24264 5/8 x 3/4 x 1 for 3/4" meter).

*End Of Section*

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## SECTION 6

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### STEEL PIPE

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- 6.1        **General:** Steel pipelines are not standard and will only be installed where shown on the plans, or for applications where specifically written approval has been granted by the Waterworks.
- 6.2        **Steel Pipe:** For use in water pipelines shall be electrically butt-welded straight-seam, or seamless pipe. Steel pipe 6 inches and larger shall be in accordance with AWWA C200. Wall thickness and exterior coatings shall be as indicated on the plans. Field welding of steel water pipe shall be in accordance with AWWA C206.
- 6.3        **Interior Coating:** The interior surfaces of all steel water lines shall be coated with an epoxy coating system to a thickness of 14 to 24 mils. The coating must be approved by the Virginia Department of Health for contact with potable water and shall not contain lead, coal tar resins, lampblack, carbon black or bituminous materials.

*End Of Section*

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## SECTION 7

### FILL & BEDDING MATERIAL

7.1 **General:** This section governs the furnishing of all fill and bedding material required to complete the work as shown on the plans or as directed by the Engineer. The type of material used will be as specified if the right-of-way authority agrees. If there is a discrepancy the Engineer will identify the material to be installed. Fly ash will not be allowed for backfill.

7.2 **Select Material:** Select material shall consist of approved local or commercial materials free from roots, mulch and debris, and shall conform to the following requirements:

Grading shall conform to the following table:

#### PERCENTAGE BY WEIGHT OF MATERIAL PASSING

TYPE	3-inch sieve	2-inch sieve	No. 10 sieve	No. 40 sieve	No. 200 sieve max
I	min. -100	95+5	50+25	26+14	20
II	---	min. -100	---	---	25
III	min. -100	---	---	---	20*

\* A minimum of 25 percent may be allowed if the liquid limit is less than 6. Tests will be performed in accordance with VTM-25.

Atterberg limits shall conform to the following requirements:

Type	Maximum Liquid Limit	Maximum Plasticity Index
I	25	6
II	30	9
III	30	9

Tests will be performed in accordance with VTM-7.

CBR shall be a minimum of 20 unless otherwise specified on the plans.

Soundness for Type I material shall conform to the following:

	Soundness Loss Maximum Percentage
Freeze and thaw 20 cycles	12
Magnesium Sulfate 5 cycles	30

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7.2                    **Select Material** (continued)

Tests will be performed in accordance with AASHTO T103 or T104.

7.3                    **Sand:** Sand specified for backfill shall be natural sand consisting of grains of hard, sound material free of injurious amounts of clay or other coatings and deleterious material.

7.4                    **Bedding Stone:** Stone for pipe foundation shall be open-graded course aggregate Virginia Department of Highways and Transportation size No. 57, No. 78, or No. 8, unless otherwise specified. The stone shall conform to Section 203 for the Virginia Department of Highways and Transportation “Road and Bridge Specifications” in all aspects.

Stone installed to provide drainage in addition to bedding for fire hydrants and blow-offs shall be encased in geosynthetic drainage fabric meeting the requirements of VDOT “Road and Bridge Specifications” (1997) Section 245.

7.5                    **Test Results:** Contractor shall provide test results on materials to be used to ensure conformance with the above requirements. If more than one source is utilized for any material, then test results must be provided from each source.

*End Of Section*

## SECTION 8

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### LANDSCAPING MATERIALS

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8.1 **General:** This section governs the furnishing of landscape materials required to complete the work as shown on the plans or as directed by the Engineer. The type of material used will be as specified by the right-of-way authority. If there is a discrepancy the Engineer shall identify the material to be used.

8.2 **Topsoil:** Shall be the original top layer of a soil profile formed under natural conditions, technically defined as the "A" horizon by the Soil Society of America. It shall consist of natural, friable, loamy soil without admixture of subsoil or other foreign materials. It shall be reasonably free of stumps, roots, hard lumps, stiff clay, stones, noxious weeds, brush, or other litter. It shall have demonstrated, by evidence of healthy vegetation growing or having grown on it prior to stripping, that it is reasonably well drained and free of substances toxic to plant life.

Topsoil shall be subject to inspection by the Engineer at the source of supply and it shall be mixed with organic material as directed.

8.3 **Fertilizer:** Shall be of standard commercial quality containing nitrogen, phosphoric acid and potash, respectively, in the ratio 10-20-10.

Fertilizer shall be properly packaged in manufacturer's standard bags, not to exceed 100 pounds per bag, and shall be properly labeled. Labeling shall consist of manufacturer's name, net weight of contents, type of materials, and a guaranteed analysis of nutrients on each container.

Fertilizer shall be free of chemical additives such as herbicides designed to control the growth of broadleaf vegetation.

8.4 **Lime:** Shall be agricultural grade ground limestone or agricultural grade pulverized limestone. The material source shall be registered with and approved by the Virginia Department of Agriculture and Commerce in accordance with the Virginia Agricultural Lime Law. It shall have a minimum calcium carbonate equivalent of 85 percent.

Agricultural ground limestone shall be of such fineness that at least 86 percent will pass a U.S. Standard No. 20 mesh screen, at least 47 percent will pass a U.S. Standard No. 60 mesh screen, and at least 28 percent will pass a U.S. Standard No. 100 mesh screen.

Agricultural pulverized limestone shall be of such fineness that at least 90 percent will pass a U.S. Standard No. 20 mesh screen, and at least 66 percent will pass a U.S. Standard No. 100 mesh screen.

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8. 5            **Mulch:** For seeding shall consist of dry straw or hay, free of noxious weeds. The mulch shall be reasonably bright in color and shall not be musty, moldy, caked, decayed or very dusty.

Wood chips shall not be used as mulch for seeding unless approved by the Engineer.

Wood cellulose fiber mulch for hydraulic seeding shall consist of specially prepared wood cellulose processed into a uniform fibrous physical state. The fiber mulch, including any dye to facilitate visual inspection, shall contain no germination or growth inhibiting factors.

8. 6            **Grass Seed:** Seed shall be Kentucky 31 Fescue, unless otherwise specified. All seeds used shall comply with applicable State and Federal seed laws and contract agreements.

All seed shall be subject to inspection by Virginia State Seed Regulatory Inspection of the Virginia Department of Agriculture and Consumer Services.

Seed shall be properly packaged in the supplier's standard bags, not to exceed 100 pounds per bag, and shall be properly labeled. Labeling shall consist of variety, purity percentage, germination percentage, and weed seed percentage.

No seed shall be, or shall have been, stored in any enclosure where herbicides, kerosene, or any other material detrimental to seed germination is stored.

*End Of Section*

## SECTION 9

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### CONCRETE PLACEMENT

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9.1 **General:** This section governs the furnishing of Portland cement, aggregates, admixtures, and the mixing and inspection of Portland cement concrete to be used for concrete buttresses, the restoration of concrete pavements, curbs, and walks, and the construction of concrete structures as shown on the plans or as directed by the Engineer. The type of material used will be as specified by the right-of-way authority. If there is a discrepancy the Engineer shall identify the material to be used.

9.2 **Portland Cement:** Shall conform to AASHTO M85, or ASTM C150, Type I or Type II, and shall be manufactured by a well known, acceptable manufacturer. Water for mixing shall be potable, as drawn from the public supply, and shall be reasonably clean when used in the mix, with a pH value of not less than 4.5.

Type III (High Early Strength) may be used in lieu of Type I or Type II with the approval of the Engineer.

9.3 **Aggregates:**

A. Fine aggregate shall be clean sharp natural sand free from loam, clay, lumps or other deleterious substances.

Grading - (VDOT Grade A)

B. Course aggregate shall be clean, uncoated, processed aggregate of crushed natural stone, or washed gravel either natural or crushed.

Grading - (VDOT Size 57)

9.4 **Concrete Requirements:**

VDOT Class	28-day Compressive Strength (PSI)	Cement Content lbs/cu-yd minimum	Maximum Water-lbs per lbs Cement	Slump	Air Content Percent
A4	4000	635	0.45	2-4	6-1/2 + 1-1/2
A3	3000	588	0.49	1-5	6 + 2

Aggregates per Section 9.3 A. & B. above.

9.4

Concrete Requirements (continued)

Unless otherwise shown on the plans or permits, the following listing indicates the class of concrete to be used for specific uses:

<u>USE</u>	<u>CLASS OF CONCRETE (VDOT)</u>
Buttresses and Anchors (pipeline)	A3
Patching Concrete Pavement	A3
Curbs and Gutters	A3
Sidewalks	A3
Sewer Structures	A3
Structures (precast)	A4
Structures (cast in place)	A3

9.5

Admixtures: Concrete admixtures shall be used when shown on the plans, or as directed by the Owner. Generally, High Early Strength concrete shall be used for the patching of concrete pavement which will be subjected to vehicular traffic within 72 hours of placement. Calcium Chloride will not be used in concrete unless otherwise directed by the Owner.

Air-entraining admixtures may be used whether or not it is shown on the plans, unless directed otherwise. All admixtures permitted shall be added to the mix in the quantities, and by the methods, recommended by the manufacturer.

- A. Air-entraining admixtures shall conform to AASHTO M154, or to ASTM C260.
- B. Water-reducing admixtures when permitted shall conform to AASHTO M194, Type A.
- C. Accelerating admixture, when specified or permitted shall conform to AASHTO M194, Type C or E.
- D. Calcium Chloride, when permitted as an admixture in concrete, shall conform to AASHTO, M144 Type 2. Calcium Chloride shall not be used where concrete is to be placed against galvanized steel.

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- 9.6 **Non-Shrink Mortar:** Shall consist of one part hydraulic cement, 2-1/2 parts fine aggregate by weight, and a set retarder or other admixture which will reduce the water to produce a stiff mix.

High strength grout and mortar shall consist of a prepackaged, non-shrink, hydraulic cement mixture with a 7-day compressive strength of at least 4,000 psi when tested in accordance with ASTM C109, and a 7-day bond strength of at least 1,000 psi when tested in accordance with VTM-41.

9.7 **Mixing Of Concrete:**

- A. Hand mixing, on the job site, will be permitted for concrete batches not to exceed 1/2 cubic yard. The component materials shall be measured by placing them in a rigid container in the volumetric proportions of 1:2:2-1/2 (cement to fine aggregate to coarse aggregate). Water shall be added to produce a slump not to exceed 3 inches.
- B. Transit mixing - the concrete shall be mixed in a truck mixer. Mixing shall begin immediately after all ingredients are in the mixer and, unless otherwise directed by the Engineer, shall continue until placement, at the rate of 70 to 125 revolutions per minute.

Maximum Time (hrs) Between  
Introduction of Cement to the Mix and Discharge

	Air Temperature		
	Up to 80 <sup>0</sup> F	80 <sup>0</sup> -90 <sup>0</sup> F	Above 90 <sup>0</sup> F
Agitator Type Haul Equipment Class A3 - General Use (Retarded)	2-1/2	2	1-1/2
Other Classes and Usages (Retarded and Unretarded)	1-1/2	1-1/4	1
Nonagitator Type Haul Equipment - All Concrete	1	3/4	1/2

- 9.8 **Mixing Limitations:** Placement of concrete shall not be initiated when the air temperature is below 40 degrees Fahrenheit in the shade, unless otherwise approved by the Engineer.

When permitted, in cold weather, the water and aggregates may be uniformly heated to not more than 150 degrees Fahrenheit to maintain

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9.8

Mixing Limitations (continued)

concrete between 40 degrees Fahrenheit and 95 degrees Fahrenheit when placed. In hot weather, the aggregates and/or the mixing water shall be cooled as necessary to maintain the concrete temperature below the specified maximum.

No concrete in which the ingredients have become separated will be placed in the work.

9.9

Testing & Inspection: Slump tests, compression tests, air content determinations, or tests on individual ingredients in the concrete mixture, will be conducted as directed by the Engineer.

The Contractor shall furnish all necessary assistance and materials for collecting specimens including standard slump cones and wax coated cylinder molds. Normally this will not be required for thrust blocks or other concrete work except pavement and structures unless problems occur.

The Contractor shall provide the services of an approved testing laboratory to test compression cylinders, or other tests requiring those services.

- A. Job Site Tests - the Engineer will supervise the slump tests and the preparation of standard compression test cylinders as the work progresses and will be the sole judge of the number of tests required.

Slump tests shall be in accordance with ASTM C143. If tests do not show satisfactory results, the mix shall be adjusted as directed.

Air content shall be determined in conformity with the requirements of "Test for Air Content of Freshly Mixed Concrete by the Pressure Method" ASTM C231. If tests do not show satisfactory results, the mix shall be adjusted as directed.

A compression test standard sample shall consist of 3 test cylinders, of which one will be stressed to failure at 7 days, and the other two shall be stressed to failure at 28 days.

- B. Tests by Approved Laboratory - compression strength test of cylinders shall conform to "Test for Compression Strength of Molded Concrete Cylinders" ASTM C39.

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9.9. B

**Testing & Inspection** (continued)

The testing laboratory shall submit certified copies of test results directly to the Engineer within 24 hours after the tests are conducted. Concrete which does not meet the strength requirements will be subjected to rejection and removal from the work and replacement at the expense of the Contractor.

The cost of all testing work noted above will be borne by the Contractor.

9.10

**Steel Reinforcement:**

A. Material:

1. Reinforcing bars, deformed or plain, shall conform to ASTM A615, Grade 40 or 60 as specified.
2. Welded Wire Fabric shall conform to ASTM A185. When used in continuously reinforced pavement, wire fabric shall be deformed, furnished in flat sheets and shall conform to ASTM A497.

- B. Fabrication - Bent bar reinforcement shall be cold bent to the shape shown on the plans. Unless otherwise specified or shown on the plans, bends shall be made in accordance with the requirements of the Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315). Truss bars for members 2 inches or less shall be fabricated to within a tolerance of 0 to minus 1/2 inch of the height shown on the plans.

9.11

**Valve Box Adjustment Patch:** One acceptable product for patching Portland Cement concrete is Thorite®, as manufactured by Thoro Division of Degussa Construction Chemicals' Chemex® Commercial Construction Division [www.chemrex.com]. Materials by other manufacturers with equal adhesion and strength characteristics will be acceptable.

*End Of Section*

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## SECTION 10

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### BITUMINOUS MATERIALS

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- 10.1 **General:** This section governs the preparation and furnishing of bituminous materials required to construct the work as shown on the plans or as directed by the Engineer. The type of material used will be as specified by the right-of-way authority. If there is a discrepancy the Engineer will identify the material to be used.

Bituminous concrete paving mixtures shall generally be Virginia Type BM-1, Type SM-2, or Type IM-1. This section shall govern the selection of components for preparing those mixtures.

- 10.2 **Bituminous Materials:** Shall consist of asphalt, asphalt cement, or asphalt emulsion, all of which shall conform to the definitions as specified in ASTM D8.

- 10.3 **Asphalt Cement:** Shall not foam when heated to 350 degrees Fahrenheit. Bituminous materials shall be tested for coating ability in accordance with AASHTO T182 with the following modifications:

1. Material having the ability to coat 95 percent of a shady dolomite will be classified as Type I.
2. Material having the ability to coat 95 percent of a siliceous gravel wetted by 2 percent, by weight, water will be classified as Type II.

- 10.4 **Course Aggregate:** Shall consist of crushed stone, crushed slag, or crushed/uncrushed gravel, consisting of clean, hard, tough, durable pieces, free from adherent coatings and injurious amounts of friable, thin, elongated or laminated pieces, soluble salts, and organic materials.

Open grading shall comply with the sizes and percentages in Section 10.8 for the type of bituminous mixture specified.

- 10.5 **Fine Aggregate:** Shall be clean, sharp, natural sand free from loam, clay, lumps, or other deleterious substances.

Grading - (VDOT Grade A)

- 10.6 **Marshall Stability:** The combination of aggregate and asphalt shall have a Marshall stability of not less than 1,000 pounds at 140 degrees Fahrenheit. The addition of mineral filler, not to exceed 5 percent by weight of the completed mixture, may be added to obtain the specified stability.

Mineral filler shall conform to AASHTO M17.

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- 10.7        **Heat Stable Additives:** Shall be furnished in all mixtures used as surface courses. The amount of additive to be added to the asphalt cement prior to introduction into the mix shall be as recommended by the manufacturer.

The material shall contain no ingredient harmful to the bituminous material when added in the recommended proportions.

- 10.8        **Bituminous Concrete Mixtures:**

Design Ranges:

- A.     Type SM-2:

100 percent shall pass a 3/4-inch mesh sieve.

97-100 percent shall pass a 1/2-inch mesh sieve.

82-94 percent shall pass a 3/8-inch mesh sieve.

48-62 percent shall pass a U.S. Standard No. 4 mesh sieve.

18-24 percent shall pass a U.S. Standard No. 30 mesh sieve.

4-7 percent shall pass a U.S. Standard No. 200 mesh sieve.

- B.     Type IM-1:

100 percent shall pass a 1-inch mesh sieve.

97-100 percent shall pass a 3/4-inch mesh sieve.

72-86 percent shall pass a 1/2-inch mesh sieve.

40-58 percent shall pass a U.S. Standard No. 4 mesh sieve.

14-24 percent shall pass a U.S. Standard No. 30 mesh sieve.

3-6 percent shall pass a U.S. Standard No. 200 mesh sieve.

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10.8

*Bituminous Concrete Mixtures* (continued)

C. Type BM-1:

100 percent shall pass a 1-inch mesh sieve.

85-98 percent shall pass a 3/4-inch sieve.

60-80 percent shall pass a U.S. Standard No. 4 mesh sieve.

20-30 percent shall pass a U.S. Standard No. 50 mesh sieve.

1-6 percent shall pass a U.S. Standard No. 200 mesh sieve.

D. Type BM-2:

100 percent shall pass a 1-1/2-inch mesh sieve.

97-100 percent shall pass a 1-inch mesh sieve.

75-90 percent shall pass a 3/4-inch mesh sieve.

54-74 percent shall pass a 3/8-inch mesh sieve.

30-38 percent shall pass a U.S. Standard No. 8 mesh sieve.

3-6 percent shall pass a U.S. Standard No. 200 mesh sieve.

*End Of Section*

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## SECTION 11

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### PVC SCHEDULE 80 PIPE

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- 11.1 **General:** Polyvinyl Chloride (PVC) pipelines in the 2-inch size only will be installed where shown on plans, typically on short dead ends with limits as set by the Virginia Department of Health.
- 11.2 **PVC Pipe:** Schedule 80 PVC pipe shall be furnished in 20-foot lengths of bell x spigot configuration with ends for solvent cementing. Schedule 80 PVC shall meet the requirements of ASTM D1785. Schedule 80 PVC fittings shall meet the requirements of ASTM D2467. Solvent cement for PVC pipe shall meet the requirements of ASTM D2564.
- 11.3 **Marking Tape:** [Also know as Warning Tape.] Blue polyethylene tape, 2" in width with a metallic core and continuous legend "CAUTION – WATERLINE BURIED BELOW".
- 11.4 **Tracer Wire:** A #10 AWG solid copper wire with insulation suitable for buried service.
- 11.5 **Transition Couplings:** Bolted steel couplings for connection of PVC pipe and brass nipple(s) or of PVC pipe and an existing 2-inch water main shall be in accordance with [Section MS 2.3.B](#).

*End Of Section*

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## SECTION 12

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### TAPE-WRAPPED DUCTILE IRON PIPE

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12.1 **General:** Special requirements as outlined herein shall be met when installing taps 4" and larger on tape-wrapped ductile iron piping.

12.2 **Materials:** Materials for use in corrosion control of ductile iron pipe shall be in accordance with following:

A. Tape coating:

1. Primer Polyken 1027
2. Filler Tape Polyken 1027
3. Inner Wrap Polyken 932-35 (black)
4. Outer Wrap Polyken 954-15 (white)

B. No. 12 AWG solid copper THWN test leads (black, white)

C. Cadweld equipment:

1. Test wire and standard bond wire connections
  - a. Cadweld molds:

PIPE SIZE	CADWELD MOLD	TYPE
4"	CAHBA-1G-4"	Horizontal Connection
4"	CAVHT-1G-4"	Vertical Connection
6"	CAHBA-1G-6"	Horizontal Connection
6"	CAVHT-1G-6"	Vertical Connection
8"	CAHBA-1G-8"	Horizontal Connection
8"	CAVHT-1G-8"	Vertical Connection
10"	CAHBA-1G-10"	Horizontal Connection
10"	CAVHT-1G-10"	Vertical Connection
12"	CAHBA-1G-12"	Horizontal Connection
12"	CAVHT-1G-12"	Vertical Connection
24"	CAHBA-1G-24"	Vertical Connection
36" & 42"	CAVHT-1G-Flat	Vertical Connection

- b. Cadweld charges: CA25XF-19 for the above cadweld molds.
    - c. Cadweld sleeves: CAB-133-1H for all number 12 AWG wire.

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12.2. C

**Materials** (continued)

2. Bond wire (through conductors) connections:

a. Cadweld molds:

<b>PIPE SIZE</b>	<b>CADWELD MOLD</b>	<b>TYPE</b>
4"	CAHEA-1G-4"	Horizontal
6"	CAHEA-1G-6"	Horizontal
8"	CAHEA-1G-8"	Horizontal
10"	CAHEA-1G-10"	Horizontal
12"	CAHEA-1G-12"	Horizontal

b. Cadweld charges: CA32XF-19 for the above cadweld molds.

c. Cadweld sleeves: CAB-1331H for all number 12 AWG wire.

D. Insulating flange:

1. Gasket: type E, full-faced gasket of neoprene faced phenolic.
2. Bolt sleeves: Mylar
3. Insulating washers: phenolic, provide two washers for each bolt.
4. Steel washer: 1/8" thick plated hot rolled steel, provide two washers for each bolt.
5. Test station (flush mounted): model NM-5 terminal boxes for buried service as manufactured by CP Test Services shall be furnished. Test station shaft length shall be 18 inches.
6. Mastic: Royston Roskote R28 rubberized mastic.

*End Of Section*

## SECTION 13

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### CASINGS

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13.1 **General:** Casings shall be installed in accordance with Section CS 4.22 and Department of Public Utilities Standard Drawings W-09A [Figure No. 30] & W-09A-01 [Figure No. 31].

13.1.1 **Special Applications:** Material and design of casings proposed for installation in areas other than beneath a roadway or railroad track shall be submitted by the Contractor to the Department for approval.

13.2 **Roadway Casing:** Steel casing pipe to be installed beneath roadways shall be in accordance with Virginia Department of Transportation (VDOT) Road and Bridge Specifications, Section 232.02 (c) 5, and ASTM A139.

13.2.1 For roadways within jurisdictions with VDOT oversight the minimum wall thickness shall be 0.500 inches.

13.2.2 For roadways within the cities of Hampton, Newport News or Poquoson the minimum wall thickness shall be 0.375 inches.

13.2.3 Outside diameter of casing shall be in accordance with the following:

WATER MAIN SIZE	4"	6"	8"	12"	16"
CASING SIZE (O.D.)	12"	18"	18"	24"	30"

Refer to Department of Public Utilities Standard Drawings W-09A [Figure No. 30] for casing installation details with Cascade Waterworks Manufacturing CCS spacers, and W-09A-01 [Figure No. 31] for casing installation details with RACI spacers.

13.3 **Railroad Casing:** Casing pipe under a railroad track shall meet the requirements of the railroad owning the railroad track.

13.4 **Spacers:** Spacers for use within a casing shall be either:

[1] a two-piece shell of T-304 stainless steel (minimum thickness of 14 gauge) with four (4) runners of T-304 stainless steel (minimum thickness of 10 gauge) welded to the shell, a minimum of three (3) T-304 stainless steel fasteners on each side, a non-metallic shell liner, and four (4) eight-inch wide runners (centered configuration) of ultra high molecular weight polymer with abrasion resistance and low coefficient of friction; Cascade Waterworks Manufacturing Model CCS (or approved equal), or

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13.4                      **Spacers:** (continued)

[2] a non-metallic, preformed multi-segment ring of high-density polyethylene (HDPE) projections (minimum number) equal to the nominal diameter of the carrier pipe; RACI Spacers North America (see following table for type numbers & sizes).

Carrier Pipe Size	RACI Spacer Type & Size							
	Quantity Required For One Complete Ring							
	N 75	P 120	M 90	N 90	E 110	H 110	E 130	H 130
4"	2							
6"		2						
8"			2	1				
12"					3	1		
16"							4	1

*Example:* Use of a RACI casing spacer on an 8" waterline will require two M90 spacer segments & one N90 spacer segment for each spacer.

*End Of Section*

## SECTION 14

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### ANCILLARY MATERIALS

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- 14.1 **General:** Materials of secondary importance required for completion of the proposed installation are identified by this Section.
- 14.2 **Restraining Rods:** Rods used to provide restraint of piping shall meet the requirements of ASTM A-193, Grade B7 alloy steel with minimum tensile strength of 225,000 psi and minimum yield strength of 105,000 psi. Rods shall be ¾" diameter with black-oxide finish and coarse threads.
- 14.3 **Bollards:** Traffic-protection bollards (guard posts) shall be seamless schedule 40 black carbon steel pipe of at least 4 inches nominal diameter and meeting the requirements of ASTM A53 Grade B.

See Department of Public Utilities Standard Drawing W-06F [\[Figure 26\]](#) for bollard installation details.

- A. Each bollard shall be anchored in place with and filled with concrete that has a 28-day compressive strength of 3,000 psi (minimum). Fill concrete shall extend above the top of the pipe and be finished with a convex contour to shed rainwater.
- B. Exposed portion of each bollard shall receive two coats of an industrial gloss oil paint, Pittsburgh Paints' safety yellow, product no. 7-808, or approved equal.
- C. **OPTION:** In lieu of painting bollards as noted in B above, bollards may be protected from the elements and provided with increased visibility by use of high-density polyethylene sleeves, 1/8" thick (minimum). Sleeves shall be yellow in color. If a bollard sleeve with an enclosed upper end is used, it is not necessary to produce a convex contour of concrete fill at the top as noted in A above.

Ideal Shield of Detroit MI is a source of bollard sleeves that will fit over bollards of ductile iron pipe (as used by Waterworks)...product number: BPD-YL-4-52-S.

- 14.4 **Brass Nipples:** Pipe nipples used in the distribution system for specified applications such as:
- connection between cast/ductile iron pipe & PVC pipe
  - connection between a ball valve & 2-inch piping
  - installation of a 2-inch blow-off assembly, including the check valve
  - installation of tailpieces for 1-½-inch & 2-inch meters
  - in lieu of bending 2-inch copper service pipelines

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14.4

**Brass Nipples** (continued)

shall be 2 inches [1-½ inches for 1-½-inch meter] nominal diameter, brass (Schedule 40) meeting the requirements of ASTM B687, with male American National Standard Taper Pipe Threads (MPT) in accordance with ANSI B1.20.1 on each end.

*End Of Section*

# **CONSTRUCTION STANDARDS**

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## SECTION 1

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### CLEARING & GRUBBING

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- 1.1 **General:** This Section shall govern the clearing, grubbing, removing and disposing of all vegetation and debris within designated areas as shown on the plans or as directed by the Engineer, except such objects that are designated to remain or are to be removed in accordance with other Sections of these Specifications.

Erosion control measures shall be in accordance with [Section 3](#) of the Construction Standards.

The Contractor shall not damage trees, shrubs, vegetation, fences or other items outside of the designated area. Branches of trees, which overhang the limits of the areas designated, and are less than 20 feet above the finished grade shall be trimmed or cut using approved tree surgery practices unless such trimming will permanently damage the tree.

- 1.2 **Disposal by Combustion:** Tree limbs and other timber having a diameter of 3 inches or greater shall not be burned, buried or otherwise wasted. Such material shall be disposed of in an approved manner; however, treated timber shall not be disposed of as firewood.

When specified in the contract that trees or other timber are reserved by the City or property owner, the Contractor shall cut such material in lengths specified and pile it where designated.

When open burning is not prohibited by State or Local Ordinance, stumps and material less than 3 inches in diameter may be open burned. The Contractor shall keep himself fully informed of all laws, decrees and regulations in any way pertaining to the burning operations and shall comply with provisions of the State Air Pollution Control Law and Rules of the State Air Pollution Control Board.

At no time shall a fire be left unattended.

- 1.3 **Disposal in Landfill:** All non-combustible materials, and combustible materials not to be burned, shall be properly disposed of in a landfill authorized to receive such materials. The Contractor shall pay all fees charged by landfills for the disposal of materials.

*End Of Section*

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## SECTION 2

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### EXCAVATION

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- 2.1 **General:** This Section shall govern the excavation, and the removal and disposal of unsuitable materials, as necessary to install the water pipeline and associated work, to line and grade as shown on the plans or as directed herein.
- 2.2 **Erosion Control:** Shall be in accordance with the provisions of [Section 3](#) of the Construction Standards.
- 2.3 **Excavation Defined:** Excavation shall include, but shall not be limited to, the removal of soil, rock, abandoned underground structures, pavement surfaces and base materials, curbs, walks, and driveway aprons, to neat lines and to the width and depth as shown on the plans or as specified herein.
- 2.4 **Protection of Existing Utilities:** In the event that any utility is damaged due to negligence, carelessness or violation of any requirement of the Virginia Utility Damage Prevention Act, by the Contractor, the utility company shall be notified. The Contractor shall pay any charges for necessary repairs.
- 2.5 **Pavement & Curb Removal:** Pavements, curbs, walks, etc. shall be line cut prior to removal. For specific requirements see applicable portions of Section 8 of the Construction Standards.
- 2.6 **Reference Standards:** Excavation and trenching shall be in accordance with applicable provisions of the following standards except as modified herein:
- A. Installation of Ductile Iron Pipe, AWWA C600
  - B. Waterworks Regulations, Part III, Article 6.
- 2.7 **Required Submittals:** Where trenching depths are expected to exceed 5 feet from the existing surface and/or wet/unstable soil conditions are encountered, the Engineer may require that the Contractor submit in writing a description of proposed methods to be used to combat these conditions. Such submittals shall include drawings or sketches as necessary to properly describe the work and they shall be subject to review and approval by the Engineer.

Proposals requiring submittals shall include, but will not be limited to, the following:

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2.7 **Required Submittals** (continued)

- A. Proposed method of dewatering.
- B. Proposed method of sheeting and/or shoring.
- C. Proposed increases in trench widths when expected to exceed those widths shown on the plans, or on Standard Drawings, by 1 foot or more.

In cases where written submittals will unnecessarily delay the work in progress, the Engineer may elect to accept oral descriptions of methods proposed.

- 2.8 **Trenching Operations:** Excavations for pipeline installations and related items, shall be by the open trench method. Generally, the trench shall not be wider than necessary for proper pipeline installation. No more than 100 feet of trench shall be open at any time. The Contractor may elect to jack the pipe beneath driveway aprons, walks, curbs, etc. to avoid cutting and replacement of those items.

The installation of pipe, valves and thrust blocking shall be done under reasonably dry conditions. Compaction of backfill materials shall be at optimum moisture content to achieve prescribed density values.

Equipment with cleated tracks will not be allowed on pavement surfaces. Marred and scratched pavement surfaces shall be repaired at the Contractor's expense; see [Section 8](#) of Construction Standards.

- 2.9 **Unsuitable Materials:** Where existing material at the proposed grade is considered unsuitable by the Engineer, the Contractor shall remove it to the extent directed and shall replace it with select backfill material.

The additional excavation, select backfill material, and the placement thereof, when ordered in writing by the Engineer, shall be included for payment under other applicable bid items.

Excavated materials, which in the opinion of the Engineer, are unsuitable for use in backfilling or the quantity is in excess of that needed for backfill, shall be removed from the site. It shall be the responsibility of the Contractor to arrange for a suitable landfill, or other site, on which to dispose of such materials.

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2.10            **Material Storage:** Excavated materials suitable for reuse in the backfill shall not be stored on pavement surfaces unless otherwise approved by the right-of-way authority. Such materials shall be stored or transported by truck or deposited in areas well clear of traveled portions of the roadway.

2.11            **Unauthorized Excavation:** All excavation outside of and beyond the prescribed trench width and length and not expressly approved by the Engineer, shall be backfilled with approved material and the surface shall be restored to that which existed prior to removal or to current requirements of the jurisdiction where work is being performed. Such work shall be at the sole expense of the Contractor.

Claims for damages resulting from unauthorized excavation shall be the responsibility of the Contractor.

2.12            **Sheeting, Shoring & Bracing:** Shall be installed in the trench as needed to protect works and/or to adequately support adjacent earth masses, pavements and structures during the pipeline installation.

The Contractor shall be solely responsible for the strength and placement of sheeting and shoring used, and for the adequacy of support to the sides of the trench for the duration of the work.

Unless otherwise directed, all temporary sheeting and shoring shall be removed when the work is completed. Removal shall be done in a manner that such the installed pipeline will not be damaged and that the specified compaction of backfill materials can be achieved. Removal shall be gradual and equal on both sides of the trench. Compaction of backfill material shall continue at the prescribed layering as sheeting is withdrawn.

*End Of Section*

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## SECTION 3

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### EROSION CONTROL

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- 3.1        **General:** The Contractor shall exercise every reasonable precaution, including the application of temporary and permanent measures, throughout the duration of the project, to control erosion and minimize the siltation of rivers, streams, lakes and impoundments. Such measures shall include, but are not limited to, the use of berms, dikes, dams, sediment basins, fiber mats, brush silt barriers, silt fences, netting, gravel or crushed stone, mulch, stage seeding, slope drains and other approved methods.
- 3.2        **Standards, Criteria & Guidelines:** Erosion control materials and methods shall be in accordance with applicable sections of the “Virginia Erosion and Sediment Control Handbook” by the Virginia Soil and Water Conservation Commission, and the requirements of the jurisdiction in which the work is being performed.
- 3.3        **Pollution Control:** The Contractor shall exercise every reasonable precaution throughout the duration of the project to prevent pollution of rivers, reservoirs, lakes, streams, and natural or manmade channels leading thereto, with chemicals, fuels, lubricants, bitumens, raw sewage, paints, sedimentation and other harmful wastes.

In the event the Contractor dumps, discharges or spills any oil or chemical that reaches or has the potential to reach a waterway, the Contractor shall immediately notify the Engineer and/or all appropriate jurisdictional (state, federal and local) agencies and shall take immediate actions for containment and removal of the oil or chemical.

*End Of Section*

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## SECTION 4

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### PIPELINE INSTALLATION

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- 4.1 **General:** This section governs the installation and inspection of pipe and fittings, the setting of valves, blow-offs and fire hydrants, the installation of thrust blocking and restraint systems, pressure testing and disinfection – all as shown on the plans or as directed herein.

The operation of existing valves shall only be performed by personnel of the Newport News Department of Public Utilities.

No unauthorized person shall be allowed to tap into, or alter any part of the existing transmission or distribution systems.

Installation of special fittings shall be in accordance with the fitting manufacturer's printed instructions.

- 4.1.1 **Lead-Joint Fittings:** The purpose of this sub-section is to inform the Contractor of the possibility of unique circumstances that will require the Contractor's resolution for completion of the waterline work.

In the course of performing any waterline work involving existing mains it is possible that lead-joint fittings and/or fire hydrants will be encountered; when such a situation arises, the Contractor shall be responsible for removal and disposal of these items.

No lead-joint fittings, valves, or fire hydrants shall be reused, relocated, or reinstalled. The Contractor shall be responsible for furnishing and installing fittings, valves, and/or fire hydrants as replacement(s) for lead-joint fittings, valves, and/or fire hydrants that are encountered in the performance of the waterline work. All replacement items shall meet the requirements of Material Specifications [Section 2](#), [Section 3](#), or [Section 4](#) as applicable.

- 4.2 **Reference Standards:** The work shall be performed in accordance with the applicable sections of the following standards:

- A. AWWA C600
- B. AWWA C651
- C. AWWA C105
- D. AWWA C111, APPENDIX A
- E. AWWA C115, APPENDIX A
- F. AWWA C500, APPENDIX A
- G. AWWA MANUAL M17
- H. WATERWORKS REGULATIONS (Commonwealth of Virginia, Department of Health)

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4.3

**Required Submittals & As-Built Data:**

- A. In all cases the Contractor shall submit the following for review and approval by the Engineer:
1. Certificates of compliance (material affidavits) for all pipe, valves, fittings and accessories furnished.
  2. As-built drawings, and specified data for installed valves, fire hydrants and blow-offs. The dimensions and data shall be clearly indicated on prints of the Department of Public Utilities' drawings, with separate sketches as deemed necessary.

As-built information shall include, but not be limited to the following:

- a. Locations of horizontal bends, vertical offsets, valves, ends of installed lines, and corporations with dimensions referenced to existing mains, property lines, curb lines, or other permanent objects. Generally, dimensions shall be shown from center to center of fittings, i.e., tee to bend, bend to bend, tee to valve, valve to hydrant, etc.
- b. Data for valves installed - date set, grade-to-nut distance, size, type, manufacturer, number of turns to open, rotational direction to open, and end connections.

*Note: Grade-to-Nut distance is measured from top of pavement or finished grade to top of operating nut.*

- c. Data for hydrants installed - date set, depth of bury, manufacturer, model, number of turns to open, rotational direction to open, internal valve size, and distance branch valve to hydrant.

*Note: Depth of bury is measured from the ground line (usually 2 or 3 inches below the hydrant's breaker ring/traffic coupling) to the bottom of the hydrant shoe (base).*

- d. Data for blow-off assemblies installed – size, date set, manufacturer, type, number of turns to open, rotational direction to open, end connection, grade-to-nut distance, and the bury depth.
- B. In those cases where the installation or procedure proposed is not detailed on the plans or in the specifications; or a significant modification is required, the Contractor shall submit the following for review and approval by the Engineer:
1. Procedures and equipment to be used for pressure testing, leakage testing, and disinfection.
  2. Detailed drawings and method of joint or pipe restraint.
  3. Method of installing polyethylene tube or sheet material for pipe encasement.
  4. Detailed drawings of proposed modifications, off-sets, or special fittings and method of installation.
  5. Procedure for flushing and disposal/dechloramination of flushing waters.

The receipt and processing of a Contractor's submittals shall be in accordance with the requirements of Section 8 of the General Conditions (not included as part of these Standards).

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- 4.4            **Line, Grade & Cover:** All pipe shall be laid to line and grade as shown on the plans and as specified herein.

Normally the grade above a proposed pipeline is determined by surface grade and cover requirements. Careful attention shall be given to the depth of new pipelines at points where tie-ins to existing mains are to be made. The existing main shall be uncovered in the presence of the inspector and the new pipeline set to proper elevation to provide for a level tie-in. An offset might be required to avoid an obstruction within the tie-in length. Taps of existing mains shall be perpendicular to the existing main.

The Contractor shall investigate the proposed location of the main, far enough in advance of the work, to determine where conflicts (if any) will occur and to determine joint deflections necessary to clear any obstructions.

Normal cover (top of pipe to ground or pavement surface) for water mains shall be 36 inches or as shown on the plans. Cover may be reduced to a minimum of 18 inches or extended to a maximum of 48 inches, as necessary, to clear any obstructions not previously identified. When such obstructions are encountered, the Inspector shall be notified before proceeding.

- 4.4.1            **Minimum Cover Requirement:** Regardless of other cover requirements, the minimum cover for pipe adjacent to gate valves shall be governed by the “finished grade to operating nut” clearance as shown on Standard Drawing W-05A [[Figure No. 12](#)].

- 4.5            **Separation Between Water Lines & Sanitary Sewers:** See Section 6 of Construction Standards and Standard Drawing W-07A [[Figure No. 27](#)].

- 4.6            **Joint Deflection:** At any single joint, deflection shall not exceed 80 percent of the pipe manufacturer’s allowable deflection for the type of joint to be used. Joints shall be assembled with the pipes in straight alignment and the required deflection accomplished after assembly. Allowable deflections shall be in accordance with the following tables:

**Mechanical Joint Pipe**

Pipe Diameter	Deflection Angle	Offset Per 18-ft Pipe Length	Offset Per 20-ft Pipe Length
4 in.	6 <sup>0</sup> 38'	25 in.	28 in.
6 in.	5 <sup>0</sup> 42'	22 in.	24 in.
8 in.	4 <sup>0</sup> 17'	16 in.	18 in.
10 in.	4 <sup>0</sup> 17'	16 in.	18 in.
12 in.	4 <sup>0</sup> 17'	16 in.	18 in.
14 in.	2 <sup>0</sup> 52'	11 in.	12 in.
16 in.	2 <sup>0</sup> 52'	11 in.	12 in.

**Bell Type Pipe (push-on joint)**

Pipe Diameter	Deflection Angle	Offset Per 18-ft Pipe Length	Offset Per 20-ft Pipe Length
4 - 12 in.	4 <sup>0</sup> 00'	15 in.	17 in.
16 in.	2 <sup>0</sup> 24'	9 in.	10 in.

**Bell Type Pipe Restrained With Gripper Gaskets\***

Pipe Diameter	Deflection Angle	Offset Per 18-ft Pipe Length	Offset Per 20-ft Pipe Length
4 – 12 in.	4 <sup>0</sup> 00'	15 in.	17 in.
14 in.	3 <sup>0</sup> 12'	12 in.	13 in.
16 in.	2 <sup>0</sup> 24'	11 in.	10 in.

\*Gripper Gasket is defined as **restrained push-on joint gasket with integral stainless steel locking segments** (e.g., American Cast Iron Pipe Company's Fast-Grip<sup>®</sup>); refer to Material Specifications [Section 2.2.H](#).

- 4.7 **Excavation:** The trench bottom shall be graded and compacted to provide a continuous and uniform bedding surface for the pipe. The trench shall be shaped around the joint gland to ensure continuous support for the barrel of the pipe. Trenches excavated to excessive depths shall be backfilled with select material and prepared to provide a proper bedding surface.

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4.7.1 **Test/Tie-In Pit:** At the point of connection to the existing system, the soil shall be excavated to an elevation at least 18 inches below the pipe; and as necessary to allow access for installation of tie-in nipple & sleeves, as well as installation & operation of equipment used for pressure testing & disinfection. Length of the tie-in nipple shall be a minimum of 3.5 feet for pipe 8 inches and smaller, and a minimum of 5.5 feet for pipe larger than 8 inches. See Standard Drawing W-15A [\[Figure No. 41\]](#).

4.8 **Pipe Handling & Installation:** The interior of the pipe shall be kept clean during storage and handling. The interior of each section of pipe shall be inspected and thoroughly cleaned before being placed into the trench. A watertight plug shall be secured in the open end of the pipe at the end of each day's work. Pipe shall be laid with the bell end facing the direction of the work unless otherwise approved by the Engineer.

4.8.A **Ductile Iron Pipe Installation:**

Exercise care in handling & installation of DIP to reduce risk of injury to personnel and damage to the pipe. Never roll or drop DIP into a trench.

Pipe joints will not be allowed beneath structures that would prohibit access to the joint. When the structure, by its size and/or configuration, precludes this requirement, then the water pipeline shall be installed within a casing (see [Section CS 4.22](#)). All joints and/or fittings outside of the casing shall be a minimum of two feet away from the adjacent end of the casing. Only mechanical joint pipe will be installed within a casing.

All pipe, joints and fittings shall be examined after installation to determine if the coating has been damaged during installation. Any damaged areas shall be coated with a minimum of 1 mil of a bituminous coating as specified in [Section 2.2.E](#) of the Material Specifications.

4.8.B **PVC Pipe Installation:**

Exercise care in handling & installation of PVC pipe to reduce risk of damage to the pipe, especially when the ambient air temperature is below 50° F. Never roll or drop PVC pipe into a trench. Avoid severe contact with sharp objects such as rocks or tools. Preferably, PVC pipe should be continuously supported for its full length; if stored on supports, spacing of such supports should not exceed three (3) feet.

When installing PVC pipe, a tracer wire shall be installed adjacent to and parallel to the pipe, and brought to the surface through the valve and/or

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4.8.B

**PVC Pipe Installation** (continued)

blow-off risers (truss pipe). Secure the tracer wire to the PVC pipe, by use of plastic cable ties, tape, or a similar product, at intervals of not more than 10 feet. The end of the tracer wire, at the point of transition from metallic pipe to PVC pipe, shall be stripped of insulation and mechanically attached to the metallic pipe. In addition, marking/warning tape shall be installed directly over the pipeline at a depth of approximately 18 inches below finished grade for the entire length of the PVC installation.

Straight runs (without bends) of PVC pipe shall be installed in full lengths; partial lengths will only be accepted for installation of fittings and/or at dead ends. **NOTE:** Manufacturers of PVC pipe do not recommend any bending.

- 4.8.1 **Transitions:** Transitions from ductile iron pipe to 2-inch PVC pipe shall be in accordance with the following:

Material – End of DIP closed with MJ plug that has a hole (on center) tapped with 2" FIP threads; a 2" brass nipple with MIP threads on at least one end; and a bolted steel coupling (see Section [MS 2.3](#)).

Procedure – DIP shall be restrained as if it were a dead end; based on Table on Standard Drawing W-05C-02 [[Figure No.19](#)]. For configurations with DIP in more than one direction, such as a tee, all DIP branches entering the transition fitting shall be restrained as if they were dead ends.

4.9

**Field Cutting Pipe:**

- A. **Ductile iron pipe** may be cut using an abrasive wheel, a rotary wheel cutter, a guillotine pipe saw, a milling wheel saw, or an oxyacetylene torch. Cuts shall be made at 90 degrees with centerline of the pipe so that a framing square placed against the side of the pipe will reveal no more than 1/4 inch variation across the diameter of the pipe in any direction. Cut ends and rough edges shall be ground smooth and for push-on type connections, the cut end shall be beveled slightly on the outer edge.

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4.9. A **Field Cutting Pipe** (continued)

Pipe coatings damaged in handling or during the cutting operation shall be touched-up and repaired prior to installation.

- B. **PVC pipe** may be cut with an ordinary hand saw, hacksaw, circular power saw or band saw. Use of wheel cutters is not permitted. Cuts shall be made square by use of a miter box or similar guide. The cut end shall be beveled by hand file and interior deburred with a knife or a round file.

4.10 **Joint Assembly:**

- A. **Ductile Iron Pipe** joint assembly and gaskets shall be in accordance with AWWA C111.

Both the gasket and plain end of the pipe shall be thoroughly cleaned to remove all loose rust and foreign material. Just prior to assembly both the gasket and the plain end shall be brushed with soapy water or approved pipe lubricant.

When joint deflection within recommended limits is required, the pipe shall be inserted straight into the bell and the pipe deflected after complete insertion.

1. Mechanical Joint – Nuts on T bolts (or tie bolts) shall be gradually and uniformly tightened to the applicable torque range as follows, and in an alternating sequence to ensure that the gland compresses the gasket evenly around its perimeter:

Pipe Size	Bolt Dia.	Torque Range (lb-ft)
4" - 24"	3/4"	75 - 90
30" - 36"	1"	100 - 120
42" - 48"	1-1/4"	120 - 150

- B. **PVC pipe** joints shall be solvent cemented in accordance with manufacturer's recommendations or in accordance with ASTM D2855. Pipe joints shall not be made when temperature is below 40<sup>0</sup> Fahrenheit.

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4.11 **Joint Restraint (DIP):** Where the potential for pipe separation due to thrust exists, restraint shall be provided by employing any one or a combination of the following methods, although the preferred method is by use of retainer glands (Refer to Department of Public Utilities Standard Drawings Series W-02 and W-03 [[Figures No.1 thru 7](#)]):

- Retainer glands on mechanical joint pipe (See Material Specifications [Section 2.2.G](#))
- Gripper Gaskets on bell type pipe (See Material Specifications [Section 2.2.H](#))
- MJ FIELD LOK™ glands & gaskets on mechanical joint pipe (See Material Specifications [Section 2.2.G.1](#))
- Threaded rods (See Material Specifications [Section 14.2](#)) & retainer glands on mechanical joint pipe
- Cast-in-place concrete. (See Material Specifications [Section 9](#)).

A. Concrete buttresses and concrete anchors shall be placed where indicated on the plans or as required herein. Buttresses are required for all horizontal changes in direction. For concrete requirements see [Section 9](#) of the Materials Specifications. To allow for future accessibility, concrete buttresses and anchors shall be carefully formed as required to prevent the joint gland or fasteners from becoming embedded in concrete. Fasteners and glands shall be shielded with polyethylene film to prevent a bond between the concrete and the fitting. Alternate forming requirements must be approved by the Engineer prior to installation.

The Engineer may direct that thrust blocking with larger dimensions be used in specific instances. In those cases payment will be calculated at the price bid per cubic yard for thrust blocking, which shall include all excavation, forming and backfilling to complete the blocking as directed.

B. Restraining rods shall be installed as shown on the Standards Drawings or as directed by the Engineer. Tie-bolts, threaded rods, couplings, nuts, washers and clamps used for rodding shall be manufactured expressly for use in restraining underground pipelines (see [MS 14.2](#)) and shall be installed as recommended.

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4.11.B

**Joint Restraint (DIP)** (continued)

ALL RODS AND FASTENERS SHALL BE COATED WITH TWO COATS OF BITUMINOUS PAINT BEFORE BACKFILLING THE TRENCH.

- C. Joint restraint shall be provided where there is a change in direction (by use of a bend) or change in size of the pipe, where indicated on the plans or as directed by the Engineer,
1. Pipe on each side a bend for horizontal deflection shall be restrained in accordance with Standard Drawing W-03B [\[Figure No. 7\]](#).
  2. Pipe on each end of a vertical offset shall be restrained in accordance with Standard Drawing W-03A-2 [\[Figure No. 5\]](#) or W-03A-1 [\[Figure 6\]](#) as applicable.

Retainer glands shall be carefully installed to properly compress the gasket, then insert and tighten the joint T-bolts & nuts (in accordance with Construction Standards [Section 4.10.A](#)) in an alternating pattern to maintain alignment; and then tighten the wedge bolts in an alternating pattern, gradually increasing the torque until the break-off bolt heads separate.

- D. Temporary blocking may be of heavy timber, steel, or other materials and shall be of sufficient strength and securely braced or supported so as to prevent any movement of the pipe or fittings. Poured-in-place concrete shall not be used.

The Contractor shall be solely responsible for the adequate restraint of the pipe and fittings during pressure testing or during any other procedure requiring that the pipeline be pressurized prior to final acceptance by the Owner.

- 4.12 **Installing Valves:** Valves shall be installed at the locations shown on the plans or as otherwise directed by the Engineer.

Valves shall be set with the operating stem truly plumb, and in accordance with Department of Public Utilities Standard Drawings W-05A [\[Figure No. 12\]](#) for gate valves & W-05A-01 [\[Figure No. 13\]](#) for ball valves, unless a special enclosure is detailed on the plans.

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4.12

**Installing Valves** (continued)

For gate & butterfly valves, the top of the operating nut shall be not more than 48 inches below the top rim of the valve box frame when said frame is properly installed to finished grade. The Contractor shall install an approved valve stem extension device where necessary to comply with the 48 inches maximum distance. Attachment of the extension shall be by use of specified flat-point set screw secured against the operating nut.

Installation of an in-line ball valve will require a brass, threaded, 2" x 12" nipple on each end of the valve. Support shall be provided to prevent the weight of the valve from being imposed on the PVC pipe. Ball valves shall be set with the operating nut at a grade-to-nut depth not greater than 36 inches. See Department of Public Utilities Standard Drawing W-05A-01 [[Figure No.13](#)].

For each underground valve and blow-off, the Contractor shall furnish and install a Newport News Waterworks standard cast iron frame and lid, and a length of 12-inch nominal diameter truss pipe to serve as the lower portion (riser) of the valve box. See Material Specifications [Section 3.7](#); and Department of Public Utilities Standard Drawings W-05A [[Figure No.12](#)], W-05A-01 [[Figure No.13](#)], & W-05C [[Figure No.16](#)].

- 4.12.1 **Installing Blow-Offs:** Each dead-end main 8 inches or smaller shall be equipped with a permanent blow-off. See Department of Public Utilities Standard Drawing W-05C-01 [[Figure No. 17](#)]. See Drawing W-15C [[Figure 43](#)] and [Section CS 11.2.A](#) for temporary blow-offs on fire suppression branch pipelines.

Gil blow-offs shall be installed plumb with the top of the operating nut at a maximum depth of 18 inches below grade and the top of the standpipe cap at a depth of 3 to 6 inches below grade. A 2-inch check valve shall be installed immediately upstream of the blow-off. See Department of Public Utilities Standard Drawing W-05C [[Figure No. 16](#)].

- 4.13 **Installing Fire Hydrants:** Hydrants shall be installed at the locations shown on the plans or as otherwise directed by the Engineer. Requests for hydrants in addition to those shown on the plans must be coordinated with and approved by the Engineer before installation.

Each dead-end main larger than 8 inches shall terminate with a fire hydrant.

Hydrants shall be set with the frangible safety/traffic flange approximately 2 to 3 inches above proposed finished grade. Hydrants of required bury depth shall be furnished; extension spool pieces shall not be used to achieve the proper height; if no other option such as an offset in the branch pipe is practicable, then an extension may be used but its use must be approved prior to installation.

Each hydrant shall be set with its vertical axis truly plumb, and in accordance with Department of Public Utilities Standard Drawings W-6 (A through E [[Figure No. 21 thru 25](#)] as applicable). Unless otherwise noted on the plans, or otherwise directed by the fire department/fire division for the applicable jurisdiction; each hydrant shall be oriented (by rotation of the upper barrel) to position the steamer/pumper nozzle toward the adjacent paved roadway or parking area.

The hydrant branch valve shall be set in accordance with [Section 4.12](#) of the Construction Standards.

Generally, in those cases where a parallel ditch exists between the pavement or shoulder and the proposed hydrant, and the depth of that ditch is greater than 18 inches (edge of shoulder to flowline of ditch), a culvert pipe of the type, diameter and length indicated by Department of Public Utilities Standard Drawing W-06C [[Figure No. 24](#)], shall be installed. For payment purposes the culvert installation and backfill will be considered a part of the complete hydrant installation.

Special close-coupled or offset hydrant branch installations will be detailed on the plans. In the event that an obstruction is discovered during excavation, which requires that the standard or detailed hydrant branch be modified, the Contractor shall submit a workable design for approval in accordance with [Section 4.3 B](#) of the Construction Standards.

The base of each hydrant, to a point above the drainage opening, shall be surrounded with VDOT No. 57 stone which is encased with geosynthetic drainage fabric meeting the requirements of VDOT "Road and Bridge Specifications" (1997) Section 245.

Newly installed fire hydrants not yet in service shall be covered with a bag or sheet material, securely tied in place indicating to firefighters that hydrant is not useable. Cover shall be removed after completion of tie-in to existing distribution system.

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4.13                    **Installing Fire Hydrants** (continued)

Fire hydrants should be accessible for a full 360° circle of at least 5 feet in diameter with no obstructions such as fences, light standards, utility poles bushes, trees, flowers, walls or any other similar object.

Hydrants should not be installed within a concrete surface such as a sidewalk; however, if this situation is unavoidable then the hydrant shall be set with the frangible safety/traffic flange approximately 2 to 3 inches above the concrete and the lower barrel (for the full depth of the concrete) shall be wrapped with two layers of bituminous-coated paper.

4.14                    **Air Relief:** Air relief assemblies required by the plans or installed by the Contractor, with the approval of the inspector, to facilitate air removal shall be installed in accordance with Department of Public Utilities Standard Drawing W-05D [[Figure No. 20](#)].

4.15                    **Polyethylene Encasement:** Encasement of the pipeline shall be installed as shown on the plans or as directed. In the event that corrosive soil (as defined by Appendix “A” of ANSI/AWWA C105/A21.5) is encountered during excavation, the Engineer may direct that all or a portion of the pipeline be encased, whether or not encasement was indicated on the plans.

Materials and methods of installation shall be in accordance with ANSI/AWWA C105/A21.5; Method A, B, or C may be used unless otherwise specified.

4.16                    **Tapping of Existing Mains:** Tapping sleeve and valve shall be utilized for connecting to an existing main when shown on the plans, or when in the opinion of the Engineer, the use of other methods would require interruption of water service to an extent considered undesirable.

In those cases where the main is not to be tapped under pressure, and more than 20 services will be affected by a shutoff, then that shutoff shall be scheduled to provide at least 48 hours notice to the affected customers. Printed notices will be provided by the Department of Public Utilities with distribution coordinated by the Department of Public Utilities.

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**Tapping of Existing Mains** (continued)

- A. Clearance: Minimum distance between an existing joint or fitting and the proposed tap shall be 3.5 feet for existing pipelines 8 inches or smaller, and 5.5 feet for existing pipelines larger than 8 inches (see Standard Drawing W-04A-2 [\[Figure No. 10\]](#)).
1. Measurement shall be from the “homeline” at the joint or centerline of the fitting to the centerline of the outlet of the tapping sleeve.
  2. If clearance, as required above, cannot be attained then a pipeline tee shall be substituted for the tapping sleeve and a horizontal offset provided. The decision to do this shall be at the inspector’s discretion.
- B. Excavation: At the proposed point of connection to the existing system, the soil shall be excavated to an elevation at least 18 inches below the pipe; as necessary to ensure sufficient distance from adjacent joints and fittings; and as necessary to allow access for installation of the tapping sleeve and valve, and to allow installation & operation of pipeline tapping equipment.
- C. Material: Mechanical joint tapping sleeves shall be used for all taps of cast iron pipe and size-on-size taps of ductile iron pipe. Tapping saddles shall be used for all other taps of ductile iron pipe or as noted on the plans.
1. All materials used shall conform to the Material Specifications of this Standard.
  2. If Department of Public Utilities’ records indicate that an existing main is “cast iron”, it is the Contractor’s responsibility to determine the outside diameter at the location of the proposed tap so properly sized tapping sleeve or couplings will be provided.

NOTE: Most cast iron pipes in the Department of Public Utilities' distribution system are Class A or B; however, Classes C and D have been encountered in old pipelines.

D. Procedure: An inspector must be present when an existing main is being tapped. Only taps of size equal to the diameter of the branch are acceptable; reduced size taps will not be allowed.

1. The existing pipe, and all equipment and materials to be used in tapping the main shall be cleaned of all dirt and deleterious material.
  - a. Clean the exterior of the main by brushing and/or scraping followed by wiping with potable water, for a distance greater than the width of the tapping sleeve.
  - b. Swab the exterior of the main, the interior of the tapping sleeve & valve, and the tapping machine's bit & shell cutter with a 1% chlorine solution (1 part household bleach to 4 parts water).
2. After the tapping sleeve and valve assembly has been installed on the main, aligned and all bolts properly tightened, the assembly shall be hydrostatically tested for one (1) hour at a minimum pressure of 125 psig.
  - a. Tapping valve shall remain open during the pressure test.
  - b. Water shall be injected into the body of the tapping sleeve through a test plug; if tapping sleeve does not have a test plug, a tapped mechanical joint pipe plug shall be attached to the valve and the water shall be injected through the pipe plug.
  - c. No leakage will be allowed.

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4.16 .D

**Tapping of Existing Mains** (continued)

3. Following a successful pressure test, the main may be tapped. Exercise caution to ensure removal of the coupon. The inspector shall receive the coupon to verify its removal.
  4. All tapping sleeves shall be restrained by concrete buttresses in accordance with Department of Public Utilities Standard Drawing W-02A [\[Figure No. 3\]](#), and Construction Standards [Section 4.11.A](#). For the purpose of determining dimensions of the buttress, each tapping sleeve shall be considered as a tee with like nominal diameters of run and branch.
  5. Tapping of steel cylinder concrete pipe shall be in accordance with the pipe manufacturer's recommendations. Manufacturer's literature on the method of installation shall be submitted to the Engineer for approval prior to starting work.
- E. PVC Branch: Tapping of an existing cast iron or ductile iron main for connection of 2-inch PVC pipe shall be in accordance with Department of Public Utilities Standard Drawing W-04A-1 [\[Figure No. 9\]](#); materials for Option 1 are noted in [Section MS 2.4.G](#).

4.16.1 **Tap Extension:** For pipeline installations where the existing main is beneath a roadway and the new line is not parallel to the existing roadway, an extension of pipe shall be installed from the tapping valve to a point approximately 4 feet beyond the edge of the roadway so that the test/tie-in pit will not interfere with traffic (See Department of Public Utilities Standard Drawing W-15A [\[Figure No. 41\]](#)).

- A. Disinfection: Swab the interior of the pipe for its entire length with a solution of 1 part household bleach to 4 parts water.
- B. Pressure test: After installation, pressure test this length of pipe for a minimum of one (1) hour at a pressure not to exceed the system pressure in the existing main.

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- 4.17 ***Flushing of New Water Mains:*** All mains shall be thoroughly flushed, using potable water, prior to pressure testing and at the completion of disinfection. Velocity in the main during flushing shall be a minimum of 2.5 feet per second, for a period sufficient to remove sediment and discolored water from the main. All valves and hydrants shall be operated and flushed.

The Contractor shall be responsible for the planning and disposal of all flushing waters. He shall ensure that disposal is performed in such a manner as to cause no adverse environmental effects such as fish kills or erosion, and in accordance with applicable legal requirements. The Contractor's procedure for disposal of flushing waters shall be specific for each site.

THIS PROCEDURE MAY INCLUDE USE OF DECHLORAMINATION CHEMICALS SUCH AS **SODIUM SULFITE** ( $\text{Na}_2\text{SO}_3$ ) TO AVOID ADVERSE ENVIRONMENTAL IMPACT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING APPROVAL FOR USE OF SUCH CHEMICALS FROM THE APPROPRIATE STORMWATER RUN-OFF AGENT. THE CONTRACTOR'S PROCEDURE FOR DISPOSAL OF FLUSHING WATER SHALL ADDRESS TESTING OF THE WATER FOR TOTAL CHLORINE RESIDUAL PRIOR TO ITS DISPOSAL.

The Contractor shall provide notice to the Department of Public Utilities' Distribution Operations Division (Construction Services Branch, 757 234-4850) at least 72 hours in advance of performing a flush. An inspector must be on site during the flushing operation. Only Department of Public Utilities personnel shall operate valves in the existing system.

- A. **Equipment:** The Contractor shall provide and install temporary full pipe size blow-offs (with the ends elevated to prevent contaminated water from re-entering the pipe) on all branches and loops of the extension (see Department of Public Utilities Standard Drawing W-15C [[Figure No. 43](#)]). Only equipment which is clean and functioning properly shall be used.

**Flushing of New Water Mains** (continued)

- B. Water Supply: Water for the initial flush and for flushing after disinfection will be furnished by the Owner without charge to the Contractor. The Contractor will be charged for water used in any additional flushing operations. The charge will be calculated using current rates for water consumption and will be metered at the source of supply.
- C. Procedure: Every proposed pipeline installation shall have a flushing schedule which has been approved by the Department of Public Utilities. If the Contractor wants any change in this schedule, the requested change(s) must be submitted and approved prior to beginning installation of the new main.
1. Flushing shall proceed in a logical progression from the water supply to the end of the extension. New loops shall not be closed until after flushing has been completed.
  2. Mains containing reducers will be flushed at the rate for the larger main.
  3. Flow rates required to attain flushing velocity (2.5 fps) are in accordance with the following:

<b>Pipe Size (in.)</b>	<b>Req'd Flow (gpm)</b>
4	98
6	230
8	392
12	882
16	1,560

4. Mains shall be flushed until the water is clear or until at least two pipe volumes have passed through each branch, whichever is greater. Use the following formula to determine time (minutes) required for a flush of two pipe volumes:

4.17. C

**Flushing of New Water Mains** (continued)

$$\frac{V \times L \times 2}{\text{GPM}}$$

V = volume per ft (see below)

L = length of pipe (feet)

GPM = flow (see 4.17 C.3)

Pipe Size (in.)	Volume Per Ft (gallons)
4	0.65
6	1.47
8	2.61
12	5.88
16	10.44

D. Clarity Check: The inspector shall check the clarity of the water prior to conducting the pressure test, notwithstanding the duration of the flush.

1. The water shall be allowed to flow for at least 5 minutes before the sample is collected.
2. At least 25% of the branch line blow-offs shall be sampled.
3. Samples shall be collected in clean containers.
4. No visible particles or cloudiness shall be allowed.
5. If any sample is found to be unacceptable, then all lines shall be checked for clarity.
6. Any mains found to be unacceptable shall be flushed again using the procedure noted above and a charge, based on the size of the system, will be paid by the Contractor.
7. The connection between the new main and the existing system shall be broken when flushing has been completed or when requested by the inspector.

4.18 **Pressure Tests:** All newly laid pipe, or any valved section thereof, shall be subjected to a hydrostatic pressure of 1.5 times the expected working pressure, or 125 psig, whichever is greater, measured at the high point in the line.

Pressure tests shall be of at least a 2-hour duration, shall be in accordance with AWWA C600; and must be witnessed by authorized personnel of the Department of Public Utilities. No leakage will be allowed during the pressure test.

- A. **Gauges and Equipment:** The Contractor shall furnish all pumps, fittings and gauges as necessary to fill the line with potable water, dispel air from the system, and pressurize the pipeline for the tests. The Engineer reserves the right to test gauges on a dead weight tester to determine their accuracy. The Contractor shall provide and install an approved backflow preventer (RP) in the water supply line, between the newly laid pipeline and existing distribution system. Only equipment which is clean and functioning properly shall be used.
- B. **Water Supply:** Water for the first pressure test will be furnished by the Owner without charge to the Contractor. If the pressure test is unsuccessful, and in the opinion of the Engineer an additional test or tests are required, the Contractor will be charged for water used in those additional tests. The charge will be calculated using current rates for water consumption and will be metered at the source of supply.
- C. **Procedure:** The Contractor shall test the line prior to the formal pressure test and shall provide notice to the Department of Public Utilities' Distribution Operations Division (Construction Services Branch, 757 234-4850) at least 72 hours in advance of a formal pressure test. If the line is not pressurized when the inspector arrives, the test must be rescheduled.
  1. The inspector shall verify that the water used for the test is supplied through a fully valved manifold (see Department of Public Utilities Standard Drawing W-15B [[Figure No. 42](#)]) with an approved backflow preventer (RP), and that all mainline and hydrant branch valves are open.

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4.18. C

**Pressure Tests** (continued)

2. The test pressure shall be attained and stabilized before the test duration will begin. If the pressure is higher than the required minimum pressure, the higher pressure will be the basis for determining compliance.
3. During the test, at least every 20 minutes, the inspector shall check and record the pressure as indicated on the pressure gauge. Any loss in pressure will terminate the test as a failure. Any leakage shall be considered test failure.
4. At the conclusion of the test, the inspector shall verify that the pressure gauge registers zero. Failure of the gauge to register zero shall invalidate the test.

The Contractor shall repair and correct any and all leaks in order to achieve a successful pressure test.

4.19

**Disinfection:** Disinfection of the main and appurtenances, and acceptable bacteriological analysis of sample(s) collected therefrom, shall be completed before any newly laid pipeline is connected to the potable water distribution system. All work shall be in accordance with AWWA C601, VDH Waterworks Regulations, and as specified herein. Chlorination shall be by the continuous feed method. Only equipment which is clean and functioning properly shall be used.

Flushing and disposal of flushing waters shall be in accordance with [CS 4.17](#), with the Contractor responsible for the planning and disposal of all flushing waters.

- A. **Equipment:** All equipment to be used for disinfection shall be provided by the Contractor, and will be cleaned and disinfected prior to use.
  1. Solution for disinfecting equipment may be prepared by adding 1 gallon of bleach (5.25% available chlorine) to 4 gallons of water (total volume of 5 gallons).

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4.19. A

Disinfection (continued)

2. Equipment shall be immersed in solution, or swabbed or flushed out with the solution.
  3. After disinfection, do not place equipment directly on the ground or where it will be recontaminated.
- B. Water Supply: Water for use in disinfection will be furnished by the Owner without charge to the Contractor. Connection to the existing system to obtain water for disinfection shall be made with the inspector present. The existing system shall be protected by use of a fully valved manifold and approved backflow preventer (RP) as shown on Department of Public Utilities Standard Drawing W-15B [\[Figure No. 42\]](#). NO CONNECTION WILL BE ALLOWED WITHOUT A PROPER BACKFLOW PREVENTER.
- C. Procedure: Potable water shall be introduced into the pipeline at a constant flow rate. Using chlorination equipment specifically designed for the purpose, chlorine (household bleach with 5.25% available chlorine) shall be added at a constant rate, proportional to the water flow, so that the chlorine concentration in the water main is at least 50 mg/l. Additional chlorine may be required depending on site specific conditions.
1. The chlorine solution shall remain in the main for at least 24 hours but should not remain longer than 48 hours.
    - a. This solution shall not be flushed out until the inspector has checked the residual and confirmed that it is below 20 mg/l.
  2. At the beginning of the holding period, the inspector shall measure total chlorine residual at each dead end and each loop, as applicable.
  3. The inspector shall randomly check the chlorine residual and if any residual is below 50 mg/l, then the inspector shall check the residual on each line.
  4. All valves and appurtenances shall be operated during the holding period.

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4.19. C      *Disinfection* (continued)

5.      At the end of the holding period, the residual shall be at least 10 mg/l and if the residual is less than 20 mg/l, the chlorine solution shall be flushed from the main using potable water. Flushing shall be in accordance with [4.17](#).
  - a.      If, at the end of the holding period, the residual is less than 10 mg/l, the disinfection procedure shall be repeated.
  
- D.      Sampling & Analysis:      Water samples shall be collected at a maximum interval of 2,000 feet along the pipeline, and along each branch main. Two samples, collected at least 24 hours apart, shall be collected at each sampling point. Samples shall be collected only from suitable sampling setups (See Department of Public Utilities Standard Drawing W-15D [[Figure No. 44](#)]) installed by the Contractor at locations shown on the plans or as directed by the inspector.
  1.      Water shall be allowed to run full flow for 20 seconds and then turned off.
  2.      Carefully flame the hose bibb by use of an alcohol flame, Sterno<sup>®</sup>, or small lighter (matches are not acceptable).
  3.      Water shall be run full flow for 2 to 4 minutes, then reduced to a slow, even flow.
  4.      Carefully open sample container, not touching mouth of container, and fill to line. Close and tightly seal container.
  5.      Measure and record chlorine residual.
  6.      Complete sample report form including the following information:

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4.19. D.6

**Disinfection** (continued)

- a. Project name, administrative work order number, and sample point identification
  - b. Time and date of sample collection
  - c. Chlorine residual reading
  - d. Name of person collecting sample.
7. The inspector will deliver the sample(s) to an appropriate laboratory. Results of the sample analysis will be provided to the Contractor.
  8. If analysis indicates the presence of coliform bacteria, the inspector shall:
    - a. Determine possible source of contamination by reviewing disinfection and sampling procedures used.
    - b. Resample points which indicate contamination.
  9. If analysis of repeat samples indicates contamination, the main shall be disinfected again and a new set of samples collected for analysis.

4.20

**Final Tie-in to Existing Main:** The Department of Public Utilities must have received and accepted: (1) Material Affidavit, (2) Maintenance Bond, (3) Statement of Cost, and (4) As-Built Drawing(s) **before** tie-in will be allowed.

If the new piping consists of a short distance (i.e., does not require a test/tie-in pit) and serves only one appurtenance such as a fire hydrant or a fire suppression (sprinkler) system, then the aforementioned documents, with the exception of the as-built drawing(s), must be submitted **prior** to tapping the existing main. An offset in existing piping will also require document submittal **prior** to starting the waterline work. In either of these scenarios the as-built drawing(s) will be submitted at the conclusion of the project.

Final tie-in shall not be made until the bacteriological samples collected following disinfection of the new main have indicated no contamination. The inspector must be present during this procedure.

An excavation as specified by [4.7.1](#) shall be provided and equipped with a pump(s) as necessary to maintain water level below the bottom of the pipe.

- A. Material Preparation: The interior of all pipes, nipples, sleeves, clamps and gaskets shall be cleaned and disinfected prior to installation.
  - 1. Solution for disinfecting tie-in materials may be prepared by adding 1 gallon of bleach (5.25% available chlorine) to 4 gallons of water (total volume of 5 gallons).
  - 2. Materials shall be immersed in solution, or swabbed or flushed out with the solution. Use only clean rags, sponges, or mop heads for swabbing.
  - 3. After disinfection, do not place materials directly on the ground or where they will be recontaminated.
  
- B. Procedure: Clean and swab end of existing water pipeline (inside & outside) for at least 12 inches from the end of the pipe. Install tie-in materials taking care to not contaminate the disinfected materials.
  - 1. Upon completion of the installation, open a hydrant or a blow-off and flush the pipeline in accordance with [4.17](#).
  - 2. At the conclusion of the flushing procedure, a bacteriological sample shall be collected in accordance with [4.19 D](#).
  - 3. The newly laid main will be considered "in service" and as a part of the Department of Public Utilities' distribution system after acceptable bacteriological analysis.

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- 4.21 **Abandonment of Existing Pipe:** In the event that an existing pipe is abandoned as the result of the installation of new pipe, the ends of the abandoned pipe shall be capped. Certain situations, as noted on the project drawing(s) will require the abandoned pipe be filled with *flowable fill* (slurry mixture of fine aggregate, water and cementitious material) and the ends sealed to prevent intrusion of foreign matter into the pipe.

Unless directed otherwise, if practicable all buried valves (except in-line installations), Gil blow-offs, valve boxes and fire hydrants on a pipeline being abandoned shall be removed and returned to the Department of Public Utilities.

Situations such as an offset to clear another utility will require removal of the pipe and any appurtenances that are within the area of the offset.

- 4.22 **Casings:** A casing shall be provided by the Contractor when (1) required by the drawing(s), (2) a representative of VDOT or of the local jurisdiction having authority requires it, (3) a pipeline is to be installed beneath an existing railroad track, (4) a pipeline joint beneath a structure (such as box culvert) is unavoidable, or (5) when in the opinion of the Department such an installation would be in the best interest of the general public.

Casings to be installed beneath a roadway, a railroad track, or as otherwise specified, shall be steel pipe meeting the requirements specified in [Section 13](#) of the Material Specifications.

Casings beneath a roadway shall be of sufficient length to extend a minimum of 4 feet beyond the edge of pavement (typical each end of casing); see Department of Public Utilities Standard Drawings W-09A [[Figure No. 30](#)] or W-09A-01 [[Figure No. 31](#)].

**NOTE: Only mechanical joint pipe will be allowed within a casing.**

Pipe spacers, meeting the requirements specified in Section 13 of the Material Specifications, shall be installed within 24 inches of each end of the casing and spaced a maximum of 10 feet apart within the casing. If RACI spacers are used, install two (2) spacers, spaced a maximum of 6 inches from each other, at each end of the casing.

See Department of Public Utilities Standard Drawings W-09A [[Figure No. 30](#)] for positioning of Cascade brand spacers, or W-09A-01 [[Figure No. 31](#)] for positioning of RACI brand spacers

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4.22                    **Casings** (continued)

NOTE:                Cascade brand centered-configuration spacer assemblies consist of unique top & bottom segments; exercise caution to ensure proper assembly and rotational orientation.

4.23                    **Close-Coupled Fittings:** A Foster Adaptor, or approved equal, may be installed between two mechanical joint items when a close-coupled configuration is required. Installation shall be in accordance with adaptor manufacturer's printed instructions.

4.24                    **Shut-Off Notices:** Shut-off notices shall be provided to Waterworks customers a minimum of 48 hours in advance of any planned event that will affect more than 20 customers, or as determined by Waterworks. This includes, but is not limited to, events such as a tie-in, pipeline adjustment, or installation of an offset. The Department of Public Utilities will provide printed notices and coordinate distribution of same.

*End Of Section*

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## SECTION 5

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### SERVICE INSTALLATION

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5.1 *General:* This section governs the installation and inspection of service lines including associated corporation stops and angle valves.

- A. The following conditions must be met before service line installation will begin:
1. The distribution main shall have been completed and accepted as part of the Department of Public Utilities' distribution system.
  2. All concrete structures (i.e., curb & gutter, paved swale, or sidewalk) which the service line(s) will pass beneath must be in place, or a waiver allowing installation of service line(s) in advance of such structures must be applied for and approved.
  3. All required documents (i.e., material affidavit, statement of cost, and maintenance bond) shall have been provided to the Department of Public Utilities. (These documents are in addition to similar documents required for distribution main installation.)
    - a. Material affidavit shall be a notarized original.
    - b. Statement of cost shall indicate cost for each size if more than one size of service line is to be installed.
    - c. Maintenance bond for installation of up to and including 100 service lines shall be in the amount of \$2500 for two (2) years; for installations of more than 100 service lines, a two (2) year bond in the amount of 6% of the total estimated cost of the service lines to be installed shall be provided.
  4. All easement requirements shall have been satisfied and service line installation work orders issued.

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5.1. A

**General** (continued)

5. Developer will have identified proposed location for each water meter by markings on curbs or paved swales, by stakes, or by other means approved by the Department of Public Utilities.
  - a. A utility policy, adopted by a jurisdiction, which specifies location of water meters shall be enforced for that particular jurisdiction.
  - b. Where it is necessary to install multiple meters in one location, the meters shall be arranged in a logical progression of addresses (i.e., ascending or descending numerically).
  - c. Meters shall NOT be located in paved areas.
- B. No Contractor personnel will be permitted to install new service lines or modify (tap) an existing distribution main unless the person directly responsible for overseeing the work has passed the Department of Public Utilities' Certification Program Test.
- C. No tapping of the distribution main or installation of service lines shall be performed without a Department of Public Utilities inspector on site.
  1. Contractor shall contact the Construction Services Branch (757-234-4850) to schedule an inspector at least 72 hours in advance of planned start of service line installation.
- D. Only products approved for human consumption (non-toxic) will be allowed for lubrication of items which will penetrate the distribution main.
- E. The as-built dimensions of service line installations will be measured and recorded by the inspector and, at conclusion of installations, the Contractor's certified representative will verify and sign the as-built drawing(s).

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5.1. E

**General** (continued)

1. In those cases where a curb & gutter waiver has been issued for service line installation, the as-built drawing(s) will be provided by the inspector to the Contractor for certification by a Certified Land Surveyor or Professional Engineer, with no additional cost to the Owner. The certified drawing(s) will then be submitted to Construction Services Branch.
  2. As-built drawing(s) will include the following:
    - a. Size of the service line
    - b. Horizontal distance between centerline of distribution main and angle valve
    - c. In a cul-de-sac or otherwise main dead-end, the distance between the distribution main blow-off and corporation stops.
    - d. Distance between angle valve and one or more fixed reference points such as a valve box, sanitary sewer manhole, fire hydrant, or storm drain drop inlet
    - e. House number, if assigned.
    - f. Sketch of service line configuration for all installations in which the service line is not perpendicular to the distribution main.
- F. Excavation and backfill, in general, shall be in accordance with Construction Standards, [Section 2](#) and [Section 7](#), respectively.
1. Passages for installation of service lines may be created by means of open-cut trenching or horizontal boring (i.e., piercing, punching, or thumping).
  2. There shall be a separate passage for each service line; shared passages will not be allowed.

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5.2 **Sizes:** The correlation of sizes of corporation stop, tubing, and angle valve for the various meter sizes shall be in accordance with the following table:

METER SIZE	CORPORATION SIZE	TUBING SIZE	ANGLE VALVE SIZE
5/8"	3/4"	3/4"	5/8"
3/4"	3/4"	3/4"	3/4"
1"	1"	1"	1"
1-1/2"	1-1/2"	1-1/2"	1-1/2"
2"	2"	2"	2"

Refer to Material Specifications [Section 5.5](#) for service saddle requirements.

5.3 **Installation:**

- A. Excavate the soil as necessary to expose the distribution main with adequate clearance to allow assembly and operation of tapping equipment, and as necessary to permit installation and proper alignment of service line and installation of angle valve.
  - 1. Care shall be exercised to prevent damage to the distribution main and all other utilities in areas of excavation.
    - a. All damage (chips, scratches, abrasions) to the distribution main's coating resulting from the Contractor's excavation shall be repaired with bituminous coating.
- B. The exposed distribution main shall be cleaned of all dirt, mud, scale and other deleterious material, and washed with a 1% chlorine solution in the area of the proposed tap.
  - 1. 1% chlorine solution is 1 part household bleach (5.25% available chlorine) to 4 parts water.

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5.3. B

**Installation** (continued)

2. In those cases where the distribution main is encased with polyethylene, the undisturbed polyethylene in the area of the proposed tap (including all polyethylene that will be in contact with any part of the tapping device) shall be wrapped with at least two layers of 2" wide polyethylene adhesive tape, and the tap shall be made directly through the tape and polyethylene. See [Special Conditions](#) at the end of this Section.
- C. All surfaces of tapping equipment which will contact the distribution main in the area of the proposed tap or will penetrate the distribution main's wall shall be free of all dirt, mud, scale and other deleterious material, and washed with a 1% chlorine solution prior to assembly on the distribution main.
- D. Taps of the distribution main shall be at an angle of approximately 45 degrees from the vertical with a minimum spacing of 18 inches between a tap and a distribution main joint or fitting, except as noted below. Spacing between taps made on opposite sides of the distribution main (in an alternating fashion) shall be a minimum of 18 inches.
  1. Taps made on the same side of the distribution main for parallel service lines to adjacent meters shall be spaced a minimum distance of 24 inches apart for ¾" & 1" meters, and 36 inches apart for 1 ½" & 2" meters.
    - a. Spacing for conditions other than specified shall be established by the inspector.
    - b. Taps adjacent to a fitting on 2-inch PVC pipe shall be a minimum of 12 inches from the fitting, as measured between the end of the fitting and the side of the tapping saddle.
  2. Where practicable, except in cul-de-sacs, the service line shall be installed perpendicular to the distribution main.

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5.3. D

**Installation** (continued)

- a. Nothing in this section shall be interpreted as predominating other requirements such as a jurisdictional utility policy or minimum separation between pipes conveying sewage and potable water pipelines.
3. In cul-de-sacs, unless otherwise indicated by the project plans, the service lines shall be installed with the angle valves for adjacent lots paired at the common side property line. See Department of Public Utilities Standard Drawing W-16A [[Figure No. 45](#)].
4. Where practicable, the distribution main shall be tapped on the same side as the lot which will be served by that service line.
5. The corporation stop, where practicable, shall be oriented with the key nut on top.
6. For installation of a 2" service, a "swing joint" of two 2" street elbows shall be furnished between the corporation stop and the FPT x flare coupling.
- E. Each service line shall be a single piece of tubing; 3-part fittings will not be allowed.
- F. Due to difficulty in bending 1-1/2" & 2" tubing, an alternate configuration utilizing a 90-degree fitting and a brass nipple below the angle valve is acceptable, if approved by the inspector.
- G. All connections between fittings and copper tubing shall be flared.
- H. Normal cover for service lines shall be 36 inches from finished grade.
  1. Finished grade is the finished road elevation for that portion of service line beneath a roadway, and the top of the curb or finished grade elevation for that portion of service line outside of a roadway.

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5.3. H

**Installation** (continued)

2. Minimum cover beneath a drainage ditch shall be 36 inches.
  
- I. The angle valve shall be installed on top of the vertical portion of the service line and in accordance with the applicable configuration of Department of Public Utilities Standard Drawings W-16B [[Figure No. 46](#)], W-16C [[Figure No. 47](#)] & W-16C-01 [[Figure No. 48](#)]. The angle valve shall be oriented to position the outlet facing the proposed meter location.
  
- J. The outlet locknuts of all angle yoke valves shall be removed from the valves and retained by the inspector. If available, the plastic protective cap removed from the corporation stop should be placed on the exposed outlet threads of the angle valve.
  
- K. The Contractor shall furnish and install a number 4 steel rebar, 18 inches long, driven to 1 inch below finished grade along side each angle valve.
  1. **OPTION:** In lieu of the rebar, the Contractor may choose to furnish a section of 4-inch PVC pipe, approximately 18 inches long, placed vertically over the angle valve and protruding approximately 6 inches above the finished grade
  
- L. The actual location of the installed angle valve shall be marked, by the Contractor, on the curb or paved swale by cutting the letter "W" into the concrete with either a saw or chisel, or by any other means approved by the Department of Public Utilities. Markings shall be made neatly and be no larger than 4 inches square.
  1. In those cases where a curb & gutter waiver has been issued, a stake shall be placed to temporarily mark the location of the angle valve. The Contractor will be responsible for permanent marking after completion of the curb or swale.

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5.3

**Installation** (continued)

- M. Prior to backfilling, the completed service line shall be pressure tested (at system pressure; no leakage allowed) and flushed. The corporation stop will remain in the open position and the angle valve will be closed.

5.4

**Special Conditions:** If the Engineer determines that corrosive soil conditions are present where service lines are to be installed, he/she might require encasement of the service pipelines. Materials to be used for such encasement shall as specified by the Engineer, and shall be furnished and installed by the Contractor.

5.5

**Service Saddles:** Installation of an approved service saddle shall be required for the following conditions:

- A. All service taps on PVC pipe, regardless of the size of the main or the size of the tap.
- B. All 1 ½" & 2" service taps on 8" or smaller ductile iron or cast iron pipe. See Material Specifications [Section 5.5](#) for specific requirements.

*End Of Section*

## SECTION 6

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### SANITARY SEWER LINES AND WATER MAINS INTERFACE

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- 6.1 **General:** Virginia Health Department Regulations and the BOCA Basic Plumbing Code require that water mains be installed with 10 feet minimum horizontal separation and 18 inches vertical separation from all sanitary sewer lines. In areas where sanitary sewerage facilities exist prior to a watermain installation the Contractor shall install the water pipeline and/or replace portions of the sanitary sewer mains and laterals in compliance with the provisions of this Section.
- 6.2 **Standard Drawings:** Department of Public Utilities Drawing No. W-07A [[Figure No. 27](#)], "Waterline Crossing Sanitary Sewer/ Lateral", is a graphic representation of the Health Department regulations.
- 6.3 **Parallel Separation:** Except as shown on the plans, or otherwise directed by the Inspector, water lines shall be laid at least 10 feet horizontally from existing or proposed sanitary sewer lines. This distance shall be measured edge to edge. Should site-specific conditions prevent a lateral separation of 10 feet, a water line may be laid closer than 10 feet to a sewer manhole or sewer line if the top of the sewer pipe is at least 18 inches below the bottom of the water line. Where this vertical separation cannot be attained, the sewer shall be constructed of "water quality" (ductile iron or PVC C-900) pipe and pressure tested at 50 psig for 30 minutes to assure water tightness prior to backfilling.
- 6.4 **Vertical Separation:** Water lines crossing **above** sanitary sewer mains or laterals shall be laid to provide a separation of at least 18 inches between the bottom of the water line and the top of the sewer line. Where this separation cannot be attained (i.e., compliance with 18 inches minimum cover on the water line), 6" separation is acceptable if the sewer line is constructed of "water quality" (ductile iron or PVC C-900) pipe, and no joint in the sewer line is less than 5 feet from the water line. If sewer line is not "water quality" pipe, a suitable section of the sewer shall be replaced with "water quality" pipe as described in [Section 6.6](#).

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6.4 Vertical Separation (continued)

In those cases where the water line must pass **beneath** a sewer line, the water line shall be installed with a **minimum distance of 18 inches** from the top of the water line to the bottom of the sewer, and the **sewer line must be of “water quality”** (ductile iron or PVC C-900) pipe with joints a minimum of 5 feet from the water line. If sewer line is not “water quality” pipe, a suitable section of the sewer shall be replaced with “water quality” pipe as described in Section 6.6.

In all cases, a full (18-foot minimum) length of water main shall be centered on the crossing so that the joints will be as far as practicable from the sewer main or lateral.

Water mains shall not pass through nor come in contact with any part of a sanitary sewer, combined sewer, or sewer manhole.

6.5 Water Pipe Installation: Shall be in accordance with [Section 4](#) of the Construction Standards. The Contractor shall perform the cutting of the pipe, and furnish and install additional sleeves or couplings as required to comply with the requirements of the Section without additional cost to the City.

6.6 Sewer Line Replacement: In those cases where the minimum vertical separation between a water line and a sanitary sewer main or house lateral cannot be attained, and the sewer line is not of “water quality” pipe the Contractor shall remove a suitable length of the sewer line and replace it with ductile iron or PVC C900 “water quality” pipe of the same nominal diameter as the existing sewer line.

The pipes shall be joined using suitable transition couplings of rubber or neoprene material and stainless steel circumferential clamps. The joints in the sewer line shall be a minimum of 5 feet from the water line.

*End Of Section*

## SECTION 7

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### BACKFILLING

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7.1 **General:** This section shall govern the backfilling and compaction of prescribed materials to bring all excavated areas to finished grade, or to subgrade when the application of additional roadway base or surface materials are required. The material shall be as specified unless otherwise required by the authority having jurisdiction. All discrepancies shall be resolved by the Engineer.

7.2 **Required Submittals:** This Section shall include certificates of compliance for commercially supplied materials. Other submittals shall include the results of field and/or laboratory testing when specifically requested by the Engineer, as follows:

- A. Compaction density tests
- B. Optimum moisture determination
- C. Standard proctor tests
- D. Gradation tests
- E. California Bearing Ratio

7.3 **Execution:** Trench backfilling shall be done as pipeline installation progresses, in a manner such that no more than 100 linear feet of trench will be open at any time.

Backfilling shall not begin until necessary as-built data is gathered and recorded. Backfilling shall not be completed until pipe restraints (including rods, retainer rings and thrust blocks), sewer replacements, and pipe bedding conditions are inspected and approved by the Department of Public Utilities' Inspector.

The excavation shall be free of all trash and construction debris (including wood, paper and metal) prior to backfilling.

Fly ash shall not be used as backfill material.

A riser of 12-inch truss pipe shall be installed at each valve and blow-off prior to backfilling.

The Contractor shall plan the day's work so that all excavated areas are backfilled and properly compacted at the end of that day. If, for any reason, temporary backfill is placed, or compaction as specified is not completed, such backfill shall be removed, replaced and compacted as specified at another time.

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7.3

**Execution** (continued)

No fill material shall be placed or compacted in a frozen condition. Fill containing significant quantities of organic or other unacceptable materials will be rejected.

Backfill already in place which, in the opinion of the Engineer or inspector, contains unacceptable materials shall be removed, replaced with approved materials and compacted to specifications at the Contractor's expense.

7.4

**Compaction:** Compaction of fill material shall be performed with equipment suitable for the type of material placed and which is capable of obtaining the densities required. When using mechanical tampers proper care shall be exercised to ensure that the pipe and joints are not damaged.

Select fill material shall be placed in 6-inch layers, each layer containing within 3 percent of optimum moisture content and compacted to at least 95 percent of maximum density. This percentage is of standard proctor density. In general, compaction tests shall be required at regular intervals for work within existing right-of-ways. No test is generally required to work within easements unless, in the opinion of the inspector, it is deemed necessary.

If the specified densities are not obtained because of improper control of placement or compaction procedures, or because of inadequate or improperly functioning compaction equipment, the Contractor shall perform whatever work is required to provide the required densities. This work shall include complete removal of unacceptable fill areas and replacement and recompaction until acceptable density is achieved.

7.5

**Pavement Areas:** Backfill under pavement areas and right-of-ways shall be subject to inspection and approval by the department having jurisdiction in County or City in which the work is performed:

- A. City of Newport News – Department of Engineering
- B. City of Hampton – Department of Public Works
- C. City of Poquoson – Department of Public Works
- D. York County and James City County – VDOT

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- 7.6        ***Repairs of Settlement:*** The Contractor shall repair any settlement in excess of those limits stated in Section [CS 8](#), which occurs within the 2-year guarantee period. The Contractor shall make all necessary repairs and replacements within 30 days after notice from the Engineer or Owner.

*End Of Section*

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## SECTION 8

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### ROADWAY & SITE RESTORATION

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- 8.1 **General:** This Section governs the furnishing of all materials, labor and equipment to repair and restore all pavements, structures and systems, both above and below the surface, removed, displaced, damaged or otherwise disturbed during the process of construction.

In all cases, the area shall be restored to the same or better condition than that which existed prior to construction in both appearance and function. The Engineer and/or governing authority shall make any final determination.

Where applicable, Newport News Department of Public Utilities' standard drawings "Roadway Restoration Details" are shown on the plans or bound with and made a part of these specifications. These standard drawings indicate minimum applications of the prescribed materials and nothing shown thereon shall be construed to negate other more specific requirements stated herein.

- 8.2 **Permit Requirements:** Materials, methods and other requirements set out in permits issued by the Municipality, Railway Company, Utilities Authority, the Virginia Department of Transportation and any other Federal, State or Local Agency shall be complied with. When a discrepancy exists between specific permit requirements and standards shown on the plans or stated elsewhere in these specifications, the permit requirements shall govern.

- 8.3 **Patching Portland Cement Concrete Pavement:** Existing concrete shall be removed from areas shown on the plans or designated by the Engineer. Undisturbed portions of the existing pavement, adjacent to areas to be patched, shall be left with neatly trimmed or sawn edges extending from the existing surface, vertically not less than 1-1/2 inches and shall be free of foreign substances. In areas from which concrete has been removed, the subgrade shall be dressed, brought to grade and compacted. Unsuitable subbase material shall be removed, disposed of and replaced with material in accordance with Section 7 of the Material Specification.

Concrete shall be deposited on the subgrade – spaded, tamped or vibrated so that it completely fills the area of the patch and all irregularities in the edges of the adjacent pavement.

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8.3

**Patching Portland Cement Concrete Pavement** (continued)

Joints shall be placed to coincide with joints in the existing pavement, unless otherwise directed. All other joints shall be construction joints. All concrete shall be finished to conform to the cross-section of existing pavement.

The patch and existing pavement, for a distance of 8 feet, shall be tested for level inconsistencies by means of a 10-foot straightedge laid parallel to the centerline of the road, and irregularities in the patch in excess of  $\frac{1}{4}$  inch shall be corrected, except that this tolerance will be  $\frac{1}{2}$  inch in the 10-foot span where the patch is to receive an overlay.

Portland cement concrete patching shall not be subjected to vehicular traffic until the compressive strength of the patching material has attained 2000 psi.

8.4

**Patching Bituminous Concrete Pavement:** Existing surface and base courses shall be removed from areas shown on the plans or designated by the Engineer. Edges of pavement to be removed shall be neatly line-cut, using suitable power equipment, for a depth equal to the combined depth of existing base and surface courses of bituminous materials. In areas from which bituminous concrete has been removed, the subgrade shall be dressed, brought to grade and compacted. Unsuitable subbase material shall be removed, disposed of and replaced with material in accordance with [Section 7](#) of the Material Specifications.

Unless otherwise specified, a tack or prime coat of bituminous material shall be applied between the subgrade surface and the bituminous paving mixture, and between courses of bituminous paving mixture.

Contact surfaces of curbing, gutters, manholes and other structures shall be painted with a thin uniform coating of bituminous material prior to the bituminous paving mixture being placed against them.

Bituminous concrete paving mixtures, of the type and thickness shown on the plans, shall be deposited, tamped or rolled to achieve breakdown. If the air temperature is such that the minimum lay down temperature cannot be maintained during the breakdown rolling, a temporary surface shall be applied and final surface course shall be installed at a later time.

Surface course shall be finished to conform to the cross-section of existing pavement.

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8.4

**Patching Bituminous Concrete Pavement** (continued)

The patch and existing pavement, for a distance of 8 feet, shall be tested for level inconsistencies by means of a 10-foot straightedge laid parallel to the centerline of the road, and irregularities in the patch in excess of  $\frac{1}{4}$  inch shall be corrected, except that this tolerance will be  $\frac{1}{2}$  inch in the 10 feet where the patch is to receive an overlay.

When directed, the Contractor shall cut samples from the compacted pavement for testing of depth and density. The areas of pavement so removed shall be replaced with new mixtures and refinished. No additional compensation will be allowed for furnishing test samples.

Bituminous materials and bituminous concrete paving mixtures shall be in accordance with [Section 10](#) of the Material Specifications.

The surface of the compacted course shall be protected until the material has cooled sufficiently to carry normal traffic without marring.

Bituminous concrete mixtures shall not be placed when weather or surface conditions are such that the material cannot be properly handled, finished, or compacted.

8.5

**Repair of Damaged Pavement:** The Contractor shall take all reasonable precautions to prevent scratching or otherwise marring existing pavement surfaces. The defacing of existing surfaces by the use of cleated track equipment, the careless use of machine blades, the failure to keep abrasive material swept from the surface, or the spilling of liquid materials shall be repaired to the satisfaction of the State or Municipal department responsible for maintenance of the roadway.

8.6

**Pavement Marking:** All existing pavement markings including, but not limited to, pavement line marking, stop lines, school zone markings, railroad crossing markings, elongated arrows and messages, shall be replaced when they were a portion of removed pavement, or otherwise damaged or obliterated during construction.

The Contractor shall record the location, type, line width, color and configuration of all markings in the construction area prior to beginning pavement removal.

White and yellow traffic zone paint, reflectorized fast drying – shall be an alkyd resin paint made specially for marking pavement.

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8.6 **Pavement Marking** (continued)

Newly painted lines shall be protected until field dry.

Thermoplastic materials and preformed plastic pavement marking materials shall be repaired or replaced with materials similar to those that existed. Adhesives, where necessary, shall be as recommended by the manufacturer of the marking materials.

Generally, raised pavement markers and snow-plowable raised pavement markers shall be salvaged and reset in their original locations.

8.7 **Curbs, Walks & Entrance Gutters:** Existing curbs, combination curbs and gutters, entrance gutters, driveways, driveway aprons, sidewalks and entrance walks will be cut or removed only when necessary to facilitate the installation as shown on the plans, or when efforts to bore or excavate beneath them would result in settlement or structural failure.

In general, concrete items shall be cut or removed to the nearest existing joint where practicable.

The thickness, width, configuration, slope and grade of all concrete replacements shall be the same as that which was removed or damaged during construction.

Subbase materials and Portland cement concrete, for items to be replaced, shall be in accordance with applicable requirements of [Section 7](#) and [Section 9](#) of the Material Specifications.

Bituminous concrete materials shall be replaced to a depth at least equal to the thickness of that which existed. Bituminous materials shall be in accordance with applicable requirements of [Section 10](#) of the Material Specifications.

Areas paved with special decorative treatment (gravel, stone, brick, block or tile) shall be restored with materials of a type, size and color resembling that which existed as closely as practicable.

8.8 **Drainage Items:** Existing storm drain pipes, culverts, manholes, catch basins, curb inlets, paved ditch liners, end walls, or any other items intended to convey storm runoff will be cut, removed or replaced only when required to facilitate the installation as shown on the plans or when efforts to excavate or bore near them would result in settlement or structural failure.

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8.8

*Drainage Items* (continued)

Drainage pipe, including driveway culverts, damaged by the Contractor's operations shall be replaced with pipe of the same diameter, material, joint length, joint type and class.

Drainage pipe dislocated for any reason, due to the Contractor's operations, shall be reset to the line and grade which existed prior to being disturbed. The Contractor shall be responsible for setting stakes or other reference markings, prior to excavating, for the purpose of re-establishing the original grade and alignment.

No attempt will be made to redirect or alter the gradient of any storm drainage item except when shown on the drawings as a planned alteration to the existing system.

Minor damage to drainage pipe and structures not requiring replacement shall be patched or repaired, using suitable materials and methods, as directed by and to the satisfaction of the Owner.

8.9

*Sanitary Sewerage Items:* See [Section 6](#) of the Construction Standards which deals with the required vertical and horizontal separation between water mains and sanitary sewers as prescribed by law.

Generally, sanitary sewer manholes and mains will be shown on the plans; however, house laterals are not normally shown and it shall be the responsibility of the Contractor to determine their exact location and depth before beginning pipeline trenching work.

Existing sanitary sewer pipes, manholes, house laterals or any other item intended to convey domestic sewage will be cut, removed or relocated only when required to facilitate the installation as shown on the plans, or when replacement of sewer lines with "Water Quality Pipe" is required.

Sewer pipes damaged due to the Contractor's operations shall be replaced with pipe of the same diameter, material and class, except where replacement with "Water Quality Pipe" is required under [Section 6.6](#).

Minor damage to sewer appurtenances not requiring replacement shall be patched or repaired, using suitable materials and methods, as directed by and to the satisfaction of the Owner.

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8.10            **Utility Damage:**        In the event that any utility is damaged due to negligence, carelessness or violation of any requirement of the Virginia Utility Damage Prevention Act by the Contractor, the utility company shall be notified. The Contractor shall pay any charges for necessary repairs.

8.11            **Shoulders & Ditches:**        All areas within a public right-of-way, outside of the paved roadway, including grassed areas, shoulders, swales, and ditches shall be protected from damage during construction to the maximum extent practicable considering the nature of the work. The function of existing drainage channels shall not be altered unless regrading or relocation is specifically set out on the plans or is a permit requirement.

Side slopes and longitudinal grades of ditches or swales shall be maintained or restored to the conditions that existed prior to construction. No attempt will be made to regrade the flow line of a ditch or swale to meet the inverts of in-line culverts or storm drains, unless such regrading would require no more than 0.5 foot of cut from the existing flow line.

Roadway shoulders disturbed during construction shall be regraded with a cross-slope equal to that which existed prior to the construction. In those cases where a trench is excavated within the shoulder area for pipeline installation, parallel to the roadway, the entire shoulder, for the length of the trench, shall be regraded with a negative cross-slope of 1 inch per foot from the edge of pavement to provide positive drainage from the pavement surface.

Shoulders, stabilized by the application of selected aggregate base materials, soil cement, bituminous materials, etc., shall be resurfaced using similar materials, or as shown on the plan or required by the permit.

Shoulders paved with Portland cement concrete or bituminous concrete paving mixtures shall be considered "Pavement" with regard to restoration requirements. See Sections [8.3](#) and [8.4](#) of the Construction Standards.

In cases where underdrains or specially graded backfill materials, filter fabrics, or conduits associated with them, are encountered, they shall be protected or restored with like materials.

8.12            **Valve Box Adjustments:** When valve box adjustment is required, the pavement shall be removed only to the extent necessary to allow removal of the valve box.

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8.12                                    *Valve Box Adjustments*    (continued)

Reinstallation of the valve box shall be on a carefully compacted bed of gravel. If adjustment of the valve box results in a clearance between the valve box lid and riser pipe greater or less than as shown on Department of Public Utilities Standard Drawing W-05A [[Figure No. 12](#)] then the riser pipe shall be adjusted.

Bituminous concrete and surface treated pavements shall be repaired using cold patch or hot mixed asphalt, thoroughly compacted with the surface struck to match the roadway surface. Portland cement concrete shall be similarly repaired with a suitable non-shrink patching material, mixed and applied in compliance with the manufacturer's instructions. See Material Specifications [Section 9.11](#).

8.13                                    *Landscaping – General:* Landscaping shall consist of restoring the turf on grassed areas and replacing trees, shrubs and other ornamental plantings which were disturbed in any manner during the construction or installation work.

8.14                                    *Trees & Shrubs:* Trees and shrubs in the path of the proposed excavation will normally be shown on the plans indicating replacement requirements. Small trees, shrubs and ornamental plants not shown on the plans, or located outside of the construction area (such that damage or removal would not normally be expected), and which are inadvertently damaged or removed during the progress of the work shall be replaced by the Contractor with plants of like variety and similar size. Replacement plants shall be health nursery stock, balled and burlapped or in suitable containers and shall be prepared and planted by persons experienced in such work.

8.15                                    *Topsoil:* Topsoil shall meet the requirements of Section 8.2 of Material Specifications. Areas designated to receive topsoil shall be scarified or tilled to a depth of approximately 2 inches after having been graded or shaped to the original grade. Topsoil shall be applied only when the subsoil is in a loose, friable condition.

Topsoil shall be spread on the designated areas to the depth shown on the plans, or as otherwise directed. The Contractor shall restore or replace any portion of the topsoil which erodes or is otherwise damaged before final acceptance of the project.

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8.16 **Fertilizer:** Fertilizer shall meet the requirements of [Section 8.3](#) of Materials Specifications. At the time of seeding, fertilizer shall be applied uniformly to the designated seeding areas at the rate of approximately 3.5 pounds per 100 square feet (1500 pounds per acre). Should the Contractor elect to use liquid fertilizer in a hydroseeder, the material shall be mixed with a volume of water sufficient to provide the same value of nutrients per acre as that specified for dry fertilizer.

8.17 **Agricultural Lime:** Agricultural lime shall meet the requirements of [Section 8.4](#) of Material Specifications.

For relatively small areas, lime will not be considered necessary unless directed by the Owner. If the Contractor elects to apply lime prior to seeding, it shall be uniformly spread at the rate of approximately 9.2 pounds per 100 square feet (2 tons per acre) prior to loosening the soil.

8.18 **Seed:** Seed for grass shall conform to the requirements of [Section 8.6](#) of the Material Specifications.

Grass seed shall be uniformly spread to properly prepared areas at a rate of not less than 0.4 pound of pure live seed per 100 square feet (174 pounds per acre) and shall be lightly raked into the ground to a depth not to exceed ¼ inch. After seed placement, the area shall be rolled.

8.19 **Mulch:** Mulch shall be applied to those areas requiring protection to the seed during the germination period. Straw or hay mulch shall be evenly spread at a rate of about 9 pounds per 100 square feet (2 tons per acre). Mulch shall meet the requirements of [Section 8.5](#) of the Material Specifications.

8.20 **Clean Up:** Removal from the project site of rubbish, scrap material, and debris caused by the Contractor's personnel or construction operations shall be a continuing process throughout the course of the work so that the site will present a neat, orderly and workmanlike appearance at all times.

Before final acceptance, the roadway shall be swept free of loose soil and debris, and all ground occupied by the Contractor or used for storing materials shall be cleared of all rubbish, excess materials, and temporary structures; and all parts of the project area shall be left in a neat and presentable condition.

*End Of Section*

## SECTION 9

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### CONCRETE PLACEMENT

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9.1 **General:** This Section governs the construction of new concrete structures and replacement of damaged structures.

9.2 **Form Work:** Forms shall be built reasonably mortar tight and of sufficient rigidity to prevent distortion due to the pressure of the concrete and other loads incidental to the construction operations. Forms shall be constructed and maintained so as to prevent warping and the opening of joints.

The forms shall be substantial and unyielding and shall be so set that the finished concrete will conform to the proper dimensions and contours. The design of the forms shall take into account the effect of vibration of concrete as it is placed.

Forms shall be faced with metal, plywood, or other approved smooth-faced composition material constructed to provide a minimum number of joints and minimize leakage. The concrete shall present a uniform and smooth surface upon removal of forms without requiring touch up or surface finishing.

Metal ties or anchorages within the forms shall be so constructed as to permit their removal to a depth of at least 1 inch from the face without injury to the concrete. In cases where ordinary wire ties are permitted, all wires shall be cut back at least  $\frac{1}{4}$  inch from the face of the concrete with chisels or nippers, upon removal of the forms. All fittings for metal ties shall be such design that, upon their removal, the resulting cavities will be the smallest possible size. The cavities shall be filled with cement mortar and surface left sound, smooth and even.

All forms shall be set and maintained true to the line designated until the concrete has sufficiently hardened. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the Engineer may order the work stopped until the defects have been corrected.

The shape, strength, rigidity, water tightness and surface smoothness of reused forms shall be maintained at all times. Any warped or bulged lumber must be resized before being reused. For narrow walls where the bottom of the form is inaccessible, the lower form boards shall be left loose so they may be removed for cleaning out extraneous material immediately before placing concrete.

All forms shall be treated with oil or an approved form-coating material or thoroughly wetted with water immediately before placing the concrete.

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9.3            **Reinforcing Steel:** Steel reinforcement shall be free of dirt, paint, oil or other foreign substances. Steel reinforcement with rust and/or mill scale will be permitted, provided hand wire-brushed samples conform to the specified requirements for weight and deformation height. Bent bar reinforcement shall be cold bent to the shape shown on the drawings. Bends shall be made in accordance with the requirements of the Manual of Standard Practice for Detailing Reinforced Concrete Structures (ACI 315). All steel reinforcement shall be accurately placed in the positions shown on the drawings and firmly held during the placing and setting of concrete. Bars shall be tied at every intersection where spacing is greater than 12 inches in each direction. Where the spacing is less than 12 inches ties shall be made at alternating intersections. The minimum clear distance from face of concrete to any reinforcing bar shall be two (2) inches except as follows:

Top of slab	1-1/2 inches
Bottom of slab	1 inch

9.4            **Concrete Placement:** Concrete shall be placed as soon as practicable after forms have been prepared, the excavation completed, and subgrade prepared.

Water shall be removed from excavation before concrete is deposited.

A continuous flow of water into the excavation shall be diverted through proper side drains to a sump, or by other approved methods, which will avoid washing the freshly deposited concrete.

Before concrete is deposited, all sawdust, chips, dirt and other debris, and all temporary struts and braces shall be removed from the space to be occupied by the concrete.

Maximum time between introduction of cement to the mix and placement in the forms shall be in accordance with VDOT Road and Bridge Specifications, Section 217.09. The method of placing shall be such as to avoid possibility of segregation of the constituents or the displacement of reinforcement or void forms.

Troughs, pipes, or chutes used as aids in placing concrete shall be arranged and used in such manner that the ingredients of the concrete are not segregated. Where steep slopes are required the chutes shall be equipped with baffle boards. When pipes are used they shall be kept full of concrete and have their lower ends buried in fresh concrete where necessary to prevent excess rate of flow. All chutes, troughs, and pipes

9.4            **Concrete Placement** (continued)

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shall be kept clean and free from coatings of hardened concrete by thoroughly flushing with water after each run. Water used for flushing shall be discharged clear of the concrete in place.

Dropping the concrete a distance of more than five (5) feet or depositing a large quantity at any point and running or working it along the forms will not be permitted unless approved by the Engineer.

Embedded materials as shown on the drawings shall be installed during each stage of concreting operations and shall be suitably supported and maintained in correct position during concreting.

Care shall be taken to fill each part of the forms by depositing concrete as near its final position as practicable, to work the coarser aggregates back from the forms and to move the concrete under and around the reinforcing bars without displacing them. After the concrete has taken its initial set, care shall be exercised to avoid jarring the forms or placing any strain on the ends of the projecting reinforcement.

Concrete shall be thoroughly consolidated during and immediately following placement in the forms. Consolidation shall be accomplished by mechanical vibration applied to the concrete but not directly to the reinforcement or form work. When vibrating is not practical, concrete may be consolidated and all faces well spaded by continuous working with a suitable tool in a manner acceptable to the Engineer.

9.5            **Joints in Concrete:** When construction joints between fresh concrete and concrete that has already set are made, the work already in place shall have its surface roughened thoroughly with a suitable tool and all shavings, sawdust, or other loose and foreign material shall be removed. The surface shall be washed and scrubbed with wire brooms when necessary to remove substances that will interfere with bonding. The concrete of the preceding placement shall be thoroughly wetted prior to the placement of the next unit of fresh concrete. In lieu of the above where waterstops are required by the Engineer, they shall conform to VDOT Road and Bridge Specifications, Section 212.02.

9.6            **Finishing Concrete Surfaces:** The concrete surface shall be floated with a hand float to produce a uniform surface texture and then given a light broom finish. Surface edges shall be edged with an approximate ¼ inch radius edging tool.

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9.7

**Post Finishing Treatment:** Immediately following the finishing operations, the entire surface of the exposed concrete shall be sprayed uniformly with white pigmented liquid membrane. Waterproof paper or white polyethylene sheeting may be used as an alternate.

Liquid membrane shall be applied under constant pressure at the rate of one gallon to not more than 150 square feet. At the time of use, the membrane shall be in a thoroughly mixed condition with the pigment uniformly dispersed throughout the vehicle.

The liquid membrane shall be of such character that the film will harden within 30 minutes after application. Personnel and equipment shall be kept off the freshly applied material to prevent damage to the seal. Should the film become damaged from any cause within the initial 72 hours, the damaged portions shall be repaired immediately with additional membrane.

When concrete is being placed and there is a probability of the air temperature dropping below 40<sup>0</sup> F in the shade during the first 72 hours immediately following placement, a sufficient supply of suitable blanketing material (straw, hay, grass, or other similar material) shall be stored alongside the work; and any time the temperature is expected to reach the freezing point, the blanketing material shall be spread over the concrete to a depth sufficient to prevent the temperature at the surface of the concrete from falling below 40<sup>0</sup> F. The blanketing material shall be left in place for an additional 48 hours in the event freezing air temperatures are expected to continue. Such protection shall be furnished in addition to the liquid membrane seal.

The Contractor shall be responsible for the quality of the concrete placed during cold weather, and any concrete injured by frost action or freezing shall be removed and replaced at the Contractor's expense. Special care shall be taken in hot, dry, or windy weather to protect the concrete by applying the curing medium at the earliest possible time after finishing operations.

Forms shall remain in place a minimum of two (2) days after the concrete is placed when there is no imposed load on the concrete. When there is an imposed load, the forms shall remain in place for seven (7) days.

After removal of forms or a minimum of two (2) days after completion of masonry, the backfill shall be placed in layers not to exceed six (6) inches in thickness, loose measurement, and thoroughly tamped to the required elevation.

*End Of Section*

## SECTION 10

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### LARGE METER VAULTS

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- 10.1 **General:** Domestic meters, 3" through 10" shall be placed in non-traffic vaults. Details of the vault and large meter assemblies are shown on Department of Public Utilities Standard Drawings W-11A [[Figure No. 33](#)] and W-11A-01 [[Figure No. 34](#)].

*End Of Section*

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## SECTION 11

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### BACKFLOW PREVENTION

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- 11.1 **General:** This section governs installation of devices required to protect the integrity of Waterworks' Distribution system from potential contamination.
- 11.2 **Automatic Fire Suppression Systems:** Systems designed to provide fire suppression with no manual intervention shall be governed by the following:
- A. **General:** Each fire suppression (sprinkler) system (4-inch or larger) shall include a Single Check Detector Assembly (SCDA) buried at the terminus of Waterworks' responsibility. A typical installation is illustrated by Department of Public Utilities Standard Drawing W-12A [Figure 35]. Details of the Assembly are shown on Department of Public Utilities Standard Drawing W-12A-01 [Figure 36].  
  
Prior to installation of the SCDA, the Contractor shall provide a temporary blow-off assembly (see Department of Public Utilities Standard Drawing W-15C [Figure 43]) on the end of the branch pipe. This assembly will be removed and retained by the Waterworks at time of SCDA installation.  
  
Installation of a 2-inch or smaller fire suppression system shall comply with the specified requirements for a domestic service of the same size.
  - B. **SCDA Responsibility:** Single Check Detector Assemblies are furnished, installed, and maintained by Waterworks.
  - C. **Backflow Prevention:** The developer/owner of any building or facility with a fire suppression system connected to the distribution system via an SCDA shall be responsible to ensure that a Reduced Pressure backflow prevention device (RP) is installed downstream of the SCDA in accordance with Virginia *Waterworks Regulations* and local codes. (This requirement does not apply to systems where the automatic fire suppression system is installed as a part of the domestic water system, consists of "drinking water quality" pipe, and has no fire department connection.)
  - D. **Fire Department Connections:** Connection of piping between an automatic fire suppression system and an exterior inlet connection (siamese or other), where required, shall be located downstream of an installed backflow prevention device.

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- 11.3        **Private Fire Hydrants:** The developer/owner of any development or facility with one or more private fire hydrants (i.e., hydrants that are not owned by and maintained by the Department of Public Utilities) shall provide appropriate protection by installation of an RP located to isolate the Waterworks' Distribution System piping from the privately-owned system piping.
- 11.4        **Domestic Service:** Part II, Article 3, 12 VAC 5-590-610 of the Virginia Department of Health *Waterworks Regulations* requires installation of approved backflow prevention devices for a variety of facilities' domestic service scenarios, such as the following:
- A.        **Cross Connections:** Backflow prevention devices are required for premises having internal cross connections that, in the judgment of the Department of Public Utilities or the Virginia Department of Health, may not be easily correctable or have intricate plumbing arrangements which make it impracticable to determine whether or not cross connections exist.
  - B.        **Restricted Access:** Installation of an RP is required downstream of the meter and before any branches, bypasses or connections for premises where, because of security requirements or other prohibitions or restrictions, it is impossible or impractical to make a complete cross connection survey.
  - C.        **High-Rise Buildings:** Buildings of four or more stories require installation of an approved backflow prevention device downstream of the meter and before any branches, bypasses or connections.
- 11.5        **Irrigation Service:** For any waterline serving a landscape irrigation (lawn sprinkler) system Part II, Article 3, 12 VAC 5-590-610 of the Virginia Department of Health *Waterworks Regulations* requires installation of an approved backflow prevention device downstream of the meter and before any branches, bypasses or connections. This device must be an RP or a Pressure Vacuum Breaker (PVB).

*End Of Section*

## SECTION 12

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### REPAIR PROCEDURES

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- 12.1 **General:** This Section specifies the standard procedures for repairs to water mains.

Care shall be exercised to prevent contamination of the existing water distribution system.

Reference to HTH<sup>®</sup> shall be interpreted as a granular chlorinator (calcium hypochlorite) with 65% minimum available chlorine, such as HTH<sup>®</sup> manufactured by Olin Corporation.

- 12.2 **Excavation & Dewatering:** The soil surrounding the work site must be removed to provide sufficient access around the pipe, and to provide a sump for collection of water.

- A. Excavate the soil to a depth of at least 18 inches beneath the pipe.
- B. Pump(s) of sufficient capacity shall be available to maintain the level of water in the excavation below the bottom of the pipe.
- C. If the pipe must be drained then all sides and bottom of excavation shall receive HTH<sup>®</sup> powder or crystals by sprinkling. **NOTE:** If substantial contamination is suspected (e.g., broken sewer main in excavation, sewage odor), follow procedures in Section [CS 12.5](#), Alternate Repair Procedure.

- 12.3 **Material Preparation & Installation:** The cleanliness of the materials being used must be maintained to ensure cleanliness of the water main.

- A. Swab the interior of all pipes, nipples, sleeves, clamps and gaskets with a 1% chlorine solution.
  - 1. Prepare solution by adding 1 gallon of bleach (5.25% available chlorine) to 4 gallons of water.
  - 2. Use only clean rags, sponges or mop heads for swabbing.
  - 3. After materials have been swabbed, **DO NOT LAY MATERIALS DIRECTLY ON THE GROUND.**

12.3

**Material Preparation & Installation** (continued)

- B. If the interior of an existing pipeline is exposed, clean and swab the end(s) of the pipeline (interior and exterior) for at least 12 inches from the end of the pipe.
- C. Install nipples, sleeves, clamps, etc. (as required) taking care to not contaminate the disinfected materials.

12.4

**Flushing & Sampling:** Upon completion of a repair, the portion of the distribution system affected by the repair shall be flushed to remove all contaminants; and a bacteriological sample shall be collected for laboratory analysis.

- A. Flushing shall be accomplished by use of a fire hydrant, a standard 2" blow-off, or a service blow-off (See Department of Public Utilities Standard Drawing W-16D [[Figure No. 44](#)]) as close as practicable to the affected portion of the main.
  - 1. Flow rates required to attain flushing velocity (2.5 fps) are in accordance with the following:

<b>Pipe Size (in.)</b>	<b>Req'd Flow (gpm)</b>
4	98
8	392
12	882
16	1,560

- 2. Mains shall be flushed until the water is clear and at least two pipe volumes have passed. Use the following formula to determine time (minutes) required for a flush of two pipe volumes:

$$\frac{V \times L \times 2}{\text{GPM}}$$

V = volume per ft (see below)

L = length of pipe (feet)

GPM = flow (see CS 12.4.A.1)

<b>Pipe Size (in.)</b>	<b>Volume Per Ft (gallons)</b>
4	0.65
8	2.61
12	5.88
16	10.44

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12.4. A

**Flushing & Sampling** (continued)

3. If necessary, flush all service lines to remove cloudy water.
- B. After flushing has been completed, collect bacteriological sample.
1. Install a service blow-off in a meter location as close as practicable to the repair site and flush for an additional 5 minutes before collecting 1 sample.
  2. Deliver sample to laboratory for analysis.

12.5

**Alternate Repair Procedure:** This procedure is to be implemented if there is evidence or suspicion of substantial contamination such as a broken sewer main in vicinity of the water main repair site.

- A. In addition to compliance with the procedure outlined above (CS 12.2 through 12.4) the following shall be implemented:
1. HTH<sup>®</sup> powder or crystals shall be applied to suspected source(s) of contamination.
  2. Disinfect the affected portion of the water main using a fire hydrant, a service blow-off, or a new tap (choose that which is farthest from repair site and still within area of affected main) to introduce chlorine into the pipeline.
    - a. Determine size and length of affected pipe.
    - b. Determine quantity of bleach using chart entitled [Chlorine Required To Disinfect Main](#) (Chart A, following this Section); from point where length of section intersects line for size of pipe, extend to left and read quantity of bleach required. Use only full gallon quantities.

- c. For pipe lengths greater than 500 feet, divide total length into segments of 500 feet or less, determine required quantity of bleach required for each segment, and then add quantities for all segments. [Example: 700 ft length of 8" pipe; first segment of 500 ft requires 8 gal, and second segment of 200 ft requires 3 gal; use a total of 11 gallons to disinfect 700 ft of 8" pipe.]
- d. Connect a hose between the chlorine injection point and a service or fire hydrant that is not served by the affected main. Monitor chlorine residual readings at end of affected main farthest away from the injection point.
- e. If chlorine residual reading is less than 100 mg/l, the disinfection procedure must be repeated. If chlorine residual reading is 300 mg/l or greater, contact time will be 15 minutes. For all other residual readings, determine minimum time using chart entitled Required Contact Time (Chart B, following this Section); from point where concentration (mg/l) intersects curve, extend to left and read required contact time (minutes). [Example: chlorine residual is 250 mg/l, minimum contact time will be 18 minutes.]
- f. After disinfection has been completed, the main shall be flushed until the chlorine residual reading at the sampling point is 2 to 3 mg/l.
- g. Collect a bacteriological sample at the flushing discharge point and deliver to the laboratory for analysis.

*End Of Section*

# Chlorine Required to Disinfect Main 300 mg/l concentration

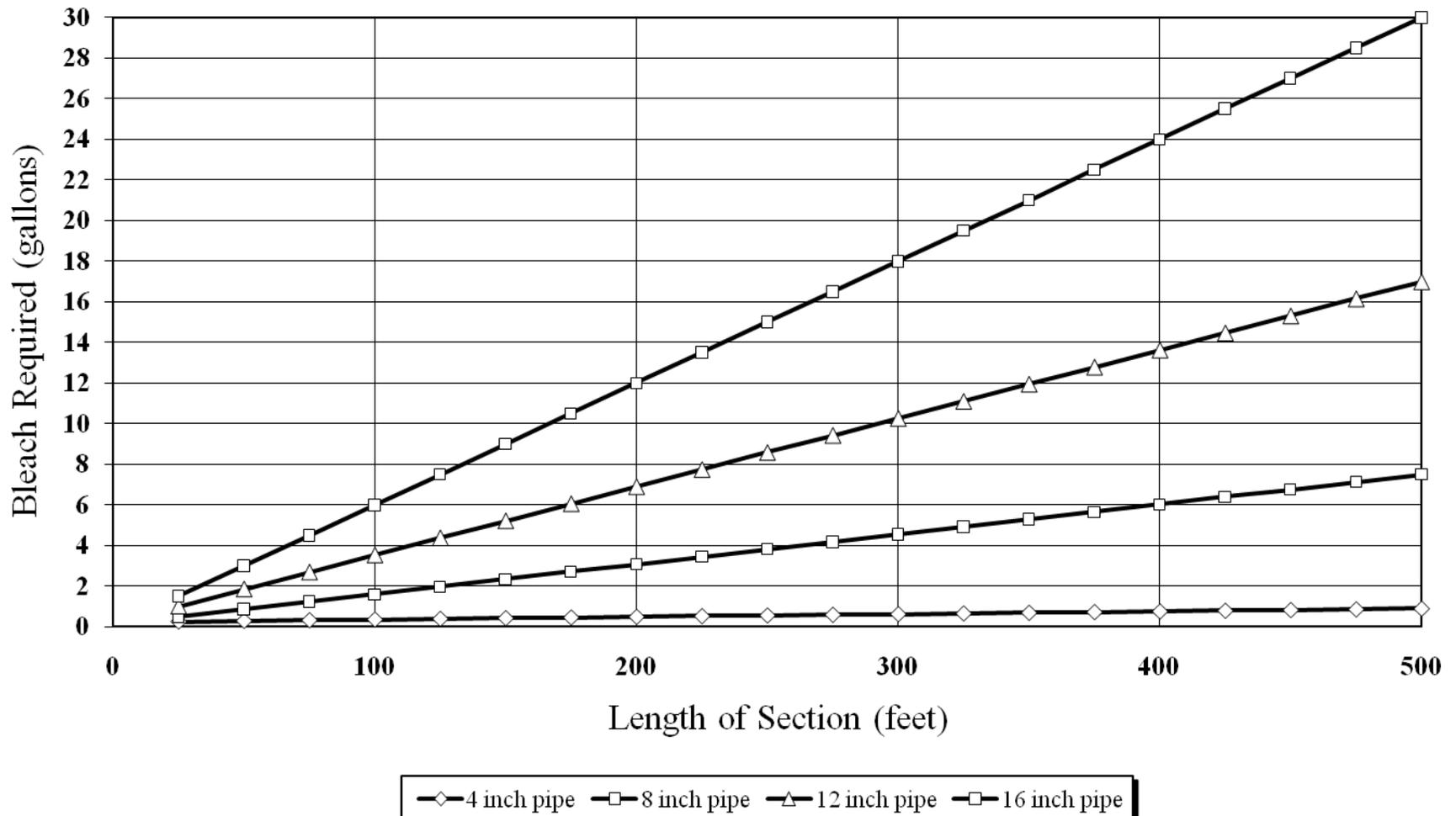
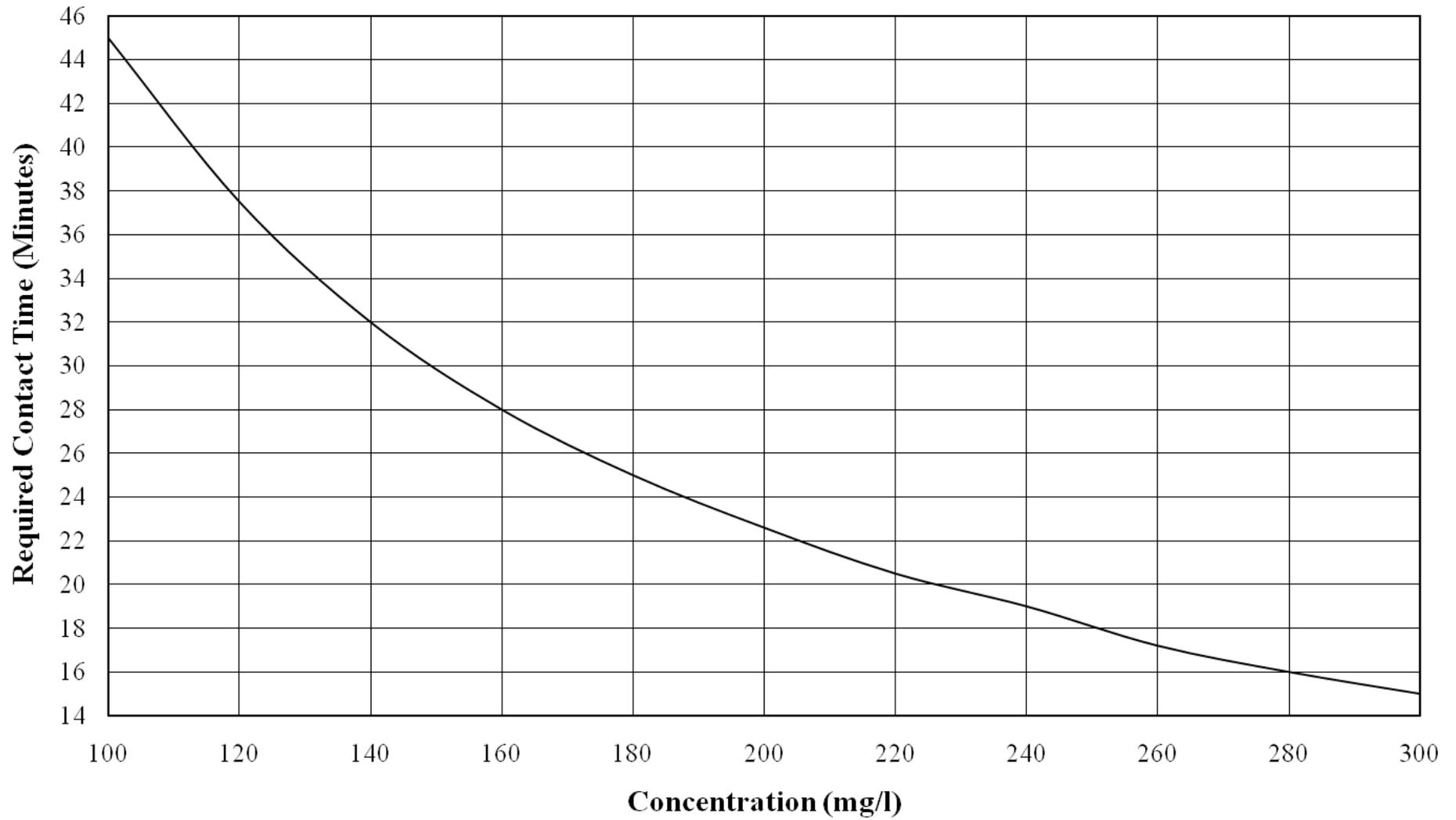


Chart A

Chart B

**Required Contact Time**



## SECTION 13

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### TAPPING OF TAPE-WRAPPED DUCTILE IRON PIPE

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- 13.1 **General:** This Section shall govern the special corrosion control requirements for installation of taps 4" and larger on tape-wrapped ductile iron pipe.

Materials shall be as specified in Material Specifications, [Section 12](#). See Department of Public Utilities Standard Drawing W-17A [\[Figure No. 50\]](#) for arrangement of test wiring for valves.

- 13.2 **Installation:** Installation of ductile iron flange outlet/tapping saddles on tape-wrapped ductile iron pipe shall be in accordance with the following:

- A. Prior to installation of the saddle, attach test and bond wires:
1. Thermit weld two #12 AWG white THWN test wires to the sides of the outlet/tapping saddle. The length of the test wires shall be sufficient to reach the test station (see [13.2.Q](#)) with a minimum of 28 inches of slack. Test wires are required for insulating flange installations and for PVC insulators if no other test stations exist within 500 feet of the new water service.
  2. Thermit weld two #12 AWG white THWN bond wires to the sides of the outlet/tapping saddle. The bond wires shall be attached using a through conductor thermit weld. The length of the bond wires shall be sufficient to reach the valve on one side and the tape-coated water main on the other. The bond wires shall be long enough to allow for slack in them after connection to the valve and water main.
- B. Using a sharp knife, remove the tape coating from the water main for a distance of 6 inches beyond the dimensions of the area to be tapped.
- C. The tape coating will relax slightly in the same direction as it was stretched when applied. Using a sharp knife, remove any ends of the tape that curl up due to relaxation so that the edges of the remaining coating are completely flat against the pipe's surface.
- D. Clean the exposed area using a wire brush to a clean metal finish, removing all debris and foreign matter. **DO NOT USE ANY FORM OF SOLVENT TO CLEAN THE PIPE AS IT MAY DAMAGE EXISTING COATING.**

- E. After the pipe surface is prepared, the pipe may be tapped in accordance with Newport News Waterworks' specifications and procedures.
- F. After the flange outlet/saddle and valve have been installed, install the insulating gasket, insulating sleeves, insulating washers and steel washers. The insulating flange components are required only if a flange valve is being installed. No insulating flange components are required if a PVC insulator is to be installed at the valve MJ fitting. If an insulating flange is being installed, care shall be exercised to align the bolt holes properly so as to prevent damage to the insulating components, especially the sleeves. Care must be taken in ordering the proper size bolts to fit the flange bolt holes with the sleeves in place. Under no circumstances are the sleeves to be forced into the bolt holes.
- G. If an insulating flange is installed, use a common ohm meter to measure the resistance of each bolt and nut to each flange face. A minimum resistance of 500,000 ohms for each reading is acceptable. If the resistance is lower than the specified resistance, remove the bolt with the low resistance, examine the sleeve for damage (replace if damaged), dry the bolt and sleeve as well as the bolt hole and reassemble. Repeat the resistance measurement to verify that proper isolation has been achieved. Once all bolts have been measured and are acceptable, measure the resistance across the flange. A measured resistance of 250,000 ohms shall be acceptable. These measurements shall be made prior to installing the rest of the water service piping and with the first section of piping not in contact with the earth.
- H. Thermit weld the bond wires to the tape-wrapped water main and to the valve. The wires shall be attached where convenient and with slack in the wires.
- I. After installation of the first section of piping to the insulating flange, thermit weld two #12 AWG black THWN wires to the top of the new piping with the first wire approximately one foot from the flange and the second wire one foot from the first. The length of the test wires shall be sufficient to reach the test station with a minimum of 18 inches of slack. Test wires are required for insulating flange installations and for PVC insulators if no other test stations exist within 500 feet of the new water service.

- J. Remove all sharp edges from the flange outlet/tapping saddle and appurtenances by smoothing them down to prevent damage to the tape coating when wrapped.
- K. Surface to be wrapped shall be cleaned of all dirt and moisture. Exposed metal surfaces shall be cleaned by power wire brushing to remove all debris, foreign matter and surface corrosion. Apply tape primer (Polyken 1027) to all exposed metal including all portions of the tapping saddle and appurtenances as well as the flange and first section of piping for a distance of one foot beyond the last installed test wire.
- L. Install Polyken 939 filler tape at all irregular surfaces to eliminate voids under the first layer of tape wrap.
- M. At areas where the tape was removed prior to tapping, repair using strips of tape (Polyken 932), overlapping a minimum of 1 inch and extending 2 inches beyond the cutback area.
- N. Apply a layer of Polyken 932 to all exposed metal. Apply the tape spirally with a minimum overlap of 1 inch. Apply tape across the insulating flange and for a distance of one foot beyond the last test wire. If no insulating flange is installed, then tape shall be applied over the valve, stopping at the PVC insulator. All overlaps should be facing downwards to prevent moisture from seeping underneath the coating. All tape shall be tight and wrinkle free.
- O. Apply a second layer of tape (Polyken 954) over the first layer of tape in a similar manner as the first layer. The second layer of tape shall completely overlap the first layer taking care to assure that the second layer overlaps do not coincide with the overlaps of the first layer.
- P. Carefully backfill the tape-wrapped piping in accordance with standard Newport News Waterworks' procedures to avoid any damage to the coating, bond wires and test wires.
- Q. The test station shall be located immediately off the edge of the roadway and set in place, at grade, with a concrete collar.
- R. Bring the test wires to grade and place in the test station.

*End Of Section*

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## SECTION 14

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### METER ROOM REQUIREMENTS

---

14.1 **General:** This section governs special requirements for installation of water flow detection/consumption measuring devices within a facility, including backflow prevention devices and domestic water meters.

14.2 **Waterworks' Responsibilities:** Unless otherwise noted, the Newport News Department of Public Utilities (Waterworks) will furnish all water meters, including the flow-detection meters for connection to backflow prevention devices. Waterworks will also furnish the touch pad devices and the wire necessary for remote meter reading.

Ownership of these meters and touch pads will remain with Waterworks.

Waterworks will be responsible for connection of the wiring from each remote-read touch pad at its respective meter.

14.3 **Contractor's Responsibilities:** The Developer's Contractor shall be responsible for furnishing & installing all piping, valves, appurtenances, and supports required for project completion.

The Contractor will install the Waterworks-furnished meters, remote-read touch pads, and connecting wire (except for wiring connections at meters).

14.4 **Installation Requirements:** Piping & appurtenances within a meter room shall be installed parallel to and adjacent to a wall, in a neat manner with the meters placed no more than four (4) feet above the finished floor.

Piping shall be arranged to allow access for installation, reading, or removal of any meter.

Each meter shall be equipped with a ball valve on the inlet side and a check valve & ball valve on the outlet side.

Meter sizes 5/8" through 1" (inclusive) shall be installed by use of two (2) brass straight meter couplings such as Ford Meter Box Company C38 Series body style A, or approved equal.

Meter sizes 1-1/2" & 2" shall be installed by use of two (2) bronze meter flanges such as Ford Meter Box Company CF31 Series, or approved equal.

Remote-read wiring shall be installed in a neat manner using straight runs where practicable, securely attached to the wall(s), and protected from physical damage.

---

14.4

*Installation Requirements* (continued)

Remote-read touch pads shall be installed on the exterior of a meter room wall, at a height between three (3) feet and five (5) feet above finished grade or pavement.

Each remote-read touch pad shall be identified with a permanently attached lamincoid/phenolic label plate displaying the account address, and the interior wiring shall also be identified in a similar manner to denote its corresponding touch pad.

*End Of Section*

# **STANDARD DRAWINGS**



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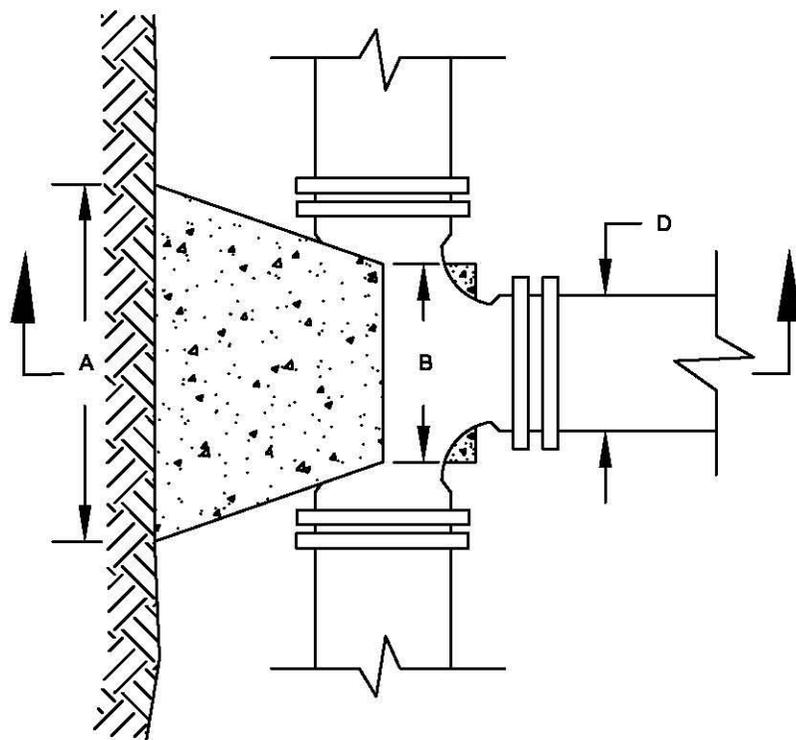
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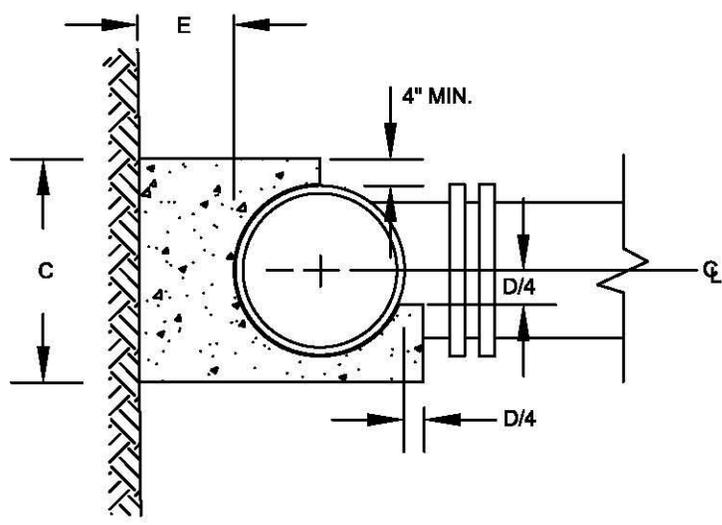
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**PLAN**

TEE SIZE (INCHES)	A (INCHES)	B (INCHES)	C (INCHES)	E (INCHES)	CY
4 X 4	13	9	13	5	.03
6 X 4	12	8	14	9	.04
6	19	12	18	9	.10
8 X 4	10	7	16	9	.05
6	19	13	18	9	.11
8	25	13	24	9	.20
12 X 4	8	6	20	9	.05
6	17	11	20	9	.12
8	25	16	24	9	.22
12	37	18	34	9	.51
14 X 6	15	10	22	9	.12
8	25	16	23	9	.23
12	37	21	34	9	.53
14	43	21	39	9	.74
16 X 6	13	9	24	9	.13
8	23	15	25	9	.24
12	37	22	34	9	.55
14	43	22	40	9	.78
16	49	22	45	9	1.04

CY = CUBIC YARDS OF CONCRETE  
D = PIPE DIAMETER (INCHES)



**SECTION**

**NOTES:**

1. ALL CONCRETE TO BE VDOT CLASS A3.
2. BUTTRESS DIMENSIONS SHOWN ARE MINIMUM. DIMENSIONS ARE BASED ON SOIL BEARING PRESSURE OF 3000 PSF AND STATIC WATER PRESSURE OF 150 PSI. WHERE SOIL BEARING CAPACITY IS LESS THAN 3000 PSF SPECIAL BUTTRESS DESIGN IS REQUIRED.

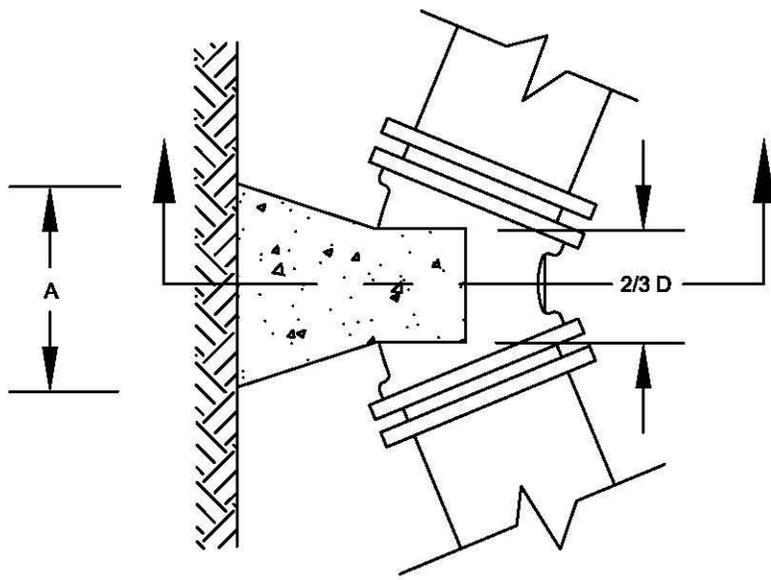
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**BUTTRESSES  
FOR  
TEES**

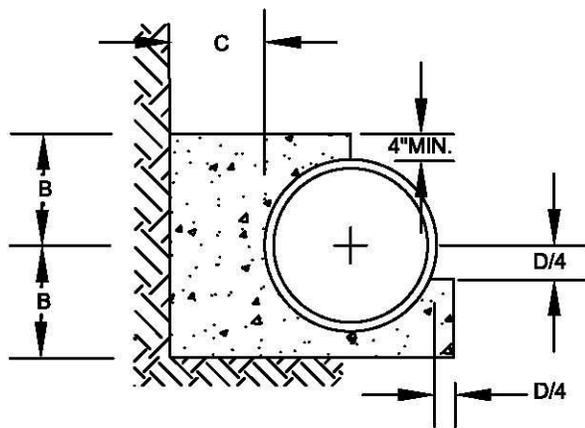
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**FIGURE NO. 1**



**PLAN**



**SECTION**

ANGLE	D PIPE SIZE	A (INCHES)	B (INCHES)	C (INCHES)	CY
11 1/4°	4	4	6	6	.005
	6	6	7	7	.010
	8	8	8	7	.017
	12	12	10	8	.041
	14	14	11	8	.058
	16	15	12	9	.082
22 1/2°	4	7	6	7	.006
	6	9	7	8	.012
	8	12	8	9	.023
	12	21	10	11	.063
	14	23	11	12	.091
	16	25	12	13	.124
45°	4	12	6	7	.007
	6	15	7	8	.015
	8	20	8	9	.028
	12	30	11	11	.080
	14	33	13	12	.121
	16	36	14	13	.164
90°	4	19	7	7	.010
	6	22	8	8	.021
	8	27	9	9	.037
	12	36	12	12	.099
	14	42	14	13	.152
	16	48	16	14	.221

CY = CUBIC YARDS OF CONCRETE  
D = PIPE DIAMETER (INCHES)

**NOTES:**

1. ALL CONCRETE TO BE VDOT CLASS A3.
2. BUTTRESS DIMENSIONS SHOWN ARE MINIMUM. DIMENSIONS ARE BASED ON SOIL BEARING PRESSURE OF 3000 PSF AND STATIC WATER PRESSURE OF 150 PSI. WHERE SOIL BEARING CAPACITY IS LESS THAN 3000 PSF SPECIAL BUTTRESS DESIGN IS REQUIRED.

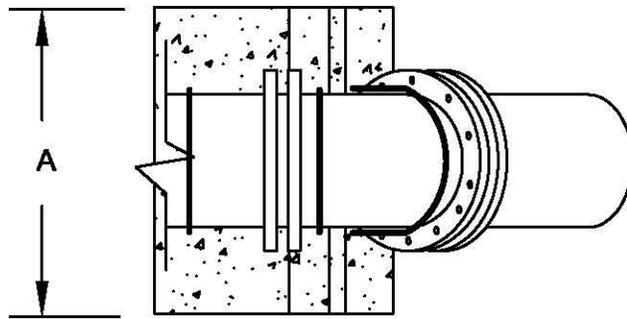
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**BUTTRESSES  
FOR  
HORIZONTAL BENDS**

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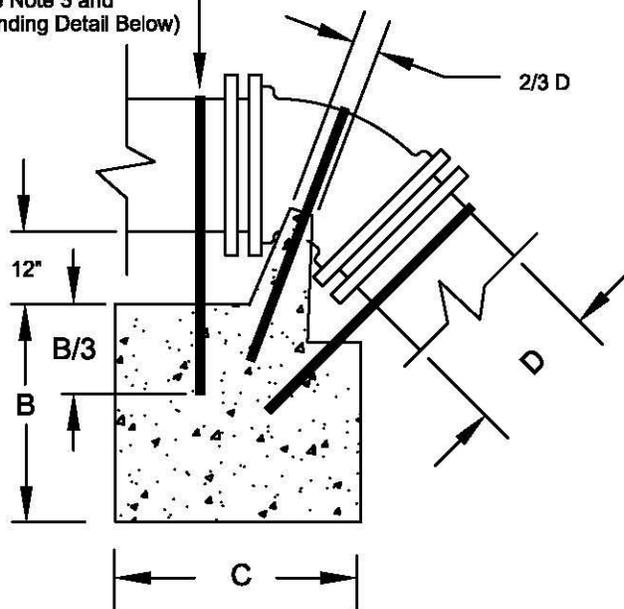
**FIGURE NO. 2**



PLAN

ANGLE	D PIPE SIZE	A (INCHES)	B (INCHES)	C (INCHES)	CY
11 1/4°	4	18	14	23	.14
	6	23	17	29	.27
	8	27	21	35	.48
	12	35	27	46	1.03
	14	39	30	50	1.39
	16	42	32	55	1.75
22 1/2°	4	23	17	29	.26
	6	29	22	37	.55
	8	35	27	45	.98
	12	45	34	58	2.04
	14	49	38	64	2.73
	16	54	41	70	3.54
45°	4	29	22	37	.53
	6	36	28	47	1.07
	8	44	34	57	1.91
	12	57	43	74	4.06
	14	62	47	81	5.28
	16	68	52	89	7.02
90°	4	REQUIRES SPECIAL DESIGN			
	6				
	8				
	12				
	14				
	16				

No. 6 Rebar (Typ. of 3)  
(See Note 3 and  
Bending Detail Below)

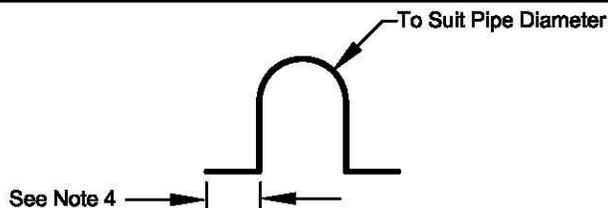


ELEVATION

CY = CUBIC YARDS OF CONCRETE  
D = PIPE DIAMETER (INCHES)

**NOTES:**

1. All concrete to be VDOT Class A3.
2. Anchor dimensions shown are minimum. Dimensions are based on soil bearing pressure of 3000 psf and static water pressure of 150 psi. Where soil bearing capacity is less than 3000 psf special buttress design is required.
3. Rebar shall meet requirements of ASTM A615/A615M, Grade 60, deformed.
4. Ends of rebar shall be bent 90° outward and, if necessary, cut to allow minimum clearance of 3" between the end of the horizontal leg and the side of the concrete block.



REBAR BENDING DETAIL

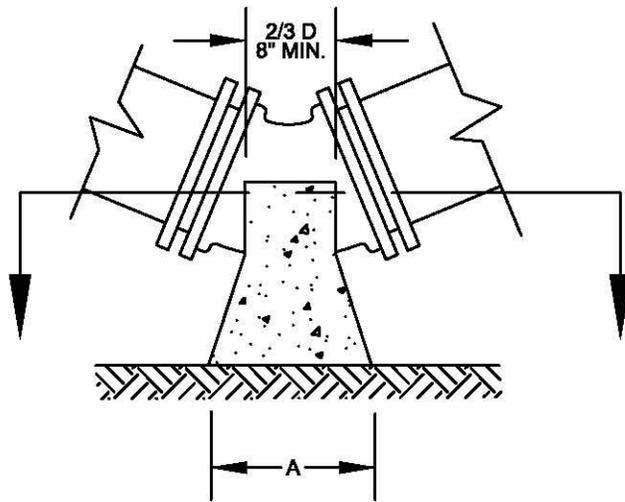
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**ANCHORAGES FOR  
VERTICAL BENDS**

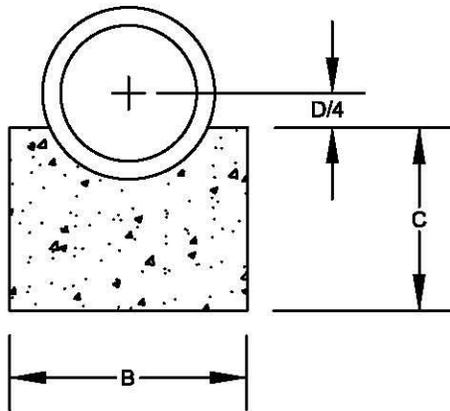
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REVISED DATE:	4/17/00	1/2009		

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Dwg. File No.	R-926	Dwn. By	B.S.	10/13/95
Print File No.	N-1809	Ckd. By	F.B.	

**FIGURE NO. 3**



**ELEVATION**



**SECTION**

ANGLE	D PIPE SIZE	A (INCHES)	B (INCHES)	C (INCHES)	CY
11 1/4°	4	7	5	3	.002
	6	10	7	4	.006
	8	13	9	5	.010
	12	19	13	7	.020
	14	22	15	8	.040
	16	25	17	9	.060
22 1/2°	4	10	7	4	.006
	6	14	9	5	.010
	8	18	12	6	.020
	12	26	18	9	.060
	14	30	20	10	.090
	16	34	23	12	.140
45°	4	14	11	6	.020
	6	19	13	7	.020
	8	25	17	9	.050
	12	37	25	13	.160
	14	42	28	14	.220
	16	48	32	16	.340
90°	4 6 8 12 14 16	REQUIRES SPECIAL DESIGN			

CY = CUBIC YARDS OF CONCRETE  
D = PIPE DIAMETER (INCHES)

**NOTES:**

1. ALL CONCRETE TO BE VDOT CLASS A3.
2. BUTTRESS DIMENSIONS SHOWN ARE MINIMUM. DIMENSIONS ARE BASED ON SOIL BEARING PRESSURE OF 3000 PSF AND STATIC WATER PRESSURE OF 150 PSI. WHERE SOIL BEARING CAPACITY IS LESS THAN 3000 PSF SPECIAL BUTTRESS DESIGN IS REQUIRED.

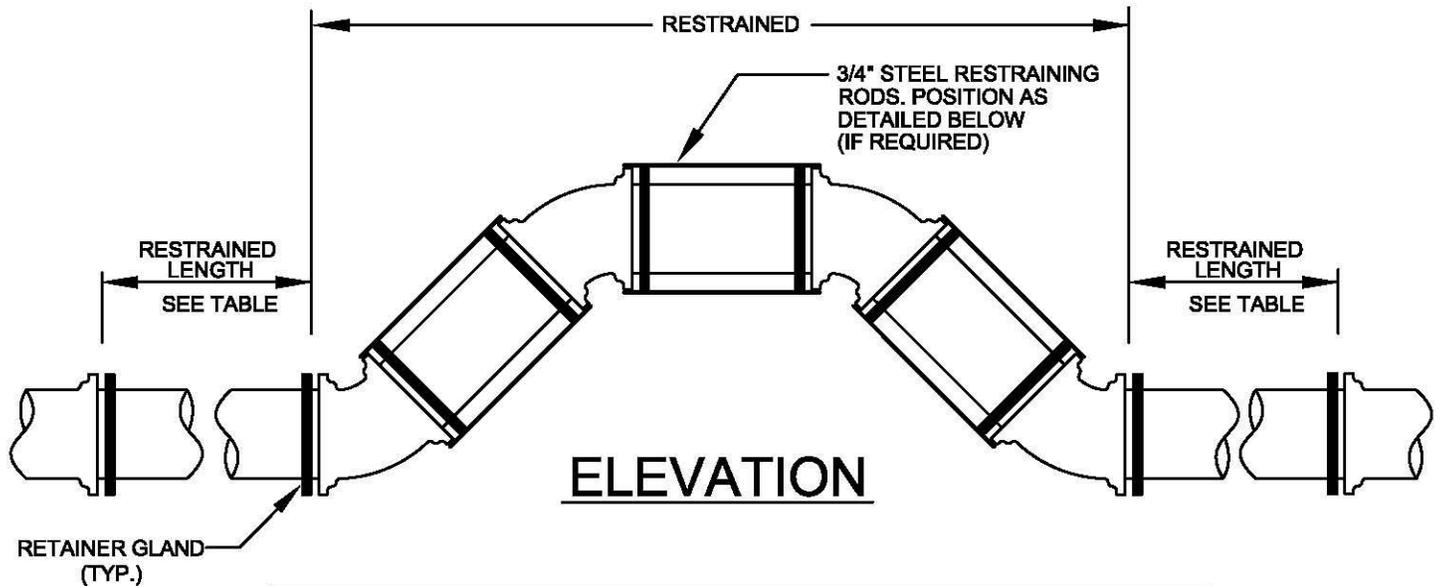
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**BUTTRESSES  
FOR  
VERTICAL BENDS**

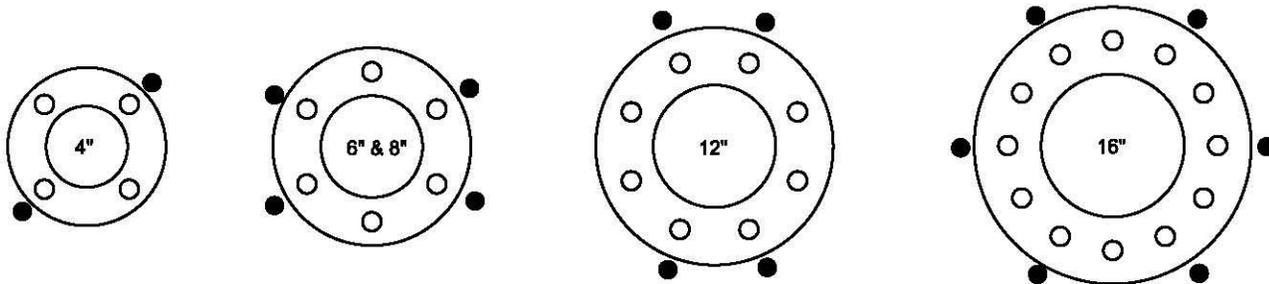
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**FIGURE NO. 4**



MINIMUM RESTRAINED LENGTH (FT) EACH SIDE OF OUTERMOST BEND									
DIA	ANG	11 1/4°		22 1/2°		45°		90°	
		DIP	POLYWRAP OR PVC	DIP	POLYWRAP OR PVC	DIP	POLYWRAP OR PVC	DIP	POLYWRAP OR PVC
4	2	2	2	5	5	11	12	33	46
6	3	3	3	7	8	15	18	46	66
8	4	5	5	9	11	20	23	60	86
12	6	7	7	14	16	29	34	87	124
16	8	10	10	18	21	38	44	112	160



**NOTES:**

1. RODS, IF REQUIRED, MAY BE INSERTED THROUGH BOLT HOLES IN LIEU OF USING TIE-BOLTS. IF USED, KEEPER NUT & WASHER MUST BE INSTALLED BEHIND GLAND.
2. BOLT HOLES ARE SHOWN FOR A NORMAL MECHANICAL JOINT FITTING, I.E. STRADDLING THE VERTICAL AXIS WHEN FITTING IS POSITIONED FOR A HORIZONTAL CHANGE OF DIRECTION. FITTINGS WITH BOLT HOLES ORIENTED OTHERWISE SHOULD NOT BE USED IN ROD ASSEMBLES.
3. 3/4" TIE-BOLTS AND THREADED RODS SHALL HAVE A MINIMUM YIELD STRENGTH OF 11,000 LBS. EACH.
4. ALL RODS AND FASTENERS SHALL BE GIVEN TWO COATS OF BITUMINOUS PAINT AFTER ASSEMBLY.
5. RESTRAINED LENGTH DETERMINED USING DIPRA FORMULA WITH TYPE 3 BEDDING, COHESIVE-GRANULAR SOIL, 3' COVER, 125 PSI AND A SAFETY FACTOR OF 1.5.

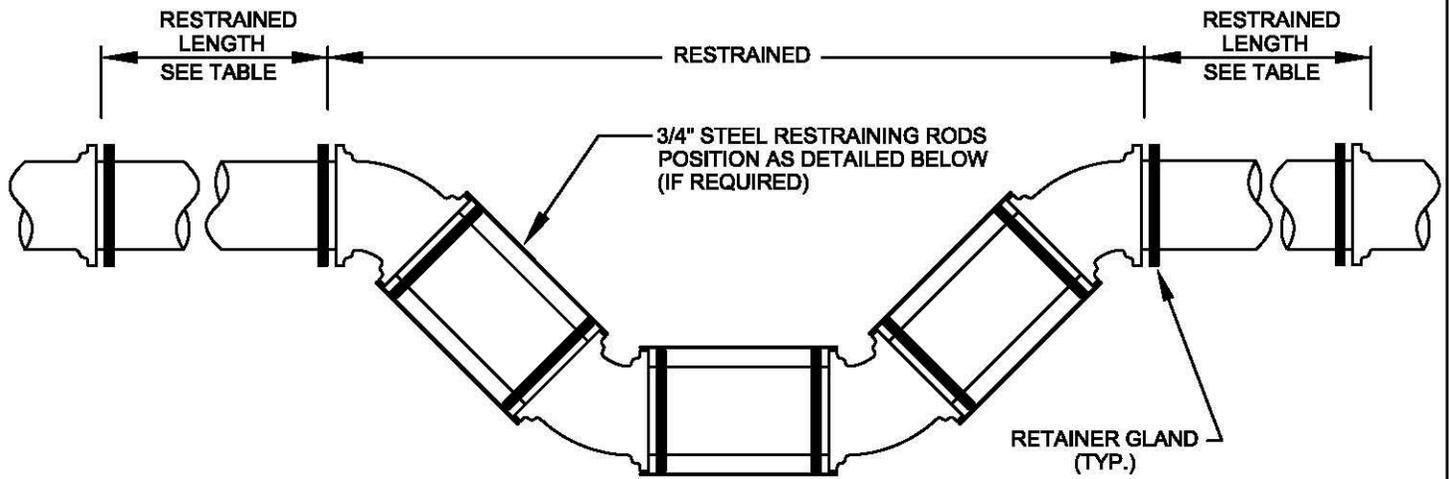
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**VERTICAL UP OFFSET**

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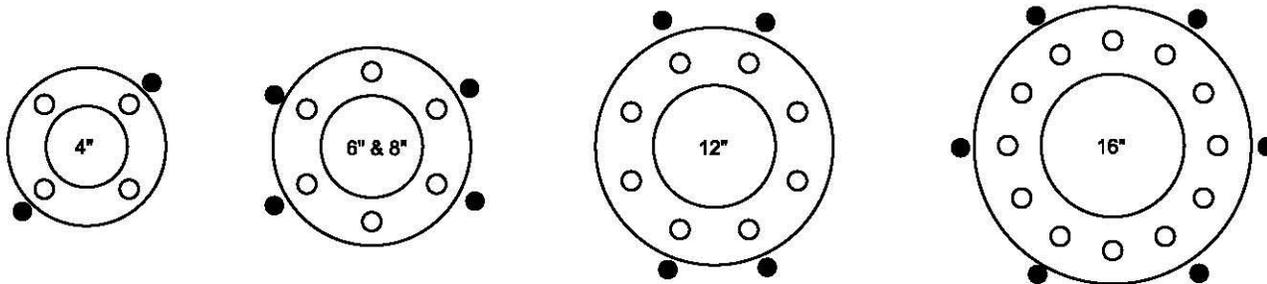
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REVISED DATE:				

**FIGURE NO. 5**



## ELEVATION

MINIMUM RESTRAINED LENGTH (FT) EACH SIDE OF OUTERMOST BEND									
DIA	ANG	11 1/4°		22 1/2°		45°		90°	
		DIP	POLYWRAP OR PVC	DIP	POLYWRAP OR PVC	DIP	POLYWRAP OR PVC	DIP	POLYWRAP OR PVC
4	5	8	12	17	26	38	33	46	
6	8	12	17	25	37	54	46	66	
8	11	16	23	33	49	70	60	86	
12	16	23	33	48	71	101	87	124	
16	21	31	44	63	92	132	112	160	



**NOTES:**

1. RODS, IF REQUIRED, MAY BE INSERTED THROUGH BOLT HOLES IN LIEU OF USING TIE-BOLTS. IF USED, KEEPER NUT & WASHER MUST BE INSTALLED BEHIND GLAND.
2. BOLT HOLES ARE SHOWN FOR A NORMAL MECHANICAL JOINT FITTING, I.E. STRADDLING THE VERTICAL AXIS WHEN FITTING IS POSITIONED FOR A HORIZONTAL CHANGE OF DIRECTION. FITTINGS WITH BOLT HOLES ORIENTED OTHERWISE SHOULD NOT BE USED IN ROD ASSEMBLES.
3. 3/4" TIE-BOLTS AND THREADED RODS SHALL HAVE A MINIMUM YIELD STRENGTH OF 11,000 LBS. EACH.
4. ALL RODS AND FASTENERS SHALL BE GIVEN TWO COATS OF BITUMINOUS PAINT AFTER ASSEMBLY.
5. RESTRAINED LENGTH DETERMINED USING DIPRA FORMULA WITH TYPE 3 BEDDING, COHESIVE-GRANULAR SOIL, 3' COVER, 125 PSI AND A SAFETY FACTOR OF 1.5.

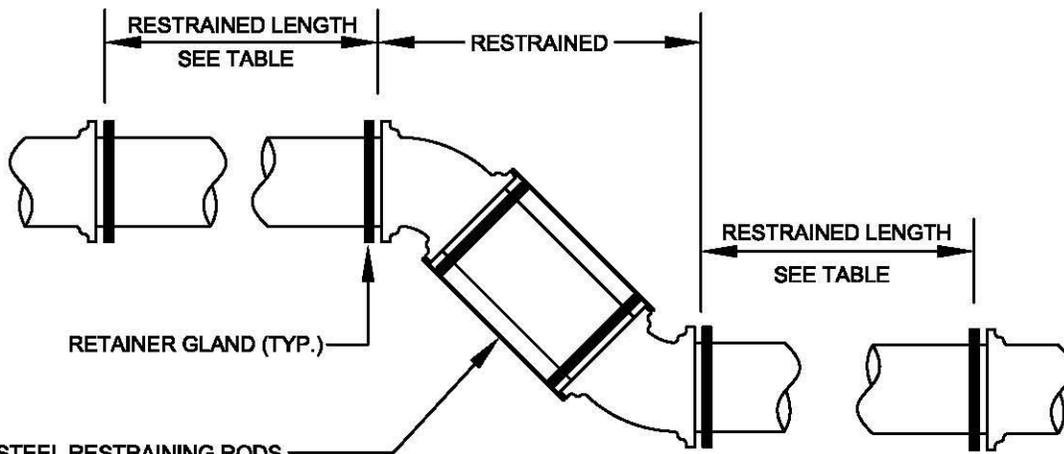
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## VERTICAL DOWN OFFSET

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REVISED DATE:	4/17/00	1/2009	

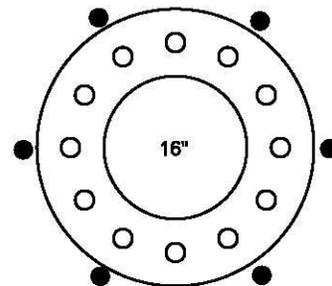
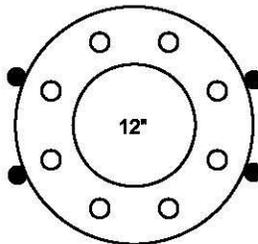
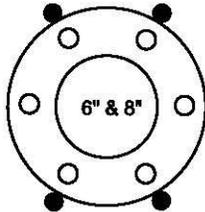
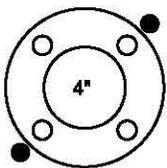
**FIGURE NO. 6**



3/4" STEEL RESTRAINING RODS  
POSITIONED AS DETAILED BELOW  
(IF REQUIRED)

## PLAN VIEW

MINIMUM RESTRAINED LENGTH (FT) EACH SIDE OF OFFSET									
DIA	ANG	11 1/4°		22 1/2°		45°		90°	
		DIP	POLYWRAP OR PVC	DIP	POLYWRAP OR PVC	DIP	POLYWRAP OR PVC	DIP	POLYWRAP OR PVC
4		2	2	5	5	11	12	22	31
6		3	3	7	8	15	18	31	45
8		4	5	8	11	20	23	41	58
12		6	7	14	16	29	34	59	87
16		8	10	18	21	38	44	77	110



IF REQUIRED  
3/4" STEEL RESTRAINING ROD  
(TYP.)

### NOTES:

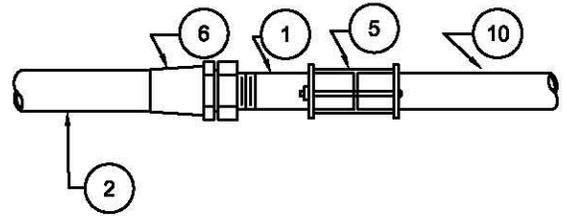
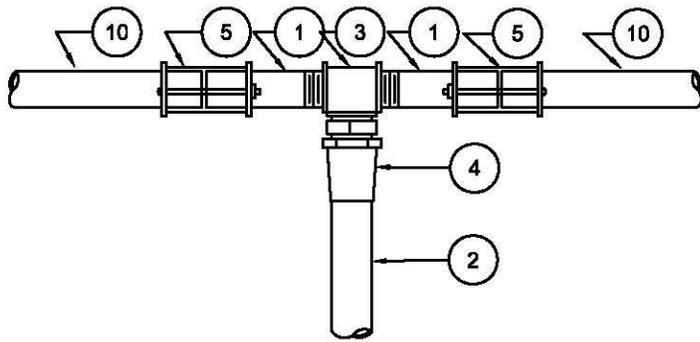
1. RODS, IF REQUIRED, MAY BE INSERTED THROUGH BOLT HOLES IN LIEU OF USING TIE-BOLTS. IF USED, KEEPER NUT & WASHER MUST BE INSTALLED BEHIND GLAND.
2. BOLT HOLES ARE SHOWN FOR A NORMAL MECHANICAL JOINT FITTING, I.E. STRADDLING THE VERTICAL AXIS WHEN FITTING IS POSITIONED FOR A HORIZONTAL CHANGE OF DIRECTION. FITTINGS WITH BOLT HOLES ORIENTED OTHERWISE SHOULD NOT BE USED IN ROD ASSEMBLES.
3. 3/4" TIE-BOLTS AND THREADED RODS SHALL HAVE A MINIMUM YIELD STRENGTH OF 11,000 LBS. EACH.
4. ALL RODS AND FASTENERS SHALL BE GIVEN TWO COATS OF BITUMINOUS PAINT AFTER ASSEMBLY.
5. RESTRAINED LENGTH DETERMINED USING DIPRA FORMULA WITH TYPE 3 BEDDING, COHESIVE-GRANULAR SOIL, 3' COVER, 125 PSI AND A SAFETY FACTOR OF 1.5.

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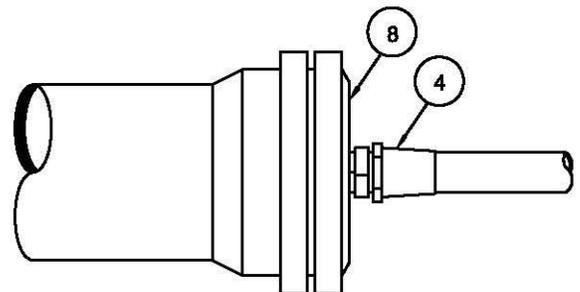
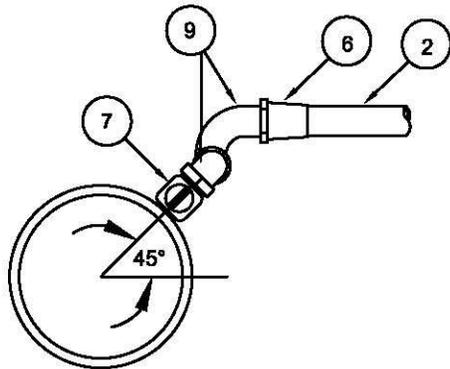
## HORIZONTAL OFFSET

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REVISED DATE:	4/17/00	1/2009			DWG. FILE NO.		DWN. BY B.S.	10/13/95
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FIGURE NO. 7



CONNECTION TO EXISTING 2" PIPE



CONNECTION TO EXISTING PIPE 4" OR LARGER

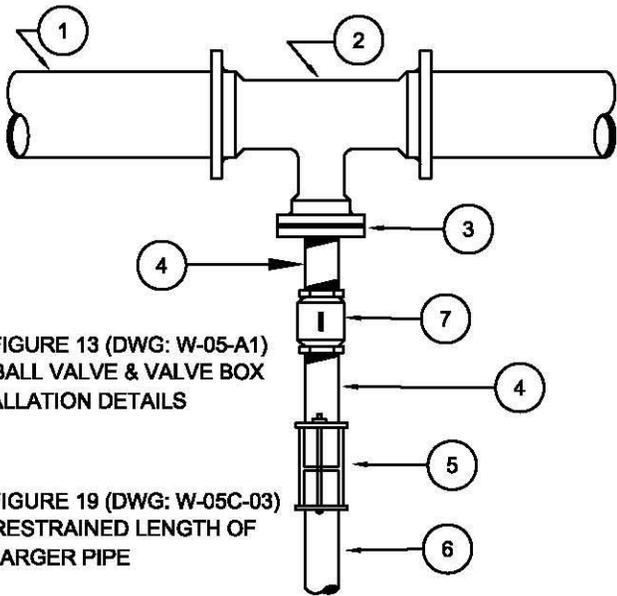
- ① 2" X 8" BRASS PIPE NIPPLE
- ② 2" COPPER TUBING, TYPE 'K'
- ③ 2" X 2" X 2" BRASS TEE, FPT
- ④ 2" COUPLING, COPPER FLAIR NUT WITH MPT
- ⑤ 2" COUPLING (DRESSER STYLE 38, 3 BOLT-EPOXY COATED OR EQUAL)
- ⑥ 2" COUPLING, COPPER FLAIR NUT WITH FPT
- ⑦ CORPORATION STOP, INLET - 2" AWWA TAPER THREAD, OUTLET 2" MPT
- ⑧ MECHANICAL JOINT PLUG, TAPPED 2" FPT
- ⑨ TWO - 2" BRONZE STREET ELLS
- ⑩ EXISTING GALVANIZED IRON OR PVC PIPE.

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STANDARD 2" CONNECTION  
WITH COPPER TUBING

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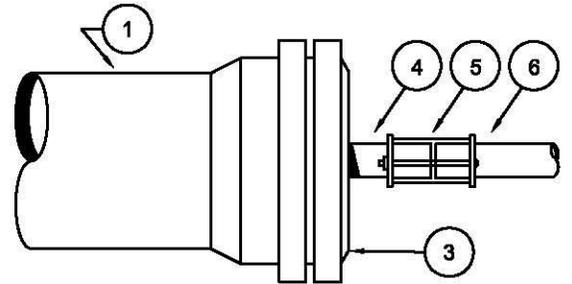
FIGURE NO. 8



SEE FIGURE 13 (DWG: W-05-A1)  
FOR BALL VALVE & VALVE BOX  
INSTALLATION DETAILS

SEE FIGURE 19 (DWG: W-05C-03)  
FOR RESTRAINED LENGTH OF  
THE LARGER PIPE

**IN-LINE CONNECTION TO NEW PIPE**



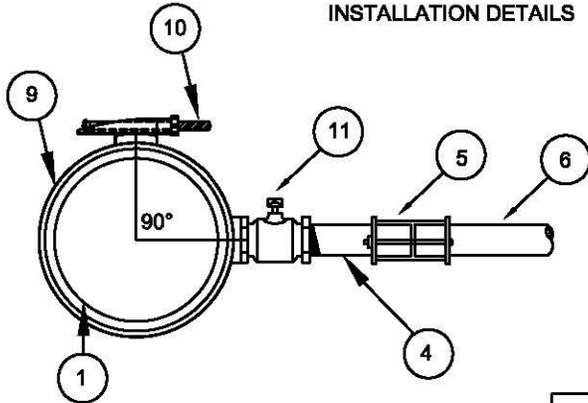
USE SIMILAR CONFIGURATION FOR HYDRANT TEE

SEE FIGURE 19 (DWG: W-05C-03)  
FOR RESTRAINED LENGTH OF  
THE LARGER PIPE

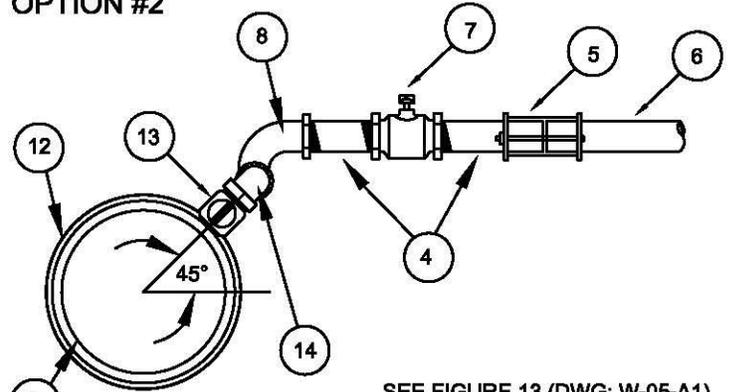
**END CONNECTION TO NEW PIPE**

**OPTION #1**

SEE FIGURE 13 (DWG: W-05-A1)  
FOR BALL VALVE & VALVE BOX  
INSTALLATION DETAILS



**OPTION #2**



SEE FIGURE 13 (DWG: W-05-A1)  
FOR BALL VALVE & VALVE BOX  
INSTALLATION DETAILS

**TAP OF EXISTING PIPE**

- ① PIPELINE 4" OR LARGER
- ② TEE, MJ, MAIN SIZE X 4" MJ
- ③ MECHANICAL JOINT PLUG, TAPPED 2" FPT
- ④ 2" BRASS NIPPLE, MPT X MPT (12" LONG)
- ⑤ 2" COUPLING (DRESSER STYLE 38, 3 BOLT-EPOXY COATED OR EQUAL)
- ⑥ 2" PVC SCH. 80 PIPE
- ⑦ BRONZE BALL VALVE - 2" FPT
- ⑧ 2" BRONZE STANDARD ELL
- ⑨ SERVICE CLAMP, 2" X MAIN SIZE X 7 1/2" WITH FPT OUTLET
- ⑩ 3-BOLTS (PART OF SERVICE CLAMP), CUT TO AVOID CONFLICT WITH TRUSS PIPE
- ⑪ BRONZE BALL VALVE, 2" MPT X FPT

- ⑫ TAPPING SADDLE, MAIN SIZE X 2"
- ⑬ CORROSION STOP, INLET - 2" AWWA TAPER THREAD OUTLET - 2" MPT
- ⑭ 2" BRONZE STREET ELL

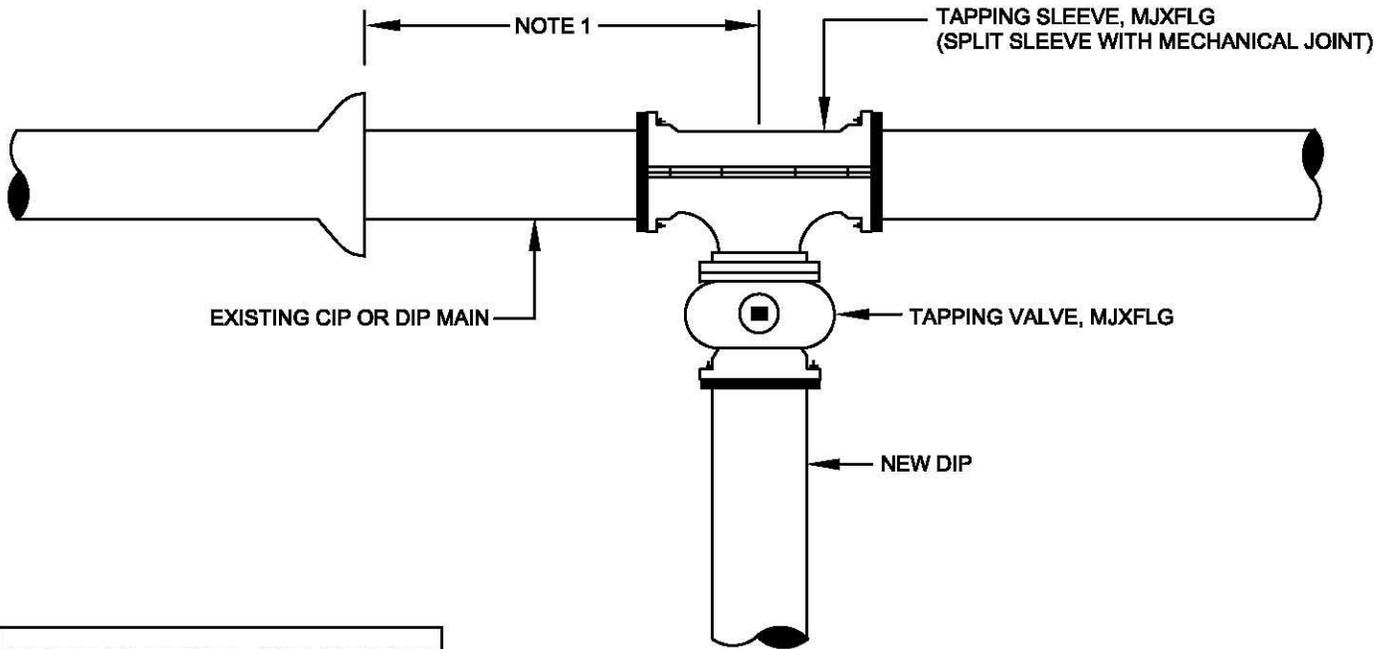
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**STANDARD 2" CONNECTION  
WITH PVC PIPE TO  
NEW & EXISTING MAINS**

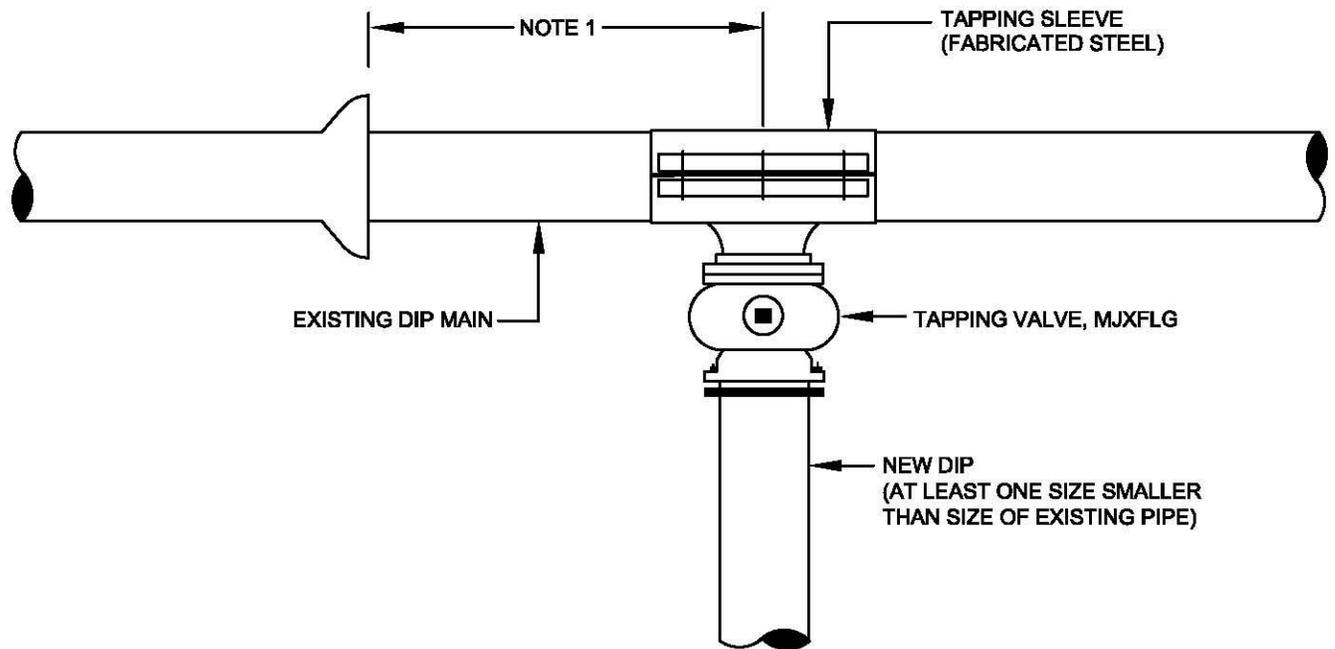
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REVISED DATE:	4/2000	1/2009		

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DWG. FILE NO.	R-926	DWN. BY:	BWS	1/30/98
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**FIGURE NO. 9**



**SPLIT SLEEVE - CIP OR DIP**



**FABRICATED STEEL SLEEVE - DIP**

**NOTES:**

1. MINIMUM DISTANCE BETWEEN AN EXISTING JOINT OR FITTING AND THE PROPOSED TAP:  
 EXISTING PIPE 8" OR SMALLER - 3.5'  
 EXISTING PIPE LARGER THAN 8" - 5.5'
2. SEE FIGURE 12 (DWG: W-05A) FOR GATE VALVE & VALVE BOX INSTALLATION DETAILS.

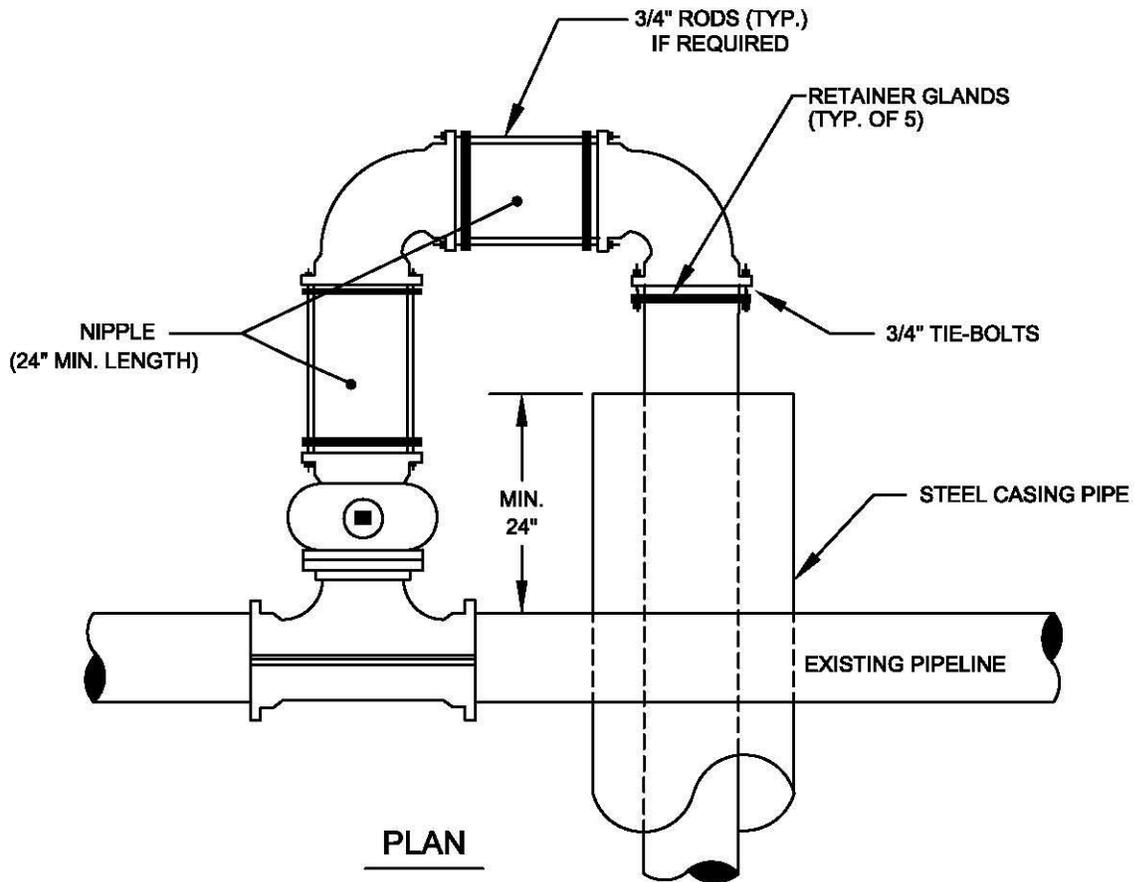
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**TAPPING SLEEVES  
 & VALVES FOR  
 4" OR LARGER PIPE**

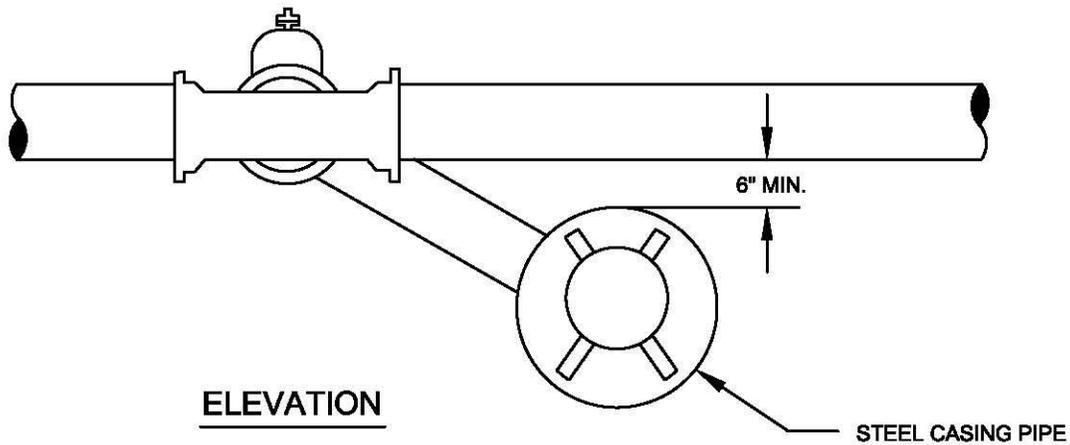
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DWG. NO.	W-04A-2	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY:	JHG	1/28/2009
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**FIGURE NO. 10**



PLAN



ELEVATION

**NOTES:**

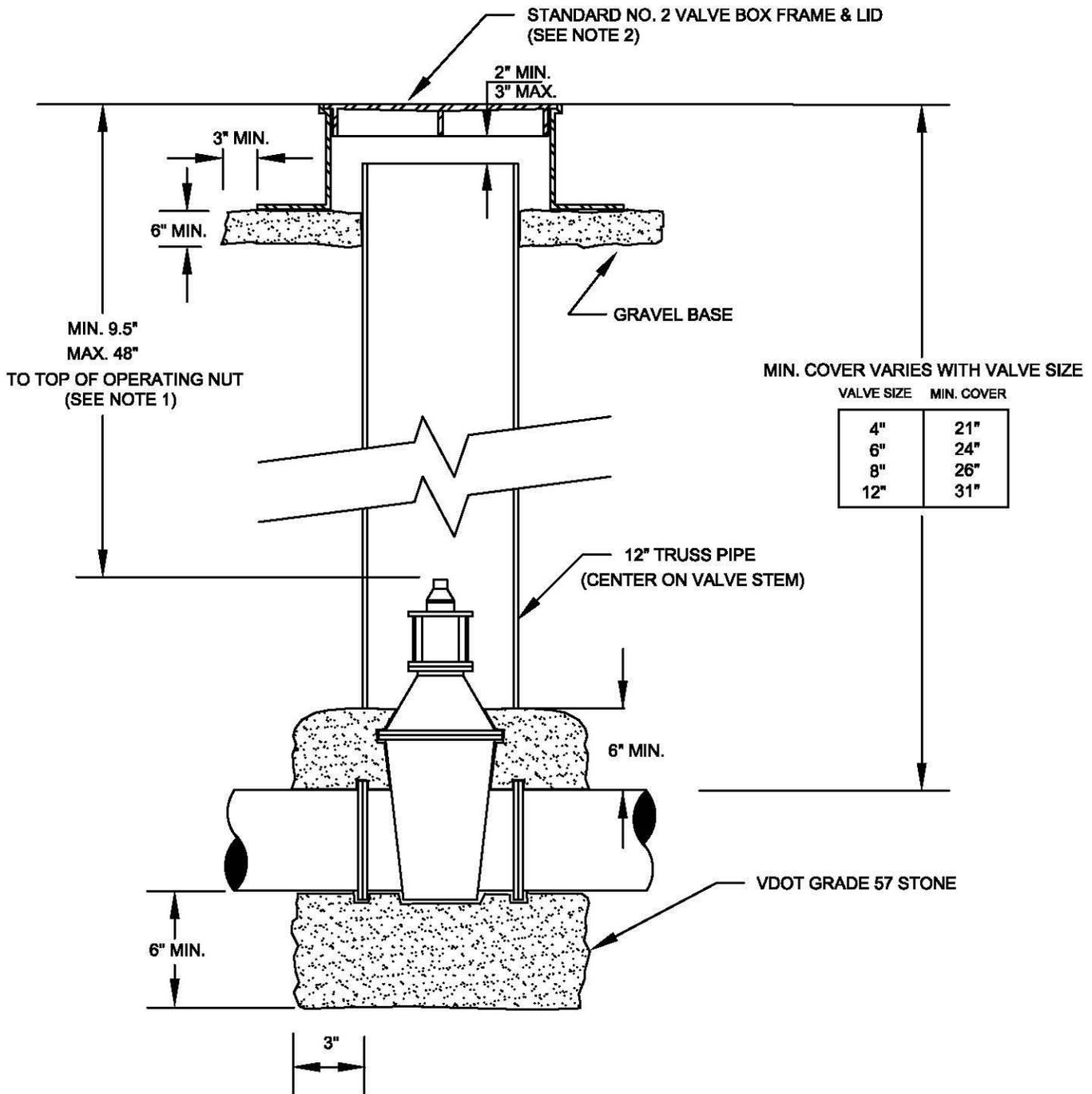
1. CASING PIPE MAY BE OVER EXISTING PIPELINE IF CONDITIONS WARRANT.
2. SEE FIGURE 30 (DWG: W-09A) AND FIGURE 31 (DWG: W-09A-1) FOR CASING DETAILS

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**REVERSE TAP**

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**FIGURE NO. 11**



VALVE SIZE	MIN. COVER
4"	21"
6"	24"
8"	26"
12"	31"

**NOTE:**

1. IF OPERATING NUT IS MORE THAN 48" BELOW GROUND LEVEL, THEN A VALVE STEM EXTENSION SHALL BE INSTALLED IN ACCORDANCE WITH SECTION 3 OF THE MATERIAL SPECIFICATIONS.
2. SEE FIGURE NO. 14 (DWG W-05B) & FIGURE NO. 15 (DWG W-05B-1) FOR STANDARD NO. 2 VALE BOX FRAME & LID

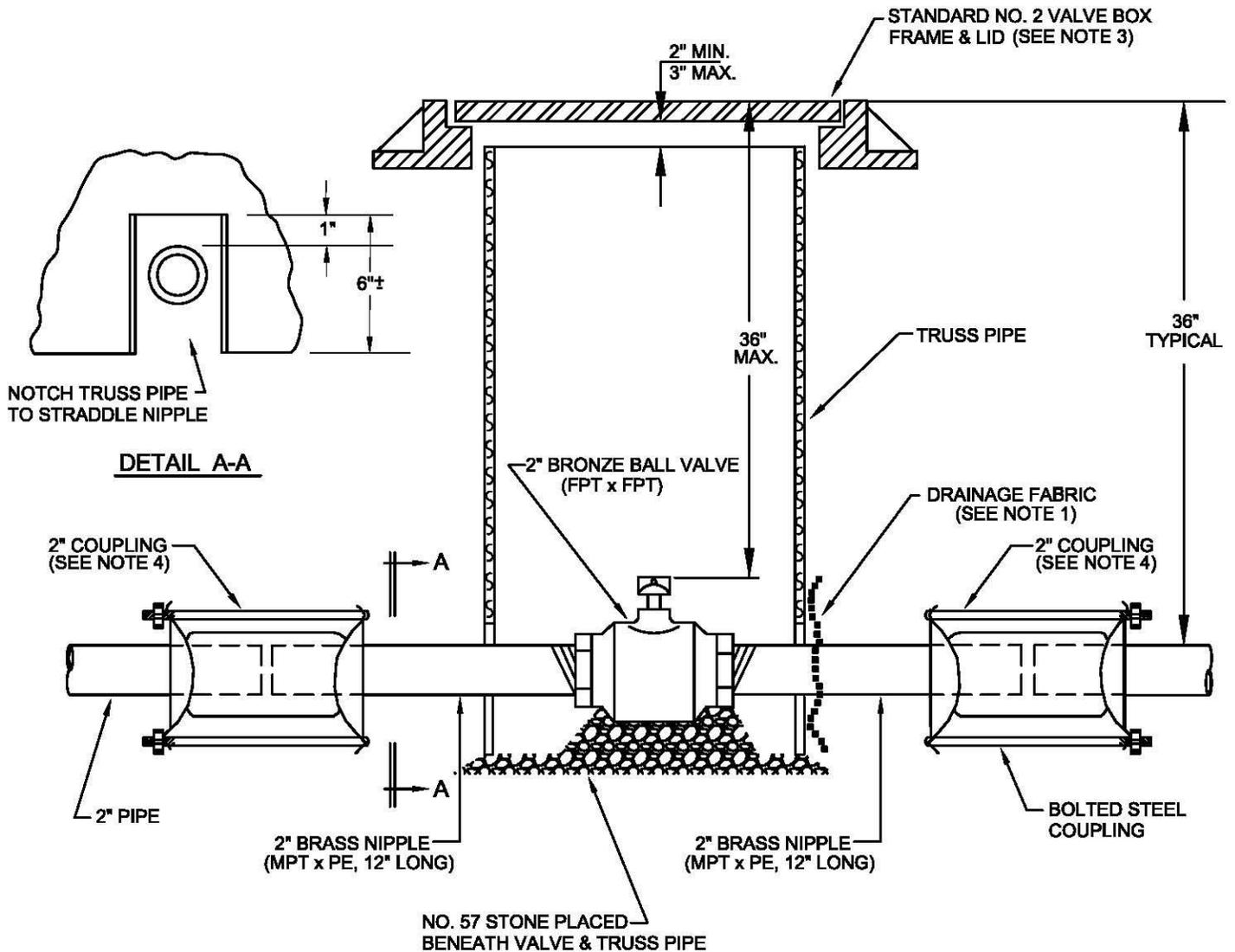
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**TYPICAL GATE VALVE  
SETTING**

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PRINT FILE NO.	N-1809	CKD. BY	F.B.	

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REVISED DATE:	1/98	4/17/00	1/2009	

**FIGURE NO. 12**



**NOTES:**

1. DRAINAGE FABRIC SHOULD BE FORMED AROUND THE PIPING TO MINIMIZE SOIL INTRUSION THROUGH NOTCHES IN TRUSS PIPE.
2. IF USING OPTION 1 OF FIGURE NO. 9, TO CENTER THE VALVE BOX OVER THE VALVE'S OPERATING NUT, THE BOTTOM OF THE TRUSS PIPE (RISER) MUST BE MODIFIED BY CUTTING A NOTCH ON ONE SIDE SO IT WILL STRADDLE THE 2" PIPE (SEE DETAIL AA) AND THE OPPOSITE SIDE OF THE TRUSS PIPE WILL REQUIRE A LARGE NOTCH TO ALLOW INSTALLATION ADJACENT TO THE EXISTING MAIN & SERVICE CLAMP.
3. SEE FIGURE NO. 14 (DWG W-05B) & FIGURE NO. 15 (DWG W-05B-1) FOR STANDARD NO. 2 VALE BOX FRAME & LID
4. DRESSER STYLE 38, 3-BOLT EPOXY COATED OR EQUAL.

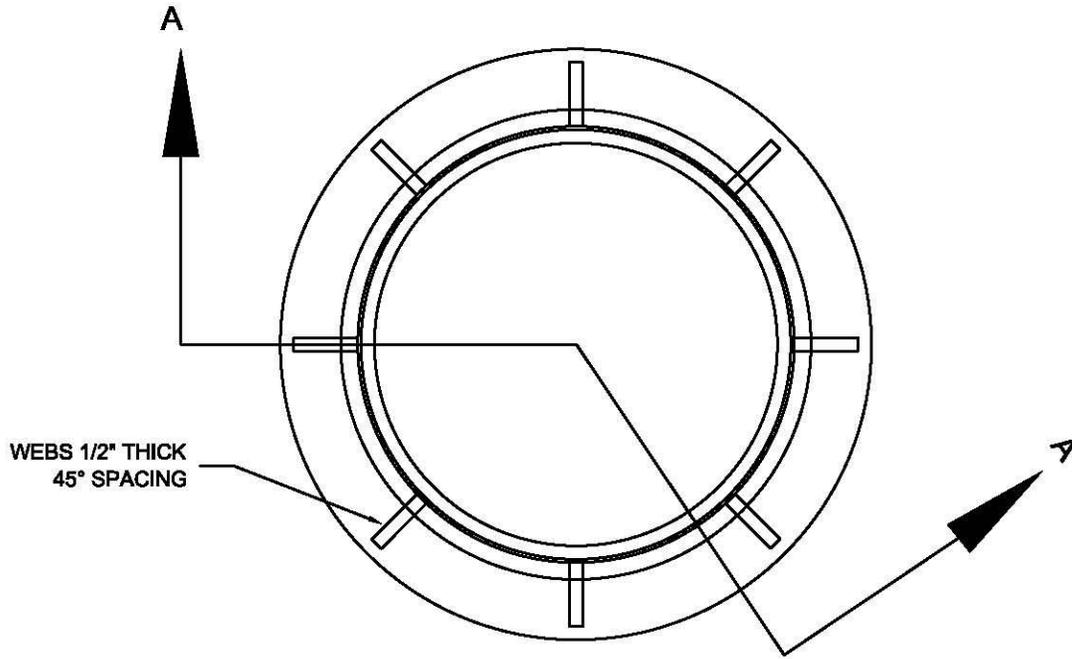
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## TYPICAL BALL VALVE SETTING

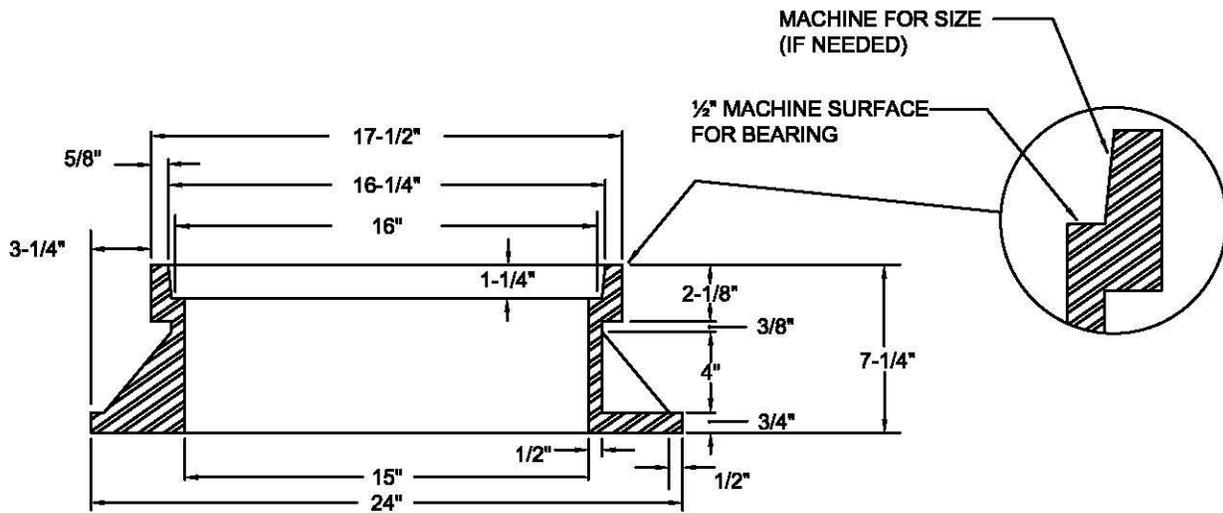
REVISED BY:	JHG			
REVISION DATE:	1/2009			

DWG. NO.	W-05A-1	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	J.G.	10/05/2006
PRINT FILE NO.	N-1809	CKD. BY		

**FIGURE NO. 13**



**TOP VIEW**  
N.T.S.



**SECTION A-A**  
N.T.S.

**NOTE:**

ANGLES WHICH APPEAR AS 90° WHICH WILL BE IN CONTACT WITH THE GROUND AFTER INSTALLATION MAY BE ROUNDED FOR EASE OF FABRICATION.

**MATERIAL**

CAST IRON MEETING ASTM A-48, CLASS 30S  
CASTING TO BE DIPPED IN ASPHALTIC PAINT.

**TOLERANCE**

1/8" - 0" FOR 16-1/4" & 16" DIAMETERS FOR LID SEAT  
ALL OTHERS ± 1/8"

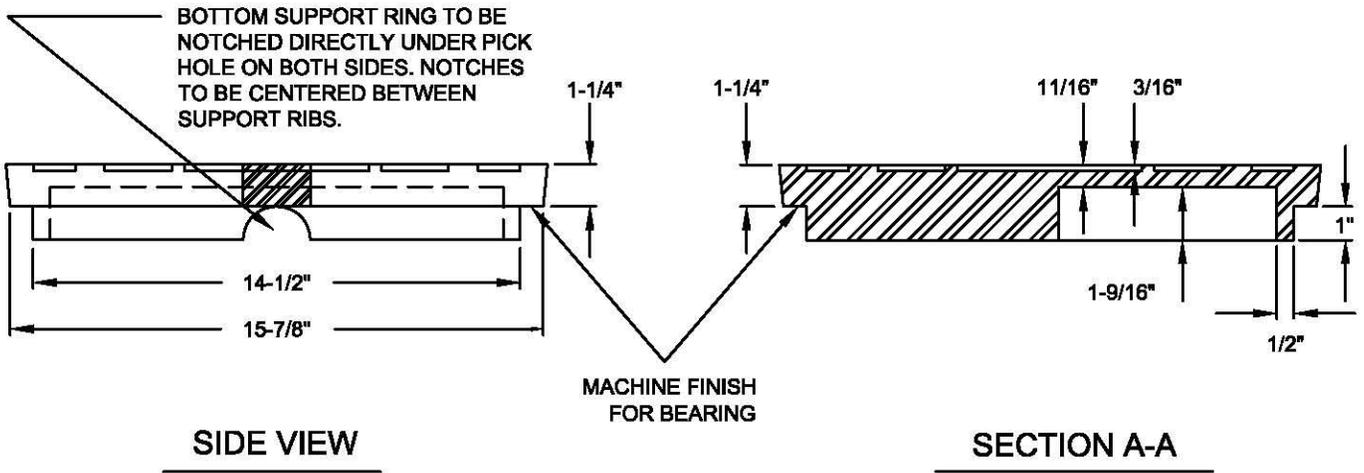
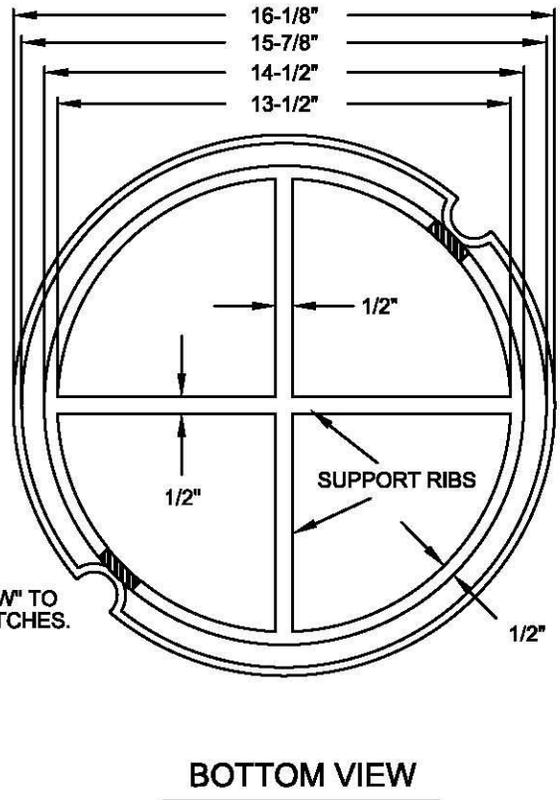
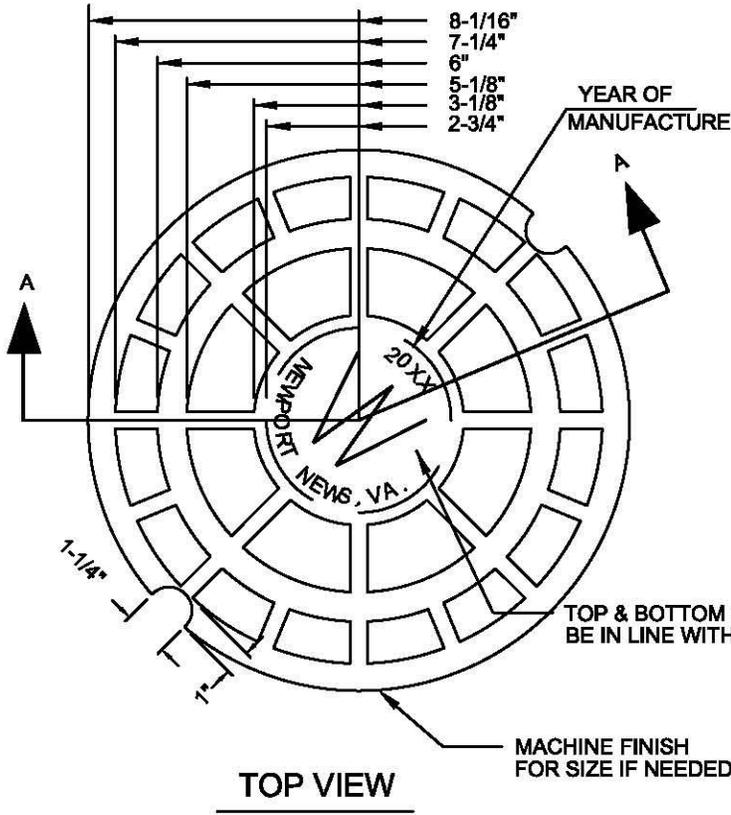
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**STANDARD NO. 2 VALVE BOX  
FRAME**

DWG. NO.	W-05B	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
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REVISED DATE:	12/97	4/20/00	1/2009	

**FIGURE NO. 14**



**NOTES:**

ANGLES WHICH APPEAR AS 90° ON INTERIOR UNDERSIDE OF COVER MAY BE ROUNDED FOR EASE OF FABRICATION EXCEPT WHERE MACHINE SURFACE NOTED.

**MATERIAL**

CAST IRON MEETING ASTM A-48, CLASS 30S.  
CASTING TO BE DIPPED IN ASPHALTIC PAINT.

**TOLERANCE**

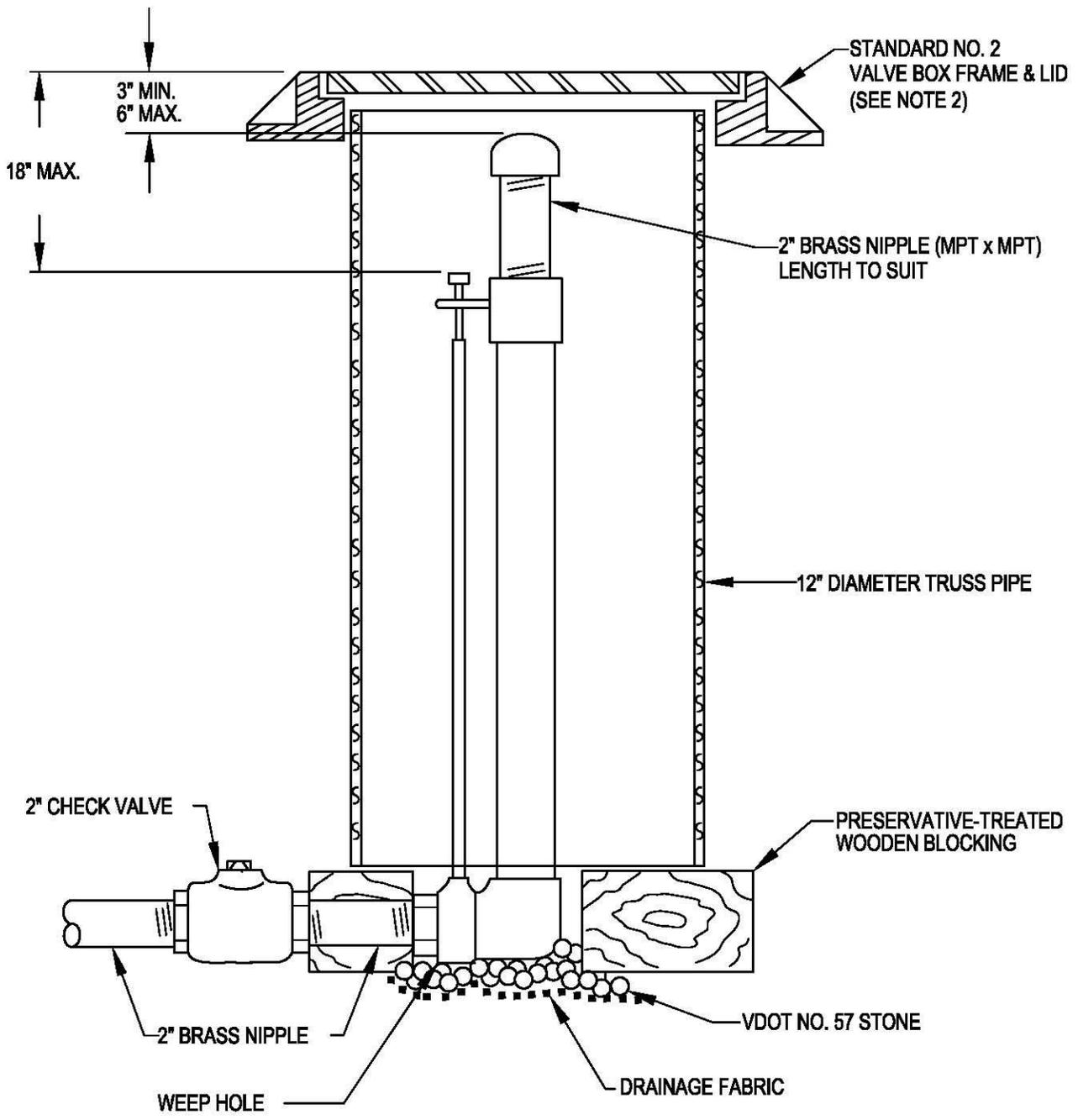
+0 TO -1/8" FOR OUTER DIAMETERS OF COVER. ALL OTHERS ± 1/8".

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**STANDARD NO. 2 VALVE  
BOX LID**

REVISED BY:	BWS	BWS	JHG	DWG. NO.	W-05B-01	SCALE	NONE	DATE
REVISED DATE:	12/97	9/00	1/2009	DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
				PRINT FILE NO.	N-1809	CKD. BY	F.B.	

**FIGURE NO. 15**



**NOTES:**

1. BLOW-OFF ASSEMBLY SHALL BE SLIM LINE 2" FLUSHING HYDRANT BY GIL INDUSTRIES.
2. SEE FIGURE NO. 14 (DWG W-05B) & FIGURE NO. 15 (DWG W-05B-1) FOR STANDARD NO. 2 VALE BOX FRAME & LID

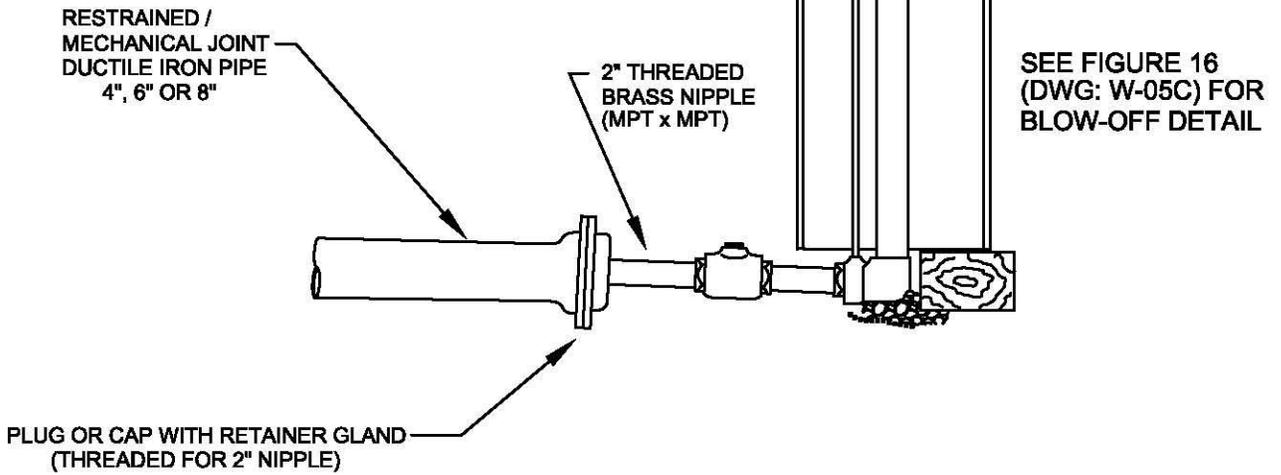
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## TYPICAL BLOW-OFF ASSEMBLY

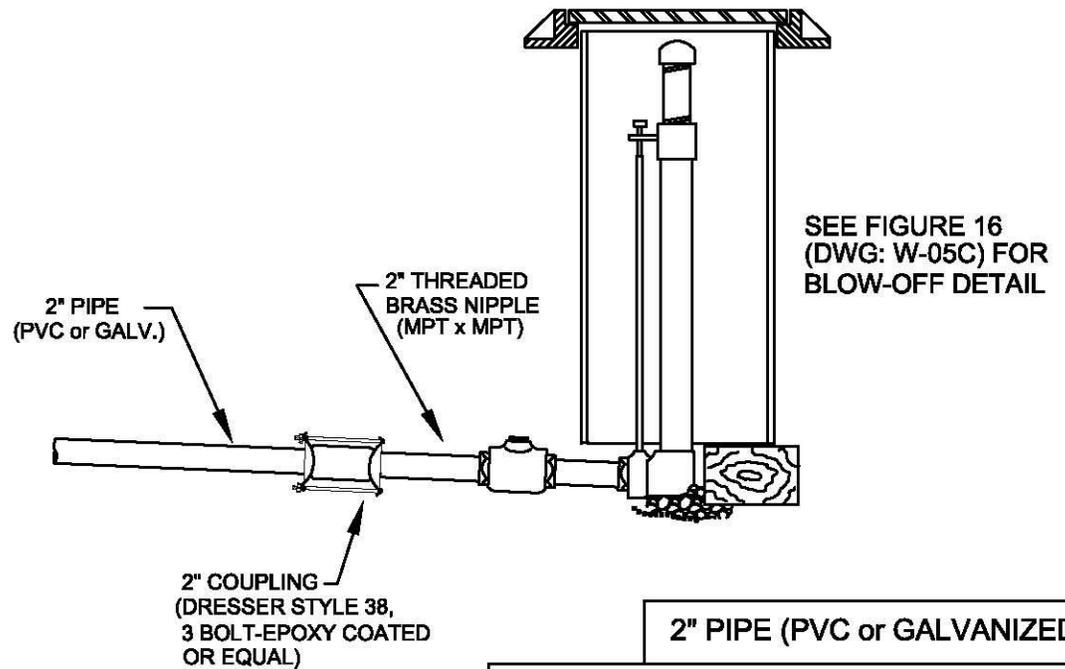
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**FIGURE NO. 16**



MJ, DUCTILE IRON PIPE (4", 6" OR 8")



2" PIPE (PVC or GALVANIZED)

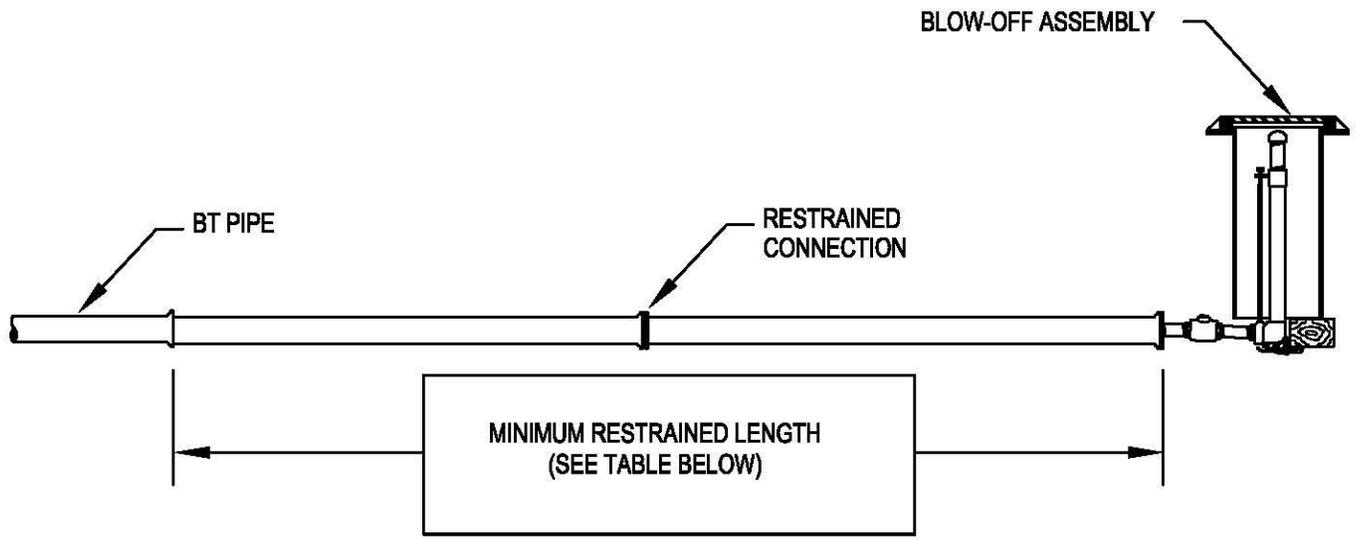
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**DEAD END BLOW-OFF  
 ASSEMBLIES**

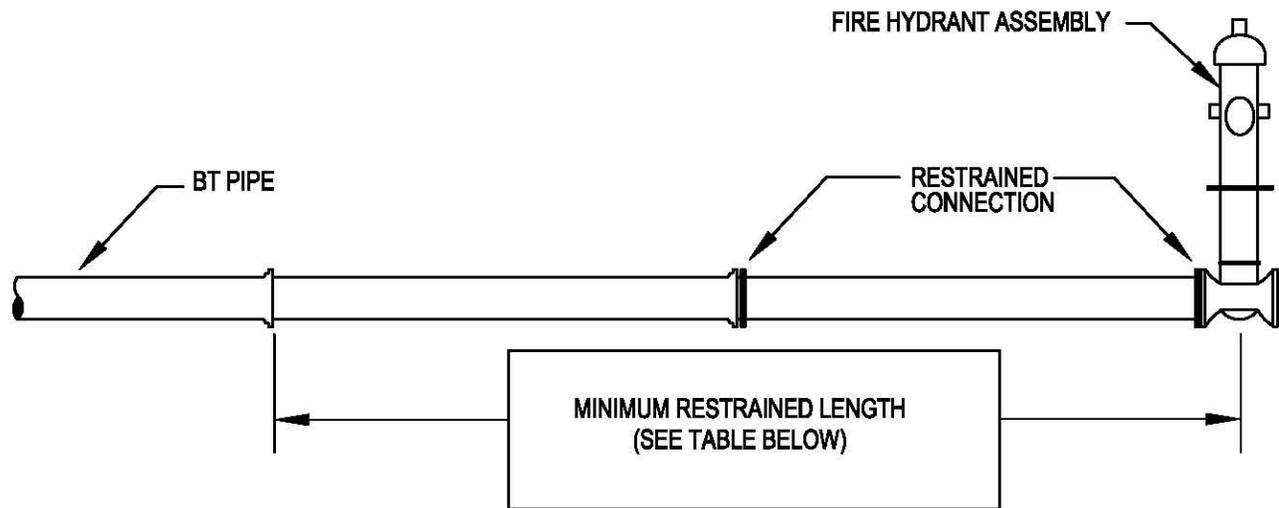
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REVISED DATE:				

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**FIGURE NO. 17**



CONNECTION TO BLOW-OFF



CONNECTION TO FIRE HYDRANT

MINIMUM RESTRAINED LENGTH (FT)		
PIPE SIZE	DUCTILE IRON	POLYWRAP OR PVC
4"	22	31
6"	31	45
8"	41	58
12"	59	84
16"	77	110

RESTRAINED LENGTH DETERMINED USING DIPRA FORMULA WITH TYPE 3 BEDDING, COHESIVE-GRANULAR SOIL, 3' COVER, 125 PSI AND A SAFETY FACTOR OF 1.5.

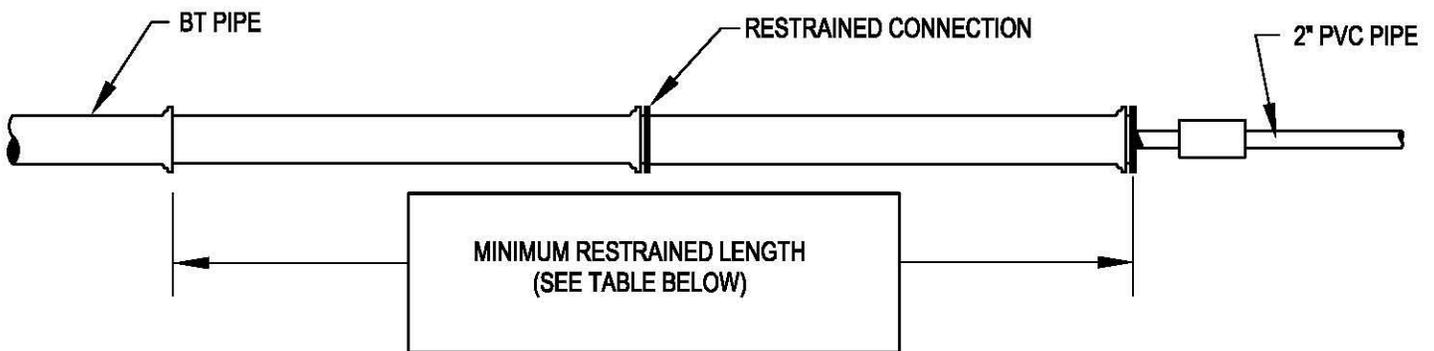
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**RESTRAINED LENGTH  
AT DEAD END**

REVISED BY:				
REVISED DATE:				

DWG. NO.	W-05C-2	SCALE	NONE	DATE
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FIGURE NO. 18



MINIMUM RESTRAINED LENGTH (FT)		
PIPE SIZE	DUCTILE IRON	POLYWRAP OR PVC
4"	22	31
6"	31	45
8"	41	58
12"	59	84
16"	77	110

RESTRAINED LENGTH DETERMINED USING DIPRA FORMULA WITH TYPE 3 BEDDING, COHESIVE-GRANULAR SOIL, 3' COVER, 125 PSI AND A SAFETY FACTOR OF 1.5.

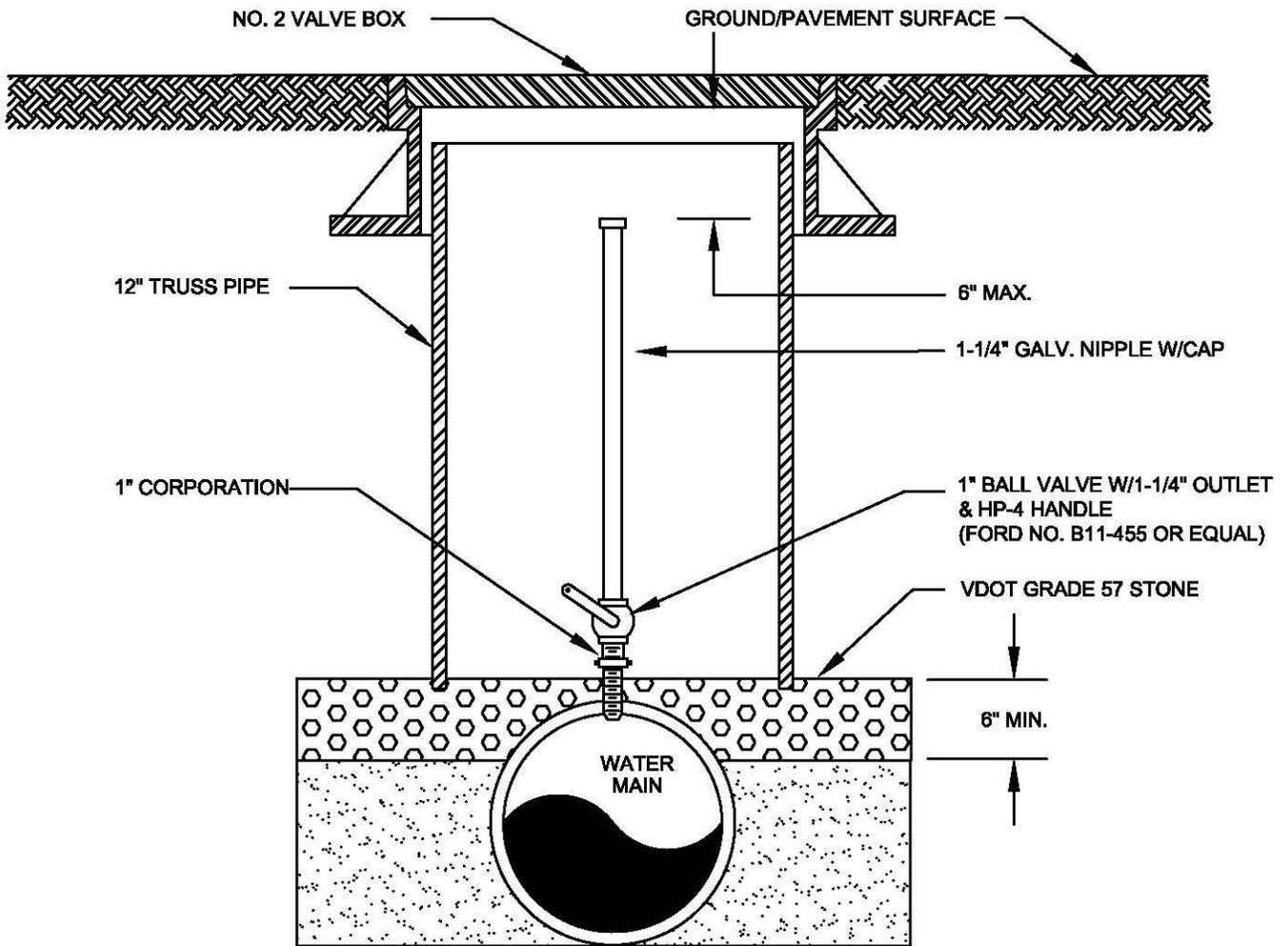
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**RESTRAINED LENGTH  
 AT TRANSITION**

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DWG. NO.	W-05C-3	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	JHG	1/14/2009
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**FIGURE NO. 19**



**NOTE:**

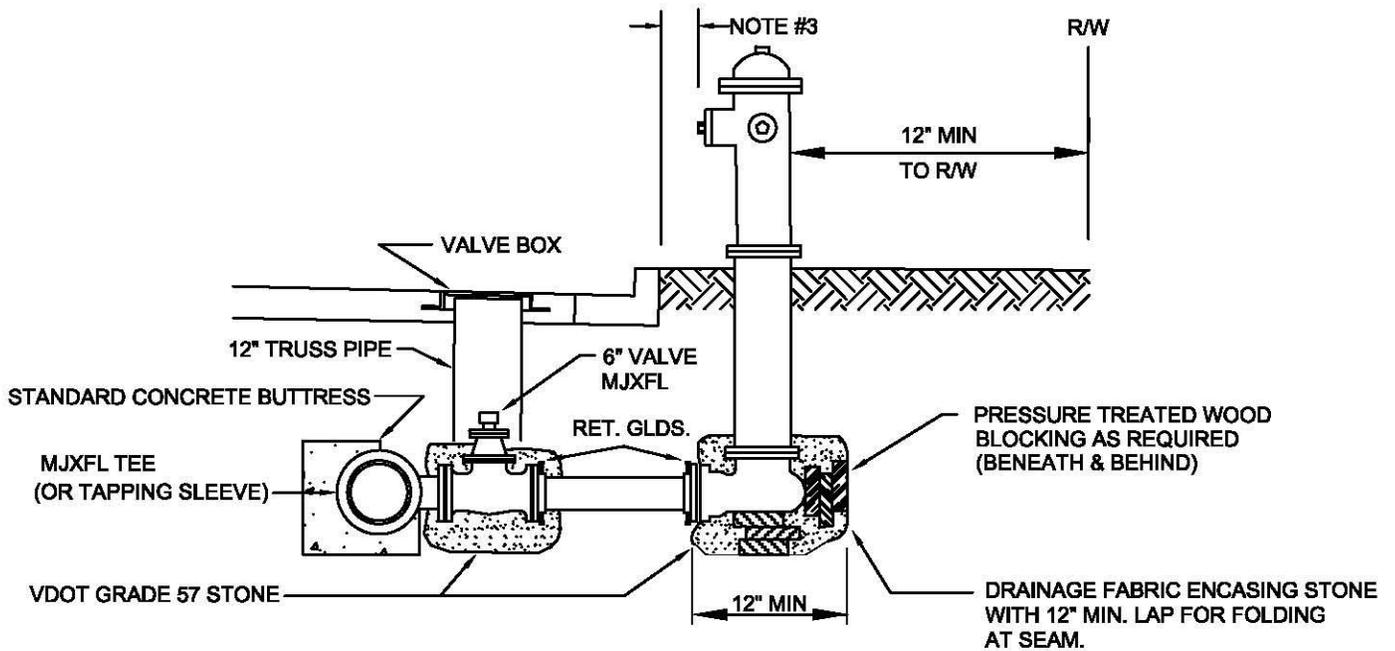
VALVE TO BE OPEN WHEN HANDLE IS IN THE UP POSITION.

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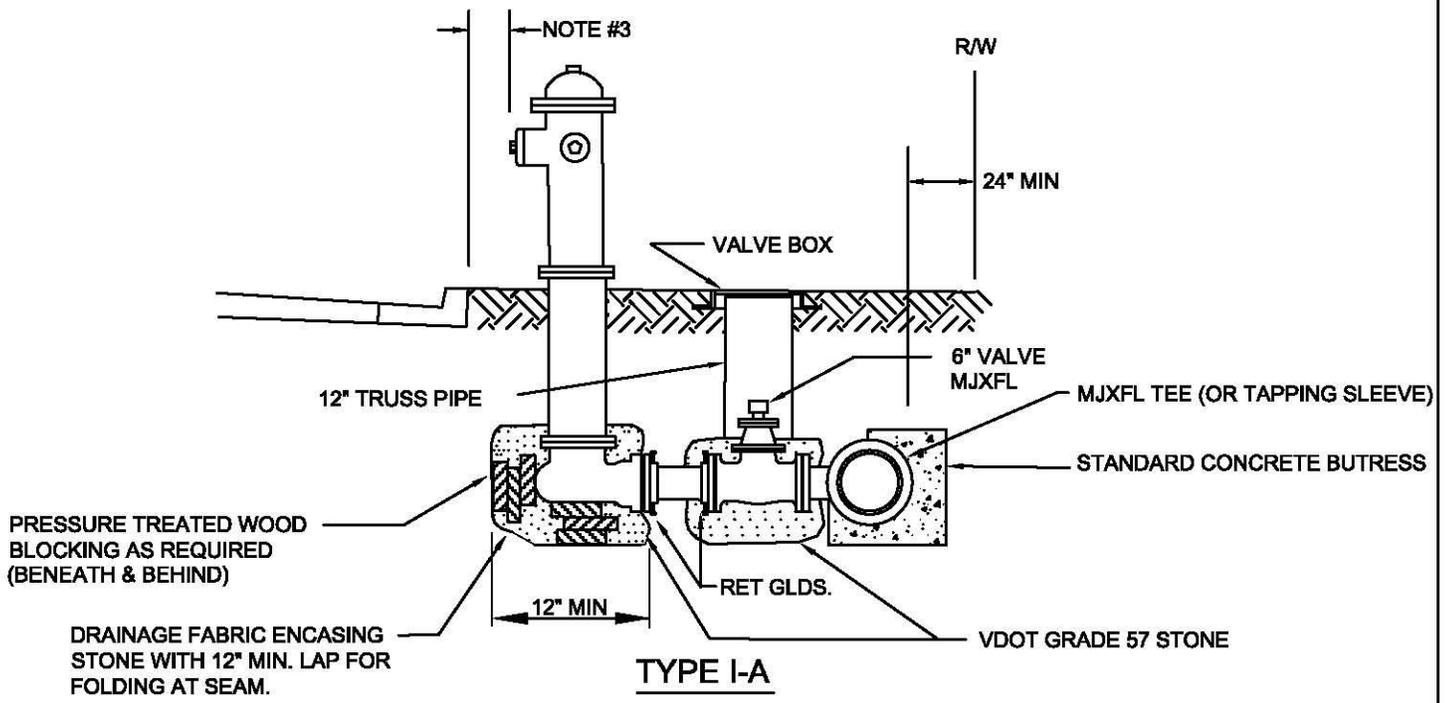
**MANUAL AIR VALVE**

REVISED BY:	B.W.S.	B.W.S.	JHG	DWG. NO.	W-05D	SCALE	NONE	DATE
REVISED DATE:	1/98	4/18/00	1/2009	DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
				PRINT FILE NO.	N-1809	CKD. BY	F.B.	

**FIGURE NO. 20**



**TYPE I**



**TYPE I-A**

**NOTES:**

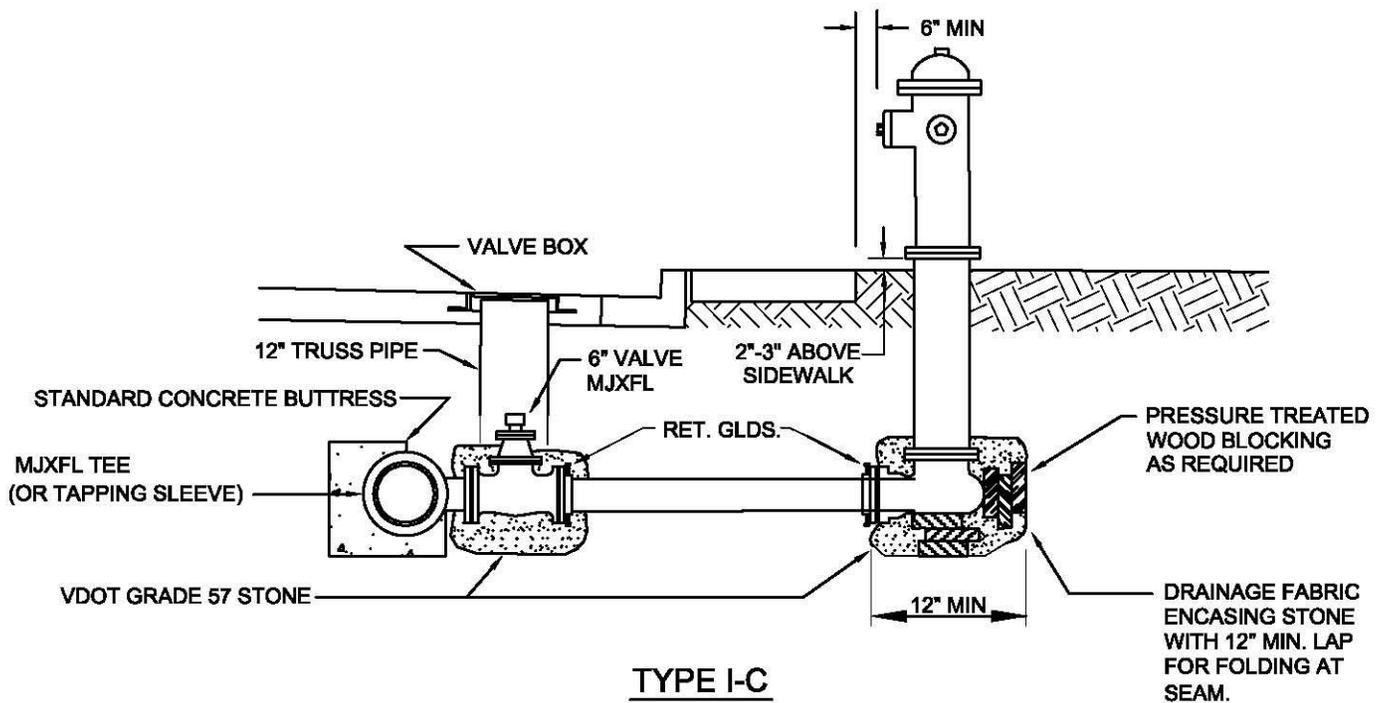
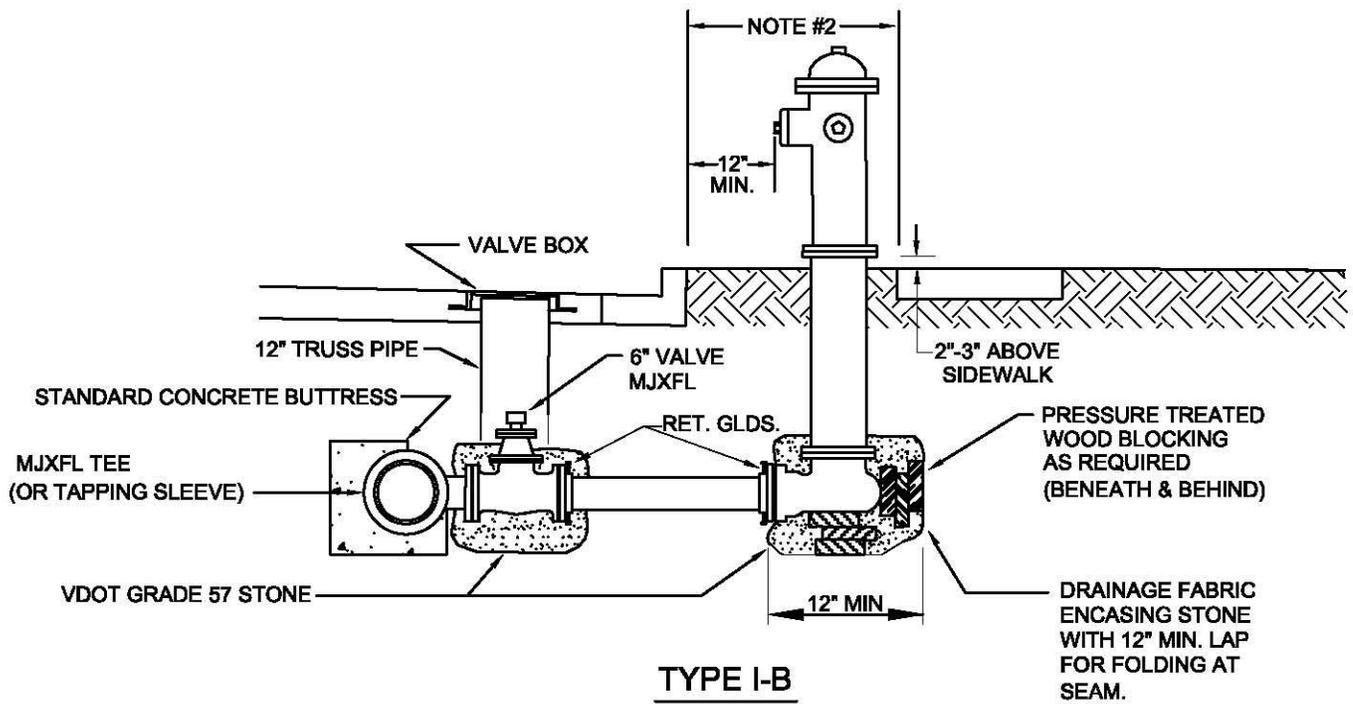
1. HYDRANT TO BE SET WITH BREAKABLE COUPLING APPROXIMATELY 3" ABOVE FINISHED GRADE.
2. PUMPER NOZZLE IS TO FACE ROADWAY UNLESS OTHERWISE NOTED.
3. PREFERRED DISTANCE BETWEEN BACK-OF-CURB AND CAP ON PUMPER NOZZLE IS 36"; MINIMUM DISTANCE IS 12".

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**TYPE I & I-A  
FIRE HYDRANT SETTING  
W/ CURB & GUTTER**

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REVISED DATE:	1/98	12/00	1/20009

DWG. NO.	W-06A	SCALE	NONE	DATE
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**NOTES:**

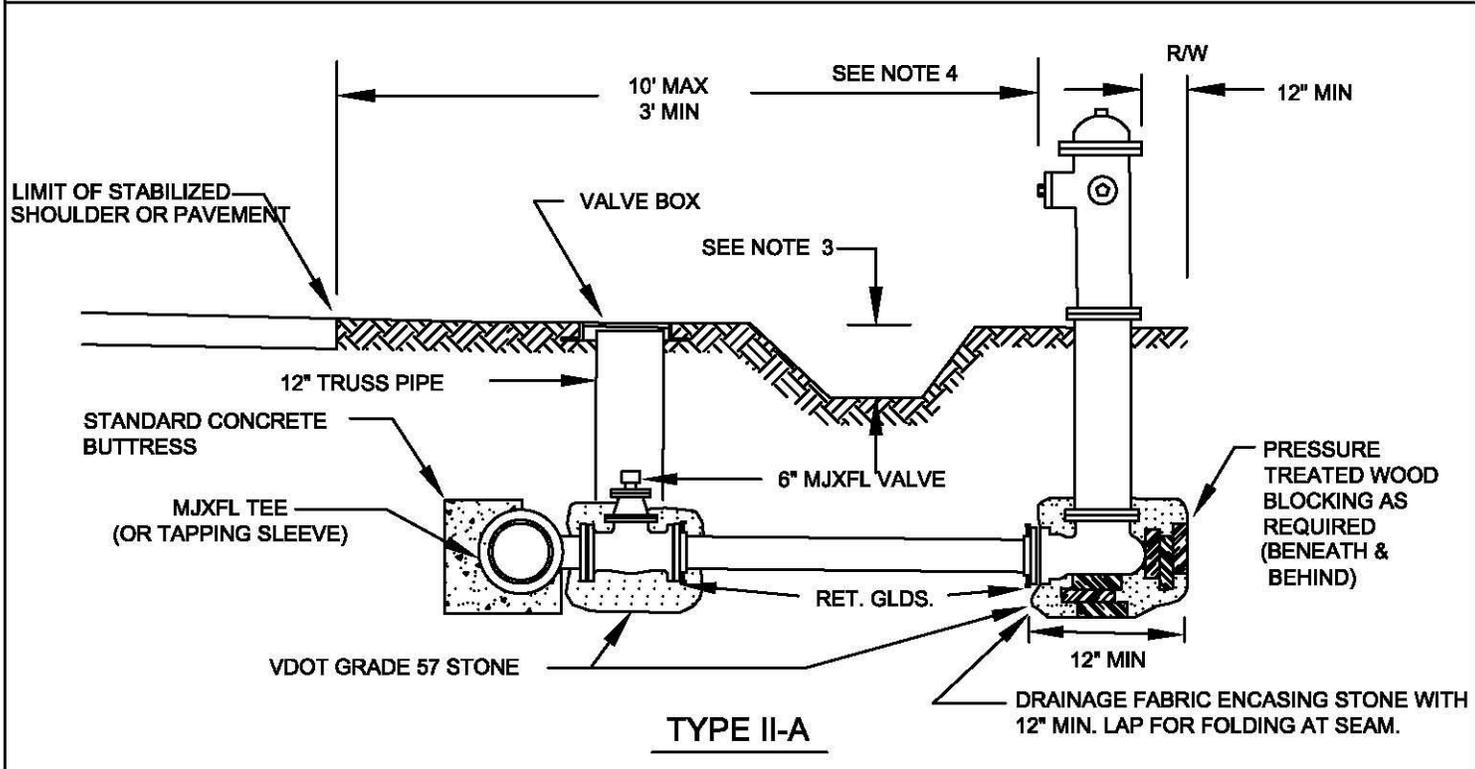
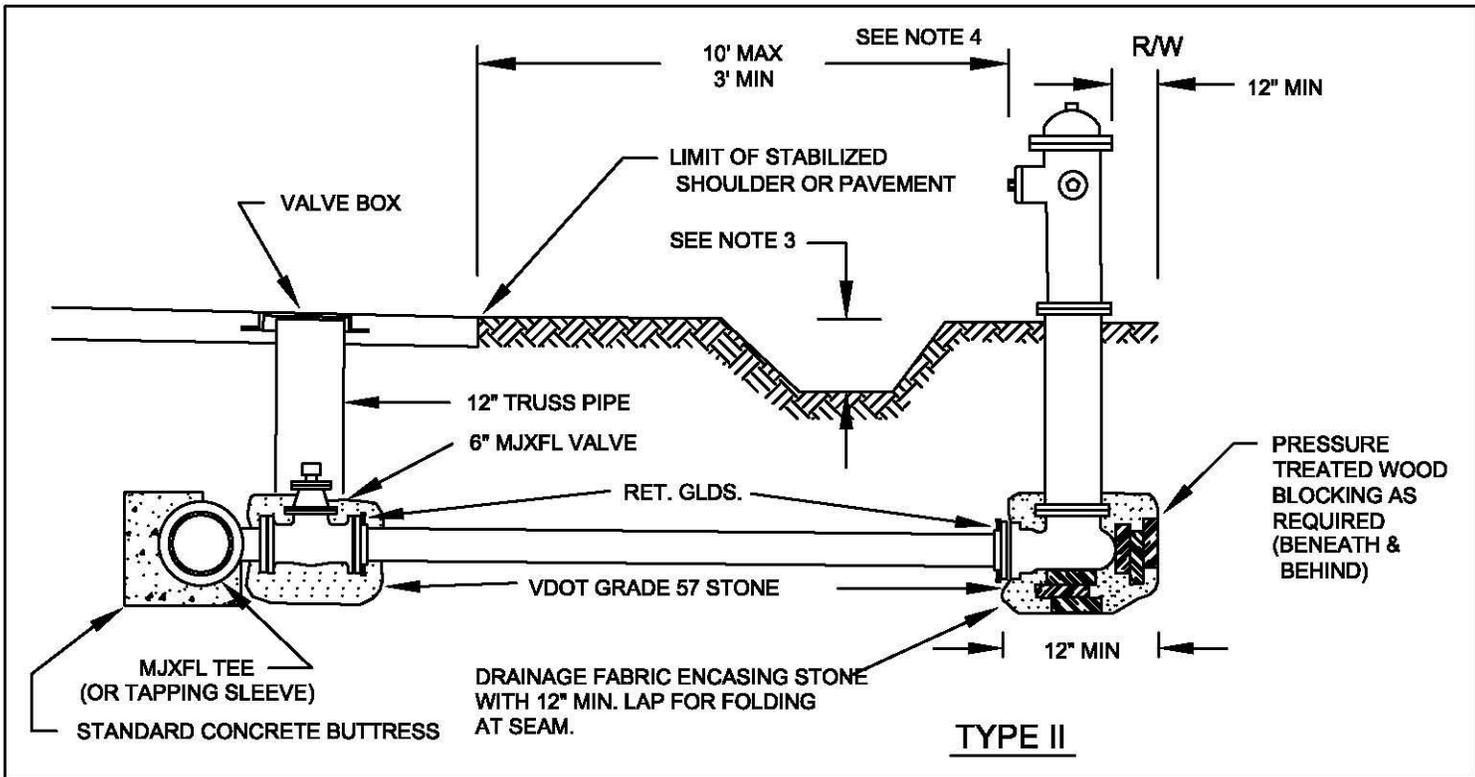
1. HYDRANT TO BE SET WITH BREAKABLE COUPLING APPROXIMATELY 3" ABOVE FINISHED GRADE.
2. IF WIDTH OF UTILITY STRIP IS NOT SUFFICIENT TO ACCOMMODATE HYDRANT AND MAINTAIN 12" MINIMUM DISTANCE FROM CURB, HYDRANT MUST BE INSTALLED BEHIND SIDEWALK AS ILLUSTRATED BY TYPE I-C SETTING.

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**TYPE I-B & I-C  
FIRE HYDRANT SETTING  
WITH SIDEWALK**

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DWG. FILE NO.	R-926	DWN. BY	JHG	1/14/2009
PRINT FILE NO.	N-1809	CKD. BY		



**NOTES:**

1. HYDRANT TO BE SET WITH BREAKABLE COUPLING APPROXIMATELY 3" ABOVE FINISHED GRADE.
2. PUMPER NOZZLE IS TO FACE ROADWAY UNLESS OTHERWISE NOTED.
3. IF DEPTH OF DITCH IS GREATER THAN 18", THEN A CULVERT PIPE IS REQUIRED TO PERMIT ACCESS TO HYDRANT; SEE FIGURE 24 (DWG: W-06C)
4. 10' MAX. UNLESS APPROVED OTHERWISE BY FIRE DEPARTMENT

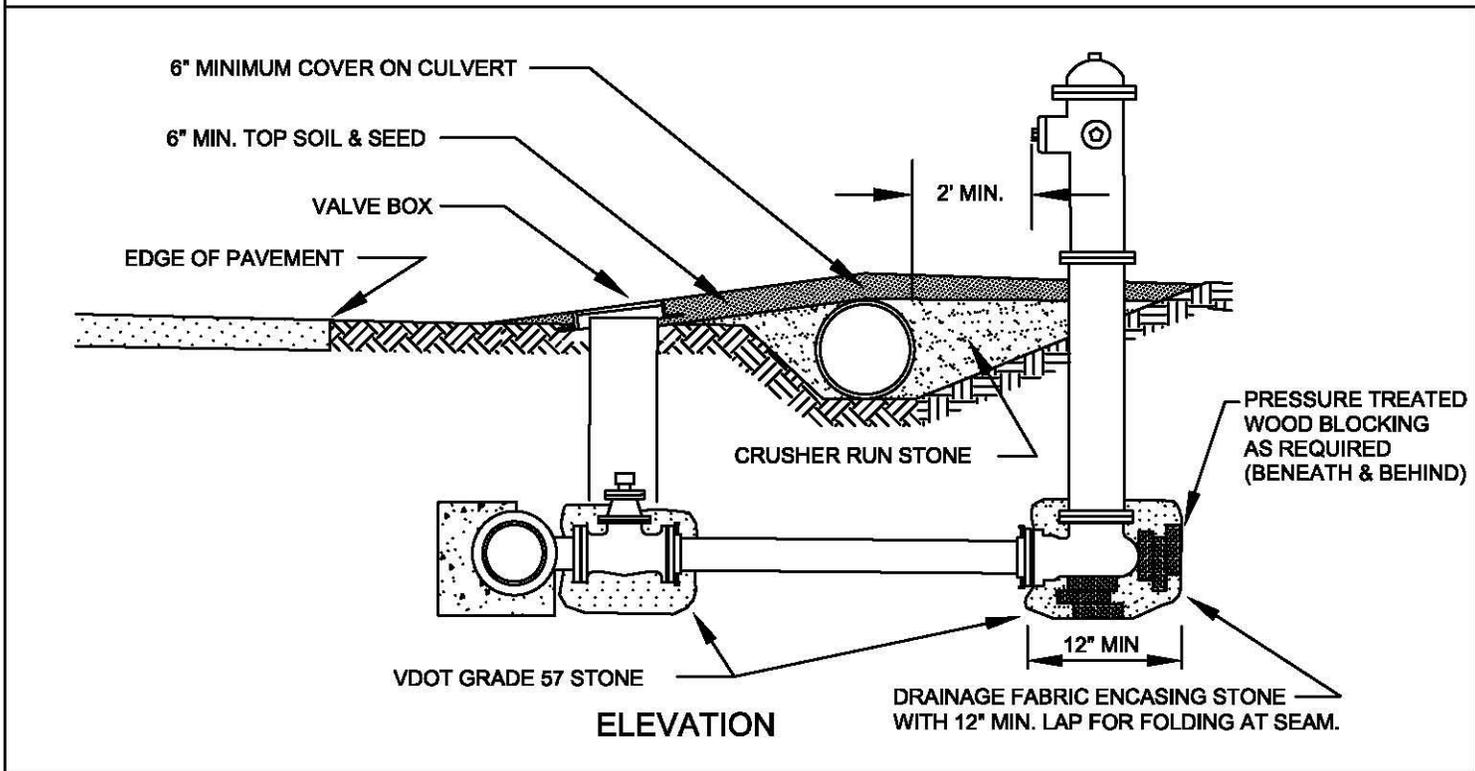
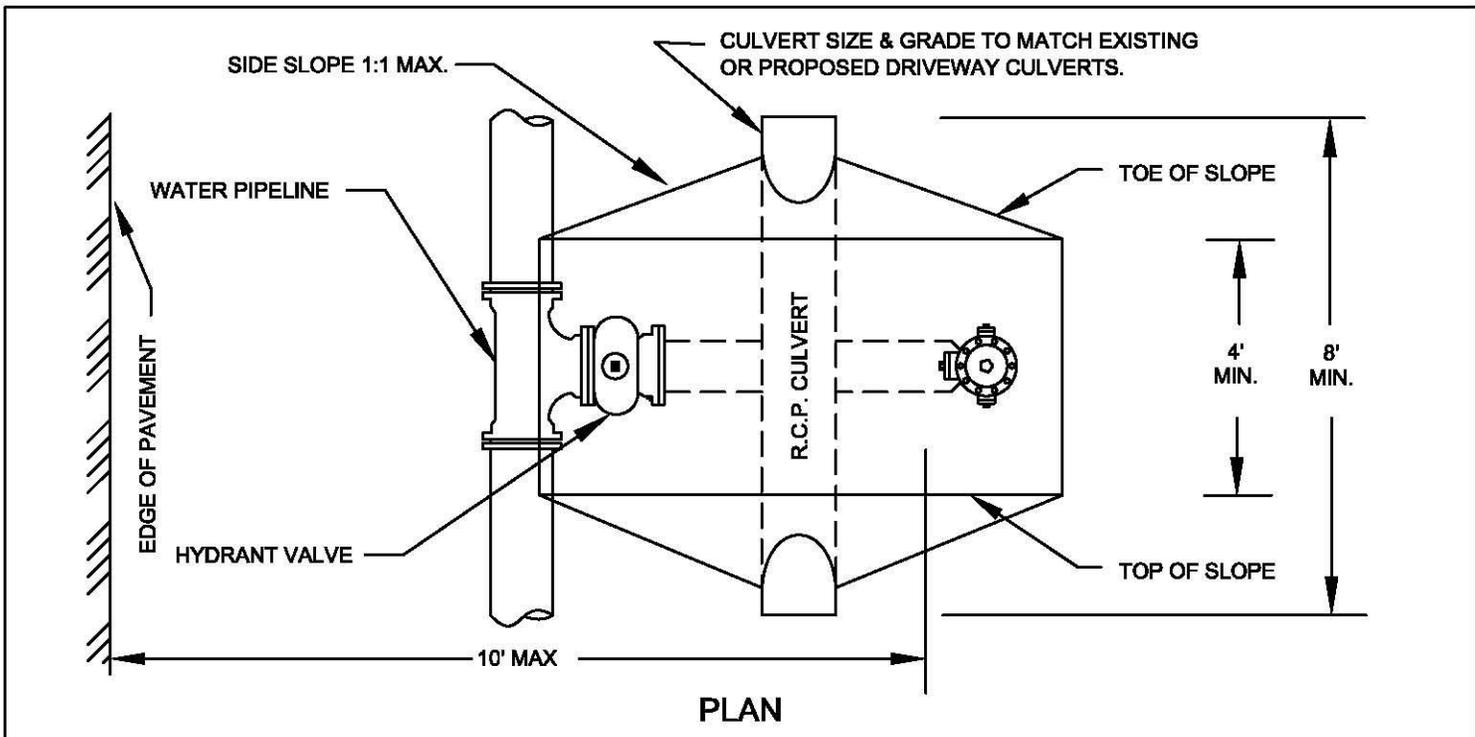
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NEWPORT NEWS, VIRGINIA

**TYPE II & II-A  
FIRE HYDRANT SETTINGS  
W/O CURB & GUTTER**

REVISED BY:	B.W.S.	B.W.S.	JHG	
REVISED DATE:	1/98	4/20/00	1/2009	

DWG. NO.	W-06B	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
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**FIGURE NO. 23**



**NOTES:**

1. HYDRANT TO BE SET WITH BREAKABLE COUPLING APPROXIMATELY 3" ABOVE FINISHED GRADE.
2. PUMPER NOZZLE IS TO FACE ROADWAY UNLESS OTHERWISE NOTED.
3. SIZE OF CULVERT RCP TO BE DETERMINED BY DEVELOPER'S ENGINEER FOR NEW DEVELOPMENTS.
4. TYPE II-B HYDRANT SETTING TO BE USED WHEN CALLED FOR ON PLANS. USE WHEN DITCH DEPTH (EDGE OF PAVEMENT TO BOTTOM OF DITCH) IS GREATER THAN 18" OR HYDRANT VALVE FALLS WITHIN DITCH SLOPE.

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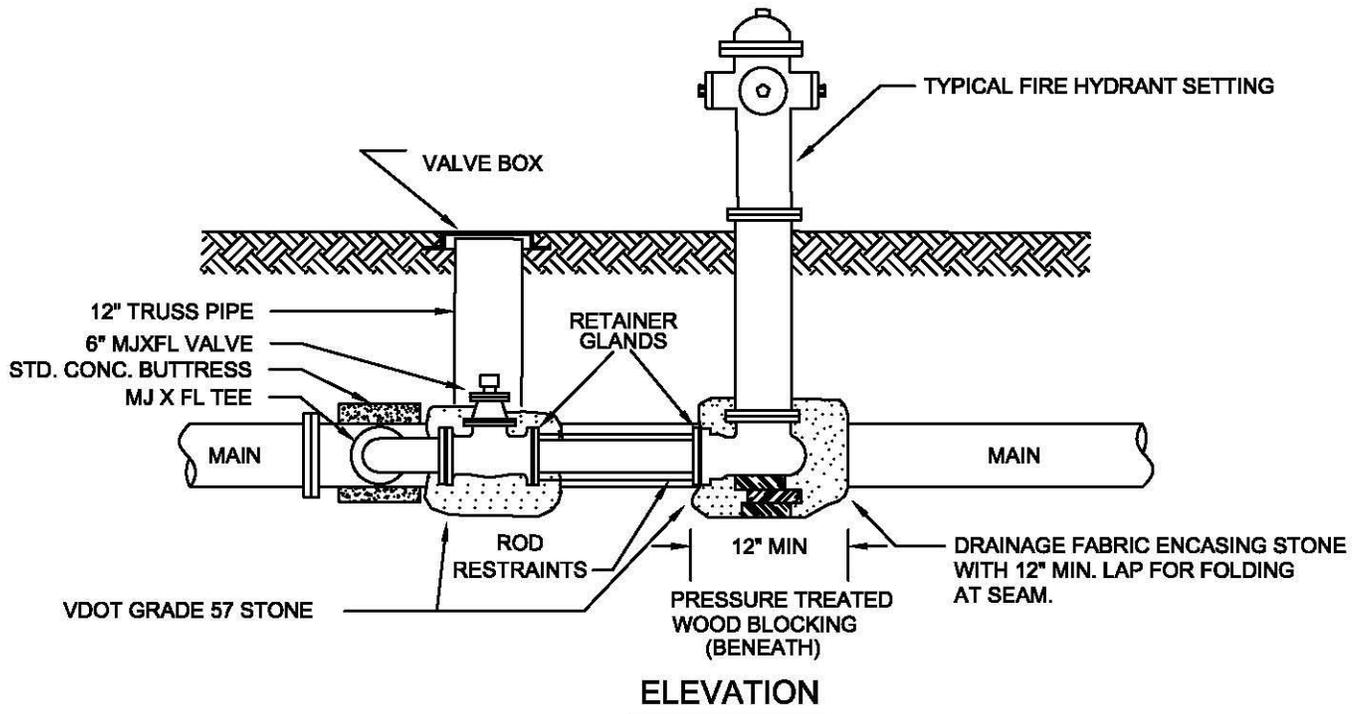
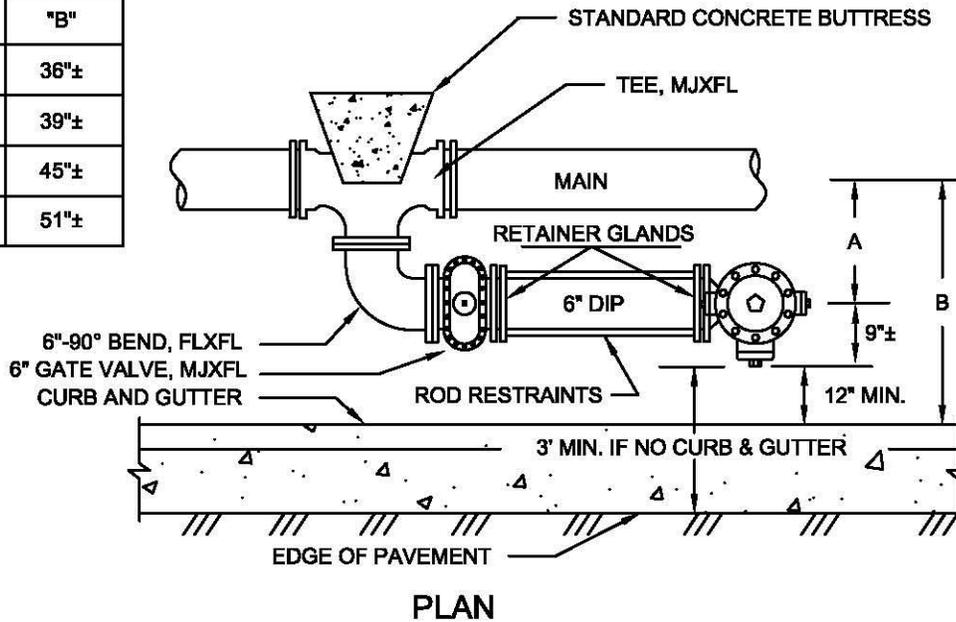
**TYPE II-B  
FIRE HYDRANT SETTING  
WITH CULVERT**

REVISED BY:	B.W.S.	B.W.S.	JHG
REVISED DATE:	1/98	4/18/00	1/2009

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**FIGURE NO. 24**

MAIN SIZE	"A"	"B"
6"	15"	36"±
8"	18"	39"±
12"	24"	45"±
16"	30"	51"±



**NOTES:**

- HYDRANT TO BE SET WITH BREAKABLE COUPLING APPROXIMATELY 3" ABOVE FINISHED GRADE.
- PUMPER NOZZLE IS TO FACE ROADWAY UNLESS OTHERWISE NOTED.

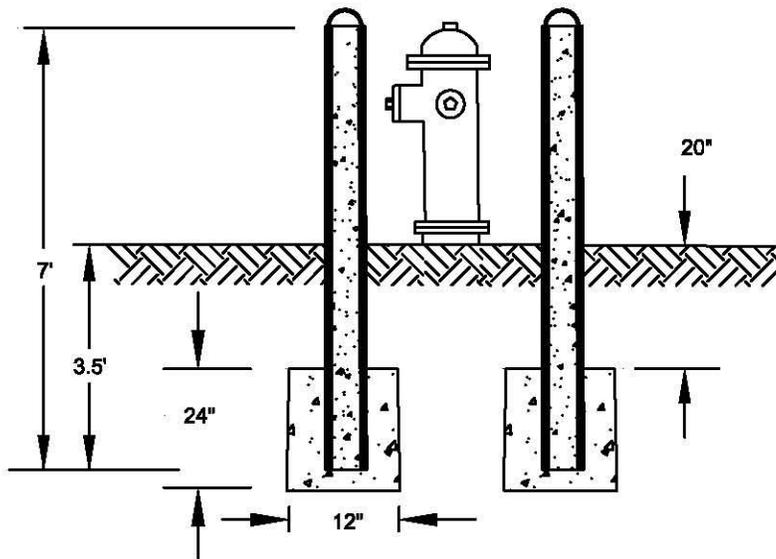
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**TYPE III  
FIRE HYDRANT SETTING**

REVISED BY:	B.W.S.	B.W.S.	JHG
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DWG. NO.	W-06D	SCALE	NONE	DATE
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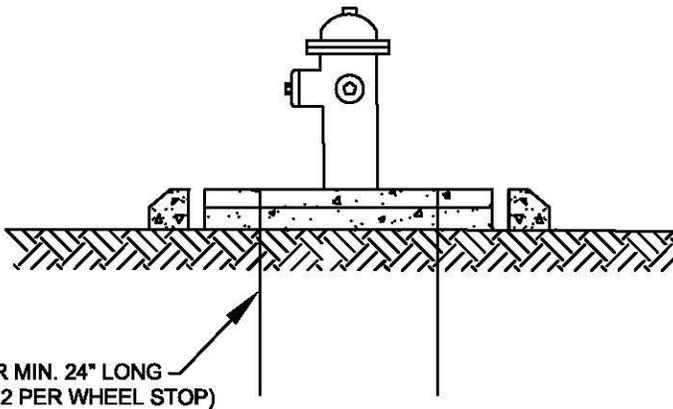
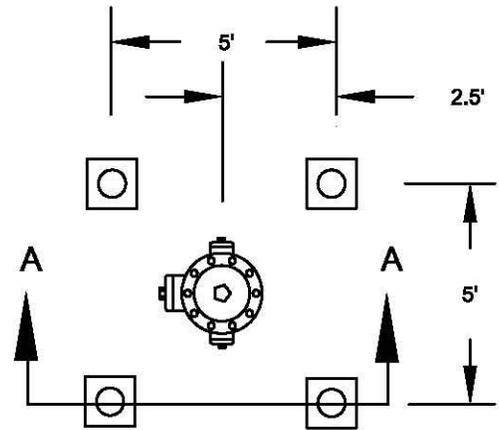
**FIGURE NO. 25**



A - A

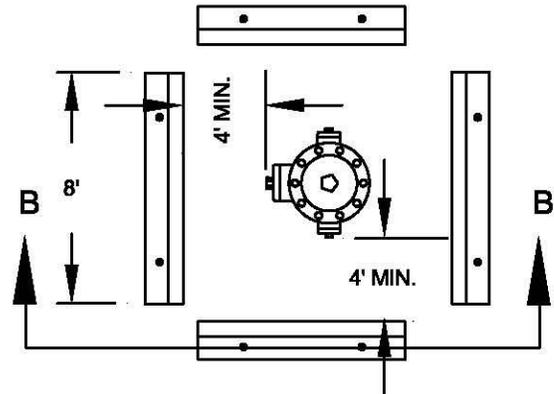
## BOLLARDS (GUARD POSTS)

1. SEE SECTION MS 14.3 FOR REQUIREMENTS.
2. FOR A MIN. RADIUS OF 24" AROUND EACH BOLLARD, COMPACT SOIL IN 6" LAYERS TO CBR 20 MIN., 95% MAX. DENSITY.
3. IN PAVED AREAS, CONCRETE SHALL BE CONTINUOUS TO GRADE.



B - B

## WHEEL STOPS

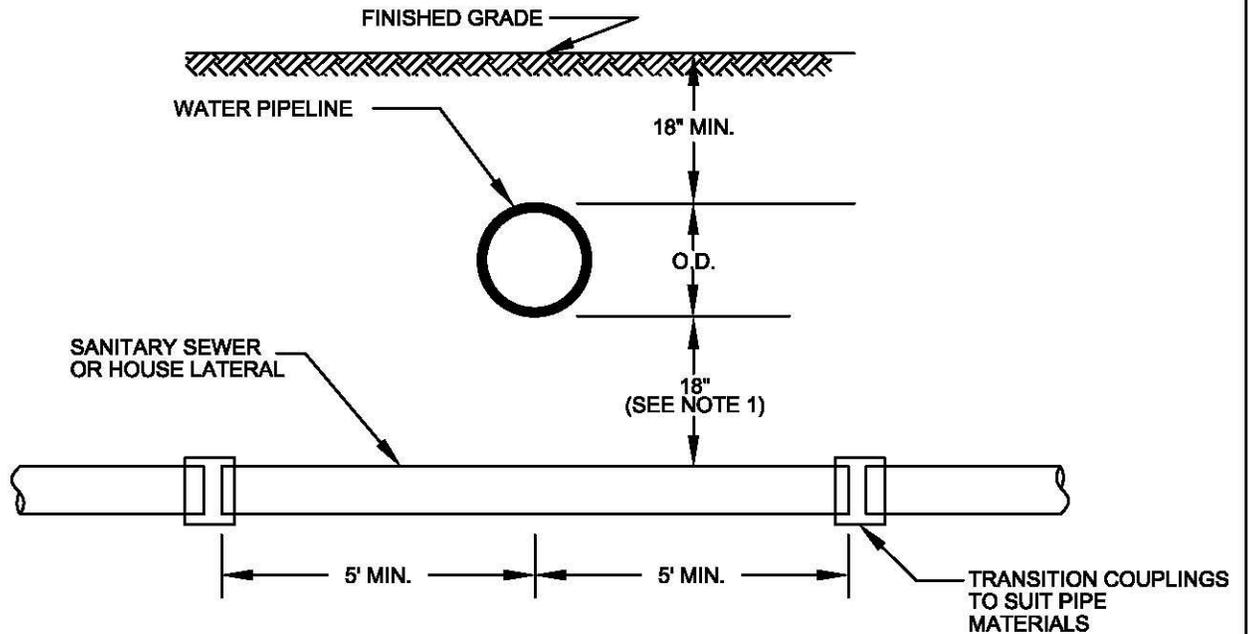


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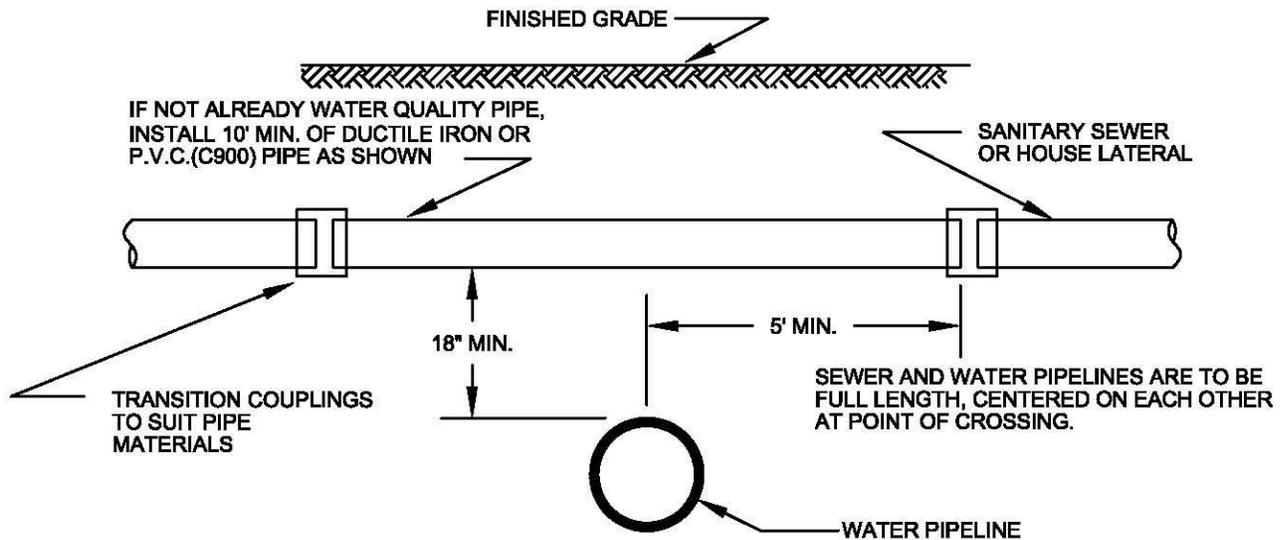
## FIRE HYDRANT PROTECTION

REVISED BY:	B.S.	JHG		
REVISED DATE:	11/2000	1/2009		

DWG. NO.	W-06F	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
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**WATER PIPELINE CROSSING ABOVE SEWER OR LATERAL**



**WATER PIPELINE CROSSING BELOW SEWER OR LATERAL**

**NOTES:**

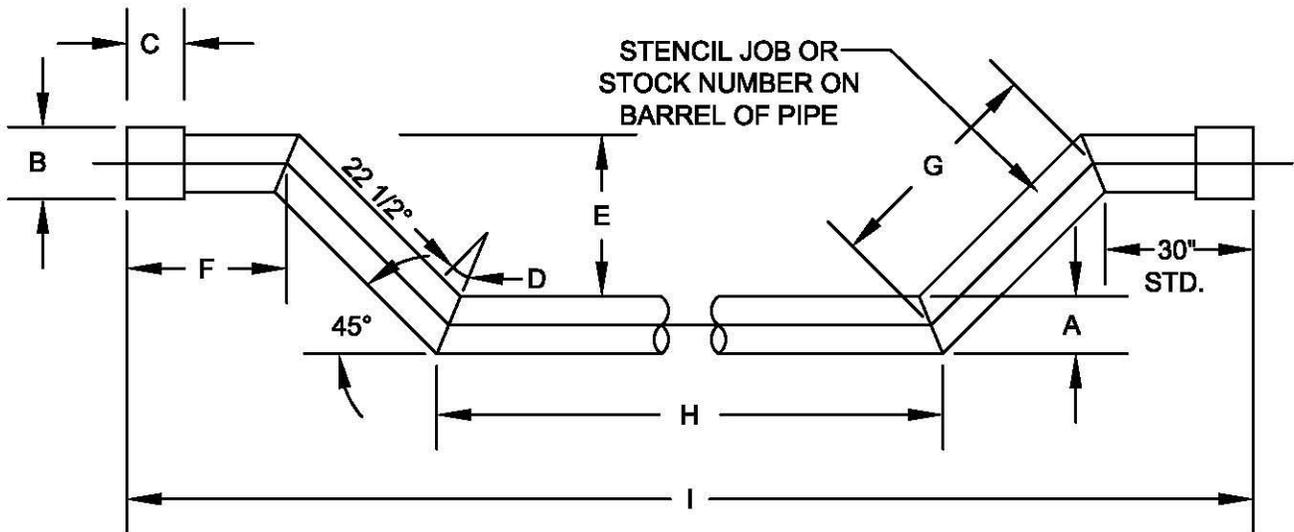
1. IF 18" VERTICAL SEPARATION BETWEEN WATER & SANITARY SEWER IS NOT POSSIBLE, LESS THAN 18" BUT NOT LESS THAN 6" SEPARATION IS ACCEPTABLE ONLY IF THE SANITARY SEWER IS DUCTILE IRON OR PVC (C900) PIPE AND ITS JOINTS ARE AT LEAST 5' FROM THE WATER LINE.
2. WHERE EXISTING CONDITIONS PRECLUDE CONFORMANCE TO THESE STANDARDS, INSTALLATION MUST BE APPROVED BY THE DEPARTMENT OF PUBLIC UTILITIES.

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**WATER PIPELINE CROSSING  
SANITARY SEWER /LATERAL**

REVISED BY:	B.S.	JHG		
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DWG. NO.	W-07A	SCALE	NONE	DATE
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SEAMLESS OR WELDED STEEL PIPE AND FABRICATION TO BE IN ACCORDANCE WITH AWWA STANDARD C-200.

SEE FIGURE 29 FOR TABLE OF PIPE DIAMETERS.  
STANDARD TEST PRESSURE 125 PSIG.

INTERIOR AND EXTERIOR TO BE LIQUID EPOXY PRIMER AND FINISH. TOTAL SYSTEM THICKNESS 14 TO 24 MILS, IN ACCORDANCE WITH AWWA STANDARD C-210. INTERIOR COATING MUST BE APPROVED BY VIRGINIA DEPARTMENT OF HEALTH FOR CONTACT WITH POTABLE WATER.

WHEN A COPY OF THIS SHEET IS TO BE USED FOR PRICING OR ORDERING FILL IN THE FOLLOWING DATA:

- A. O.D. OF STEEL PIPE \_\_\_\_\_
- B. O.D. OF BUILT-UP ENDS \_\_\_\_\_
- C. LENGTH OF BUILT-UP ENDS \_\_\_\_\_ 12"
- D. ANGLE OF MITER \_\_\_\_\_ 22 1/2°
- E. DEPTH OF DROP OR OFFSET \_\_\_\_\_
- F. SUB-LENGTH \_\_\_\_\_
- G. SUB-LENGTH \_\_\_\_\_
- H. SUB-LENGTH \_\_\_\_\_
- I. TOTAL LENGTH \_\_\_\_\_ (TOLERANCE ±2")
- J. JOB OR STOCK NO. \_\_\_\_\_

STANDARD "F" DIMENSION			
STD. PIPE O.D.	"F"	STD. PIPE O.D.	"F"
6.625"	31.37"	16.00"	33.31"
8.625"	31.79"	18.00"	33.73"
10.75"	32.23"	20.00"	34.14"
12.75"	32.64"	24.00"	34.97"
14.00"	32.90"		

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**STEEL PIPE U-BEND**

DWG. NO.	W-08A	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

REVISED BY:	B.S.	JHG		
REVISED DATE:	4/18/00	1/2009		

**FIGURE NO. 28**

ALL DIMENSIONS IN INCHES

NOM. DIA.	D.I. PIPE O.D.	C.I. PIPE O.D.		STEEL PIPE		
		CL. A&B	CL.C&D	O.D.	WALL	LB/FT
6	6.90	6.90-7.10	7.10	6.625	0.280	18.97
8	9.05	9.05	9.30	8.625	0.322	28.55
10	11.10	11.10	11.40	10.750	0.365	40.48
12	13.20	13.20	13.50	12.750	0.375	49.56
14	15.30	15.30	15.65	14.000	0.375	54.57
16	17.40	17.40	17.80	16.000	0.375	62.58
18	19.50	19.50	19.92	18.000	0.375	70.59
20	21.60	21.60	22.06	20.000	0.375	78.60
24	25.80	25.80	26.32	24.000	0.375	94.62

IF THE EXISTING PIPELINE IS THE OLDER 6" CAST IRON CLASS B OR CLASS C OR D IN THE LARGER CAST IRON SIZES, ORDER STEEL PIPE ENDS BUILT-UP TO DUCTILE IRON PIPE O.D. AND SPECIFY TRANSITION COUPLINGS IN LIEU OF STANDARD SLEEVES.

RETAINER GLANDS SHALL NOT BE USED ON CAST IRON PIPE.

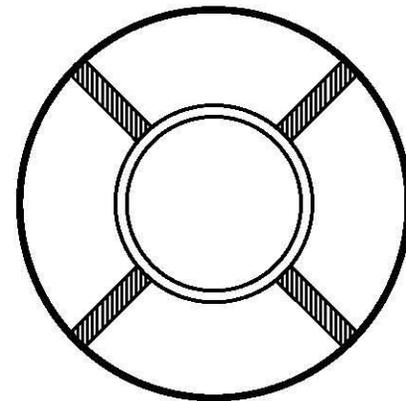
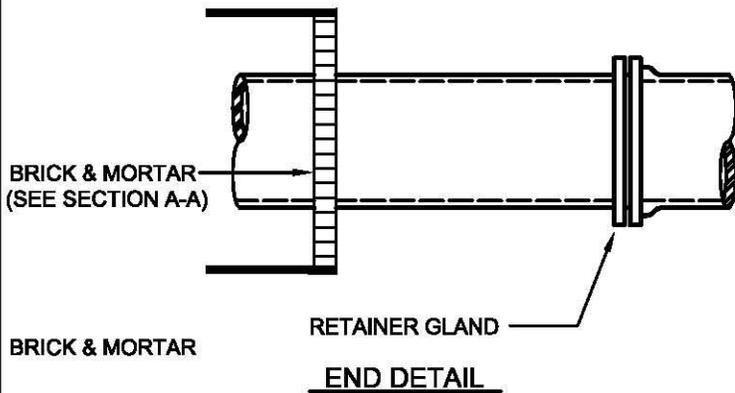
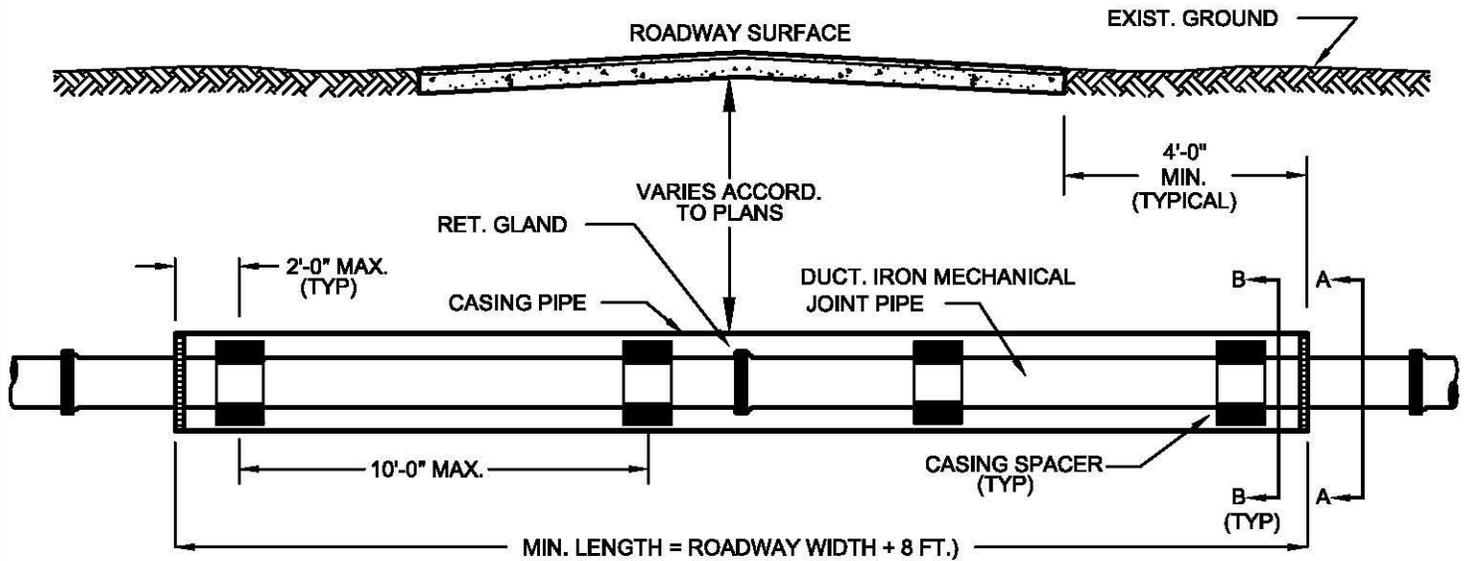
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NEWPORT NEWS, VIRGINIA

**STEEL PIPE  
U-BEND**

REVISED BY:	BWS	JHG			DWG. NO.	W-08A-1	SCALE	NONE	DATE
REVISED DATE:	4/20/00	1/2009			DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
					PRINT FILE NO.	N-1809	CKD. BY	F.B.	

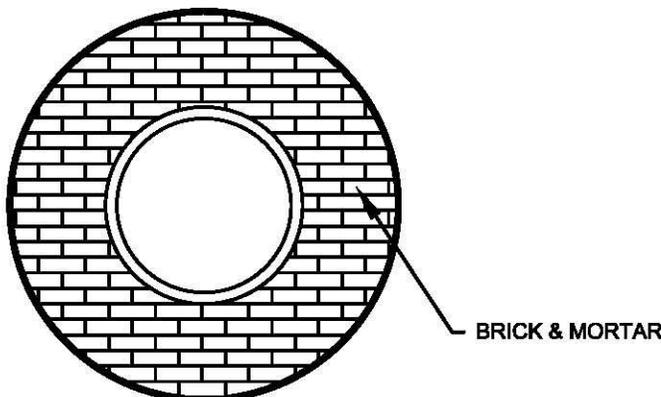
**FIGURE NO. 29**

STEEL CASING PIPE SELECTION CHART					
D. I. PIPE SIZE	4"	6"	8"	12"	16"
NORMAL STEEL PIPE CASING (O.D.)	12"	18"	18"	24"	30"
SEE SECTION MS 13.2 FOR MINIMUM STEEL CASING PIPE WALL THICKNESS					



SPACERS OF ULTRA HIGH MOLECULAR WEIGHT POLYMER RUNNERS & STAINLESS STEEL SHELL (SEE MATERIAL SPEC. SECTION 13).

A MINIMUM OF TWO CASING SPACERS REQUIRED PER FULL LENGTH OF PIPE WITHIN CASING.



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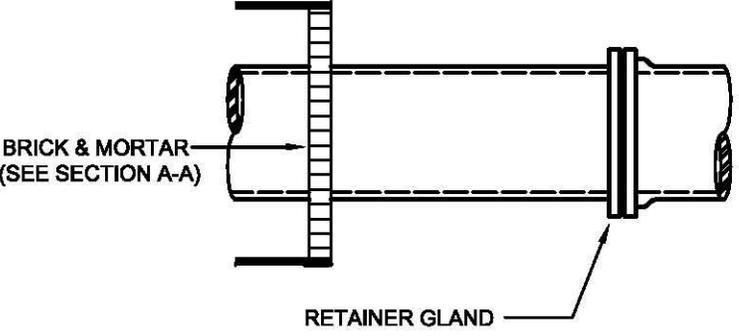
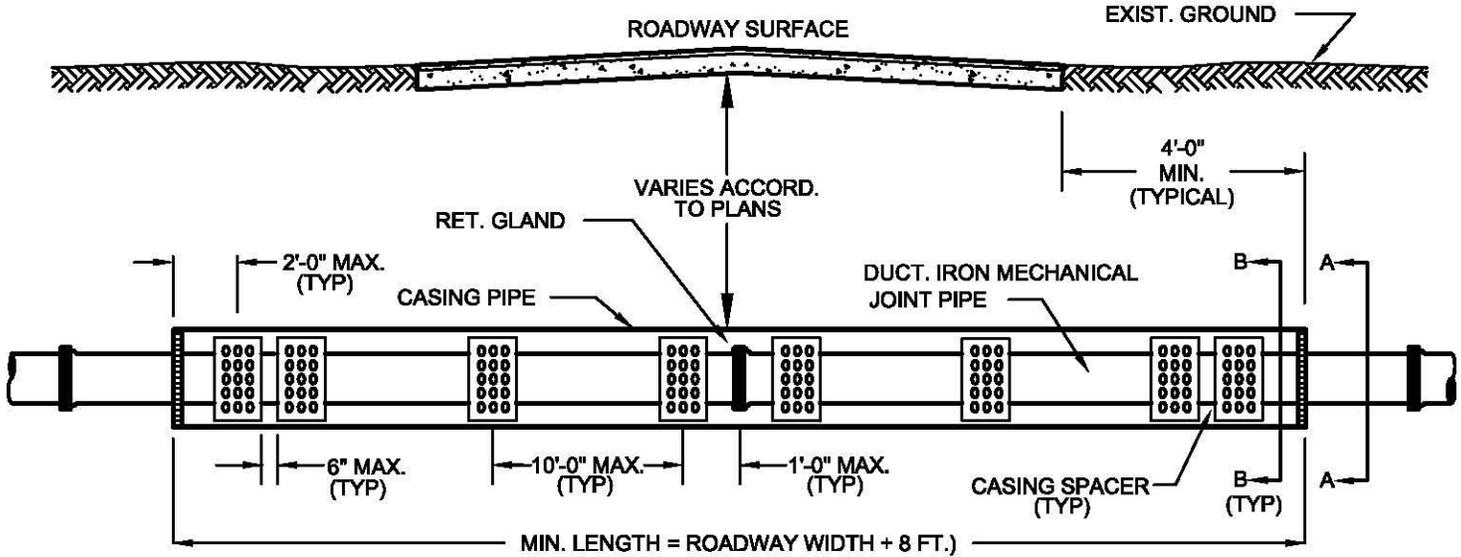
**TYPICAL CASING  
INSTALLATION WITH  
CASCADE SPACERS**

REVISED BY:	B.S.	B.S.	JHG	
REVISED DATE:	4/2000	11/2000	1/2009	

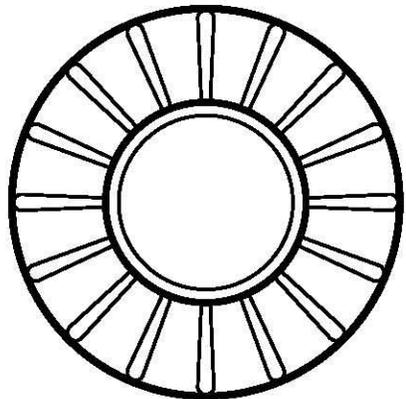
DWG. NO.	W-09A	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

FIGURE NO. 30

STEEL CASING PIPE SELECTION CHART					
D. I. PIPE SIZE	4"	6"	8"	12"	16"
NORMAL STEEL PIPE CASING (O.D.)	12"	18"	18"	24"	30"
SEE SECTION MS 13.2 FOR MINIMUM STEEL CASING PIPE WALL THICKNESS					

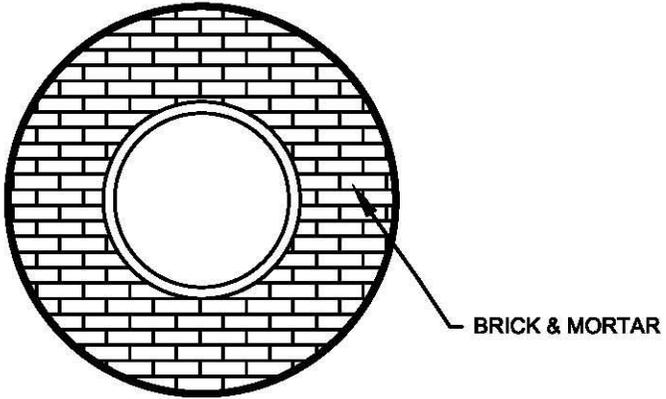


**END DETAIL**



**SECTION B-B  
(RACI SPACER)**

SPACERS OF HIGH-DENSITY POLYETHYLENE WITH NUMBER OF PROJECTIONS EQUAL TO OR GREATER THAN NOMINAL DIAMETER OF WATER MAIN  
 A MINIMUM OF THREE SPACERS REQUIRED PER LENGTH OF PIPE, WITH TWO SPACERS AT EACH END OF CASING.  
 SEE MATERIAL SPECIFICATION SECTION 13



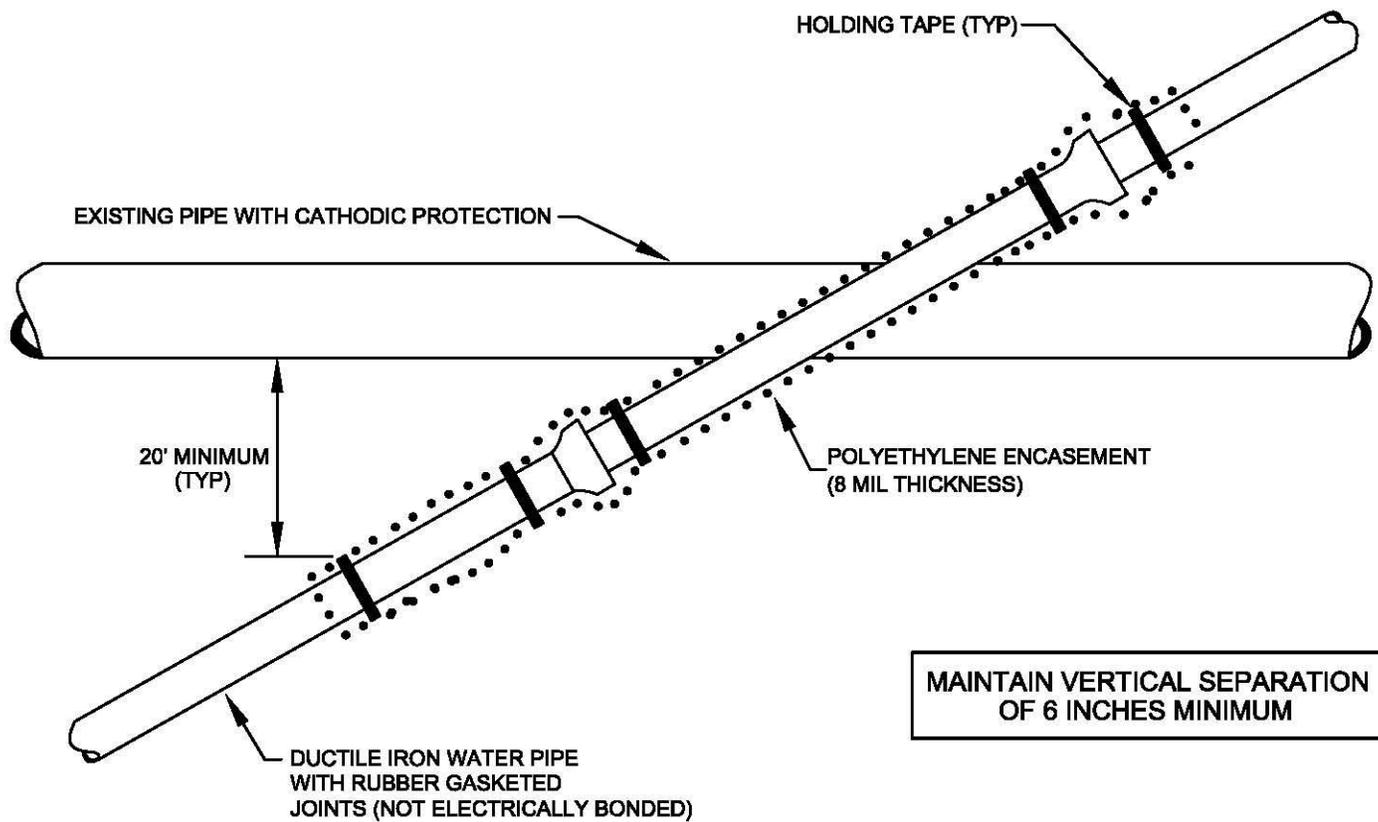
**SECTION A-A**

CITY OF NEWPORT NEWS DEPARTMENT OF PUBLIC UTILITIES NEWPORT NEWS, VIRGINIA			
<b>TYPICAL CASING INSTALLATION WITH RACI SPACERS</b>			

REVISED BY:				
REVISED DATE:				

DWG. NO.	W-09A-01	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	JHG	1/14/2009
PRINT FILE NO.	N-1809	CKD. BY		

**FIGURE NO. 31**



**MAINTAIN VERTICAL SEPARATION  
OF 6 INCHES MINIMUM**

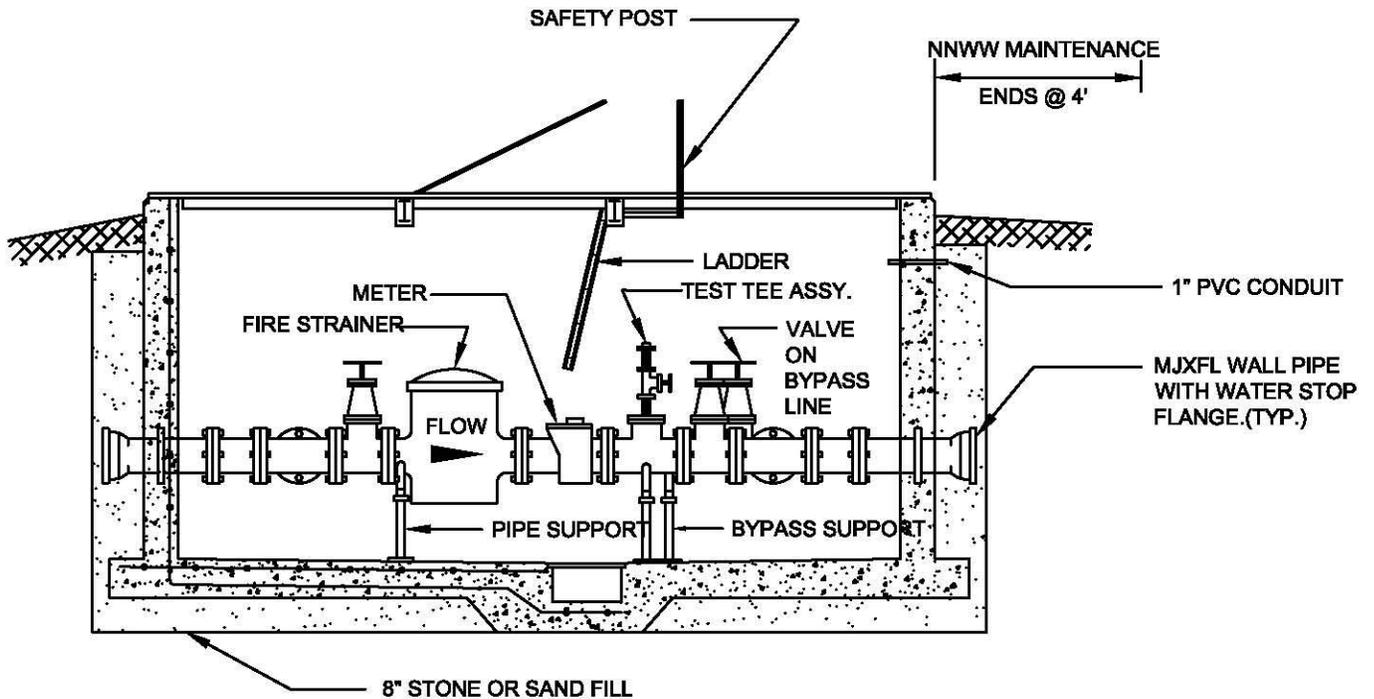
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**CROSSING CATHODICALLY  
PROTECTED PIPELINE**

REVISED BY:				
REVISED DATE:				

DWG. NO.	W-10A	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	JHG	1/14/2009
PRINT FILE NO.	N-1809	CKD. BY		

**FIGURE NO. 32**



TYPICAL INSTALLATION - NON-TRAFFIC VAULT

**NOTE:**

FOR DETAILED CONSTRUCTION SEE THE FOLLOWING DRAWINGS: N-8252, N-8252A, N-8252B, N-8253 AND NOTES ON FIGURE 34 (DWG: W-11A-1)

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**NON-TRAFFIC VAULT  
3" THRU 10" TURBINE METER  
ASSEMBLIES**

REVISED BY:	B.S.	JHG		
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DWG. NO.	W-11A	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

**FIGURE NO. 33**

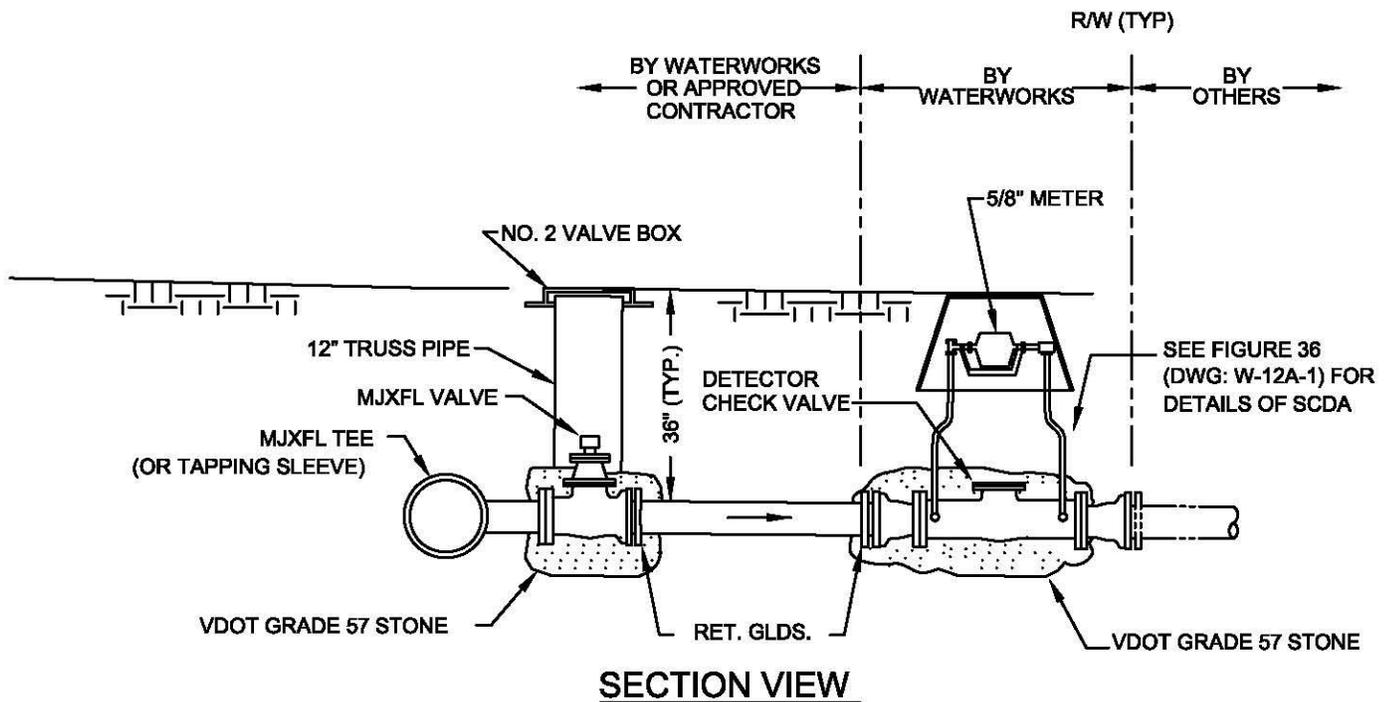
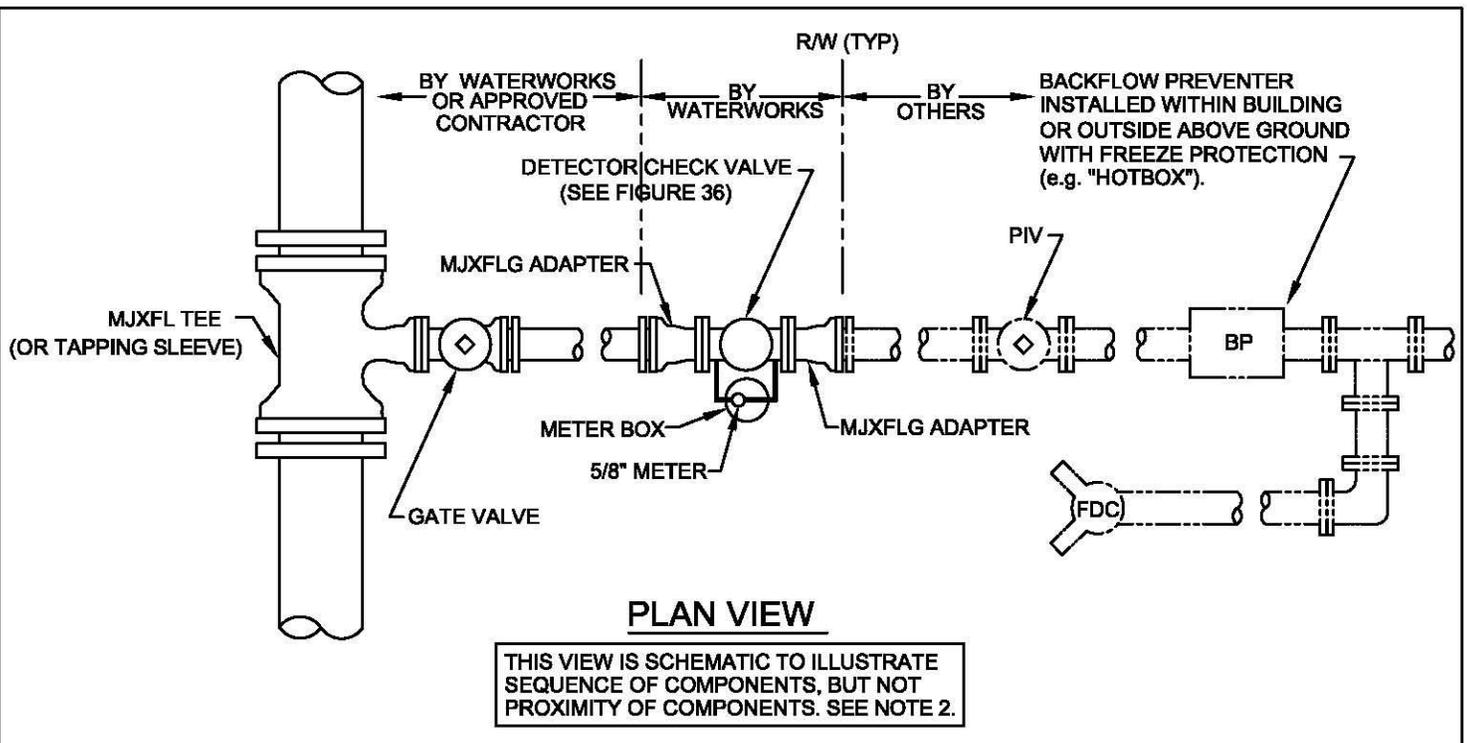
## METER VAULT - GENERAL NOTES

1. WATER STOP SHALL BE INSTALLED AT ALL CONSTRUCTION JOINTS AND SHALL BE TYPE PVC 3/16"X6" AT 0.90 LBS./FT. ALL JOINTS ARE TO BE WATER TIGHT.
2. COVER ASSEMBLY SHALL BE REMOVABLE BY MEANS OF LIFTING EYE BOLTS PROVIDED. EYE BOLTS SHALL BE STORED INSIDE OF VAULT AND ACCESSIBLE FROM LADDER.
3. ALL STEEL SHALL BE ASTM A-36. ALL 1/4" THICK STEEL TREAD PLATE SHALL BE DIAMOND PATTERN.
4. ALL CONCRETE WALLS SHALL BE 8" THICK.
5. REINFORCING BARS SHALL BE GRADE 40 AND INSTALLED AS SHOWN ON DWG. N-8252.
6. ALL RESTRAINING RODS AND FASTENERS SHALL BE GIVEN TWO COATS OF BITUMINOUS PAINT AFTER ASSEMBLY.
7. VAULT SHALL BE CONSTRUCTED TO DIMENSIONS SHOWN ON THE DETAIL DRAWINGS. NECESSARY SLOTS IN CONCRETE WALLS SHALL BE PROVIDED DURING CASTING.
8. PIPE SUPPORT TO BE PROVIDED AS SHOWN ON DETAIL DRAWING, GRINNELL FIG. 264 OR APPROVED EQUAL.
9. ALL STEEL SURFACES SHALL BE COATED WITH PRIMER: 25P DUPONT HIGH SOLIDS EPOXY MASTIC OR EQUAL. THE FINISH COAT SHALL BE 326 IMRON POLYURETHANE ENAMEL OR EQUAL, COLOR TO BE BATTLESHIP GRAY EXCEPT AS NOTED. THE COATINGS SHALL BE APPLIED PER MANUFACTURER'S RECOMMENDATIONS.
10. ALUMINUM ACCESS LADDER SHALL BE INSTALLED BETWEEN THE ACCESS DOOR OPENING (LATCH SIDE) AND THE FLOOR OF THE METER VAULT AT AN ANGLE OF 10° OFF VERTICAL. THE LADDER SHALL BE FURNISHED WITH SAFETY TREADS SET PARALLEL TO THE VAULT FLOOR.
11. ALL VALVES SHALL BE OF THE RESILIENT SEAT TYPE WITH HANDWHEEL OPERATORS.
12. WALL PIPE SHALL BE SIMILAR TO AMERICAN DUCTILE IRON PIPE TYPE 2-D9000 MEETING ANSI/AWWA C11/A21.10-87 SPECS. INSTALLED WITH WATER STOP FLANGE CENTERED IN THE CONCRETE WALL AND TO DIMENSIONS SHOWN ON DRAWINGS.
13. GROUND SHALL BE SLOPED AWAY FROM VAULT AND POSITIVE DRAINAGE PROVIDED TO PREVENT SURFACE RUNOFF FROM ENTERING VAULT.
14. TREAD PLATE TO BE WELDED TO FRAME AS SHOWN ON DETAIL DRAWINGS.
15. BILCO DOOR SHALL BE CAREFULLY POSITIONED BY THE USE OF 3/8" S.S. BOLTS & NUTS. COUNTERSUNK W/S.S. NUTS WELDED TO THE DOOR FRAME.(TYP.) INSTALLED WITH 15 LB. BUILDING FELT OR GASKET BETWEEN STEEL CHANNEL AND ALUMINUM DOOR.
16. IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROPERLY DISPOSE OF ALL EXCESS EXCAVATED MATERIAL.
17. ALL BELOW GRADE EXTERIOR WALLS SHALL RECIEVE TWO COATS OF THOROSEAL WITH ACRYLIC POLMER BONDING AGENT OR EQUAL.
18. APPROVED SITE PLAN REQUIRED PRIOR TO VAULT CONSTRUCTION.
19. FOR SPECIFIC DETAILS ON VAULT, SEE NNWW PRINT FILE NO. N-8252,N-8252A,N-8252B,N-8253

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### METER VAULT GENERAL NOTES

REVISED BY:	B.S.	JHG			DWG. NO.	W-11A-1	SCALE	NONE	DATE
REVISED DATE:	4/2000	1/2009			DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
					PRINT FILE NO.	N-1809	CKD. BY	F.B.	



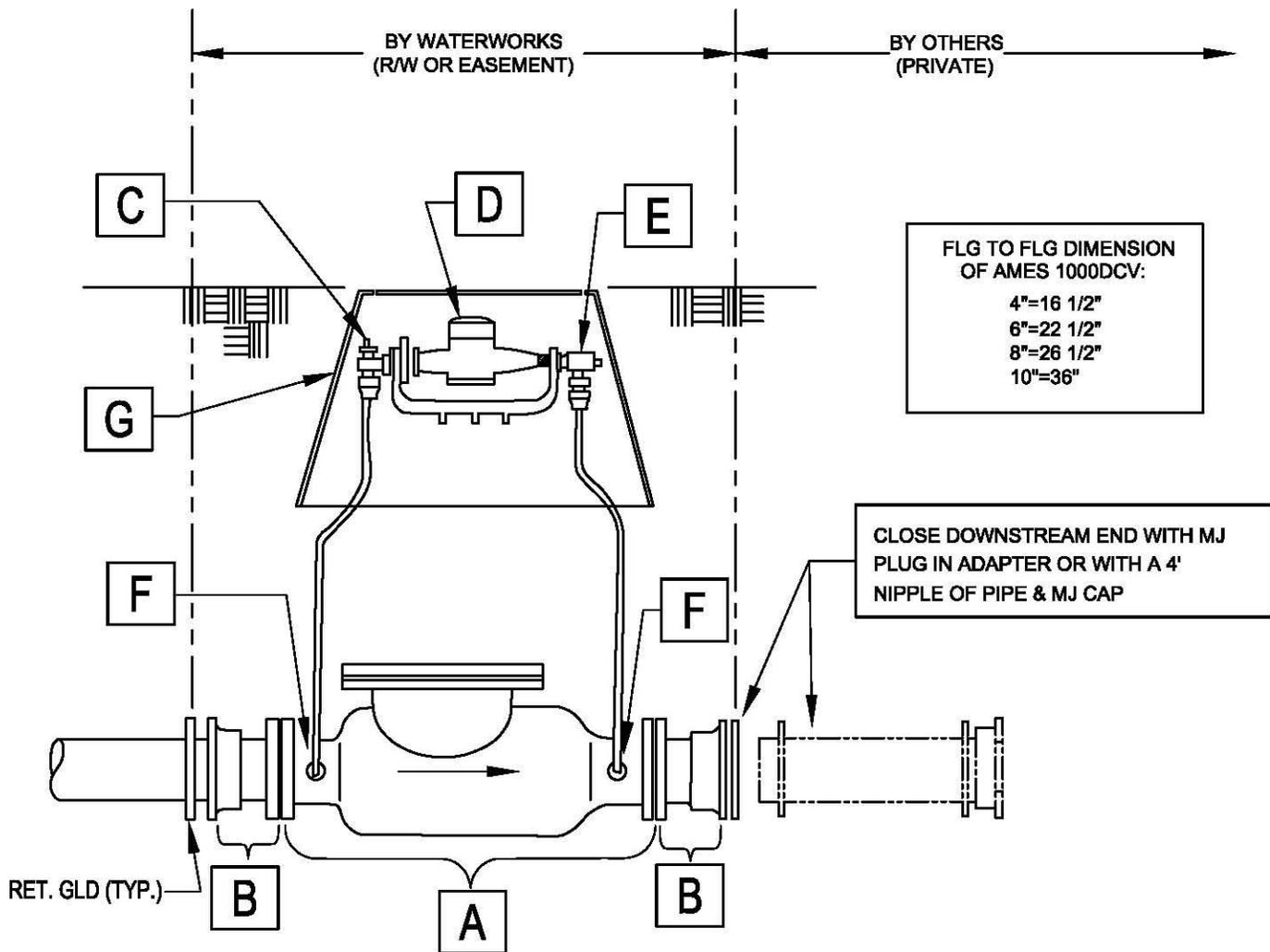
**NOTES:**

1. IT IS THE OWNER'S RESPONSIBILITY TO ENSURE THAT APPROPRIATE BACKFLOW PREVENTER, IN ACCORDANCE WITH VIRGINIA WATERWORKS REGULATIONS AND LOCAL CODES, IS PROVIDED DOWNSTREAM OF THE SCDA.
2. WHERE REQUIRED BY CODE, POST INDICATOR VALVE (PIV) AND FIRE DEPARTMENT CONNECTION (FDC) ARE THE RESPONSIBILITY OF THE OWNER. FDC MUST BE CONNECTED DOWNSTREAM OF BACKFLOW PREVENTER.
3. FOR DEAD END PIPING CONFIGURATIONS, THE SCDA SHALL NOT BE INSTALLED AT THE END OF THE MAIN. A FIRE HYDRANT OR BLOW-OFF ASSEMBLY MUST BE INSTALLED AT THE END OF THE MAIN.

CITY OF NEWPORT NEWS DEPARTMENT OF PUBLIC UTILITIES NEWPORT NEWS, VIRGINIA			
<b>SINGLE CHECK DETECTOR          ASSEMBLY FOR          FIRE SUPPRESSION SYSTEMS</b>			
DWG. NO.	W-12A	SCALE NONE	DATE
DWG. FILE NO.	R-926	DWN. BY T.G.	12/23/03
PRINT FILE NO.	N-1809	CKD. BY W.F.	

REVISED BY:	T. GRAY	JHG	
REVISED DATE:	6-3-2004	1/2009	

**FIGURE NO. 35**



FLG TO FLG DIMENSION  
OF AMES 1000DCV:

4"=16 1/2"  
6"=22 1/2"  
8"=26 1/2"  
10"=36"

CLOSE DOWNSTREAM END WITH MJ  
PLUG IN ADAPTER OR WITH A 4'  
NIPPLE OF PIPE & MJ CAP

### NOTE

INSTALLATION OF A 2-INCH OR SMALLER FIRE  
SUPPRESSION SYSTEM SHALL BE IN ACCORDANCE  
WITH THE REQUIREMENTS FOR A DOMESTIC  
SERVICE INSTALLATION OF THE SAME SIZE.  
SEE THE APPLICABLE FIGURES (FIGURES 45 - 48  
FOR SERVICE LINE INSTALLATION DETAILS AND  
FIGURES 37 - 39 FOR METER BOX INFORMATION).

- A** CHECK VALVE-AMES 1000DCV
- B** ADAPTER-MJXFLG
- C** ANGLE VALVE-FOR 5/8" METER
- D** 5/8" METER-WITH YOKE
- E** ANGLE CHECK VALVE-WW STOCK NO. 025024
- F** BUSHING-1"X3/4" (FOR 4" DCV)  
1 1/2"X3/4" (FOR 6" DCV)  
2"X3/4" (FOR 8" OR 10" DCV)
- G** METER BOX & LID-NO. 2 METER BOX

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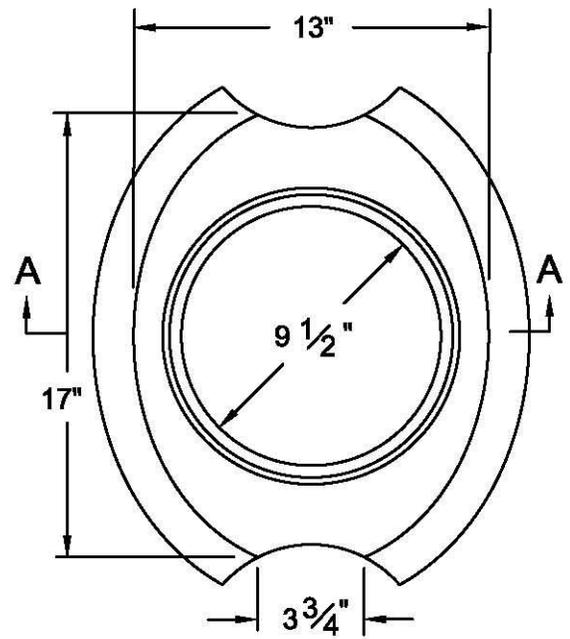
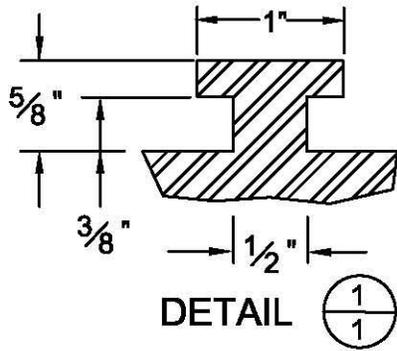
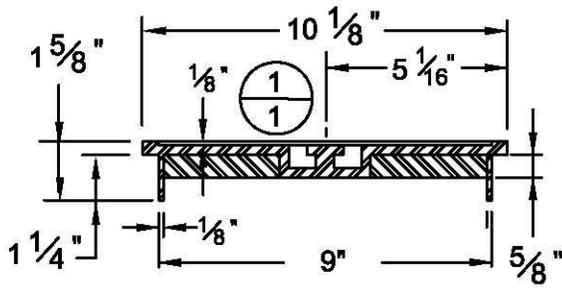
## SINGLE CHECK DETECTOR ASSEMBLY DETAIL

REVISED BY:

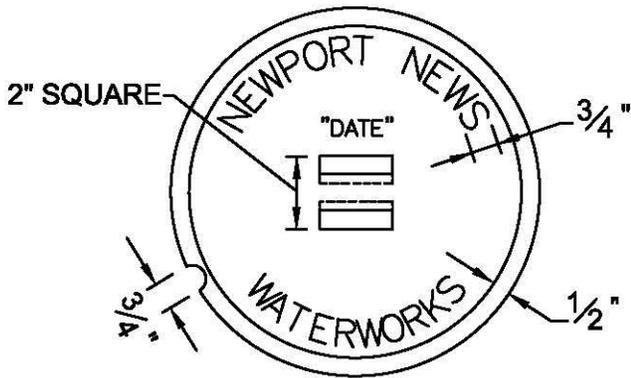
REVISED DATE:

DWG. NO.	W-12A-1	SCALE	NONE	DATE
DWG. FILE NO.	R-928	DWN. BY	JHG	1/14/2009
PRINT FILE NO.	N-1809	CKD. BY		

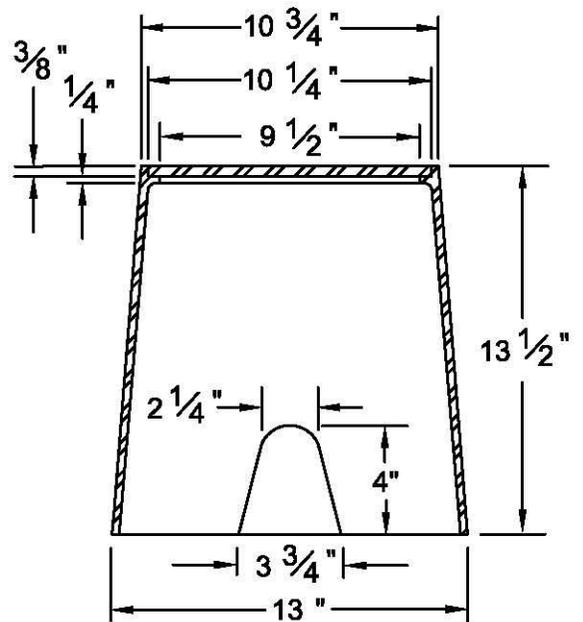
FIGURE NO. 36



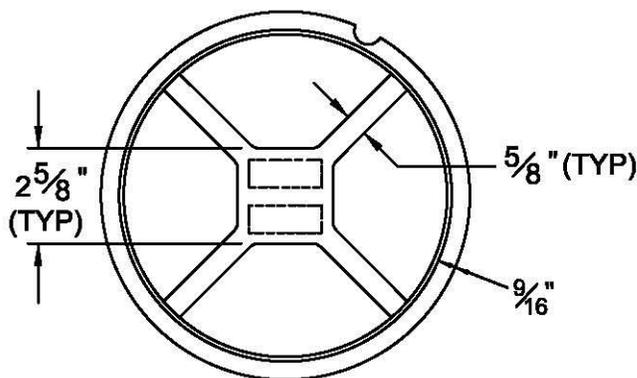
BOX TOP VIEW



LID TOP VIEW



SECTION - AA



LID BOTTOM VIEW

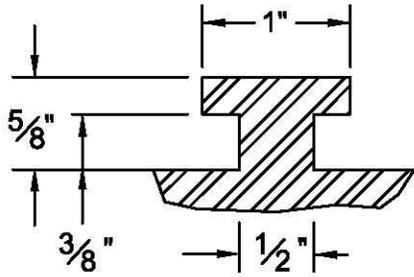
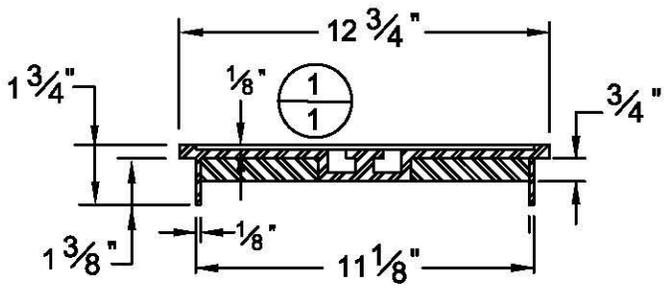
NOTES:

1. YEAR OF MANUFACTURE SHALL BE CAST ON TOP OF LID IN LOCATION MARKED "DATE".
2. NAME OF MANUFACTURER SHALL BE CAST ON THE UNDERSIDE OF LID
3. MATERIAL SHALL BE CAST IRON MEETING ASTM A48 CLASS 30.
4. CASTING SHALL BE DIPPED IN ASPHALTIC PAINT

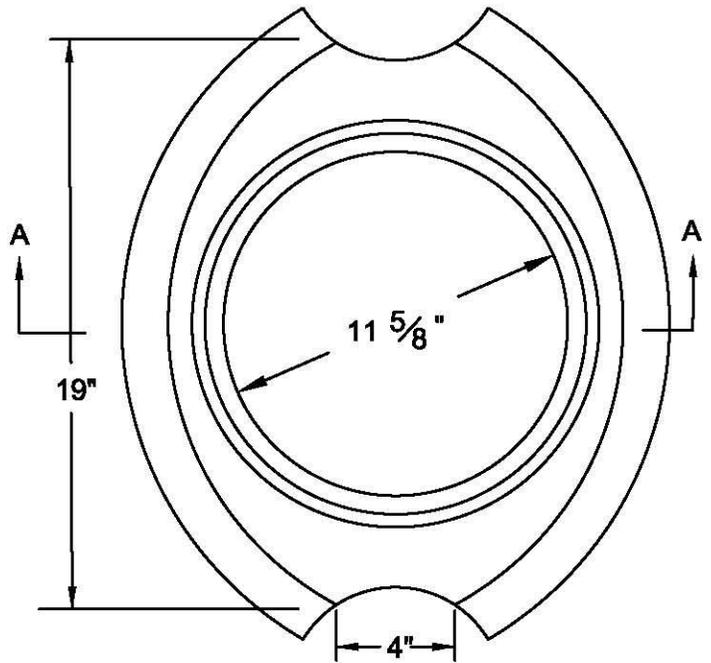
CITY OF NEWPORT NEWS  
DEPARTMENT OF PUBLIC UTILITIES  
NEWPORT NEWS, VIRGINIA

NO. 1 METER BOX & LID  
FOR 5/8" METER

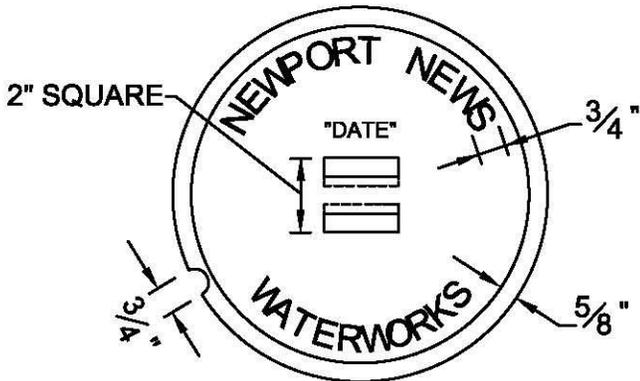
DWG. NO.	W-13A	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	JHG	1/14/2009
PRINT FILE NO.	N-1809	CKD. BY		



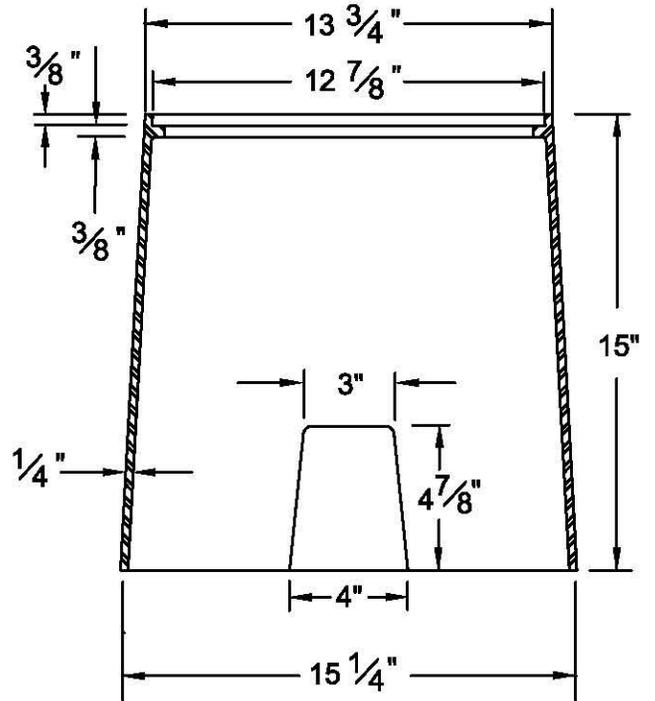
DETAIL 1  
1



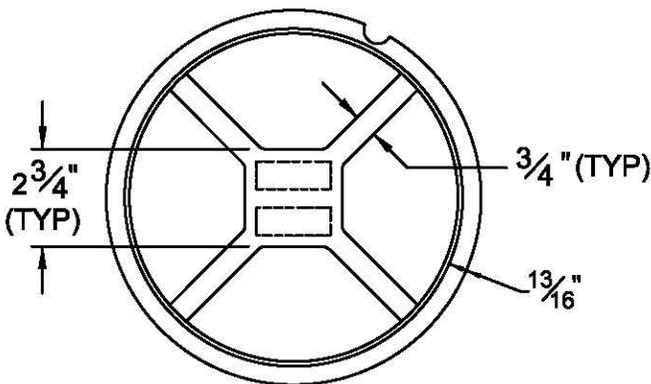
BOX TOP VIEW



LID TOP VIEW



SECTION - AA



LID BOTTOM VIEW

**NOTES:**

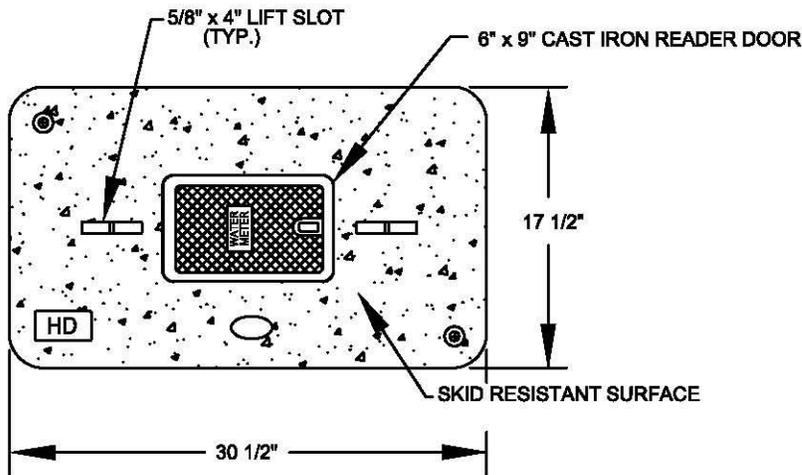
1. YEAR OF MANUFACTURE SHALL BE CAST ON TOP OF LID IN LOCATION MARKED "DATE".
2. NAME OF MANUFACTURER SHALL BE CAST ON THE UNDERSIDE OF LID.
3. MATERIAL SHALL BE CAST IRON MEETING ASTM A-48 CLASS 30S.
4. CASTING TO BE DIPPED IN ASPHALTIC PAINT.

CITY OF NEWPORT NEWS  
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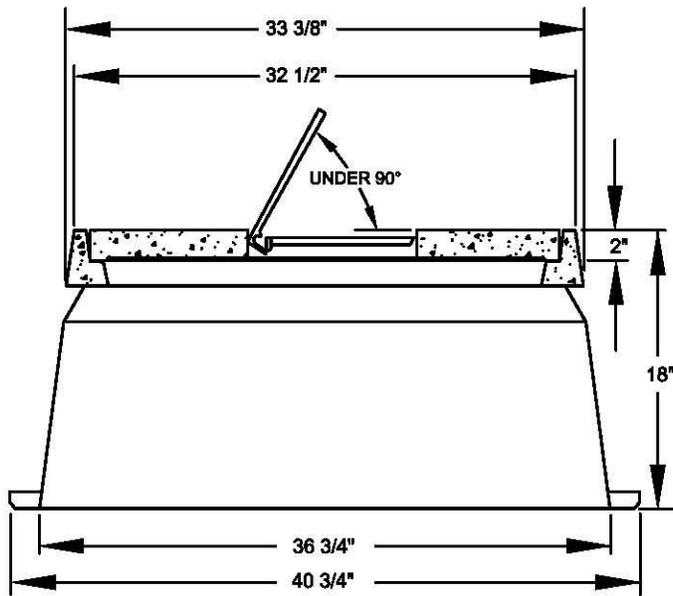
**NO. 2 METER BOX & LID  
FOR 3/4" & 1" METERS**

DWG. NO.	W-13B	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	JHG	1/14/2009
PRINT FILE NO.	N-1809	CKD. BY		

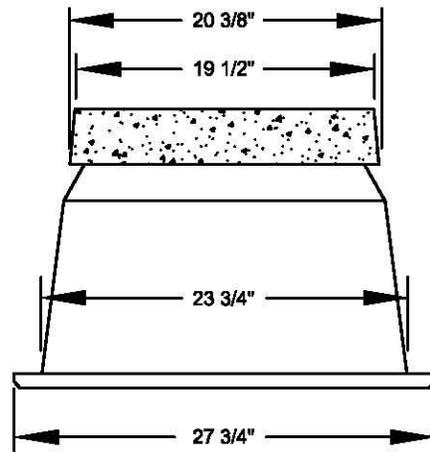
**FIGURE NO. 38**



PLAN VIEW OF LID



SECTION VIEW

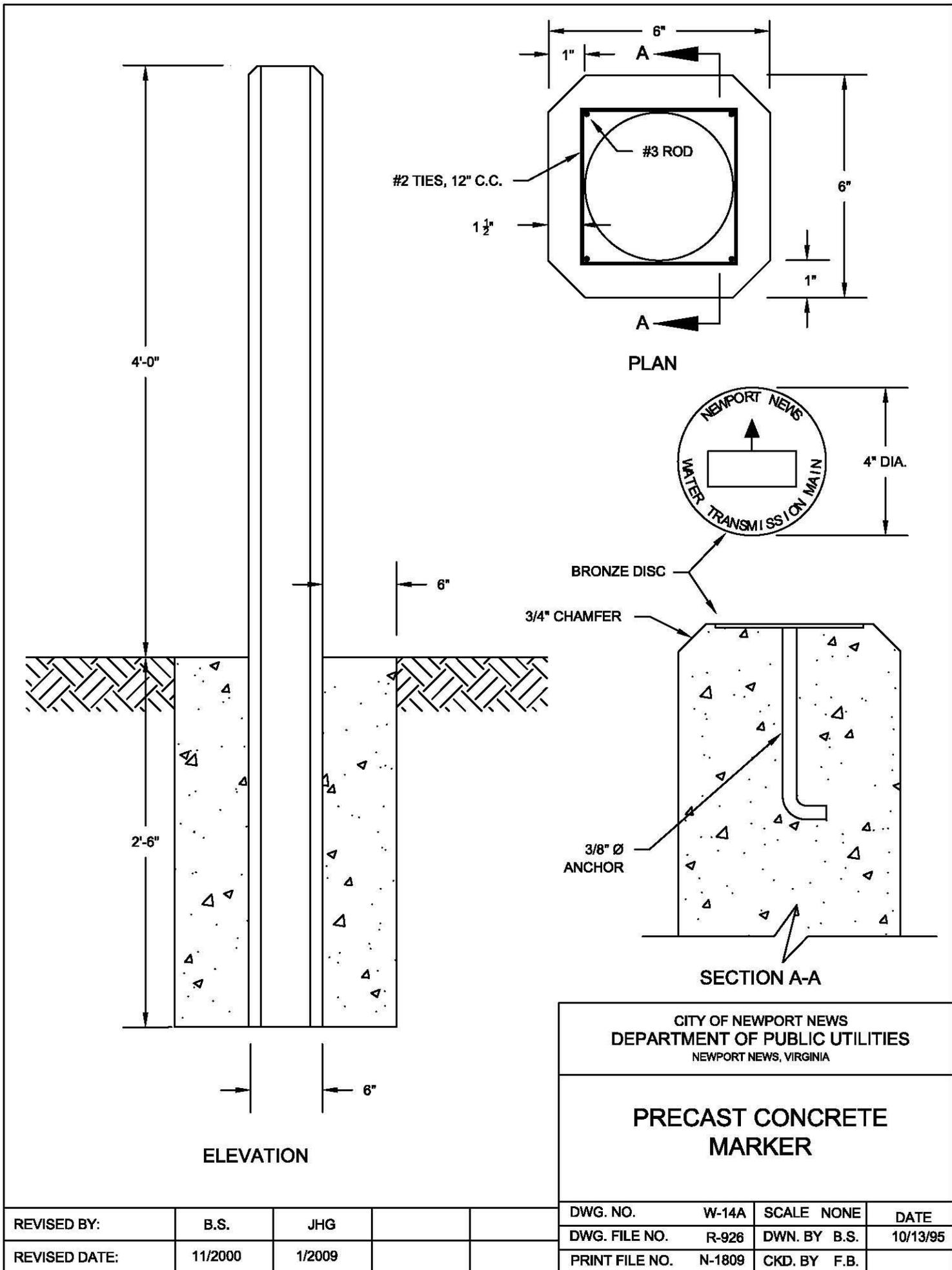


END VIEW

CITY OF NEWPORT NEWS  
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 NEWPORT NEWS, VIRGINIA

**NO. 3 METER BOX & LID  
 FOR 1 1/2" & 2" METERS**

DWG. NO.	W-13C	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	JHG	1/14/2009
PRINT FILE NO.	N-1809	CKD. BY		



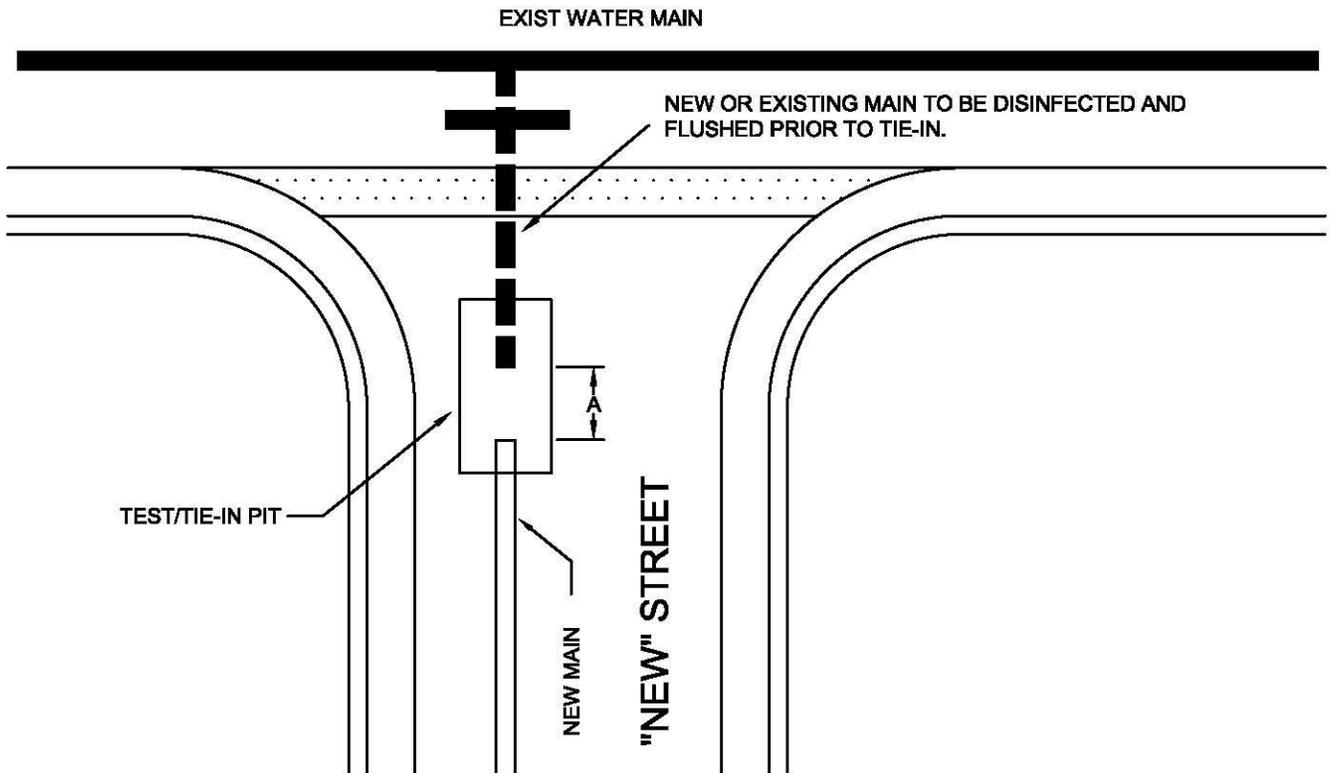
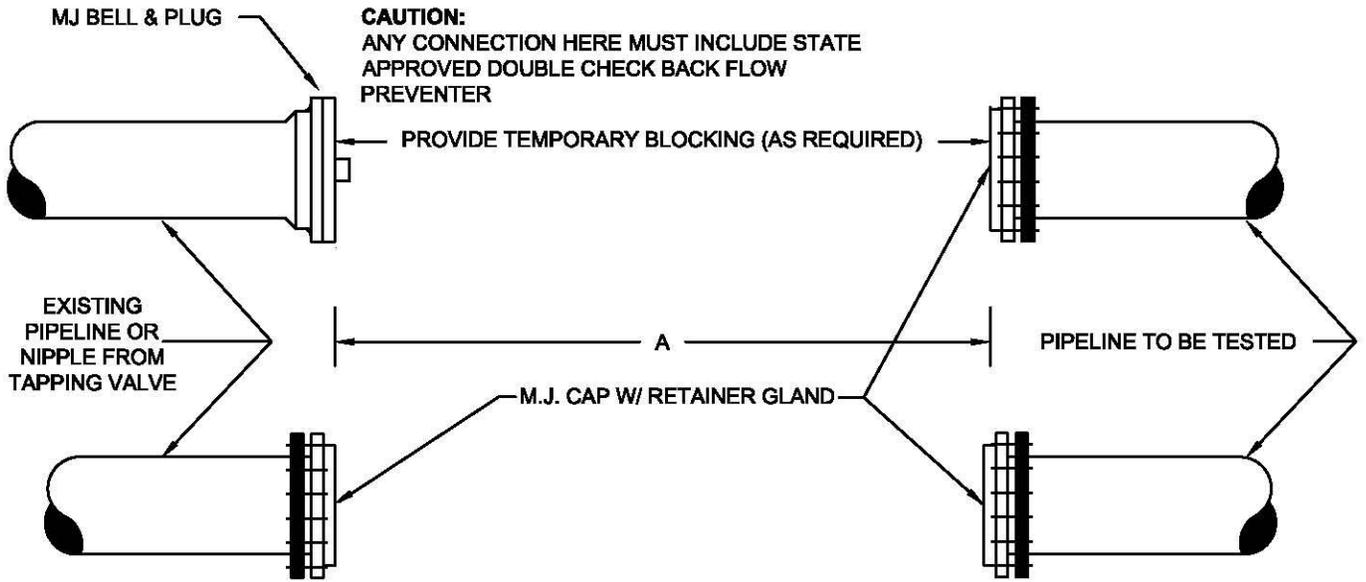
CITY OF NEWPORT NEWS  
 DEPARTMENT OF PUBLIC UTILITIES  
 NEWPORT NEWS, VIRGINIA

**PRECAST CONCRETE  
 MARKER**

REVISED BY:	B.S.	JHG		
REVISED DATE:	11/2000	1/2009		

DWG. NO.	W-14A	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

**FIGURE NO. 40**



<b>'A'</b>
3.5' FOR 8" PIPE AND SMALLER 5.5' FOR 10" AND LARGER

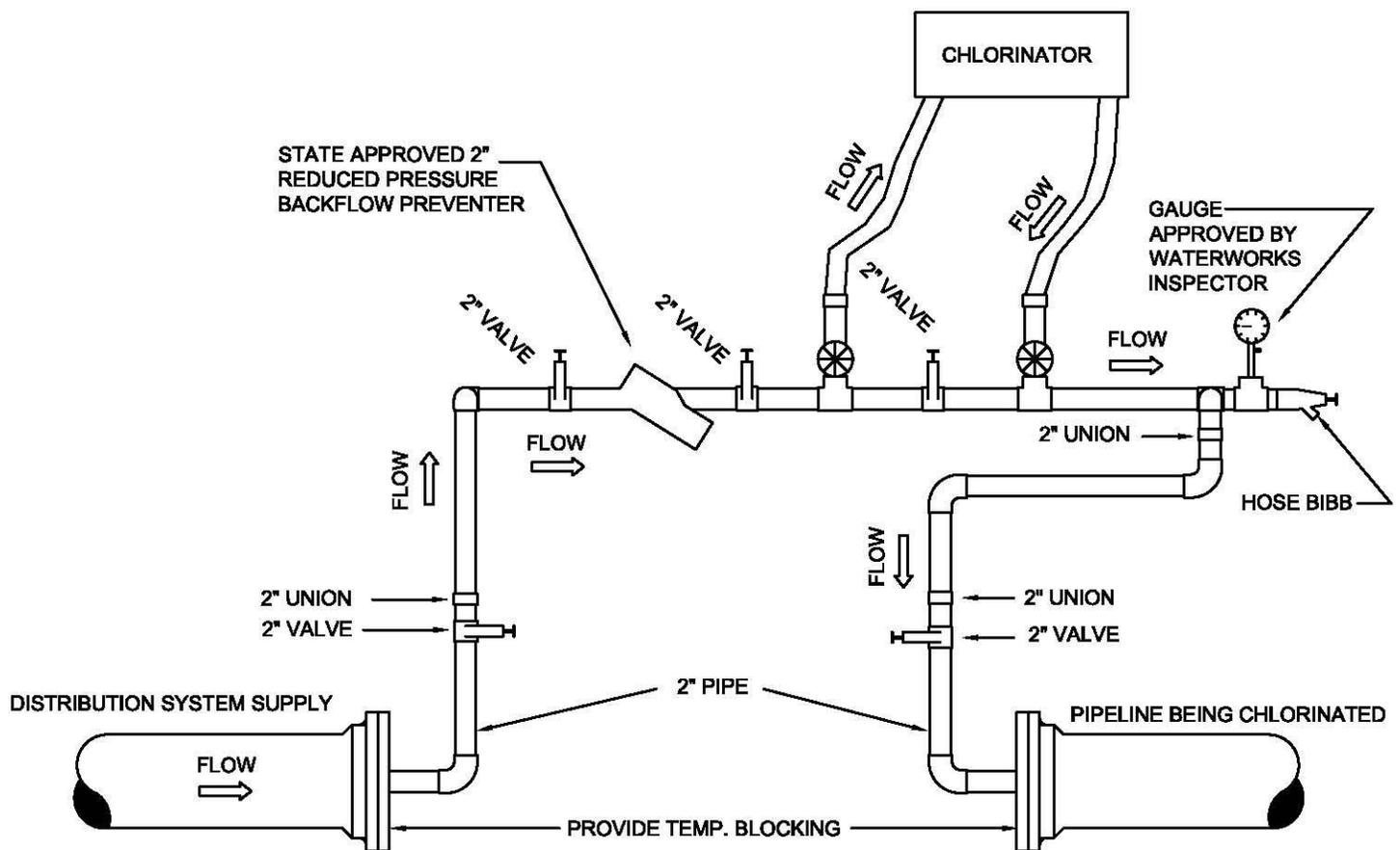
CITY OF NEWPORT NEWS  
DEPARTMENT OF PUBLIC UTILITIES  
NEWPORT NEWS, VIRGINIA

### PIPELINE PREPARATION PRIOR TO TESTING & TIE-IN

REVISED BY:	B.W.S.	B.W.S.	JHG	
REVISED DATE:	1/98	5/00	1/2009	

DWG. NO.	W-15A	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

**FIGURE NO. 41**



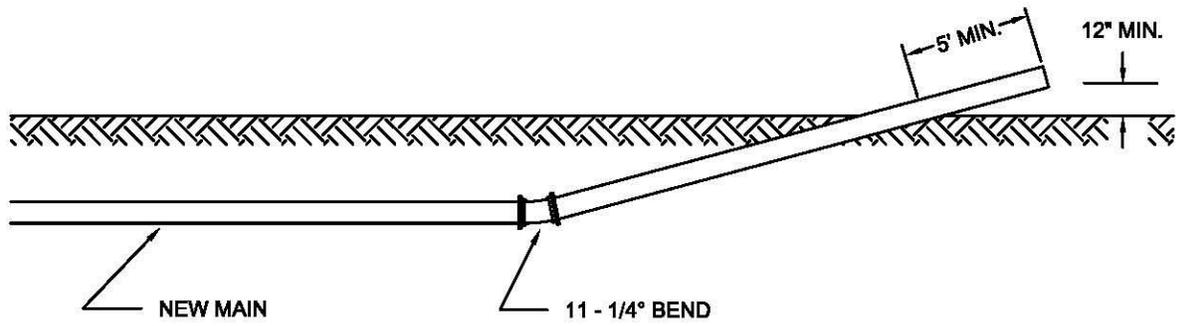
CITY OF NEWPORT NEWS  
 DEPARTMENT OF PUBLIC UTILITIES  
 NEWPORT NEWS, VIRGINIA

**MANIFOLD FOR TEST AND  
 CHLORINATION**

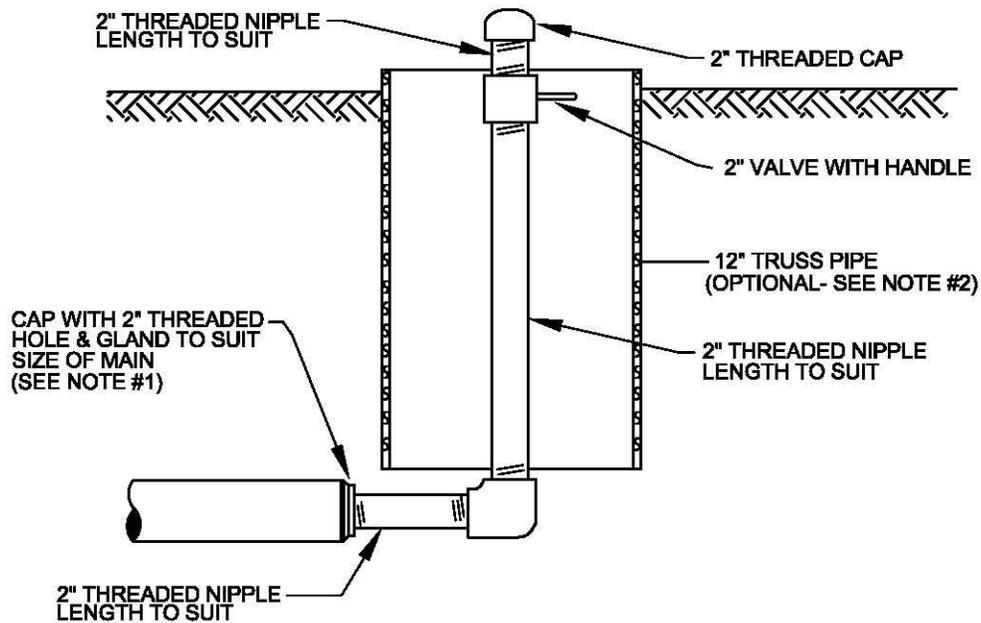
REVISED BY:	B.W.S.	B.W.S.	JHG	
REVISED DATE:	1/98	5/00	1/2009	

DWG. NO.	W-15B	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

**FIGURE NO. 42**



**FULL SIZE PIPE FLUSH**



**SINGLE CHECK DETECTOR ASSEMBLY**

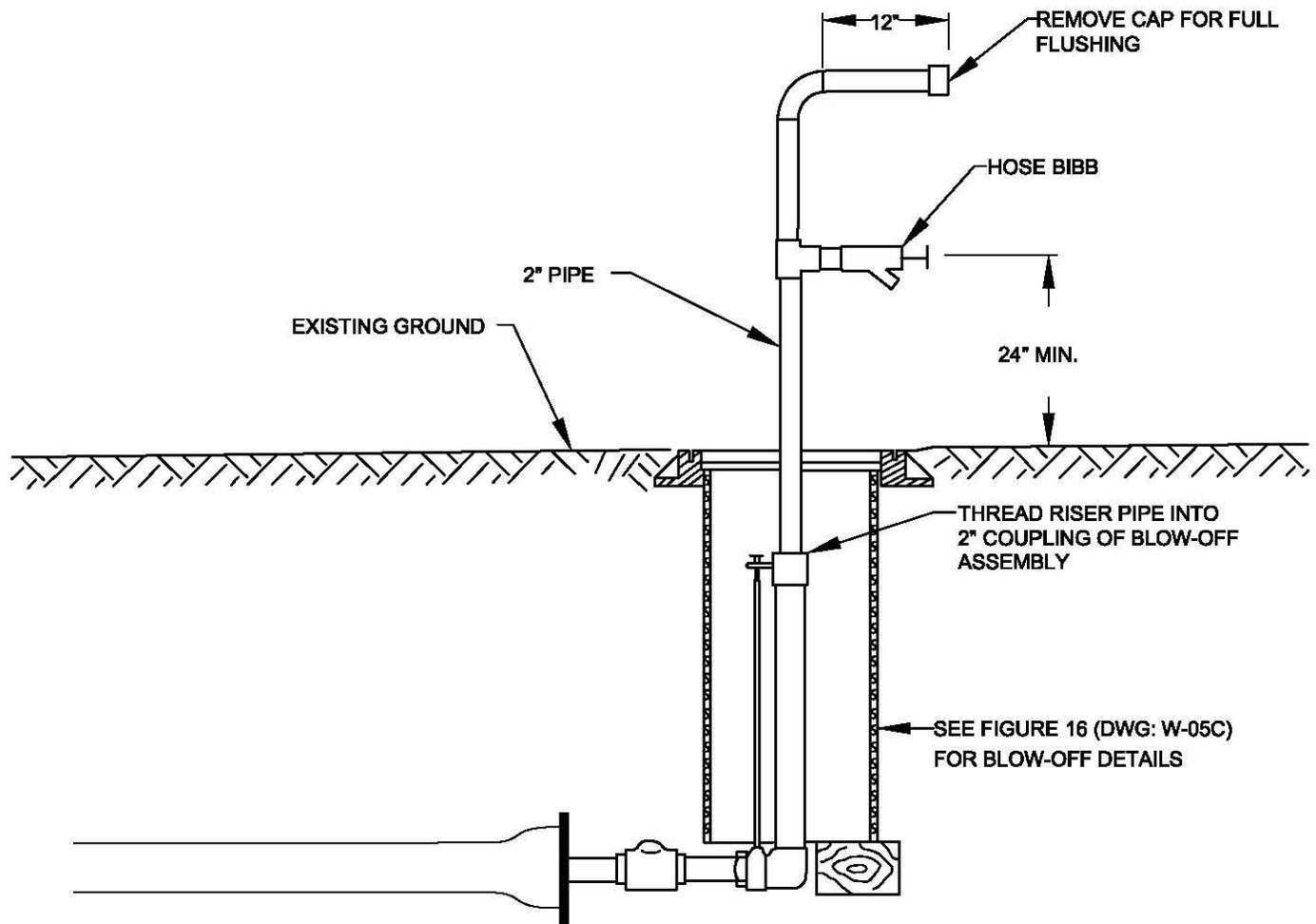
**NOTES:**

1. IF MAIN ENDS WITH A BELL, USE A PLUG WITH 2" THREADED HOLE & GLAND TO SUIT SIZE OF MAIN.
2. IF A TRUSS PIPE IS NOT USED, SOME TYPE OF VERTICAL MARKER NEEDS TO BE USED TO IDENTIFY THE BLOW-OFF LOCATION.

CITY OF NEWPORT NEWS  
DEPARTMENT OF PUBLIC UTILITIES  
NEWPORT NEWS, VIRGINIA

**TEMPORARY BLOW-OFFS**

REVISED BY:	B.S.	JHG			DWG. NO.	W-15C	SCALE	NONE	DATE
REVISED DATE:	5/00	1/2009			DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
					PRINT FILE NO.	N-1809	CKD. BY		



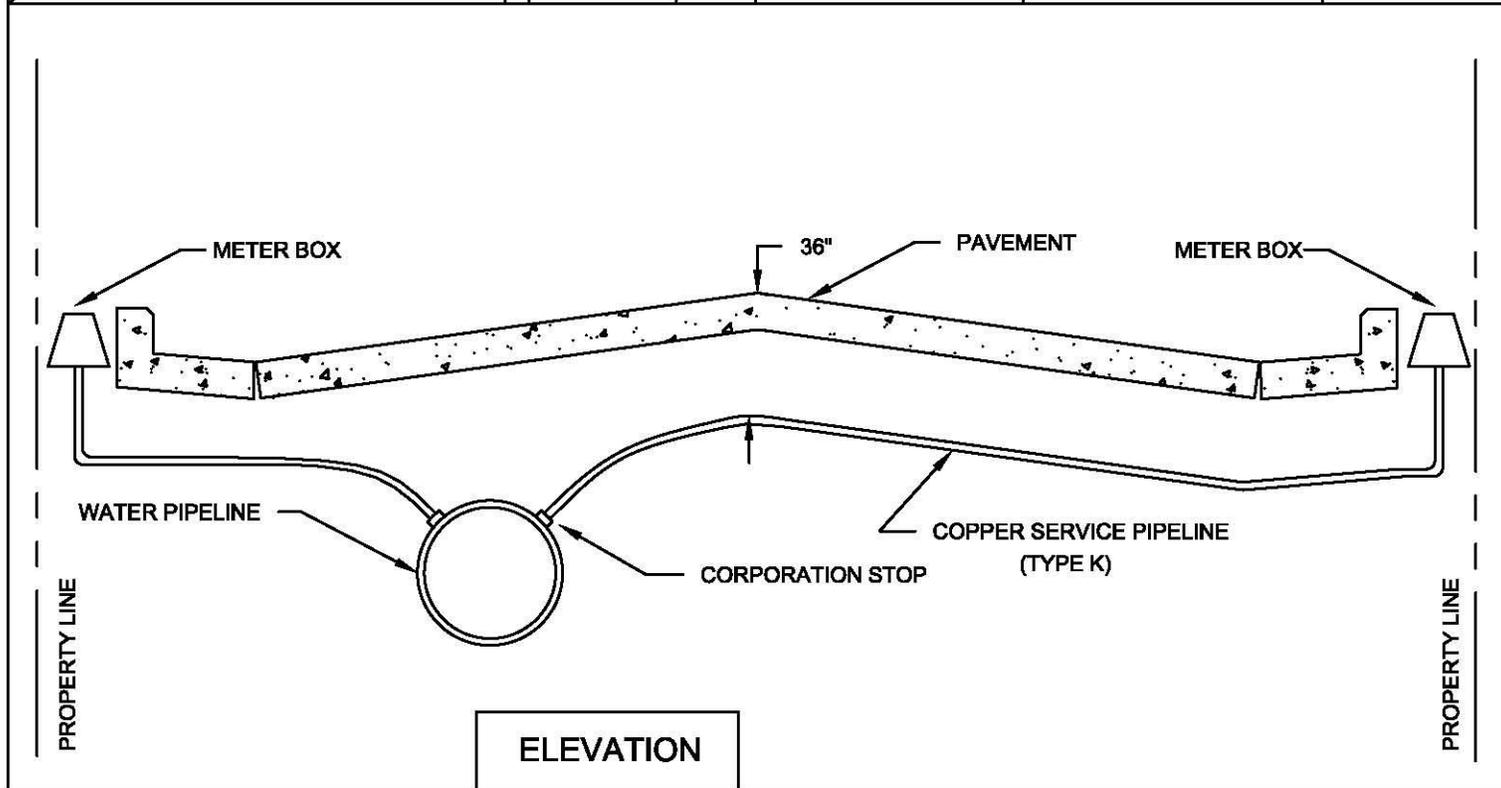
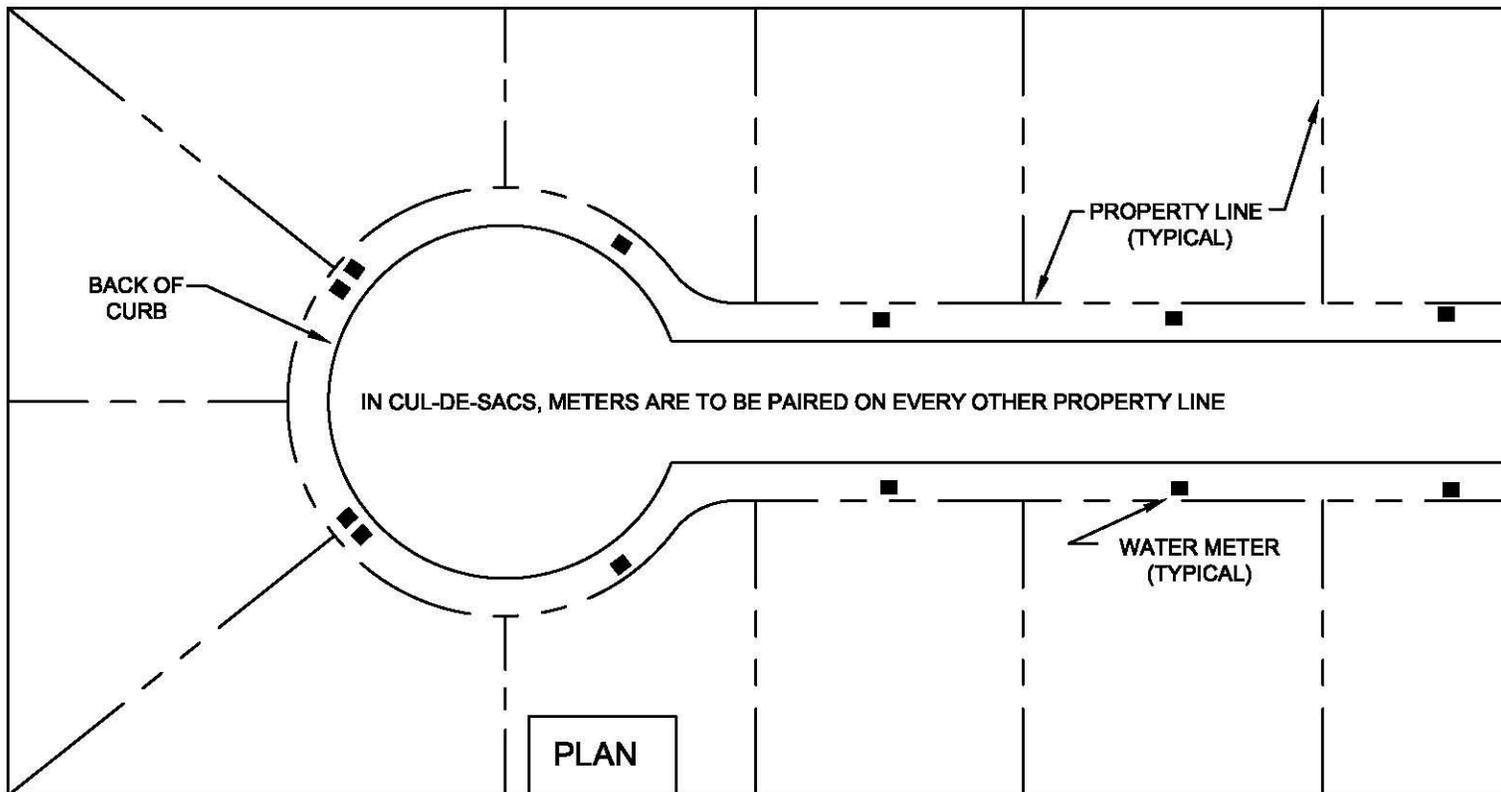
CITY OF NEWPORT NEWS  
 DEPARTMENT OF PUBLIC UTILITIES  
 NEWPORT NEWS, VIRGINIA

**SAMPLING RISER ON  
 STANDARD 2" BLOW-OFF**

REVISED BY:	B.S.	JHG		
REVISED DATE:	5/00	1/2009		

DWG. NO.	W-15D	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

**FIGURE NO. 44**



**NOTE:**

CITY OF HAMPTON UTILITIES POLICY REQUIRES ALL WATER METERS TO BE PLACED AT THE MIDPOINT OF THE FRONTAGE OF ALL LOTS, EXCEPT FOR CUL-DE-SACS.

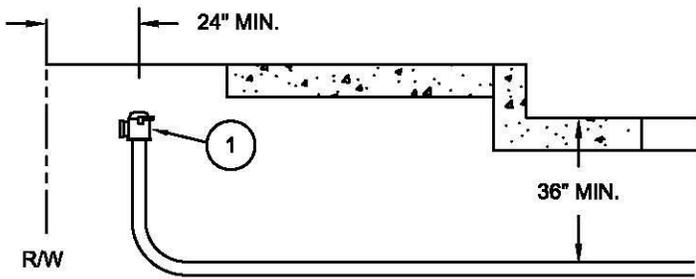
CITY OF NEWPORT NEWS  
DEPARTMENT OF PUBLIC UTILITIES  
NEWPORT NEWS, VIRGINIA

**TYPICAL RESIDENTIAL  
SUBDIVISION  
WATER METER INSTALLATION**

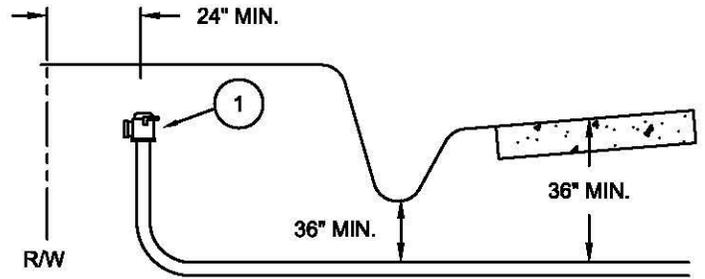
REVISED BY:	B.S.	JHG		
REVISED DATE:	5/00	1/2009		

DWG. NO.	W-16A	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

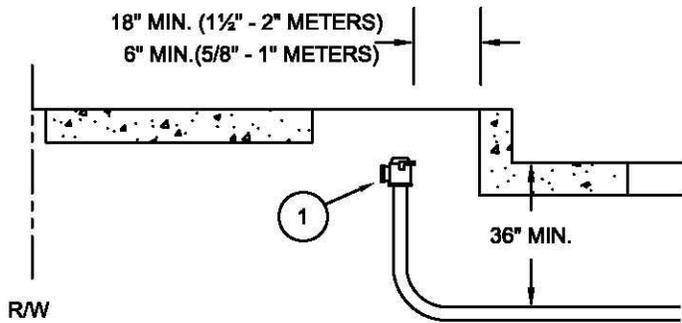
**FIGURE NO. 45**



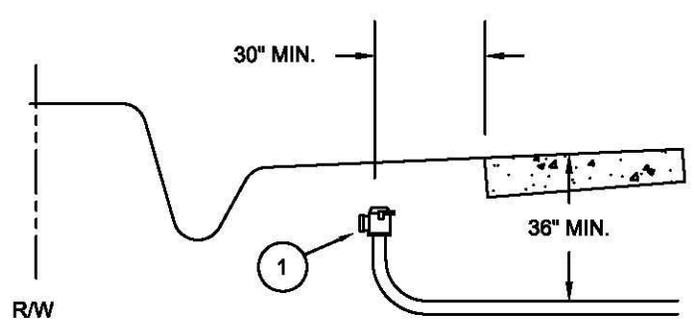
BEHIND SIDEWALK W/ CURB & GUTTER



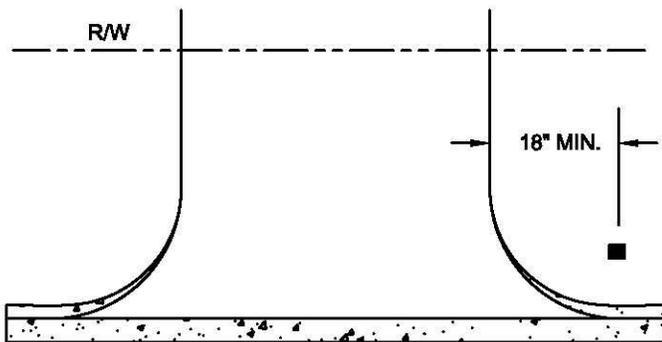
BEHIND DITCH OR PAVED SWALE W/O CURB & GUTTER



BETWEEN SIDEWALK AND CURB & GUTTER



FRONT OF DITCH W/O CURB & GUTTER



DRIVEWAY AND WATER METER

① ANGLE VALVE

NOTE: METERS SHALL NOT BE LOCATED IN PAVED AREAS.

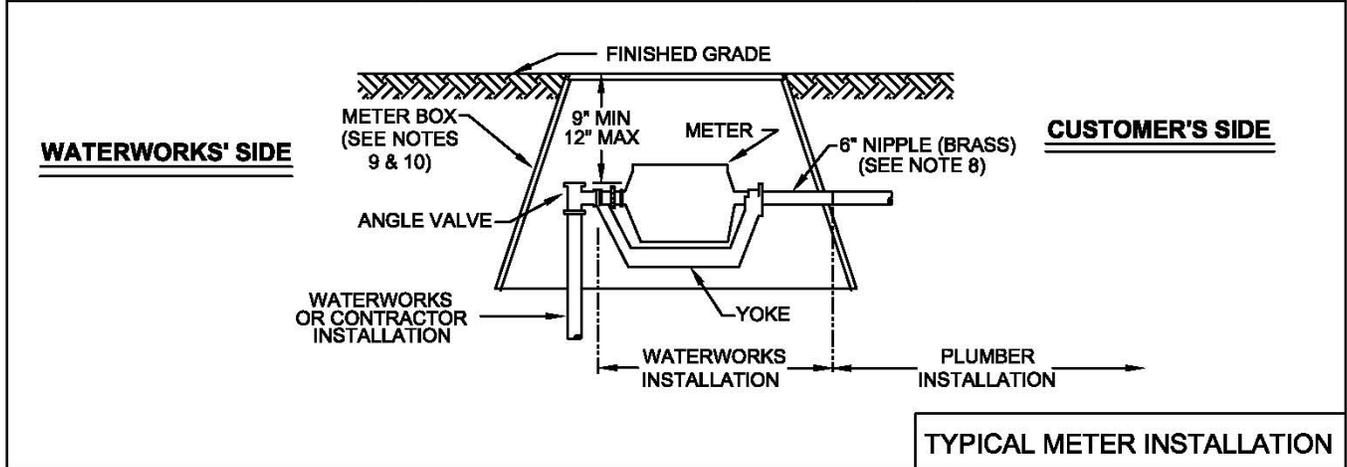
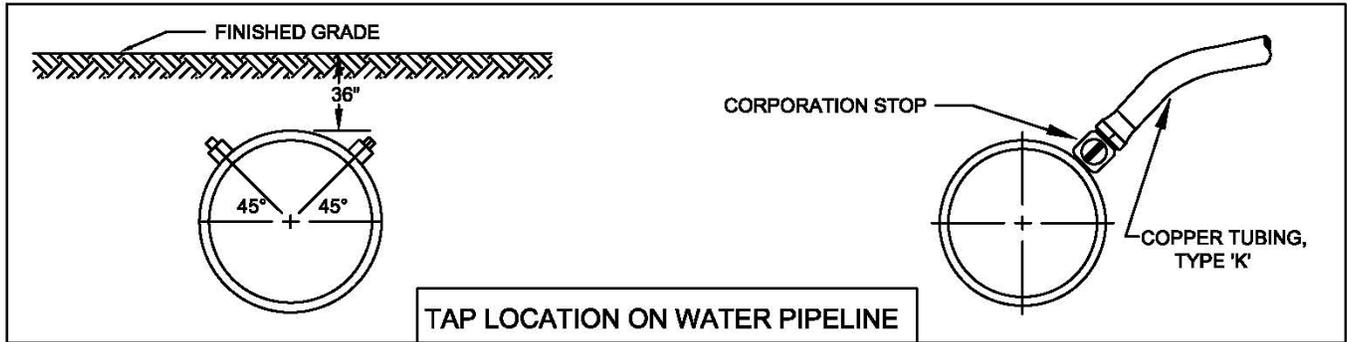
CITY OF NEWPORT NEWS  
DEPARTMENT OF PUBLIC UTILITIES  
NEWPORT NEWS, VIRGINIA

RELATION OF METER  
INSTALLATION TO  
ADJACENT PAVEMENT

REVISED BY:	B.W.S.	B.W.S.	JHG
REVISED DATE:	1/98	5/00	01/2009

DWG. NO.	W-16B	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

FIGURE NO. 46



**NOTES:**

1. METER LOCATIONS MUST BE MARKED OR STAKED PRIOR TO SERVICE INSTALLATION. LOCATIONS OTHER THAN THE STANDARD LOCATION MUST BE APPROVED BY WATERWORKS, AND NOT IN VIOLATION OF A JURISDICTIONAL UTILITY POLICY, IF APPLICABLE. METERS SHALL NOT BE LOCATED IN PAVED AREAS.
2. SERVICE PIPELINES SHALL BE INSTALLED PERPENDICULAR TO THE WATER PIPELINE, EXCEPT IN ENDS OF CUL-DE-SACS, OR AS OTHERWISE DIRECTED BY A WATERWORKS INSPECTOR.
3. SERVICE TAP SHALL BE MADE AT A 45° ANGLE FROM THE VERTICAL, UNLESS OTHERWISE NOTED.
4. METERS SHALL BE LOCATED IN NON-TRAFFIC AREAS. METER RELOCATIONS FROM TRAFFIC AREAS SHALL BE AT CUSTOMER'S COST.
5. A WATERWORKS INSPECTOR MUST BE NOTIFIED 72 HOURS PRIOR TO THE INSTALLATION OF SERVICE LINES, AND NO SERVICE SHALL BE INSTALLED WITHOUT A WATERWORKS INSPECTOR PRESENT.
6. SERVICE TAPS SHALL BE SPACED IN ACCORDANCE WITH SECTION CS 5.3D.
7. METER LOCATIONS IN HAMPTON TO BE IN ACCORDANCE WITH THE JURISDICTIONAL UTILITY POLICY (HAMPTON, JAN. 1992)
8. FOR A 1" METER INSTALLATION, A METER CHECK VALVE AND A 3" NIPPLE (BRASS) SHALL BE INSTALLED ON THE DOWNSTREAM SIDE OF THE YOKE IN LIEU OF THE 6" NIPPLE (BRASS).
9. FOR 5/8" METER SEE FIGURE 37 (DWG: W-13A) FOR DETAILS OF METER BOX.
10. FOR 3/4" OR 1" METER SEE FIGURE 38 (DWG: W-13B) FOR DETAILS OF METER BOX.

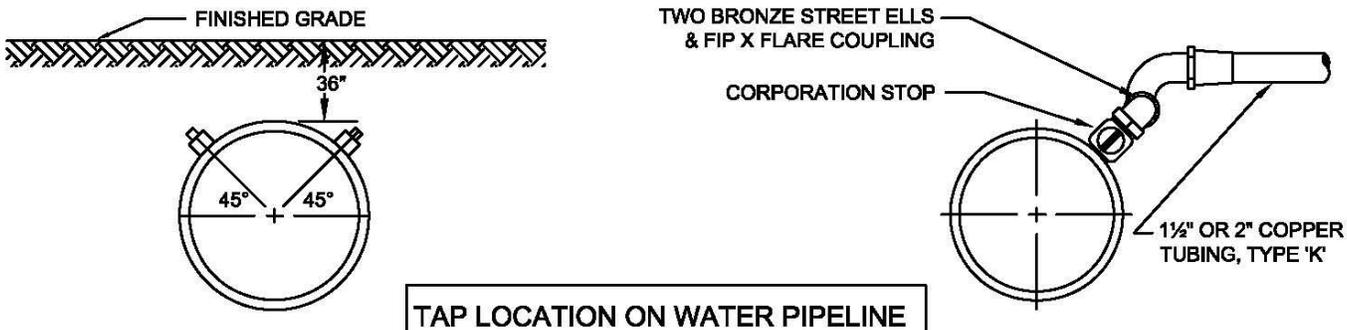
CITY OF NEWPORT NEWS  
DEPARTMENT OF PUBLIC UTILITIES  
NEWPORT NEWS, VIRGINIA

**TYPICAL WATER METER  
INSTALLATION  
OF 5/8" THRU 1"**

REVISED BY:	B.W.S.	B.W.S.	JHG	
REVISED DATE:	2/98	5/00	1/2009	

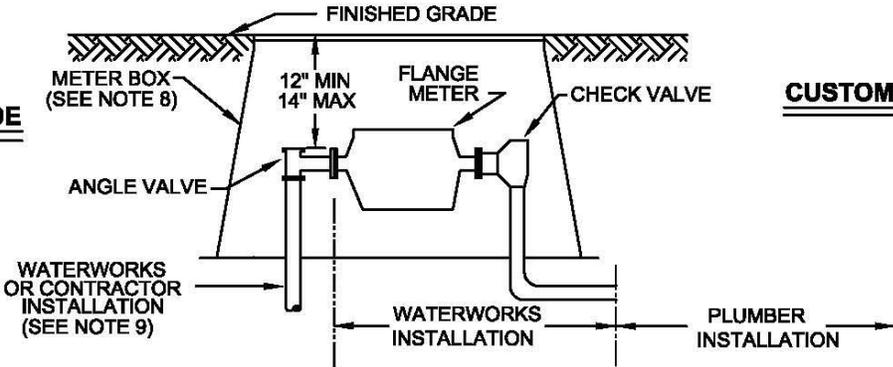
DWG. NO.	W-16C	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

**FIGURE NO. 47**



**TAP LOCATION ON WATER PIPELINE**

**WATERWORKS' SIDE**



**CUSTOMER'S SIDE**

**TYPICAL METER INSTALLATION**

**NOTES:**

1. METER LOCATIONS MUST BE MARKED OR STAKED PRIOR TO SERVICE INSTALLATION. LOCATIONS OTHER THAN THE STANDARD LOCATION MUST BE APPROVED BY WATERWORKS, AND NOT IN VIOLATION OF A JURISDICTIONAL UTILITY POLICY, IF APPLICABLE. METERS SHALL NOT BE LOCATED IN PAVED AREAS.
2. SERVICE PIPELINES SHALL BE INSTALLED PERPENDICULAR TO THE WATER PIPELINE, EXCEPT IN ENDS OF CUL-DE-SACS, OR AS OTHERWISE DIRECTED BY A WATERWORKS INSPECTOR.
3. SERVICE TAP SHALL BE MADE AT A 45° ANGLE FROM THE VERTICAL, UNLESS OTHERWISE NOTED.
4. METERS SHALL BE LOCATED IN NON-TRAFFIC AREAS. METER RELOCATIONS FROM TRAFFIC AREAS SHALL BE AT CUSTOMER'S COST.
5. A WATERWORKS INSPECTOR MUST BE NOTIFIED 72 HOURS PRIOR TO THE INSTALLATION OF SERVICE LINES, AND NO SERVICE SHALL BE INSTALLED WITHOUT A WATERWORKS INSPECTOR PRESENT.
6. SERVICE TAPS SHALL BE SPACED IN ACCORDANCE WITH SECTION CS 5.3.D.
7. METER LOCATIONS IN HAMPTON TO BE IN ACCORDANCE WITH THE JURISDICTIONAL UTILITY POLICY (HAMPTON, JAN. 1992)
8. SEE FIGURE 39 (DWG: W-13C) FOR DETAILS OF METER BOX.
9. DUE TO DIFFICULTY IN BENDING 1-1/2" & 2" TUBING, AN ALTERNATE CONFIGURATION UTILIZING A 90-DEGREE FITTING AND A BRASS NIPPLE BELOW THE ANGLE VALVE IS ACCEPTABLE, IF APPROVED BY THE INSPECTOR.

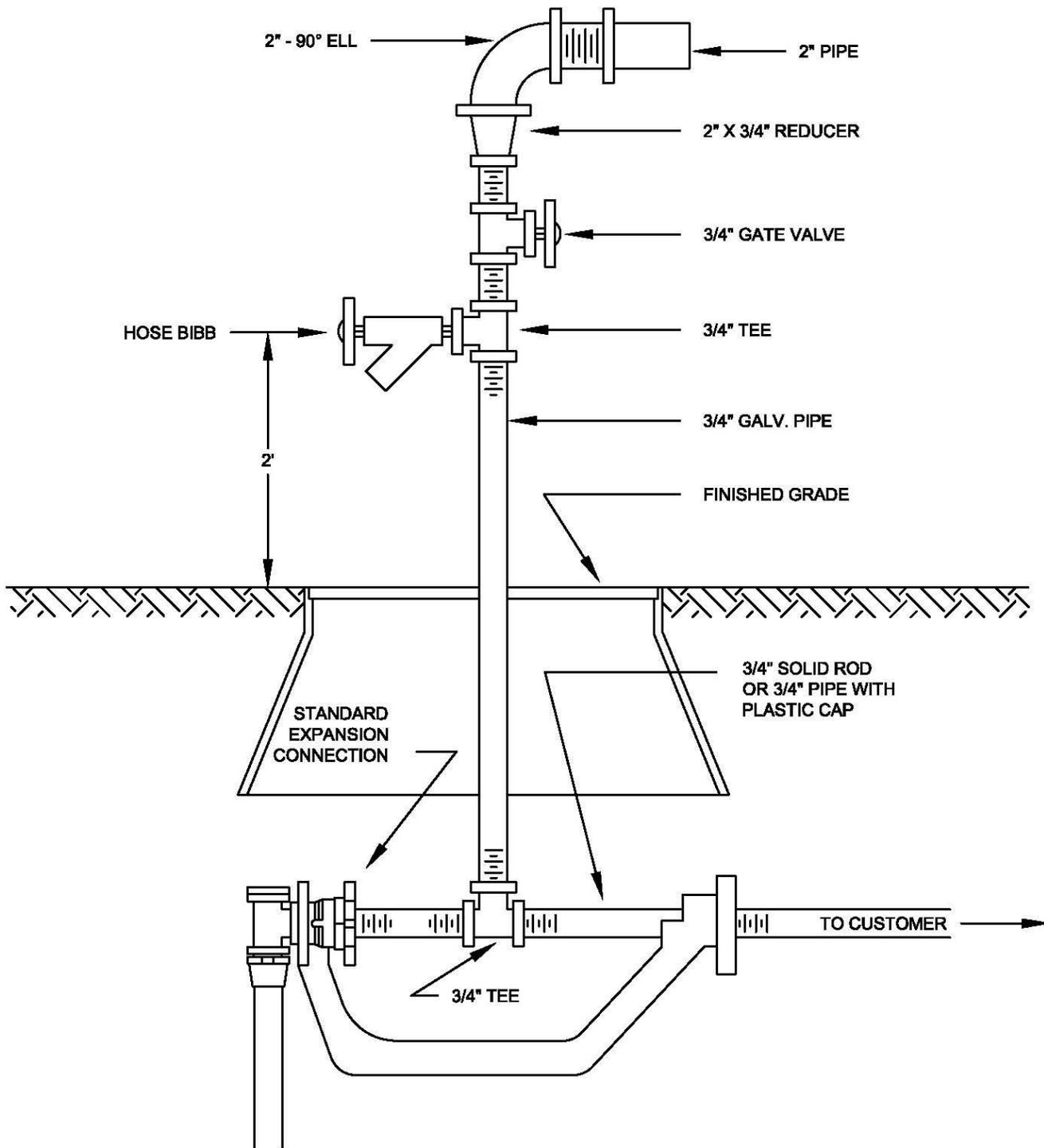
CITY OF NEWPORT NEWS  
DEPARTMENT OF PUBLIC UTILITIES  
NEWPORT NEWS, VIRGINIA

**TYPICAL WATER METER  
INSTALLATION  
OF 1-1/2" & 2"**

REVISED BY:	B.W.S.	B.W.S.	JHG	
REVISED DATE:	2/98	5/00	1/2009	

DWG. NO.	W-16C-1	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

**FIGURE NO. 48**



CITY OF NEWPORT NEWS  
 DEPARTMENT OF PUBLIC UTILITIES  
 NEWPORT NEWS, VIRGINIA

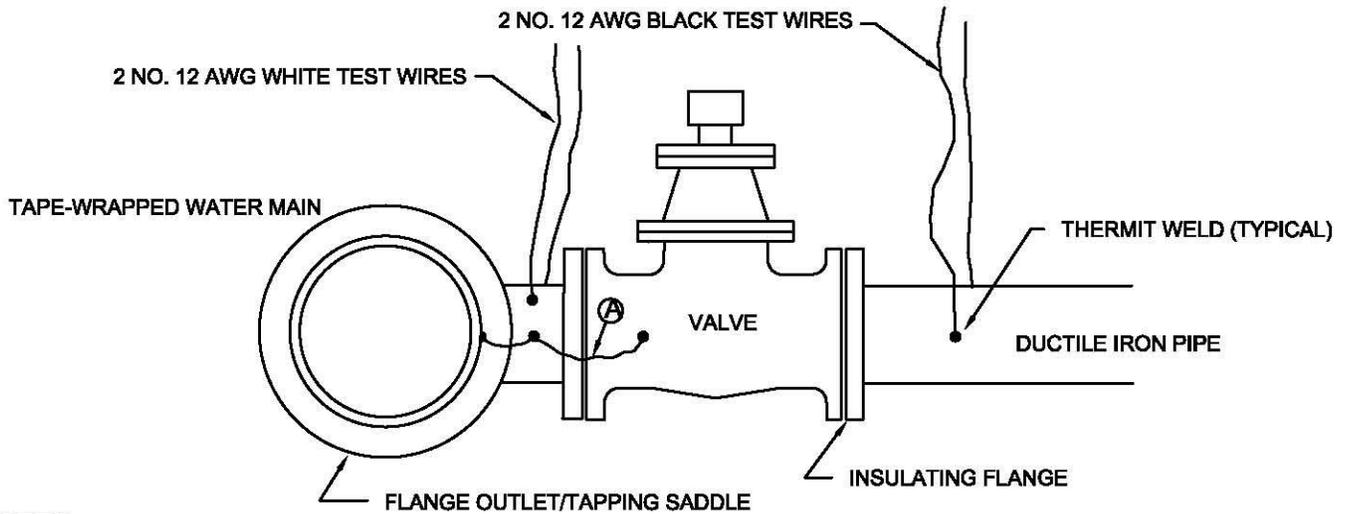
**SERVICE BLOW-OFF  
 (METER REMOVED)**

REVISED BY:	B.S.	JHG		
REVISED DATE:	5/00	1/2009		

DWG. NO.	W-16D	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

**FIGURE NO. 49**

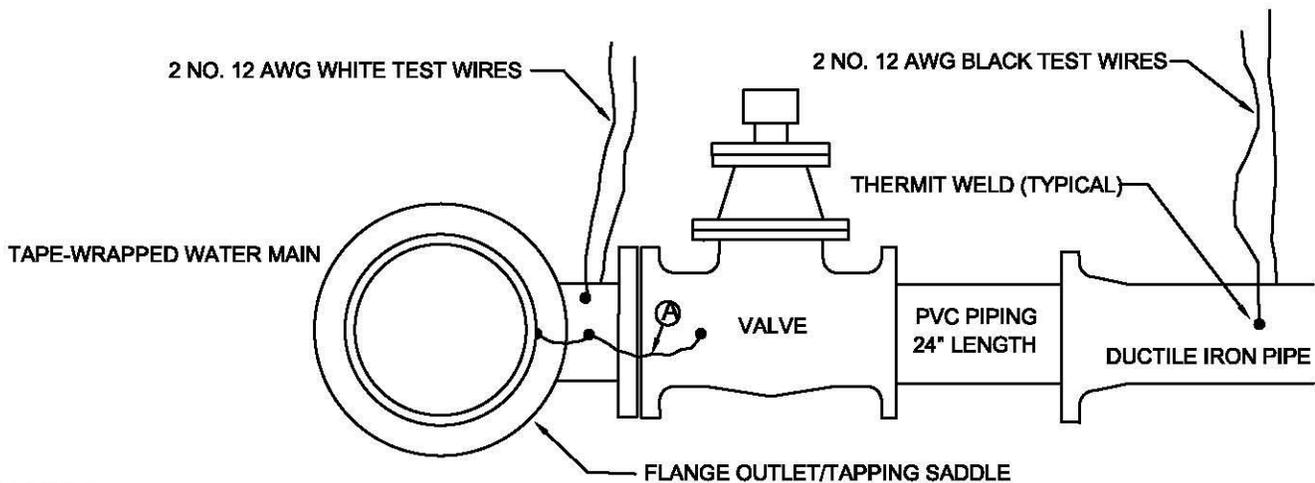
## TEST WIRES & INSULATING FLANGE FOR FLANGED VALVE



**NOTES:**

1. APPLY TAPE WRAPPING OVER ENTIRE SADDLE, FLANGE OUTLET, VALVE AND 12 INCHES PAST LAST TEST WIRE ON DUCTILE IRON PIPING.
2. EXTEND TEST WIRES TO TEST STATION.

## TEST WIRES & PVC INSULATOR FOR MJ VALVE FITTING



**NOTES:**

- INSTALL TEST WIRES ONLY IF NO OTHER TEST STATION IS WITHIN 500' OF NEW SERVICE PIPING.
- COAT THERMIT WELD OF BLACK TEST WIRES WITH MASTIC
- APPLY TAPE WRAPPING OVER ENTIRE SADDLE, FLANGE OUTLET AND VALVE.
- IF TEST WIRES ARE INSTALLED, EXTEND WIRES TO TEST STATION.

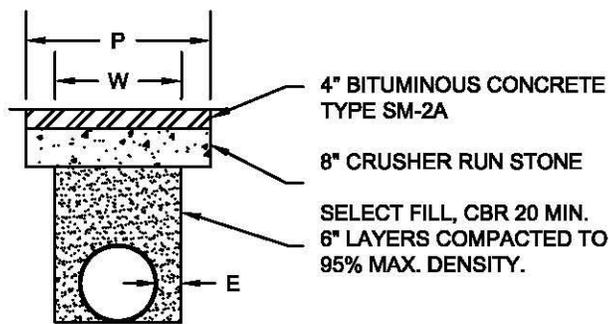
**(A)**

1. THERMIT WELD TWO NO. 12 AWG BOND WIRES TO THE FLANGE OUTLET/TAPPING SADDLE PRIOR TO INSTALLING THE SADDLE. ONE WIRE SHALL BE WELDED TO EACH SIDE OF THE SADDLE USING A THROUGH CONDUCTOR WELD MOLD (TYPE HE)
2. THERMIT WELD THE BOND WIRES TO THE VALVE AT THE MOST CONVENIENT LOCATION.
3. LEAVE SLACK IN ALL BOND WIRES.

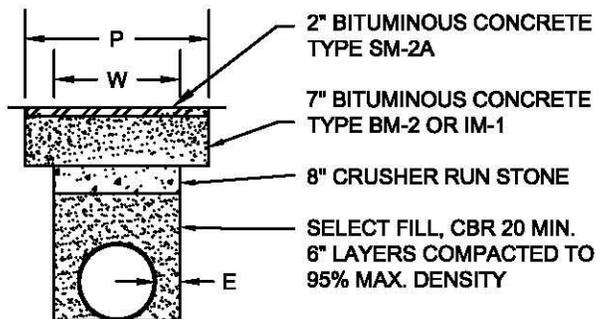
CITY OF NEWPORT NEWS  
DEPARTMENT OF PUBLIC UTILITIES  
NEWPORT NEWS, VIRGINIA

### CORROSION MONITORING TEST WIRING FOR VALVES (TAPE-WRAPPED DIP)

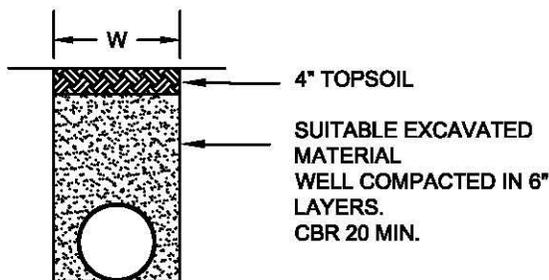
REVISED BY:	B.S.	JHG			DWG. NO.	W-17A	SCALE	NONE	DATE
					DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
REVISED DATE:	5/00	1/2009			PRINT FILE NO.	N-1809	CKD. BY	F.B.	



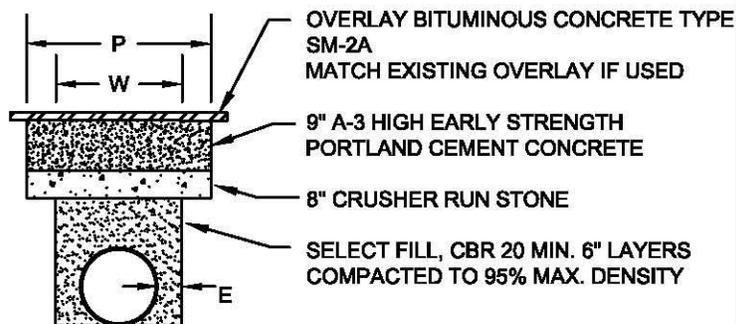
**SECONDARY STREETS**  
(PATCH LESS THAN 200 S.F.)



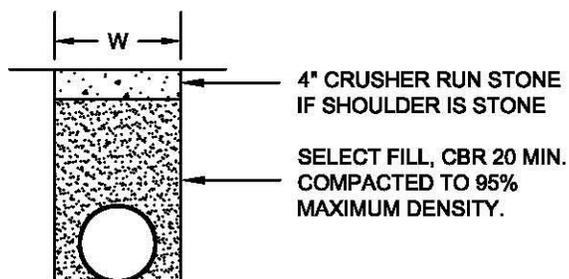
**PRIMARY STREETS**  
(PATCH LESS THAN 400 S.F.)



**GRASS AREAS**



**CONCRETE STREETS**  
**PORTLAND CEMENT**



**STABILIZED SHOULDERS**

E = 12" FOR 4" - 24" PIPE  
E = 8" FOR 2" PIPE

MAXIMUM PAVEMENT WIDTH  
W = PIPE NOMINAL DIA. + 2E  
P = W + 12"

APPROVED BY \_\_\_\_\_

DATE \_\_\_\_\_

FOR THE CITY OF NEWPORT NEWS  
DEPARTMENT OF ENGINEERING

**NOTES:**

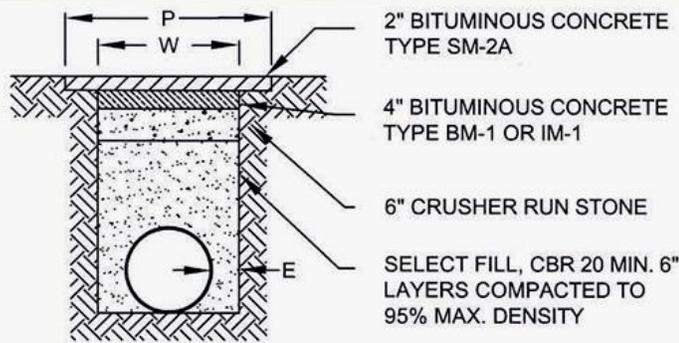
1. WHEN SIZE OF OPENING IN PRIMARY STREETS IS 400 SQ. FT. OR MORE OR IN SECONDARY STREETS IS 200 SQ. FT. OR MORE, THE PAVEMENT REPAIR SHALL BE DETERMINED BY THE CITY OF NEWPORT NEWS, DEPARTMENT OF ENGINEERING.
2. ALL REPAIRS AND RESTORATION WILL BE AS DIRECTED BY AND SUBJECT TO INSPECTION BY THE NEWPORT NEWS DEPARTMENT OF ENGINEERING. ALL PERMIT CONDITIONS SHALL BE MET.
3. ALL OTHER DISTURBED AREAS, CURBS, WALKS, ETC., SHALL BE RESTORED TO AS GOOD AS OR BETTER THAN THAT WHICH EXISTED.
4. ALL MATERIALS SHALL COMPLY WITH CURRENT SPECIFICATIONS OF THE CITY OF NEWPORT NEWS AND/OR VDOT.

CITY OF NEWPORT NEWS  
DEPARTMENT OF PUBLIC UTILITIES  
NEWPORT NEWS, VIRGINIA

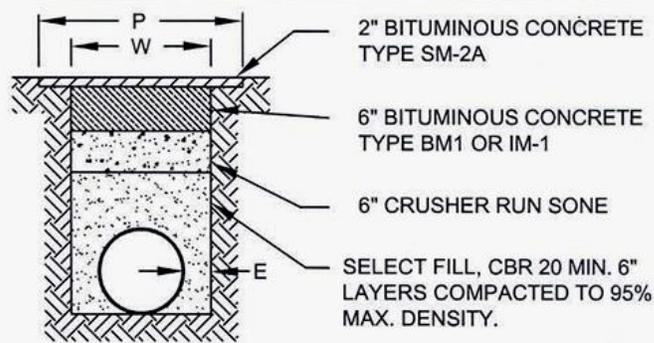
**SITE & ROADWAY  
RESTORATION CITY OF  
NEWPORT NEWS**

REVISED BY:	B.S.	JHG	
REVISED DATE:	4/17/00	1/2009	

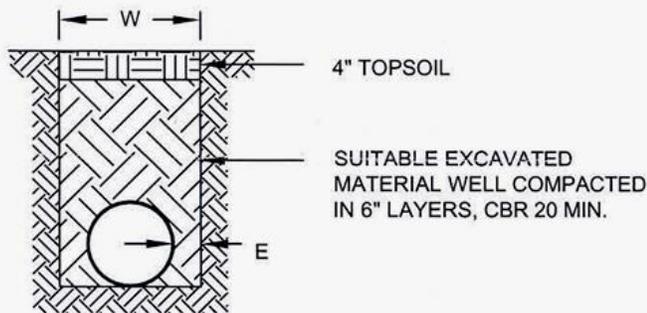
DWG. NO.	W-01A	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	



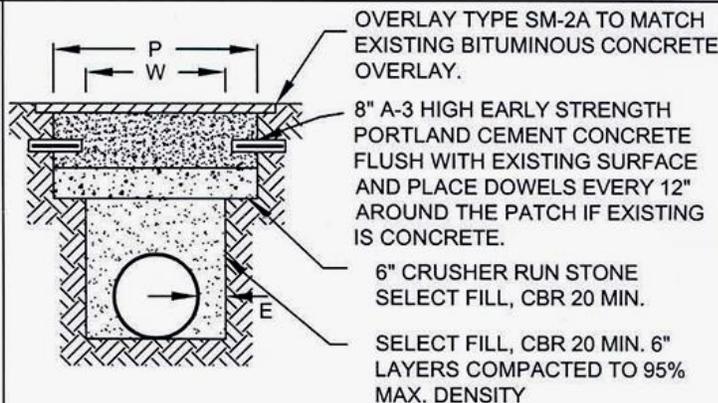
FEEDER & COLLECTOR STREETS



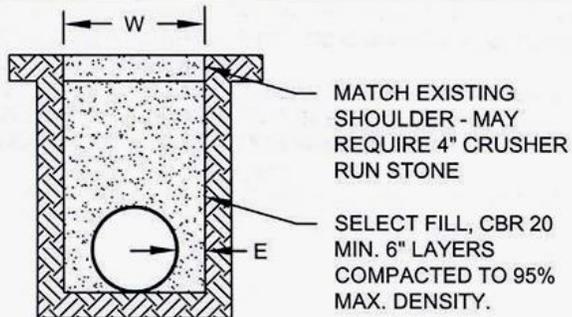
MAJOR STREETS & ARTERIALS



GRASS AREAS



PORTLAND CEMENT CONCRETE AND COMPOSITE STREETS



STABILIZED SHOULDERS

E = 12" FOR 4" - 24" PIPE  
 E = 8" FOR 2" PIPE  
 MAXIMUM PAVEMENT WIDTH  
 W = PIPE NOMINAL DIA. + 2E  
 P = W + 12"

*Leroy T. Chesterfield Jr.*  
 APPROVED BY: LEROY T. CHESTERFIELD JR.

STREET OPERATIONS \_\_\_\_\_ DATE 3/11/09  
 FOR THE CITY OF HAMPTON  
 DEPARTMENT OF PUBLIC WORKS

NOTES:

1. PAVEMENT TO BE REMOVED SHALL BE SAW CUT USING APPROPRIATE EQUIPMENT TO PROVIDE STRAIGHT NEAT EDGES. CUT EDGES TO BE "TACKED" PRIOR TO PAVEMENT PATCHING.
2. SELECT MATERIAL SHALL MEET THE REQUIREMENTS OF PUBLIC ROADS CLASSIFICATION (PRA), A-1 OR A-3.
3. CRUSHER RUN STONE, PORTLAND CEMENT CONCRETE AND BITUMINOUS MATERIALS SHALL COMPLY WITH CURRENT SPECIFICATIONS OF VDOT.
4. THESE DETAILS SHOW MINIMUM STANDARDS. PAVEMENT REPAIR WILL IN NO CASE RESULT IN A PAVED SECTION LESS THAN THAT REMOVED.
5. ALL OTHER DISTURBED AREAS, CURBS, WALKS, ETC., SHALL BE RESTORED TO AS GOOD OR BETTER THAN THAT WHICH EXISTED.
  - a. IF A CONCRETE DRIVEWAY APRON IS CUT, THE ENTIRE APRON MUST BE REPLACED.
6. FERTILIZER SHALL BE COMMERCIAL 10-10-10.
7. SEED SHALL BE KENTUCKY 31 FESCUE.
8. OVERLAP EXISTING GEOTEXTILE FABRIC PATCHES 6" MIN ON EACH SIDE OF TRENCH OPENING.
9. CONCRETE STREETS SHALL BE REPAIRED WITH CONCRETE.
10. REFER TO HAMPTON UTILITY POLICY FOR SPECIFIC INFORMATION NOT COVERED HERE.

CITY OF NEWPORT NEWS  
 DEPARTMENT OF PUBLIC UTILITIES  
 NEWPORT NEWS, VIRGINIA

SITE & ROADWAY  
 RESTORATION CITY OF  
 HAMPTON

REVISED BY:	B.S.	JHG	
REVISED DATE:	4/17/00	3/2009	

DWG. NO.	W-01B	SCALE	NONE	DATE
DWG. FILE NO.	R-926	DWN. BY	B.S.	10/13/95
PRINT FILE NO.	N-1809	CKD. BY	F.B.	

FIGURE NO. 52

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