

**WATER MAIN
DESIGN AND CONSTRUCTION STANDARDS**

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**TOWN OF HERNDON, VIRGINIA
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- (9) Standard Water Connection For 1" and 1-1/2" Meters
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SECTION 1.0 GENERAL INFORMATION

1.01 Purpose

The purpose of the Water Main Design and Construction Standards is to identify the minimum standard criteria to be followed by the Public, Designers, Design Engineers, Developers, and Contractors when preparing plans/specifications for the water system or for construction of water system facilities in the Town of Herndon (the Town). All water main extensions become the property of the Town upon completion of installation and acceptance.

This Standard covers the minimum criteria for water system facility design criteria, material and construction requirements, and compliance with the requirements of the Virginia Department of Health, Office of Water Programs, Waterworks Regulations. This standard does not purport to cover all possible circumstances. The Town of Herndon retains the right to modify these requirements as deemed necessary to protect the water distribution system. It is the responsibility of those performing work within the Town of Herndon to comply with all local, state and federal regulatory authorities. Where a conflict exists between these standards and the regulatory requirements, the more restrictive requirements shall apply.

It is the policy of the Town of Herndon, Department of Public Works to avoid and protect environmentally sensitive areas wherever possible including wetlands, historical/archaeological sites, and other designated protected areas.

SECTION 2.0 DESIGN STANDARDS

2.01 Water Demand Projections

In determining domestic water demand for future development, the following conversion factors are applied to convert dwelling units into equivalent persons per dwelling unit:

<u>Type of Dwelling Unit</u>	<u>Persons/Dwelling Unit</u>
Single Family	3.57
Duplex	3.22
Multiplex	2.42
Mobile Home	2.61
Garden Apartment	2.50
Elevator Apartment	1.50

The average daily water consumption rates for planning purposes shall be in accordance with the Virginia Department of Health, Waterworks Regulations, as follows:

<u>Service</u>	<u>Gallons Per Day</u>
Dwellings, per person	100
High Schools with Showers, per person	16
Elementary Schools without showers, per person	10
Boarding Schools, per person	75
Motels at 65 gallons per person, minimum per room	130
Restaurants, per seat	50
Factories, per person, per eight-hour shift	15-35
Shopping Centers, per 1,000 sq. ft. of ultimate floor space	200-300
Hospitals, per bed	300
Nursing Homes, per bed	200
Home for the Aged, per bed	100
Doctor's Office in Medical Center	500
Laundromats, 9 to 12 machines, per machine	500
Community Colleges, per student and faculty member	15
Swimming Pools, per swimmer	10
Theaters, Auditorium Type, per seat	5
Picnic areas, per person	5

Any such rates not given or any deviations from tabulated rates shall be estimated and justified by the Design Engineer and approved by the Town of Herndon.

The average daily water consumption rate is converted to peak water demands by using the following applicable factors:

<u>Peak Event</u>	<u>Peaking Factor</u>
Maximum Daily	1.6 (x Average Day)
Peak Hourly	1.6 (x Maximum Day)

Water Supply facilities are designed to accommodate the maximum daily demand and the distribution system is designed for the peak hourly demand. Storage facilities are designed to augment the water supply facilities during the peak hourly event.

2.02 Pressure Requirements

The water distribution system, and any extensions thereof, shall have adequate capacity to supply the average and maximum daily and peak hourly demands for all customers - domestic, public, commercial and industrial, while maintaining the following minimum pressure at points of delivery:

- 40 psi for maximum daily flow
- 30 psi for peak hourly flow
- 20 psi for maximum daily + fire flow

The system shall be capable of meeting the maximum daily demand plus fire flow demand as specified by the Fairfax County Office of the Fire Marshal. In areas where the distribution system will not be able to meet the maximum daily and peak hourly flow pressure standards, the property owner will be required to furnish the necessary on-site system to obtain required service pressure. The above 20 psi standard for maximum daily demand plus fire flow is required under all circumstances.

When the service connection for the property owner is located where the water pressure will exceed 80 psi, a pressure regulating valve shall be furnished and installed by the property owner and located in the building plumbing system in order to eliminate water hammer and decrease water consumption. System restrictions and topography may, in some cases, require a variation in the pressures identified herein. Any deviation from the requirements herein shall require approval by the Town of Herndon.

2.03 Fire Flow Requirements

Rates of flow for fire protection shall be as specified by the Fairfax County Office of the Fire Marshall. A maximum allowance of 50% reduction in needed fire flow may be allowed for buildings with automatic sprinkler systems that provide full protection.

The minimum fire flow from any individual fire hydrant shall be 500 gpm. The minimum flowing pressure at maximum flow shall be 20 psi.

2.04 Hydraulic Criteria

The installation of new system extensions within the Town of Herndon's distribution system must be analyzed to determine the proposed performance. The applicant shall determine the quantity of water required and the point of connection. The Engineer shall determine the hydraulic gradient available at the point of connection to the system while providing said demands. The distribution piping design by the applicant must be based upon provided capacities and service pressures in accordance with these standards for the supply gradient as determined by the Engineer.

2.05 Velocity

The maximum velocity to be used for piping shall be 7 fps. All mains, branches and dead ends shall be equipped with blowoffs and/or hydrants of adequate size and number to develop a velocity in the main of at least 2.5 feet per second. The Design Engineer shall consider minimum velocities in pipe sizing to avoid water quality concerns.

2.06 Pipe Friction

The Hazen-Williams formula will be used in the determination of friction loss for all piping. The Hydraulic Institute Standards shall be used for pumping systems and for headloss attributed to pipe, fittings and other miscellaneous appurtenances. Where the Hydraulic Institute Standards do not apply, the headloss for these items shall be in accordance with the manufacturers certified test data for the item.

C-values for all concrete lined ductile iron pipe shall be in accordance with the following:

<u>Pipe Diameter (Inches)</u>	<u>C-Value</u>
6	100
8	110
10	115
12 and larger	120

2.07 Minimum Pipe Size

The minimum size of public water line shall be 6-inches in size. The minimum size water line used for fire protection to properties zoned multi-family residential, commercial, or industrial shall be 8-inches in size. These fire service lines shall be looped to provide feed from at least two directions.

2.08 System Design

The proposed system extension, together with the pertinent existing system components, shall be evaluated based on the hydraulic design, demand design, and fire protection design requirements contained heretofore. The Design Engineer shall submit to the Town a neat and orderly set of signed and sealed design calculations to illustrate normal demands and fire flows, pipe size selection, and fire protection requirements. The Design Engineer shall submit a written request to the Town to review and approve the proposed system design.

Insofar as practicable, distribution systems shall be compatible with the Town's plan for an integrated water system. The number of dead end lines shall be minimized by looping mains. All dead end mains over five (5) feet in length and not terminating with a hydrant shall have adequate blowoff valves at the ends thereof. Dead end lines shall not exceed 500 feet in length. Not more than one fire hydrant shall be installed on a 6-inch dead end line, with the fire hydrant located within the first 300 feet of the line. No flushing device shall be directly connected to any sewer.

Water mains 16-inch I.D. and larger shall not be tapped for individual services. Automatic combination air-vacuum release valves shall be installed at the high points of water mains 16-inch I.D. and larger, where accumulation of air may interfere with flow. Blowoffs will be required at low points of lines 16-inch I.D. and larger. Air-vacuum release valves and blowoffs will be installed in all other main sizes as required.

Valves shall be installed at appropriate points in all mains to permit shutting off water from as small a portion of the system as practicable. A minimum of two valves shall be provided at tee fittings (except fire hydrant tees), three valves at cross fittings. The supply branch serving a hydrant shall include a valve.

2.09 Submission Requirements

Design drawings shall contain as a minimum the following information:

- (a) Professional Engineer seal and signature.
- (b) Vicinity map.
- (c) North Arrow (each plan view).

- (d) Scale (all applicable sheets).
- (e) Reference to all applicable Standard Notes and Details.
- (f) Plan and profile of all proposed water mains, with complete and consistent stationing (all views).
- (g) Show all existing water and sanitary sewer easements within and immediately adjacent to proposed limits of construction.
- (h) Inverts and slopes of sanitary sewer which are within or immediately adjacent to proposed limits of construction.
- (i) Show water service lines to each proposed structure/lot.
- (j) Label all water main fittings, valves and appurtenances, plan and profile.
- (k) Show all crossing storm sewer and other utilities accurately on profiles of water mains.
- (l) Provide and label match lines for sheet to sheet continuations.
- (m) Benchmarks and a minimum of four grid tics based on state plane or coordinate system compatible with the Town's GIS system.

2.10 Materials

- (a) All water system related materials, including pipe, fittings and valves, shall comply with Section 3.0 Technical Specifications. All materials not currently covered by these Standards shall be in accordance with the applicable American Water Works Association (AWWA) Standards or other recognized Standards acceptable to the Town. These materials shall be formally submitted to the Town with appropriate product specifications for approval.
- (b) Water mains shall be ductile iron pipe (DIP) only. Polyvinyl chloride (PVC) and all other water line piping materials are not acceptable.

2.11 Separation of Water Mains and Sanitary Sewers

- (a) General: The following factors shall be considered in providing adequate separation:
 - (1) Materials and types of joints for water and sewer pipes.
 - (2) Soil conditions.
 - (3) Service branch connections into the waterline and sewer lines.
 - (4) Compensating variations in the horizontal and vertical separations.
 - (5) Space for repairs and alterations of water and sewer pipes.
 - (6) Offsetting of pipes around manholes.

(b) Parallel Installation:

- (1) Normal Conditions - Waterlines shall be laid at least ten (10) feet horizontally from a sewer or sewer manhole whenever possible. The distance shall be measured edge-to-edge.
- (2) Unusual Conditions - When local conditions prevent a horizontal separation of ten (10) feet, the waterline may be laid closer to a sewer provided that:
 - (A) The bottom of the waterline is at least 18 inches above the top of the sewer.
 - (B) Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved water pipe and pressure tested in place to 50 psi without leakage prior to backfilling.

(c) Crossing:

- (1) Normal Conditions - Waterlines crossing sewers shall be laid to provide a separation of at least 18 inches between the bottom of the waterline and the top of the sewer whenever possible.
- (2) Unusual Conditions - When local conditions prevent a vertical separation described above, the following construction shall be used:
 - (A) Sewers passing over or under waterline shall be constructed of AWWA approved water pipe and pressure tested in place to 50 psi for leakage prior to backfilling.
 - (B) Waterlines passing under sewers shall, in addition, be protected by providing:
 - (i) A vertical separation of at least 18 inches between the bottom of the sewer and the top of the waterlines.
 - (ii) Adequate structural support for the sewers to prevent excessive deflection of the joints and settling on or breaking waterline.

- (iii) The length of the waterline shall be centered at the point of the crossing, such that the joints are equidistant and as far as possible from the sewer.
- (d) Sanitary Sewers and Sewer Manholes: No potable water pipes shall pass through or come in contact with any part of a sewer or sewer manhole.

2.12 Valve, Air Relief, Meters and Blow Off Chamber

Chamber or pits containing valves, blowoffs, meters or such appurtenances to a distribution system shall not be connected to any storm drain or sanitary sewer, nor shall blowoffs or air relief valves be connected directly to any sewer. Such chambers or pits shall be drained to the surface of the ground where they are not subject to flooding by surface water, or to absorption pits underground. Sump pumps may be used where other gravity drains are not practical. The open end of an air relief pipe should be extended from the manhole or enclosing chamber to a point at least one foot above ground and provided with a screened, downward-facing elbow.

2.13 Hydrants

- (a) Fire hydrants shall be located in accordance with the most current edition of the Fairfax County Public Facilities Manual (PFM).
- (b) Fire hydrants shall be placed on legal rights-of-way and shall generally be placed in line with street intersections. Where long block lengths require the use of intermediate fire hydrants, they shall be placed in line with the property boundary between adjacent lots or parcels of land. Where fire hydrants cannot be placed in a legal right-of-way, an easement shall be provided.
- (c) Fire hydrant spacing criteria may be modified by the Town of Herndon to improve accessibility for fire fighting purposes.
- (d) Structures protected by automatic sprinkler systems and with a fire department connection (Siamese connection) require installation of a detector check, dedicated fire hydrant, and the appropriate backflow device. The dedicated hydrant is not credited toward external protection requirements. Siamese connections must be located within 50 feet of a dedicated hydrant.
- (e) Fire hydrants shall have drains to dry wells or sumps provided exclusively for this purpose. Hydrant drains shall not be connected to sanitary sewers or storm drains.
- (f) Where directed by the Town, fire hydrants shall be strapped to valves.

2.14 Water Service and Plumbing Connections

- (a) Water services and plumbing connections shall conform to relevant and the latest revision of local and/or State Plumbing Code.
- (b) Water service lines shall be a minimum of 1-inch diameter. All service lines 1-inch through 2-inches in diameter shall be constructed of type “K” copper tubing and shall be constructed with a corporation stop, meter yoke and meter-box. Water service lines larger than 2-inches will utilize a gate valve on the service line mounted near the water main in lieu of the corporation stop.
- (c) Service lines will have a minimum cover of thirty-six inches from the top of the pipe to finished grade at all points, including the ditch line.
- (d) Water service lines shall be placed at the midpoint of the property frontage whenever possible. The meter-boxes shall be set in the utility strip for curb and gutter streets. For streets without curb and gutter, meter-box placement will be directed by the Town of Herndon.

2.15 Pipeline Cover

Minimum pipeline cover over the top of pipe and valves shall be equal to or not less than four (4) feet. In order to cross above a sewer rather than below, the normal cover at this crossing can be reduced to three (3) feet. The maximum normal cover allowed is 7.5 feet. In situations where the cover exceeds 7.5 feet, alternative water main routes must be investigated in an attempt to avoid excessive cover.

2.16 Metering

- (a) All service lines shall be metered. Meter installation shall be in accordance with the Standard Details.
- (b) Remote meter reading equipment: Section Intentionally Left Blank.
- (c) All meters, including submeters, shall be provided with backflow prevention.
- (d) Service lines larger than 3/4 inch, with meters larger than 5/8 inch, shall be sized in accordance with AWWA Manual M-22, Sizing Water Service Lines and Meters, except as follows:
 - (1) Use constant pressure factor of 1.

- (2) Include all outside hose bibs in combined fixture value total.
- (3) Irrigation System shall be excluded from domestic meter sizing criteria except as follows:
 - (A) Exclusion meters shall be at least one (1) size smaller than the domestic meter.
 - (B) If metered separately, the irrigation meter shall be sized based on demand criteria furnished by the Engineer.
- (4) For non-residential facilities with flush-valve fixtures, the meter will be sized as follows:

<u>Meter Size (Inches)</u>	<u>Combined Fixture Value Total</u>
1"	41-100
1½"	101-400
2"	401-1200

- (5) For residential facilities and office buildings with tank type water closets the meter will be sized as follows:

<u>Meter Size (Inches)</u>	<u>Combined Fixture Value Total</u>
5/8"	0-40
1"	41-400
1½"	401-5500

- (6) Plumbing Fixtures Values shall be as shown in AWWA No. M-22 for 35 psi.
- (7) Meter installations requiring a flow of greater than 160 gpm or greater than the combined fixture value totals indicated above shall be reviewed and/or approved on a case by case basis in accordance with AWWA Manual No. M-22.
- (8) A 5/8" meter may be used for non-residential facilities with tank type water closets and a 0-40 total combined fixture value. A 1" meter will be the minimum size used for any facility with flush valve fixtures.

2.17 Corrosion Control

Cathodic protection shall be required when a water main crosses or is in close proximity to a pipeline which has an impressed electrical current, such as petroleum or high pressure gas transmission mains. Necessary corrosion control measures shall be determined on a case by case basis, with the protection measures to be designed by a qualified profession engineer.

2.18 Backflow Prevention and Cross Connection Control

All water distribution facilities and operations shall comply with Part II, Article 3: Cross Connection Control and Backflow Prevention in Waterworks of the Waterworks Regulations of the Virginia Department of Health. All water distribution facilities and operations shall also comply with any applicable current programs for cross connection control and backflow prevention by the Town of Herndon.

2.19 Easements

- (a) Easements shall be in accordance with the Town of Herndon Site Plan Review and Subdivision Plan Construction Process. Coordinate with the Department of Community Development regarding all requirements.

2.20 As-Builts

During construction, the contractor shall maintain a record of the location, depth and orientation of the water utility as it is installed. These updated records shall be documented electronically in as-built drawings. The drawings shall be in Auto CADD version 14 or newer and shall utilize a CADD drawing layering standard comparable to the current AIA standard. The survey work and drawings shall be performed in the 1983 North American Datum (NAD 83). All drawings shall be conveyed to the Town for review and approval. The Contractor shall submit for review a minimum of two (2) paper copies of the complete As-Built construction plan sets, including all sheets. The location and identification of all existing underground utilities encountered during construction shall also be identified. Upon approval of the As-Builts by the Town of Herndon, the Contractor shall forward two (2) final paper copies and the digital file on CD-ROM.

SECTION 3.0 TECHNICAL SPECIFICATIONS

SECTION 02315

EXCAVATING, BACKFILLING, AND COMPACTING

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SECTION 02315

EXCAVATING, BACKFILLING, AND COMPACTING

1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Excavating Trenches for Water Mains and Appurtenant Facilities
 - 2. Excavating Access Pits
 - 3. Backfilling and Compacting
- B. The Contractor shall be responsible to notify Miss Utility 72 hours in advance or prior to beginning any excavation or ground disturbance at Telephone 1-800-257-7777.
- C. If work is performed within or adjacent to existing utility lines such as electric power lines, natural gas lines, pressurized water lines, sewer alignments, traffic signal cables and phone company cables and equipment, the Contractor shall take all necessary precautions, while complying with state and federal law, to prevent damage or injury to onsite personnel, equipment, materials and existing infrastructure. The Contractor shall also comply with the Virginia Overhead High Voltage Line Safety Act. A record of utilities encountered by during construction activities shall be maintained by the Contractor.

1.2 REFERENCES

- A. Land Use Permit Manual. Virginia Department of Transportation.
- B. Road and Bridge Specifications. Virginia Department of Transportation.
- C. American Society for Testing Materials (ASTM)
 - D698 Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort
 - D5261 Test Method for Measuring Mass per Unit Area of Geotextiles
- D. Manual of Accident Prevention in Construction. Associated General Contractors of America.

- E. Occupational Safety and Health Standards-Excavation; Final Rule 29 CFR Part 1926. OSHA.
- F. Virginia Work Area Protection Manual. Virginia Department of Transportation.
- G. Fairfax County Public Facilities Manual.
- H. American Association of State Highway and Transportation Officials (AASHTO) Standards:
 - T89 Determining the Liquid Limit of Soils
 - T90 Determining the Plastic Limit and Plasticity Index of Soils
 - T180 Moisture-Density Relations of Soils Using a 10-lb. Rammer and an 18 inch Drop
 - T265 Laboratory Determination of Moisture Contents of Soils

1.3 DEFINITIONS

- A. Utility: Buried pipe, conduit, or cable, surface features such as swales and ditches, and overhead wires or cables including their supports.
- B. Earth: The softer materials of the outer surface of the earth. The basic constituents are the products of rock disintegration, glaciation, and erosion, consisting of boulders, cobbles, pebbles, sand, silt and clay.
- C. Heavy Clearing: Clearing areas where the average diameter of the trees measured at the trunk is greater than 4 inches and the average spacing of the trees is less than 8 feet on center.

1.4 FIELD MEASUREMENTS

- A. Bench Marks: Verify that survey bench marks and intended elevations for the Work are as shown on the Drawings.

1.5 QUALITY ASSURANCE

- A. Compaction Tests: Cost of compaction tests will be borne by the Contractor.

1.6 TREE PROTECTION REQUIREMENTS

- A. Establish Clearing Limits: Prior to tree removal or beginning of clearing operations, the Contractor shall identify the clearing limits for the Project using continuous yellow or white ribbon to designate the boundaries.
 - 1. Specific trees to be saved within the clearing limits shall be flagged.
 - 2. Clearing limits and trees to be saved will be reviewed at the site by the Community Forester.
- B. Authorization for Tree Removal: No tree shall be removed until Contractor has written approval from the Community Forester.
- C. Consequences for Unauthorized Tree Removal: At the discretion of the Town of Herndon, one of the following measures will be imposed as a remedy for each tree removed without prior approval.
 - 1. The Contractor shall plant minimum 3-inch caliper replacement trees in quantities which equal the total diameter of the trees removed.
 - a. The species of replacement trees will be the same as the trees which were removed, or as directed by the Community Forester.
 - 2. The Contractor shall be required to pay the Town of Herndon a penalty fee for each tree removed. The penalty fee will be computed using the latest guide from the International Society of Arboriculture (ISA) "Guide for Plant Appraisal" as applied by the Town of Herndon.

1.7 WORK REQUIREMENTS IN RIGHT-OF-WAY

- A. Permits: All permits shall be obtained by the Contractor.
 - 1. The Contractor shall assume all responsibility for fulfilling any and all requirements specified in right-of-way permits.
 - 2. Contractor shall employ qualified personnel for clearing and tree trimming operations within the Town's Right of Way. An ISA certified Arborist must be onsite at all times.

- B. Protection of Trees and Shrubs: The following plant materials shall not be removed from the Town of Herndon's Right-of-Way without a permit therefore:
 - 1. Shrubs
 - 2. Trees regardless of size

- C. Protection of Trees and Shrubs to Remain: No tree roots over 3 inches in diameter shall be cut without special permission of the Community Forester. All roots less than 3 inches in diameter shall be clean cut with ax or saw. Particular attention shall be give not to splinter the roots or nearest trunk. Whenever possible, tunneling through or under roots shall prevail instead of cutting anchor roots.

1.8 ADDITIONAL REGULATORY REQUIREMENTS

- A. Naturally Occurring Asbestos: The Contractor shall comply with all applicable regulations of OSHA and the Fairfax County Health Department concerning Working requirements in areas containing naturally occurring asbestos deposits.

1.9 WARRANTY

- A. The Contractor shall be responsible for correcting any settlement in backfill or pavement for a period of one year after completion of the Work.

2 PRODUCTS

2.1 FILL MATERIALS

- A. Select Fill: Select fill shall meet the following requirements:
 - 1. Type A - Material: Shall consist of clean earth, inspected and approved by the Engineer, which has been obtained by the Contractor from sources outside Work and not meeting the criteria for Type B indicated below.
 - 2. Type B - Crushed Stone: Shall consist of 21-A crushed stone conforming to VDOT specifications or an approved substitute.
 - a. The conversion factor for Select Fill supplied by weight instead of volume will be 3,000 pounds per cubic yard.

3. Bluestone Dust: Shall conform to VDOT specifications or an approved substitute.
- B. Suitable Fill: Suitable fill material shall conform to the following requirements.
 1. Type I: Type I material shall consist of clean earth excavated from the trench containing no stone larger than $\frac{3}{4}$ inch across.
 2. Type II: Type II suitable material shall consist of suitable material containing good earth and stone excavated from the trench.
 - a. Stone material contained in Type II suitable fill shall not exceed 6 inches across and shall be uniformly distributed.
 - b. Type II suitable material shall not consist of more than 50 percent stone by volume.

3 EXECUTION

3.1 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Protect Existing Vegetation: Protect plant life, lawns and other features remaining as a portion of final landscaping.
- C. Protect Existing Features: Protect bench marks, existing structures, fences, sidewalks, paving, mailboxes, gas line markers, curbs, and other similar features from excavation equipment and vehicular traffic.
- D. Clearing: The site of all open cuts and excavation shall be first cleared of trees, stumps, shrubs, undergrowth and other above-ground obstructions prior to excavation.
 1. Clearing within easements and right-of-ways shall be limited to a maximum width of 20 feet or as shown on the Drawings or as directed by the Engineer.
 2. Remove and dispose of cleared materials and debris unless otherwise directed by the Engineer.

3. Remove topsoil and stockpile for use in restoration of excavated areas.

3.2 WORK IN TOWN RIGHT-OF-WAY

- A. Length of Open Trenches: The maximum length of trench at any time, including backfill portion not suitable for traffic, shall not exceed 100 feet. Trenches shall not be left open overnight.
- B. Repair of Damage: When pavement edge or shoulder is damaged due to diversions of traffic away from the pipe laying operation, repairs shall be made as directed.
- C. Permitting for Street Cutting: Street cut permits must be obtained for work within the Right-Of-Way. Permits are available from the Town of Herndon.
- D. Open Cut Requirements: Wherever pavement is permitted to be cut, the disturbed width will not exceed one-half of the existing paved street width at any time. For crossings, the first opening shall be completely restored to satisfactory travel conditions, including steel plating as required, before the second half is opened. No steel plates are allowed in roadways from November 1 to April 1 due to snow removal operations. Where the pavement is disturbed, or deemed weakened, it shall be restored or replaced as directed in its entirety, or such portion or portions as deemed necessary.
- E. Stockpiling Excavated Materials: No excavated materials shall be placed on the pavement, without written permission. When so permitted, the Contractor shall limit the amount of excavated material placed directly on the asphalt by utilizing other methods to hold or stockpile material away from paved surfaces. Any debris dropped or placed onto the roadway shall be promptly cleaned from paved surfaces in accordance with Town requirements.
- F. Equipment Restrictions: No cleated equipment shall be used on pavement. Where track equipment must enter paved areas, protect pavement with a sufficient layer of sand or approved substitute material.
- G. Traffic Maintenance:
 1. Traffic Control: Traffic shall not be blocked or re-routed without special written permission from the Town of

Herndon. Where one-way traffic is permitted, the Contractor shall provide adequate flagging operations. Traffic shall at all times be properly protected by adequate lights, barricades, signs and flagmen when needed. Signs shall be in accordance with the current specifications of the Virginia Work Area Protection Manual. The signs are to be located as directed by the Town of Herndon.

2. Entrances: Road and street connections and private entrances shall be kept in satisfactory condition. Entrances shall not be blocked, and ample provision shall be made for safe ingress and egress to adjacent property at all times.
 3. Pedestrian Traffic: If sidewalk or trail is blocked by construction activities, the pedestrian traffic shall be re-routed around the construction area. Traffic shall be properly protected by adequate lighting, barricades, signs and fencing at all times.
- H. Correction of Hazardous Situations: The Contractor shall immediately correct any situation that may arise which the Engineer or the Town deems hazardous to the traveling public.
- I. Drainage Requirement: Existing drainage facilities shall be cleaned and maintained as necessary to prevent damage to the Work and adjacent property.
- J. Dust Control: The Contractor shall ensure that dusty conditions are controlled. Earth surfaces exposed to dusting shall be kept moist with water or by application of a dust suppressant. Buildings, operating facilities or equipment that may be affected adversely by dust shall be adequately protected.
- K. Pavement Restoration: Refer to Section 02700 – Paving and Surfacing for pavement restoration requirements.
- L. Additional Requirements: Comply with approved permits and additional regulatory requirements.

3.3 EARTH EXCAVATION

A. Shaping and Trimming: Excavate trenches to the widths and depths specified below and shown on the Drawings.

1. Trench width at bottom of pipe:

<u>Nominal Pipe Diameter (Inches)</u>	<u>Trench Width (Inches)</u>
2-4	24
6-12	ID+18
16	ID+18
20-36	ID+24
42-48	ID+30

2. Trench Bottom: Grade and align pipe trench bottoms to provide bearing for the full length of the pipe barrel. Prove bell holes for the proper assembly of pipe joints.

3. Rock Trench: Remove rock to a depth of 6 inches below the bottom of the pipe and replace with a minimum of 6 inches coarse aggregate, VDOT Size Number 57, pipe bedding.

4. Excavation for all vaults shall be extended to a minimum of 12 inches below bottom of base slab elevation. The undercut excavation shall be covered with a continuous layer of non-woven geotextile fabric and refilled to the required grade with VDOT Size No. 57 coarse aggregate.

B. Additional Excavation: If unsuitable bedding materials are encountered at the specified elevation, Contractor shall consult the Engineer for approved correction methods. Engineer shall subsequently evaluate materials encountered and direct Contractor with an approved replacement method. Where additional excavation has been ordered and approved, the Contractor shall replace the removed material with select fill material as directed by the Engineer.

C. Unauthorized Excavation: Wherever the excavation is carried beyond or below the lines and grades given by the Engineer, except as specified above, all such excavated space shall be refilled with such material and in such manner as may be directed in order to ensure the stability of the various local structures. Beneath all structures, space excavated without authority shall be refilled by

the Contractor at his own expense, with Class D concrete or select fill materials, as ordered by the Engineer.

- D. Disposal of Material: Topsoil suitable for final grading shall be stored on the site separately from other excavated material. Other surplus excavated material unsuitable for backfilling or in excess of that required for constructing fills and embankments as shown on the Drawings shall be removed by the Contractor at no additional expense.
- E. Excavation Support Systems: All excavations shall be properly shored, sheeted and braced to furnish safe working conditions and to prevent damage, accidents and cave-ins.
 - 1. Shoring and bracing: Shore brace excavations as required by law and all applicable regulations or where conditions dictate to prevent shifting of material or damage to structures or adjacent property, and to avoid delays to the Work.
 - 2. Trench Shields: Trench shields shall meet all applicable OSHA Requirements for such units.
 - 3. Removal: Remove shoring and bracing as the excavation is backfilled, in a manner that avoids caving of the bank, damage to the Work, and disturbance to adjacent areas or structures. Fill voids left by withdrawal of the shoring by jetting, ramming or as otherwise directed.
- F. Removal of Water: Excavations shall be free of water. Contractor shall provide, operate and maintain pumping equipment. Water pumped, drained or otherwise removed from the work shall be disposed of in a suitable manner without damage to adjacent properties, to other work under construction or to streets. No water shall be discharged to the Town's sanitary sewer system and no water containing silt or other settleable solids shall be discharged to the Town's storm sewers.

3.4 ROCK EXCAVATION

- A. The word "rock", wherever used as the name of an excavated material or material to be excavated, shall mean only boulders and pieces of concrete or masonry exceeding 1 cubic yard in volume, solid ledge rock, or bedrock which requires for its removal, drilling and blasting, wedging, sledging, barring, or breaking up with a power-operated tool. No soft, weathered, decomposed or disintegrated rock which can be removed with a hand pick or

- power-operated excavator or shovel, no loose, shaken, or previously blasted rock or broken stone and no rock beyond the maximum limits of excavation, which may fall into the excavation, will be considered as “rock”.
- B. For excavations in which pipe will be laid, the rock shall be excavated to a depth of 6-inches below the lower outside surface of the pipe barrel or bell and filled in to the proper grade with properly graded fill material, and compacted to provide uniform support for the barrel of the pipe.
 - C. The Contractor shall keep explosives on the site only in such quantity as may be needed for the work under way and only during such time as they are being used. No on-site overnight storage of explosives shall be permitted. The Town of Herndon and the Engineer shall be notified in advance of daily storage and use of explosives. Explosives and explosive materials shall be stored in a secure manner and the Contractor shall obtain and pay for security as determined necessary. Blasting materials shall be kept away from all tools. Caps of detonators shall be safely stored at least 100 feet from the explosives when not secured in approved containers on approved vehicles during daily blasting operations. Upon completion of daily construction, all explosives and appurtenances remaining on site shall be promptly removed from the premises. In addition to observing all County ordinances and State and Federal laws relating to the transportation, storage, handling and use of explosives, the Contractor shall conform to any additional regulations which the Town of Herndon or the Engineer may deem necessary. Should any of the above mentioned laws, ordinances, or regulations require a licensed blaster to perform or supervise the work, said blaster shall, at all times, have his license on-site and shall permit examination thereof by the regulatory authorities having jurisdiction.
 - D. The Town of Herndon and the Engineer reserves the right to observe the drilling and loading of shotholes for test blasting and any excavation blasting to ensure that they are in accordance with the submitted plans. The Contractor shall inform the Town of Herndon and the Engineer 72 hours in advance of the planned work and before the start of these operations.
 - E. The Contractor shall at all times be responsible for any damage caused by blasting or any of his other operations.
 - F. All blasts shall be designed to prevent flyrock. It shall be the Contractor's responsibility to ensure that no hazards exist to

people, structures, or the environment in the area. Blasting mats shall be used at all times.

- G. Blasting shall be performed only with such quantities and strengths of explosives and in such manner as will break the rock approximately to the lines and grades shown leaving the rock not to be excavated in an unshattered condition. Controlled blasting techniques shall be used for all perimeter surfaces when blasting to final grades or lines. Controlled blasting is excavation of rock in which the various elements of the blast (hole size, depth, spacing, burden, charge size, explosive charge weight per delay, distribution, delay sequence) are carefully balanced and controlled to provide a distribution of charge that will excavate the rock to the required contours to minimize overbreak and fracturing of the rock beyond the contour line. Smooth wall blasting, pre-splitting, cushion blasting and line drill are examples of operations included in the term "controlled blasting". Where the nature of the rock is such that excessive overbreak beyond these limits may occur, the Town of Herndon or the Engineer may require that no blasting be done and that mechanical means be used for rock excavation.
- H. All necessary precautions shall be taken to preserve the material below and beyond the established lines of all excavation in the soundest possible condition. The Contractor is responsible for taking proper account of the geology and formation competency to prevent damage to foundation or perimeter rock, or structures resulting from permanent blast-induced rock movements or blast-induced gas pressures. The Town of Herndon and the Engineer will inspect an excavation following the blast and cleanup. The Town of Herndon or the Engineer may require a change in the controlled blasting technique, perimeter hole spacing, and/or loading density if unsatisfactory results are obtained, at no additional cost.
- I. Blasting shall not be performed closer to existing utilities and structures than is permitted by the Fairfax County Fire Marshal's Office for the type of blasting proposed, the type of existing utility or nearby structure and the type of rock encountered. In no case shall blasting be performed within 50 feet of existing water, gas, sewer or conduit utilities. All utilities or utility owners shall be notified prior to blasting in the vicinity of the utility.

3.5 BACKFILLING

- A. Pipe Trenches: Backfill to original grade or to such other grades as shown or directed.

1. **Manual Backfilling:** Backfill around pipe manually with suitable fill Type I or select fill, from 6 inches below the pipe up to the springline, unless specified otherwise herein or as directed. This material shall be placed in layers approximately 6 inches thick, each layer being thoroughly tamped and compacted in place to a minimum of 95% of maximum dry density in accordance with ASTM D698. Tamp using tools of approved weight to the following points:

<u>Nominal Pipe Diameter</u>	<u>Top of Manual Backfilling</u>
16 inches and Under	12 inches Above Top of Pipe
Greater than 16 inches	6 inches Above Top of Pipe

2. **Backfilling by Machine:** After backfilling around the pipes as specified above, the remainder of the trench may be backfilled by machine with suitable fill, but the Work shall be done in such a way as to prevent dropping of material directly on top of the pipe or structure. Material shall be deposited in uniform horizontal layers up to two feet in depth and compacted to a minimum 95% density.
 3. **Select Fill:** Where select fill material is ordered by the Engineer to bed and backfill the pipe, this material shall be consolidated to the identical points specified where suitable fill material is used as backfill. The use of select material shall be based upon the actual trench conditions encountered and depth shall be determined by the Engineer.
 4. **Prevention of Settlement:** Where structures such as pipe lines, walks, railroad tracks, and roadways are to be constructed or replaced later, on backfilled areas, place the entire backfill in such areas in layers, rolled, rammed, or otherwise thoroughly compacted to a minimum 95% of maximum dry density to prevent settlement.
- B. **Backfilling Around Structures:** A Town of Herndon Land Use Permit is required for all work performed within Town Right-of-Ways. Backfilling around structures and conduits shall be performed manually.
1. **Removal of foreign matter:** Remove lumber, rubbish, braces, and refuse from behind walls prior to starting backfill operation.

2. Backfill shall be compacted to a minimum 95% density.
- C. Backfilling in Town Right-of-Way: The following additional requirements apply for work performed in Town Right-of-Ways:
1. Backfill compaction: All backfill shall be placed in layers of not greater thickness than 6 inches, and shall be compacted in accordance with Virginia Department of Transportation Road and Bridge Specifications and the requirements of the Town of Herndon Land Use Permit for the project. Compact backfill with pneumatic tampers or other approved methods. Compaction by water shall not be permitted.
 2. Rejection of unsuitable materials: The Town's inspector may, at his discretion, reject backfill material that he determines to be unsuitable.
 3. Backfill requirements beneath aggregate surfaces: When the excavation is made beneath aggregate surfaces, the top 10 inches of the trench must be replaced in accordance with the requirements of Section 02700 – Paving and Surfacing.

3.6 EARTH EMBANKMENTS

- A. General: Fills and embankments required for the construction or completion of the Work shall be constructed where shown on the Drawings and to the lines and grades given by the Engineer.
- B. Removal of Vegetation: The entire surface of the ground to be covered with embankment shall be stripped of all grass, vegetation, topsoil, or destructible material of any kind, including rubbish, before any embankment material is placed.
- C. Embankment Materials: Earth embankment shall be made of the best material available from the excavation, so far as this is sufficient and of satisfactory character. No rubbish or other destructible material shall be used in embankments. Any additional material needed for earth embankment shall be from borrow pits approved by the Engineer, and this material shall be reasonably free from vegetable matter, large boulders, or rocks, greater than 6 inches in diameter, and shall be a material that can be solidly compacted and will remain stable when wet.
- D. Placement and Compaction Requirements: Wherever any structure is to be built upon embankments or fill, the earth for the

embankment shall be placed in layers of 8 inches in loose depth, and each layer shall be thoroughly sprinkled and compacted before the next layer is added. If, due to rain or other causes, the material is too wet for satisfactory compaction, it shall be allowed to dry partially before compacting. The layers shall extend entirely across the fill and shall be approximately level. Each layer shall be thoroughly compacted by the travel of trucks, where possible, or other machines. If ordered by the Engineer, the earth shall be compacted by rolling with a sheep's foot or tamping roller having a minimum weight on each tamper of 200 pounds per square inch of cross-sectional tamping area. The earth embankment, as specified above, shall be left to stand for as long a time as possible during the progress of construction and shall not be built upon until approved by the Engineer.

- E. Finish Grading: Before leaving the Work or before topsoil is placed, the top and slopes of all embankments shall be carefully trimmed to the slopes, lines and grades established by the Engineer, and any depressions shall be brought to grade with acceptable material. In general, for lawn areas, the embankments shall be fine graded to a true surface 4 inches below the established grade. For other areas, the embankments shall be fine graded to the established grade.
- F. Removal of Unsatisfactory Material: If any fill material is found to be insufficiently compacted, such materials shall be removed from the embankment, replaced with approved material and compacted to meet the required density.

3.7 RESTORATION

- A. General: The Contractor shall be responsible for maintenance and careful removal of fences, mailboxes, gas line markers, small trees, shrubs and other similar features. Temporary restoration of these items, if needed, shall be accomplished within 24-hours. All items covered by this section shall be restored or replaced in kind by the Contractor immediately upon completion of pipe installation in the affected areas.
- B. Complete finish grading and restoration of excavated areas in accordance with Section 02920 – Lawns and Grasses.
- C. Pavement: Refer to the provisions of Section 02700 – Paving and Surfacing.

*** END OF SECTION ***

SECTION 02370

EROSION AND SEDIMENT CONTROL

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SECTION 02370

EROSION AND SEDIMENT CONTROL

1 GENERAL

1.1 SUMMARY

- A. The work in this section consists of temporary methods to control water pollution such as berms, dikes, dams, sediment basins, crushed stone, gravel, mulches, grasses, straw bales, silt fence and other erosion control devices as indicated on the Drawings.
- B. Erosion and sediment controls as shown on the drawings or required by law, shall be installed prior to, or as the first step of, clearing. Temporary diversions seeded and mulched or staked straw bale diversions and other necessary control measures, are to be placed as indicated on the drawings prior to, or as the first step of excavation.
- C. The Contractor shall be responsible to maintain Erosion and Sediment measures throughout the term of the work and especially after each rainfall events.
- D. All areas, on or off site, which are to be disturbed by construction and which are not currently paved or built upon shall be adequately stabilized to control erosion and sedimentation. Acceptable stabilization shall consist of permanent grass seed mixture installed in accordance with the Virginia Erosion and Sediment Control Handbook. All slopes 2:1 and greater shall be sodded and staked or otherwise stabilized in a manner approved by the Town.
- E. No areas shall be denuded for a period longer than 30 days in advance of the work.
- F. Any disturbed area not paved, permanently seeded, sodded or built upon by November 1st or disturbed after that date shall be seeded within 7 days with Oats, Abruzzi Rye or approved equivalent, and mulched with hay or straw mulch at the rate of 2 tons per acre. For additional details, refer to the current edition of the Virginia Erosion and Sediment Control Handbook.

1.2 REFERENCES

- A. Virginia Erosion and Sediment Control Handbook.

1.3 REGULATORY REQUIREMENTS

- A. Erosion Controls: Erosion controls shall be as indicated on the Drawings and shall satisfy the governing standards of the Virginia Erosion and Sediment Control Handbook.

2 PRODUCTS

2.1 MATERIALS

- A. General: All products and materials shall comply with the “Virginia Erosion and Sediment Control Handbook”.

3 EXECUTION

3.1 PREPARATION

- A. Precautions: Take precautions to prevent the silting of streams or water impoundments during actual construction and periods when the Work may be temporarily suspended.
 - 1. Prevent construction activities from causing soil erosion on the site and adjacent property. Initiate effective E&S measures prior to the commencement of clearing, grading, excavating, or other operations that will disturb the natural protection.
- B. Work Schedule: Schedule Work to expose areas subject to erosion for the shortest time possible. Preserve natural vegetation to the greatest extent possible. Locate temporary storage and construction buildings and route construction traffic to minimize erosion. Provide temporary fast-growing ground cover or other suitable means as necessary to control runoff.

3.2 INSTALLATION

- A. Stockpiling Excavated Materials: Stockpile all excavated materials on the uphill side of the pipe trench when this practice is not contrary to safe requirements or equipment working room requirements.

- B. Protect Existing Vegetation: Retain and protect natural vegetation wherever feasible.
- C. Protection of Streams: No material shall be placed in streambeds. All work including diversion dams or temporary cofferdams and installation of culvert pipes at all stream crossings shall have proper State and Federal permits prior to installation.

3.3 PROTECTION

- A. Protection of Stockpiled Material: Any stockpiled material that will remain in place longer than 30 days shall be seeded for temporary vegetation and mulched with straw mulch. Where soil is placed on the downhill side of the trench, it shall be backsloped to drain toward a trench. When a dewatering trench is necessary, the discharge hose shall be directed to a sediment basin/trap, through a dewatering structure, or may be directed through a stabilized area from which any sediment deposits can be removed.
- B. All erosion and sediment control devices shall be kept in working order at all times by the Contractor. The Contractor shall provide daily inspection and maintenance of the erosion and sediment control measures throughout the life of the project. Any damage to physical measures shall be permanently repaired as soon as possible. Temporary repairs, constructed as protection from further damage, shall be provided by the close of the working day.

3.4 RESTORATION

- A. Seed, mulch or sod and fully restore all disturbed areas within 7 days after backfill of the applicable trench section. In no case shall a construction area be denuded for more than 30 days.

*** END OF SECTION ***

SECTION 02510

WATER DISTRIBUTION

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SECTION 02510

WATER DISTRIBUTION

1 GENERAL

1.1 DESCRIPTION

- A. This Section covers the requirements for furnishing all labor, materials, equipment and appurtenances necessary for the complete and satisfactory construction of all ductile iron piping, fittings, valves, hydrants and appurtenances as shown on the Drawings and specified herein.
- B. All work, materials and incidentals necessary to the construction of the piping, including excavation and backfill, excavation support, laying and joining of pipe, and other miscellaneous work shall meet the requirements of the Town of Herndon and the applicable requirements of other Sections and as modified herein.
- C. The Contractor shall verify all dimensions of valves, special fittings, pipe, equipment, etc., so that all of the pipe work performed will fit together properly and will conform to the arrangement as shown on the Drawings. In selecting laying lengths of fittings, the Contractor shall be guided by the dimensions of fittings and existing pipe systems to which connections are made and by the indicated dimensions on the Drawings. All pipe and appurtenances shall be accurate to the dimensions shown. Bells, spigots, and flanges shall be at right angles to the axis of the opening, and openings shall be at the exact angle specified.
- D. The Contractor shall verify the type of pipe, the joint type, configuration and direction of bell and spigot and the exact horizontal and vertical location for connections at the locations indicated on the Drawings, finalize all lay lengths, and confirm pipe layout prior to shop drawings submittal. Any deviation from the connection concept indicated which prevents construction as shown shall be brought to the Town of Herndon's and the Engineer's attention for resolution prior to shop drawing preparation. The Contractor shall provide the pipe material to match the existing pipe and/or provide the required adapters to connect to the existing pipe.

1.2 REFERENCES

- A. ANSI Standard B16.1 Cast Iron Pipe Flanges and Flanged Fittings
- B. ANSI/AWWA C104/A21.4: Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
- C. ANSI/AWWA C105/A21.5: Polyethylene Encasement for Ductile Iron Pipe Systems
- D. ANSI/AWWA C110/A21.10: Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water
- E. ANSI/AWWA C111/A21.11: Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings
- F. ANSI/AWWA C115/A21.15: Flanged Ductile Iron Pipe with Ductile Iron or Gray-Iron Threaded Flanges.
- G. ANSI/AWWA C116/A21.16: Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service
- H. ANSI/AWWA C151.A21.51: Ductile-Iron Pipe Centrifugally Cast, for Water
- I. ANSI/AWWA C153/A21.53: Ductile-Iron Compact Fittings for Water Service
- J. AWWA C500: Metal-Seated Gate Valves for Water Supply Service
- K. AWWA C502: Dry-Barrel Fire Hydrants
- L. AWWA C504: Rubber-Seated Butterfly Valves.
- M. AWWA C509: Resilient-Seated Gate Valves for Water Supply Service.
- N. AWWA C550: Protective Epoxy Interior Coatings for Valves and Hydrants.
- O. AWWA C600: Installation of Ductile-Iron Water Mains and Their Appurtenances.
- P. ASTM A325 Specification for High strength Bolts for Structural Steel Joints
- Q. National Sanitation Foundation NSF 61

- R. Commonwealth of Virginia/Department of Health, Waterworks Regulations.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Load, unload, handle, inspect and store ductile iron and gray iron pipe, fittings, hydrants, valves and accessories and appurtenances in accordance with AWWA C600.
- B. Inspect materials delivered to site for damage; store with minimum of handling. Store piping, jointing materials and rubber gaskets under cover. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris. Store materials in a manner that will not cause excessive rusting or coating with grease or other objectionable matter.
- C. Handle and transport pipe, fittings, and other accessories in a manner to ensure delivery to the trench in sound, undamaged condition.

2 PRODUCTS

2.1 GENERAL

- A. All pipe and fittings shall be new and of the sizes indicated on the Drawings, with linings and coatings specified for particular sections and shall be ductile iron pipe.

2.2 DUCTILE IRON PIPE AND FITTINGS

- A. Ductile iron pipe for buried service shall be furnished in accordance with ANSI/AWWA C151/A21.51-96 or latest revision thereof. Thickness Class 51 shall be used for buried pipe greater than 12-inches in diameter except as otherwise noted on the drawings. All ductile iron pipe 12-inches and smaller shall be thickness Class 52. Pipe shall be as manufactured by the American Cast Iron Pipe Company, Griffin Pipe, U.S. Pipe and Foundry Company, or approved equal.
- B. Joints for buried ductile iron pipe, fittings and specials shall conform to ANSI/AWWA C111/A21.11-00 or latest revision thereof and shall be push-on or mechanical joint pipe. Push-on joints may be the "Tyton" joint of the U.S. Pipe and Foundry Company, the "Fastite" joint of American Cast Iron Pipe company, the "Super Bell-Tite" joint of Griffin Pipe Products Co., or other approved equal
- C. Fittings and appurtenances shall be manufactured in accordance with ANSI/AWWA C110/A21.10-98 or latest revision thereof and shall have a

minimum pressure rating of 250 psi. The ductile iron used in the manufacture of ductile iron fittings and specials shall have a minimum tensile strength of 70,000 psi. For piping less than 16-inches in diameter, compact fittings manufactured in accordance with ANSI/AWWA C153/A21.53-00 or latest revision thereof will be permitted.

- D. Unless otherwise specified, the inside of pipe and fittings shall be cement-lined in accordance with ANSI/AWWA C104/A21.4-95 or latest revision thereof. For all piping 24-inches and larger, thickness of cement lining shall be twice the standard thickness specified in paragraph, Thickness of Lining, Section 4.8 of ANSI/AWWA C104/A21.4. The outside of buried pipe and fittings shall be bituminous coated to meet the requirements of AWWA C151. All exposed ductile iron pipe and fittings shall be shop primed (with primer compatible with field painting) on exterior surfaces and given required finish coats in the field.
- E. Flanged pipe shall comply with ANSI/AWWA C115/A21.15-99 or latest revision thereof and shall be suitable for minimum of 250 psi. Size, length and number of bolts shall be as required by the installation, in accordance with AWWA C110 and C115. Flanges shall be Class 125 ANSI B16.1. Bolts and nuts shall be carbon steel in accordance with ASTM A307. Bolts and nuts shall comply with ANSI B18.2.1 and ANSI B18.2.2. All flanged pipe 48-inches and larger shall be pressure tested by the manufacturer prior to delivery to the job site. Leaking pipe shall not be accepted. Thread compound shall be shop applied. Joint repairs using repair compound to the flange after the joint fabrication shall not be allowed.
- F. Each piece of ductile iron pipe shall have the weight and class designation conspicuously painted on it as near as possible to the flanged or bell end of the pipe and these designations shall be clearly legible.
- G. All materials that may be in contact with potable water shall be in accordance with and approved by NSF Standard 61.
- H. Pipe shall be supplied in standard lengths not to exceed 20 feet.
- I. Plugs and Caps for ductile iron pipe shall conform to AWWA C110 and shall be suitable for a minimum of 250 psi.

2.3 RESILIENT WEDGE GATE VALVES

- A. Gate valves shall be provided for sizes 2-inches in diameter through 12-inches in diameter. Gate valves shall be resilient wedge gate with non-rising stem valves manufactured and tested in accordance with AWWA C509, latest revision. The valves shall be suitable for 250 psi working pressure,

maximum temperature of 125-degrees F and minimum temperature of 33-degrees F. Body shall be grey iron ASTM-126 Class B, with a full port opening equal to the diameter of the corresponding pipe. The body shall have integrally cast guides to insure the gate is properly guided through complete travel, and shall be free of pockets and bridges in the valve bottom.

- B. Valve ends for buried valves shall be push-on or mechanical joint for underground installations and flanged for above grade or interior installations. Valve ends shall meet the requirements of AWWA C509.
- C. The sealing mechanism shall consist of a free-draining by-directional compression seating gate, which ensures a 100 percent bubble tight seal in the closed position against the line flow. The gate shall be constructed of cast iron or ductile iron with EPDM seals. Seals shall be o-ring stem.
- D. The valve stem shall be bronze-manganese bronze, CDA Alloy C67600 with bronze stem nut. The threads on the bronze stem are Acme form threads for strength.
- E. A bolted bonnet cover shall contain a grit and dust cap protecting two O-ring stem seals and the nylon bushing located above the stem collar.
- F. All internal and external surfaces of the valve including the interior of the gate shall be coated with a thermosetting epoxy coating, 10 mils nominal thickness, and conform with AWWA C550 and certified to NSF 61.
- G. Product and manufacture: Resilient wedge gate valves shall be as manufactured by Mueller, model number A-2360 or approved equal.
- H. Valve boxes shall be provided for each buried valve.

2.4 BUTTERFLY VALVES

- A. Buried butterfly valves shall be for sizes greater than 12-inches through 24-inches diameter and shall be manufactured in accordance with AWWA C504, Class 150B, and suitable for 150 psi working pressure and a velocity of 10 feet per second. Valves shall be bubble tight at rated pressures. Valve discs shall rotate 90 degrees from full closed to open. Operators shall be assembled to the valve by the valve manufacturer. The valve/operator shall be tested as a complete assembly by the valve manufacturer. The manufacturer shall have produced AWWA butterfly valves for a minimum of 5 years.
- B. Valve bodies shall be constructed of cast iron ASTM A126 Class B, cast iron ASTM A48-CL40, or ductile iron ASTM A-536. Laying length shall be

short body as listed in AWWA C504, unless otherwise noted. Ends shall conform to AWWA C111.

- C. Valve discs shall be constructed of cast iron ASTM A126 or A48, ductile iron ASTM A 536. Disc edge shall be either ni-chrome or Type 316 stainless steel.
- D. Valve seats in contact with product shall be EPDM. The seat shall be located in the valve body or disk. If seat retaining hardware such as screws and segments are used, they shall be monel or stainless steel. If screws are used, monel or stainless steel plugs shall be affixed in the valve body and tapped to receive these screws.
- E. Valve shafts shall be Type 304 stainless steel, ASTM A276 and shall be of a diameter not less than those listed in AWWA C504, Class 150B.
- F. Shaft seals shall be furnished where the shaft projects through the valve body. Shaft seals shall be standard split-v type packing.
- G. Valves shall be fitted with sleeve type bearings contained in the trunions of the valve body. Bearing material shall be nylon for valves through 20-in and fiberglass with teflon lining for valves 24-in and larger.
- H. Valve manufacturer shall furnish and mount operator suitable for buried service. Operators shall be self-locking and suitable for submergence to 20-ft. A 2-in square operating nut shall be furnished. Operator shall be capable of withstanding an input of 450 ft-lbs without damage. Valve extension for valves with cover in excess of 36-inches shall be provided.
- I. All valves shall be hydrostatically leak tested and certified reports submitted to the Engineer and the Town of Herndon.
- J. Valve class shall be AWWA Class 150B with operators sized for bi-directional flow. Maximum input torque to the 2-inch AWWA operator nut shall be 150 ft-lbs.
- K. Valves shall be as manufactured by Dezurick, Mueller, Kennedy, or approved equal.

2.5 DUAL CHECK VALVE

- A. Dual check valves shall be tested and certified to latest revision of ANSI/ASSE Standard 1024 and comply with the following:

1. Dual check valves shall have a maximum working pressure rating of 175 psig and a maximum temperature rating of 180 degrees F.
 2. Dual check valve shall have an arrow direction cast into the bronze body, showing flow direction.
 3. All check valves shall have an entry cover threaded into the body, making the internal parts available for inspection, field testing, and replacement. The cover shall be o-ring sealed.
 4. Check valve inlet shall be either a swivel lock nut connection or as required by the Town of Herndon.
 5. Check valve outlets shall be copper flare outlet or as required by the Town of Herndon.
- B. Product and manufacturer: Provide top entry vertical check valve by Mueller, model number M-98 or approved equal.

2.6 VALVE BOXES

- A. All buried gate and butterfly valves shall be provided with operating nuts and valve boxes as follows:
1. Extension shafts shall be Type 304 stainless steel and the operating nut shall be 2 inches square. Shafts shall be designed to provide a factor of safety of not less than four. Operating nuts shall be pinned to the shafts. Extension shafts shall be provided for all valves with operating nuts deeper than 36-inches below grade. The extension shaft nut shall extend to within 24-inches below grade.
 2. Top of the operating nut shall be located as specified in this Section.
 3. Valve boxes shall be 5 ¼" shaft Buffalo style, slip type, adjustable cast iron valve boxes of the two piece type, consisting of top section with cover and bottom section. Base shall be proper type and size for the valve with which it is used. The word "WATER" shall be cast or embossed on the valve box cover in letters not less than 1 inch high. Screw type extension pieces if required shall be cast iron or ductile iron. Valve box shall be manufactured by Mueller Company, Bingham & Taylor, Opelika Foundry, Tyler or approved equal. PVC pipe is not allowed for extensions.
 4. Barrel length shall be adapted to the depth of cover, with a lap of at least 6 inches when in the most extended position. Covers shall be

cast iron with integrally-cast direction-to-open arrow. Aluminum or plastic is not acceptable. A means of lateral support for the valve extension shafts shall be provided in the top portion of the valve box. Covers shall not rock when subjected to traffic.

5. The upper section of each box shall have a bottom flange of sufficient bearing area to prevent settling. The bottom of the lower section shall enclose the stuffing box and operating nut of the valve and shall be oval.
6. An approved operating key or wrench designed for valve operation shall be provided.
7. All fasteners shall be Type 304 stainless steel.

2.7 HYDRANTS

- A. Hydrants shall be designed for 150 psi service and for installation in a trench that will provide 3 ½-foot minimum cover. Hydrants shall be of the safety, flange, breakaway top type, meeting requirements of AWWA C502. Hydrants shall have a barrel diameter no smaller than 6 inches, a hydrant valve diameter no smaller than 4 ½-in, and shall be equipped with two 2 ½-in hose nozzles and one 4 ¼-in pumper connection. Hose and pumper outlet threads shall match Town of Herndon standards.
- B. Hydrant valve opening shall be obstructed only by the valve rod. Each hydrant shall be able to deliver a minimum of 600 gallons per minute through its two 2-1/2-in hose nozzles when opened together with a loss of not more than 2 psi in the hydrant.
- C. Hydrant shall be of the full compression design, opening against and closing with the water pressure. The hydrants shall be designed to permit rotary movement of the upper barrel any number of degrees required to effect proper alignment without shutting down service or removing flange bolts and nuts.
- D. Hydrant must open turning a 5/8-in (point to flat) pentagon operating nut to the left (counterclockwise) and must be marked with an arrow and word “open” to indicate the direction to turn stem to open hydrant.
- E. All internal parts shall be designed for rapid and simple removal employing a compact lightweight wrench (10 pounds or less) that will withdraw all working parts from the base of the hydrant as a unit. Hydrant must be capable of being extended without removing any operating parts.

- F. The main valve assembly shall have a bronze subseat and a bronze seat ring. The threaded bronze subseat of the hydrant shall be an integral part of the boot or elbow valve assembly. The seal between the set ring and seat shall consist of two “O” rings located in machined grooves above and below the drainage channel. There shall be a minimum of two (2) exterior drain ports, located one-hundred and eighty degrees (180 deg.) apart.
- G. Hydrant operating mechanism shall be housed in a compact seal plated with integral lubrication chamber. An “O” ring seal shall be used on the hold down nut to prevent direct condensation or atmospheric contamination entering grease chamber from outside. Downward travel of main valve shall be controlled by a travel stop nut at the top of the hydrant. Hydrant operating mechanism shall be readily available for inspection without removing seal plant from barrel.
- H. The design and construction of the hydrant operating mechanism located at the top of the hydrant shall be such that no part of the operating threads will be in contact with water in the standpipe when the hydrant is in service, and “O” ring seals shall be used to prevent water under pressure from entering the lubricating chamber. A bronze nut and check nut shall be provided to hold the main hydrant valve on its stem.
- I. Hydrant shall be furnished with a steel chain holder, double steel hose cap chain, steel pumper cap chain and any other hooks and/or appurtenances required for proper use. Each nozzle cap shall be provided with a Buna N rubber washer.
- J. All ironwork to be set below ground, after being thoroughly cleaned, shall be painted with two coats of asphalt varnish specified in AWWA C502.
- K. Hydrants shall be hydrostatically tested as specified in AWWA C502.
- L. Product and manufacturer: Hydrants shall be manufactured by Mueller A-461 Centurion or Kennedy K-81.
- M. Protective Coatings: Hydrant nozzle caps and bonnets shall be painted with Dura Clad HR Ready Mixed Aluminum 93-824 – Duron #9382411 or approved equal. Barrel assemblies shall be painted with two coats of Dura Clad Interior/Exterior Alkyd Gloss Chinese Red – Duron #1294311 or approved equal after thorough cleaning of ironwork.

2.8 TAPPING VALVES AND SLEEVES

- A Tapping sleeves shall be mechanical joint type, with an iron body and a brass test plug suitable for installation on the existing pipe, in accordance with AWWA C110. Tapping sleeve shall be Mueller H-615, or approved equal.
- B Tapping valves shall be mechanical joint type with O-ring seals and non-rising stem. Inlet end shall have a Class 125 flange for attending sleeve. Tapping valves shall be resilient wedge tapping valves manufactured in accordance with AWWA C509, and shall be Mueller Model T-2360, or approved equal.

2.9 CASING PIPE

Pipes that must be bored or tunneled under a roadway, or other natural obstruction, shall be installed in a steel casing or tunnel. Pipe in casings or tunnels shall be constructed of a minimum of Class 52 ductile iron pipe with restrained joints for the entire length. Prefabricated stainless steel pipe supports with non-conductive skids or other acceptable support systems will be provided to support the pipe. Pressure treated timber skids shall not be permitted. Casings and tunnels shall be installed on a slope such that they will drain. Provide complete design information on any utility tunnel in the project plans. The casing pipe shall conform to the materials standard of ASTM Designation A252 with minimum wall thickness of 1/4 inch for pipe 30-inches or less and 3/8 inches for pipe greater than 30-inches. Steel pipe will have minimum yield strength of 35,000 psi. Casing pipe segments shall be joined together with welded pipe.

2.10 CORPORATION STOPS

- A. Mueller H-15000 Ground Key Corporation Stop or B-25000 Ball Corporation Valve.
- B. Ford F600 Key/Plug Corporation Stop or FB600 BallcorpTM Stop.
- C. Approved equal of 2.10-A or 2.10-B.

2.11 METER VAULT FRAMES & LIDS

Frames and lids for water meter vaults shall be Neenah Foundry Company Series R-1640-A with drop handles or equal with solid lids clearly stamped HERNDON WATER METER in 1-inch lettering. Open diameter of manhole shall be 24-inches.

3 EXECUTION

3.1 EXAMINATION

- A. Verify existing field conditions.
- B. Perform test pits at all known utility crossings and as required on the Drawings.
- C. Inspect water main materials for cleanliness and absence of damage.

3.2 PREPARATION

- A. Ductile Iron Pipe and Fittings:
 - 1. Push-on Joints
 - a. Thoroughly clean the groove and bell socket and insert the gasket, making sure that it faces the proper direction and is correctly seated.
 - b. After cleaning any dirt or foreign material from the plain end, apply lubricant in accordance with the pipe manufacturer's recommendations.
 - c. When pipe is cut in the field, bevel the plain end with a heavy file or an air-driven grinder to remove all sharp edges.
 - 2. Mechanical Joints: The socket and plain end shall be wiped clean of all sand and dirt and any excess coating in the bell shall be removed. The plain end, bell socket and gasket shall be washed with a soap solution.
 - 3. Flanged Joints: Rust-prevention grease shall be removed from the flanges using a solvent-soaked rag. The flanges and gasket shall then be wiped clean of all dirt and grit.

3.3 PIPE INSTALLATION

- A. Excavating, Trenching and Backfilling: Shall be in accordance with Section 02315 – Excavating, Backfilling and Compacting.
 - 1. All Work under this Contract shall be constructed in accordance with the lines and grades shown on the Drawings. The full responsibility

for establishing and maintaining alignment and grade shall rest upon the Contractor.

2. The Contractor shall lay all pipe in trenches in accordance with the pipe manufacturer's approved laying schedule, when applicable, and the requirements of Section 02315 – Excavating, Backfilling and Compacting and this section.

B. Pipe Laying:

1. Proper and suitable tools and appliances for the safe and convenient cutting, handling and laying of the pipe and fittings shall be used. The pipe and fittings shall be thoroughly cleaned by power washing before they are laid and shall be kept clean until they are accepted in the completed Work. Special care shall be exercised to avoid leaving bits of wood, dirt and other foreign particles in the pipe. If any such particles are discovered before final acceptance of the Work, they shall be removed and the pipe, valves and fittings replaced at the Contractor's expense. All mains shall be kept absolutely clean during construction. In matters not covered by these Specifications, laying of ductile iron pipe shall meet the requirements of AWWA Standard C600. Exposed ends of uncompleted lines shall be capped or otherwise temporarily sealed with approved watertight bulkheads at all times when pipe laying is not actually in progress.
2. Pipe laid in excavations shall be laid on good foundation, trimmed to shape and, when required, secured against settlement. At joints, enough depth and width shall be provided to permit the making of the joints and the inspection of the bottom half of the joint. All elbows and tees shall be properly backed up and anchored so that there will be no movement of the pipe in the joints due to internal or external pressure. Pipes shall have solid bearing throughout their entire length.
3. The Contractor shall lay all pipes in strict accordance with the manufacturer's recommended procedures. The laying schedule for curves or other ductile iron pipe deflections shall have a maximum joint deflection eighty percent of the value shown in the approximate tables in AWWA C600, except in the case of bevel pipe, where the maximum deflection shall be as marked on the pipe. An absolute minimum of three feet of cover in localized areas shall be permitted when approved by the Engineer. Under normal laying conditions, the depth of cover shall be 4 feet.
4. Where pipe is laid in rock trenches, a minimum space of 6-inches

below the outside bottom of the pipe shall be filled with selected material in accordance with Section 02315 – Excavating, Backfilling and Compacting before the pipe is laid.

5. When special beddings are shown on the Drawings or are ordered by the Engineer, they shall conform to the requirements of Section 02315 – Excavating, Backfilling and Compacting.
6. Temporary bulkheads shall be installed at the ends of sections where adjoining water mains have not been completed. All such bulkheads shall be removed when the need for them has passed or when ordered by the Engineer.

C. Joining Ductile Iron Pipe and Fittings:

1. When joining pipes and fittings, the Work shall be done in strict accordance with the requirements of AWWA C600, the manufacturer's printed instructions, approved submittals and these Specifications.
2. Push-on joints shall be assembled with general procedure to be as follows:
 - a. Prepare pipe and joint as described in this specification Section.
 - b. Push the plain end into the bell of the pipe. Keep the joints straight while pushing segments together. Make deflection after the joint is assembled.
3. Mechanical joints shall be assembled with general procedure to be as follow:
 - a. Prepare the socket and plain end as described in this specification Section.
 - b. Place the gland on the plain end with the lip extension toward the plain end of the pipe, followed by the gasket with the narrow edge of the gasket toward the end of the pipe.
 - c. The pipe shall be pushed into the bell socket and the gasket pressed firmly and evenly around the entire socket. The gland is then pushed up to the bell and centered on the pipe. Glands may require a wedge under the top side to assist in centering the gland lip against the gasket.

- d. The bolts shall then be inserted and tightened with the fingers until all are even. A ratchet wrench shall be used to complete the tightening of the bolts, care shall be exercised to tighten the opposite nuts to keep the gland square with the socket and the bolt stress evenly distributed. The following torque shall be applied:

<u>Bolt Size</u>	<u>Torque (Foot Pounds)</u>
5/8 Inch	45-60
¾ Inch	75-90
1 Inch	100-120
1 ¼ Inch	120-150

4. Flanged joints: Shall be assembled with general procedure to be as follows:
 - a. Prepare flanges in accordance with the requirements of this specification Section.
 - b. The flanges shall be accurately aligned, using a spirit level, and pipe properly supported before the gasket and bolts are inserted. The rubber gasket shall be carefully placed to ensure full flow proper sealing of the joint.
 - c. Bolt threads shall be given a light coat of thread lubricant and then inserted and the nuts turned up by hand. Bolts shall then be pulled up with a wrench employing the crossover method. Applied torque shall be in strict accordance with the manufacturer's requirements.
5. Mechanically Coupled Joints: Mechanical couplings shall be installed in strict accordance with the manufacturer's instruction and in a manner to ensure permanently tight joints under all reasonable conditions of expansion, contraction, shifting and settlement. Mechanical couplings and harnessed mechanically coupled joints installed underground shall be coated as specified in this Section. Mechanical coupling shall only be permitted where shown on the Drawings or where specifically approved by the Engineer and the Town.

D. Ductile Iron Pipe on Supports:

1. Whenever pipe is laid on supports, the saddle angle of the support shall not be less than 120 degrees.

2. Whenever pipe is laid on supports, the minimum axial bearing length of the supports shall be in accordance with the following table:

<u>Pipe Diameter</u>	<u>Axial Bearing Length</u>
4-8 Inch	6 Inches
10-14 Inch	12 Inches
16-36 Inch	18 Inches

- E. Pipe Cradles and Encasements: Where concrete cradles or encasements are required, they shall be constructed with a minimum strength equal to VDOT Class B2 concrete.
- F. Thrust Restraints: Thrust Restraints including anchors, strapping or other approved restraining devices shall be in accordance with Section 02512 – Thrust Restraints of these specifications, and Standard Details.
- G. Pipe Installed Within Structures and Concrete Encasements: Where temporary supports are used, they shall be sufficiently rigid to prevent shifting of the pipe. Maintain a 1-inch minimum clearance between steel reinforcing and pipe.
- H. Sanitary Sewer Crossings:
 1. Maintain required separation between water and sewer facilities in accordance with Virginia Department of Health “Water Works Regulations”.
 2. Provide concrete pier supports for existing sanitary sewer pipe crossing over the water main.
- I. Surface Water Crossing:
 1. Under-water crossings are permitted and shall be installed in accordance with the Virginia Department of Health “Water Works Regulation”, latest revision.
 2. Above-water crossings are not permitted for water distribution in the town.

3.4 BURIED VALVES INSTALLATION

- A. Buried valves and boxes shall be installed in conformance to AWWA Standards C504 and C600 as applicable, except as specified herein. Valves

shall be set with the operating nut vertically aligned in the center. Valves shall be set on a firm foundation and supported by tamping selected excavated material under and at the sides of the valve.

- B. Valve boxes shall be installed vertically, centered over the operating nut, and the elevation of the top shall be adjusted to conform with the finished surface of roadway or other surface at the completion of the contract. Boxes shall be adequately supported during backfilling to maintain vertical alignment.

3.5 CONNECTIONS TO THE WATER SYSTEM

- A. General: The Contractor shall connect the pipelines to existing water mains and make provisions for future connections as shown on the Drawings.
- B. System Shutdowns
 - 1. If system shutdown is necessary, Contractor shall submit a proposed shutdown plan to the Town for review and approval. The plan shall include at a minimum, valves that will be closed, fire hydrants that will be out of service, customers affected by the shutdown, proposed work and time frame anticipated for shutdown. The Plan shall be submitted at least 30 days before scheduled work.
 - 2. At least five (5) days before the anticipated shutdown, Contractor shall notify the Town, including the Fire Marshal, of his proposed schedule and verify the Town's availability to perform valve closures. The contractor may only operate valves with specific approval by the Town.
 - 3. Contractor shall prepare and distribute notifications to customers affected by the proposed shutdown and at least 48 hours before the proposed interruption of service. The format and delivery plan for interruption of service notification must be approved by the Town prior to distribution.
- C. Make connections to existing mains in accordance with approved submittals.
- D. Where existing mains are provided with fittings for the purpose of connecting to the new main, the Contractor shall remove the plugs or bulkheads, clean the ends, prepare them for connection to the new pipeline, and make the new joint.
- E. The water released by cutting or opening existing mains shall be removed and the excavation kept dry until all necessary Work within the excavation has been completed.

3.6 SERVICE, AIR RELEASE AND BLOW OFF CONNECTIONS

- A. Service Connections: Service connections shall be installed by the Contractor as required by the Drawings and the Standard Details, or as directed by the Engineer or the Town.
 - 1. The connections shall be made by tapping the water main with a corporation stop as shown in the detail drawings. Copper tubing and any required fittings shall be attached thereto. Allowance for any possible movement of the water main or service piping at the tap shall be accomplished by making a half loop in the copper tube and firmly compacting the backfill under this loop. The tube shall be extended to the concrete curb and the tube shall be passed under and terminated at the curb stop or meter assembly as indicated on the Drawings and the Standard Details or as directed by the Engineer or the Town. Care shall be used to prevent the tube from crimping, binding or twisting. The concrete curb shall not be removed or damaged. Where required, a curb box shall be place vertically and aligned over a curb stop for proper access and, where required, a meter box shall be placed around a meter assembly as shown on the Drawings. Service connections shall be in accordance with the Town of Herndon Standard Details.
 - 2. A minimum of 3 feet of cover shall be placed over the service tube.
- B. Air Release and Blowoff Connections: All requirements for the installation of service connections are required for manual air-release and blowoff connections, 2 inches in diameter or smaller. Air release and blowoff connections shall be in accordance with the Town of Herndon Standard Details.
- C. Provide approved tapping saddles where pipe walls are insufficient to embed three threads in metal.

3.7 LEAKAGE TESTS

- A. Perform leakage tests in accordance with Section 02514 – Leakage Tests. Make necessary repairs and repeat tests until required results are obtained.

3.8 DISINFECTING

- A. Disinfect finished water mains and appurtenances in accordance with Section 02513 – Disinfection of Water Distribution Systems.

END OF SECTION

SECTION 02512

THRUST RESTRAINTS

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SECTION 02512

THRUST RESTRAINTS

1 GENERAL

1.1 SUMMARY

- A. Section Includes
 - 1. Concrete Thrust Anchors
 - 2. Concrete Thrust Collars
 - 3. Mechanical Joint Restraints
- B. Products Furnished But Not Installed Under This Section
 - 1. Restraining Glands
 - 2. Tie Rods (Strapping) and Tie Bolts (Eyebolts)

1.2 REFERENCES

- A. ASTM A325 - Standard Specification for High Strength Bolts for Structural Steel Joints
- B. ASTM A490 - Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
- C. ASTM A536 - Standard Specification for Ductile Iron Castings.
- D. AWWA C111 - Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.
- E. AWWA C153 - Ductile Iron Compact Fittings, 3-Inch through 24-Inch, and 54-Inch through 64-Inch for Water Service.
- F. AWWA C110 - Ductile Iron and Grey Iron Fittings, 3-Inch through 48-Inch, for Water and Other Liquids.
- G. AWWA M11 - Steel Pipe: A Guide for Design and Installation

2 PRODUCTS

2.1 MATERIALS

- A. Tie Rods and Tie Bolts: Tie rods and tie bolts shall be fabricated of high strength steel conforming to ASTM A325.
- B. Nuts shall conform to ASTM A490. Number of threads shall conform to AWWA M11, Table 13-7A.

2.2 RESTRAINING GLANDS

- A. Joint restraint shall be provided in the design of the follower gland and shall include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Flexibility of the joint shall be maintained after burial. Glands shall be manufactured of ductile iron conforming to ASTM A536. Restraining devices shall be manufactured of ductile iron, heat treated to a minimum hardness of 370 BHN. Dimensions of the gland shall be such that it can be used with the standardized push-on joint bell, mechanical joint bell and tee-head bolts conforming to AWWA C111 and AWWA C153. Twist-off nuts shall be used to ensure proper actuating of the restraining devices. The joint restrain device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1.
- B. Restrained pipe lengths for pipe shall be indicated on the Drawings.
- C. Restrained joints for existing ductile iron pipe to be restrained in the field by the Contractor shall be by a wedge action split harness tied across the joint by thrust bolts suitable for a pressure of 250 psi. Tie-rod number and diameter shall be designed by the manufacturer for the pressure and shall be equally spaced about the joint. The clamps, split ring, tie-bolts, backup plates twist off nuts, and assembly bolts shall be designed by the manufacturer for the installation. Rings and gripper surfaces shall be cast iron conforming to ASTM A536. Alternate restraining systems such as a steel tie bolt system may be used on approval by the Town of Herndon.
- D. Manufacturers:
 - 1. EBBA Iron, Inc.
 - 2. SIGMA/NAPPCO

3. Ford
4. Or approved equal

2.3 RESTRAINED JOINT PIPE

- A. Joints for pipe 24-inches in diameter and smaller may alternately be restrained using the manufacturers proprietary restrained joint as approved by the Town of Herndon. Other acceptable joint restraints for push-on joints for Ductile Iron Pipe include U.S. Pipe TR Flex, American Cast Iron Pipe Company Fast-Grip and LOK-Ring, Griffin Pipe Products Company Snap-Lok and Bolt-Lok, or Clow Corporation Super-Lock.

2.4 CONCRETE MIXES

- A. Concrete for Thrust Collars and Thrust Anchors shall, as a minimum level of strength, be constructed of VDOT Class B2 Concrete. Class B2 concrete is designed with a minimum 28 day compressive strength of 2,200 psi. and is intended for use in workmats beneath structures, soil stabilization, pipe cradles, encasement, corrosion control test station pads, guard posts, thrust anchors, filling and other similar purposes.

3 EXECUTION

3.1 INSTALLATION

- A. Provide thrust restraints shown or otherwise necessary to resist movement in new or existing water mains.
- B. Warning tape shall be placed 1 foot above restrained joint water mains.
- C. All carrier pipe within trenchless crossings shall be restrained.

3.2 CONCRETE THRUST ANCHORS

- A. Provide concrete thrust anchors at all bends, tees, plugs, caps, and hydrants, and welded outlets.
- B. Dimensions: Refer to Standard Details for dimensions of thrust anchors except where dimensions are shown on Drawings.
- C. Installation: Bearing area for thrust anchors shall be against undisturbed earth. The face of the excavation shall be flat and at

the proper angle to the fitting. Install formwork for sides of thrust anchors.

1. Install thrust anchors such that pipe and fitting joints are accessible for repair.
2. Brace the bowl at each hydrant against the required area of unexcavated earth at the end of the trench with solid concrete thrust anchor prior as shown in detail drawings prior to pouring thrust block.

3.3 PLACING CONCRETE

- A. Curing: Cure all concrete thrust anchors and thrust collars for a minimum of seven days prior to pressure testing.
- B. Backfilling: Backfill around concrete thrust collars and concrete thrust anchors according to the requirements of Section 02315-Excavating, Backfilling and Compacting. The Contractor shall not backfill thrust collars or thrust anchors until a minimum of four hours has elapsed.
- C. Concrete shall be placed against undisturbed soils. Where the Contractor has over excavated outside the limits of the work or disturbed soils in the opinion of the Town of Herndon or the Engineer, the Contractor shall replace the over excavated soils with concrete at the Contractor's expense.
- D. Where any concrete is placed adjacent to the pipe joint, the Contractor shall maintain a minimum of 6-inches clear between the concrete and the pipe joint. Concrete within this clearance criteria shall be removed at the expense of the Contractor.

3.4 RESTRAINING GLANDS

- A. Install joint restraint in accordance with the manufacturer's instructions.

3.5 TIE RODS

- A. Strapping with tie rods shall be performed only in the locations shown on the Drawings. Buried tie rods shall receive two coats coal tar epoxy paint.
- B. All rods shall have two nuts per end.

*** END OF SECTION ***

SECTION 02513

DISINFECTION OF WATER DISTRIBUTION SYSTEMS

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SECTION 02513

DISINFECTION OF WATER DISTRIBUTION SYSTEMS

1 GENERAL

All pipes, tanks, appurtenances and equipment which can convey or store potable water shall be disinfected prior to being placed into service. Components taken offline or isolated from the system for a time period in excess of 72-hours then subsequently reconnected shall be treated as newly installed devices and will be disinfected accordingly.

1.1 Summary

A. Section Includes

1. Disinfection: Disinfection of potable water distribution and transmission systems.
2. Testing: Testing and reporting results.

1.2 REFERENCES

- A. AWWA B300 - Standard for Hypochlorites.
- B. AWWA B301 - Standard for Liquid Chlorine.
- C. AWWA C651 - Standards for Disinfecting Water Mains.
- D. Waterworks Regulations - Commonwealth of Virginia/Department of Health

1.3 PROJECT RECORD DOCUMENTS

A. Record documents: Submit all required documents and information as identified herein and required by the Contract requirements, as directed by the Town of Herndon or the Engineer.

1. Disinfection report; record:
 - a. Type and form of disinfectant used
 - b. Date and time of disinfectant injection start and time of completion.
 - c. Test locations.
 - d. Initial and 24 hour disinfection residual concentration
 - e. Date and time of flushing start and completion.
 - f. Disinfectant residual concentration after flushing for each outlet tested.
2. Bacteriological report; record:

- a. Date issued, project name.
- b. Time and date of water sample collection.
- c. Name of person collecting sample.
- d. Test location, sample source.
- e. Initial and 24 hour disinfectant residual concentration
- f. Coliform bacteria test results.
- g. Certification that water conforms, or fails to conform, to bacterial standards of Virginia Department of Health and the Town of Herndon.

1.4 QUALITY ASSURANCE

- A. Performance Standard: Work shall be performed in accordance with the Virginia Department of Health "Water Works Regulations", AWWA C651, and as modified herein.
- B. Water samples for bacteria tests will be taken by the Town and performed by a State certified laboratory. The Contractor shall notify the Town of Herndon when the water main is ready for the samples to be taken. The Contractor shall take the sample only upon prior approval by the Town.

2. PRODUCTS

2.1 DISINFECTION CHEMICALS

- A. AWWA B300, Hypochlorite
- B. AWWA B301, Liquid Chlorine

3. EXECUTION

3.1 EXAMINATION

- A. Cleaning and Inspection: Verify that the water main has been cleaned and inspected.

3.2 DISINFECTION

- A. Disinfection of Water Mains Under 20 inches: Disinfect water mains in accordance with AWWA C651 and the Commonwealth of Virginia/Department of Health Waterworks Regulations.
 1. Filling and Contact: When installation has been completed, the main shall be filled with water at a rate such that water

within the main will flow at a velocity no greater than 1 ft/s. The Engineer will be present during this procedure to verify that the Contractor is adhering to this requirement.

- B. Disinfection of Water Mains 20-Inches and Greater: Disinfection water mains in accordance with AWWA C651 and the Commonwealth of Virginia/Department of Health Waterworks Regulations for the continuous feed method except that the method shall give a 24 hour chlorine residual of not less than 25 mg/l.
- C. Disinfectant Level: Disinfectant level should be checked and maintained in the following manner:
 - 1. Chlorine Residual: Take chlorine residual at the farthest point from the location where water is introduced when the new water main is charged. The minimum reading for proper disinfecting shall be 25 mg/L. If less than 25 mg/L are present, add additional chlorine solution to obtain the 25 mg/L.
 - 2. Disinfection Time: Allow the 25 mg/l to sit for a minimum of 24 hours before pressure testing, but no longer than 5 days. The Engineer will verify this.
 - 3. Precautions: Take precautions to assure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hours. If the water temperature is less than 41 degrees F (5° C.), the water shall remain in the pipe for at least 48 hours. Position valves so that the strong chlorine solution in the water main being disinfected shall not flow into water mains in active service.
- D. The contractor shall obtain a temporary water meter from the Town of Herndon for use during flushing and testing of the water main. The contractor shall coordinate with the Town of Herndon, Department of Public Works Maintenance Division, for Current Rental Rates and Availability. The Contractor shall provide all pumps, meters, gauges, hoses, control valves, approved cross connection control (backflow prevention) devices, sleeves, plugs/caps, and other equipment associated with the filling, leakage testing, and flushing the water main at no additional cost. The Contractor will be responsible for all costs associated with providing the water for this process.

- E. All water usage shall be metered and recorded by the Town. Operation of existing Town water system valves and fire hydrants shall be performed by Town personnel only.
- F. Leakage Testing: Pressure test water main in accordance with Section 02514 – Leakage Tests.
- G. Flushing: After a satisfactory pressure test is performed, the water main is to be flushed prior to disinfection, in the following manner:
 - 1. General: Let water flow at the maximum rate possible until it is clear (<1.0 NTU) and the chlorine residual tested at the outlet is comparable to the source water.
 - a. The Engineer and Town representative will be present at the start of the flushing process to verify procedures. Notify the Town of Herndon at least 48 hours in advance, including the location of flushing.
 - b. Length of time required for adequate flushing will vary based on size of pipe, length of line, pressure of system, size of the outlet and other factors. Contractor shall coordinate with Town for appropriate flushing time.
 - 2. Flushing from fire hydrants:
 - a. Open fire hydrant valve, street valve and source valve completely for free discharge. Use diffuser if necessary.
 - b. If a fire hydrant cannot provide for a free discharge even with a diffuser, either install a hand control valve on the 2-1/2-inch hose connection (with fire hose if necessary) or use fire hydrant street valve to control flow. Do not use fire hydrant valve to control flow.
 - 3. Flushing from Blow-offs: For blow-offs, insert a 2-inch connector pipe with adapter and attach hose if required, and open blow-off valve to control flow.
 - 4. Time Requirements: If over a week has elapsed between the pressure test and sampling, thorough flushing is required. If the time period has been in excess of a month

or transported water was utilized for pressure testing, special procedures may be required at no additional cost.

5. After the required detention period, the heavily chlorinated water shall be flushed from the pipeline using potable water. The contractor is required to dechlorinate all water or allow the chlorine to dissipate when flushing in order to prevent the introduction of chlorinated water into any natural waterway or water body. The contractor shall take all necessary steps to dechlorinate the water and shall notify the owner of the intended method of dechlorination and the intended discharge location prior to implementation. The contractor shall verify that the water being discharged is completely dechlorinated by use of a portable colorimetric kit supplied by Hach Company or equal. The kit shall have a minimum sensitivity of 0.1 mg/l.

3.3 QUALITY CONTROL

- A. Water Samples: In accordance with the Virginia Department of Health "Water Works Regulations", bacteriological samples shall be collected at regular intervals not to exceed 2,000 feet. Exact location of sampling points shall be coordinated with the Town.
 1. Scheduling: After the water main has been pressure tested, the Contractor shall call the Town of Herndon to schedule sampling activities. Samples must be taken at each sampling point on two consecutive days. No samples will be taken on Fridays. Samples will not be scheduled in advance of the pressure test.
 2. Testing: Only samples taken by the Town, or by a certified laboratory approved by the Town, will be accepted.
 3. Unsatisfactory Sample: If the samples fail, the Contractor shall reschedule and repeat the flushing and sampling process. Each sampling point on the line must pass both days of testing before the line will be permitted to be placed into service.
 4. Additional Disinfection: If the second set of samples fails, the water main shall be disinfected again with a chlorine solution and shall be allowed to sit for a minimum of 24 hours. The flushing and sampling process shall then be repeated at the contractor's expense.

5. Sampling Procedures: Only samples taken and tested by Town of Herndon staff or qualified town representative will be considered acceptable for certifying disinfection. Contractors are encouraged to run independent testing prior to official analysis using methods and procedures of their choice.

B. Failure to Meet Quality Standards

1. Water Quality: Should the initial treatment, as determined by the laboratory tests, fail to result in a water comparable in quality to the water served to the public from the existing water supply system, disinfection and flushing shall be repeated until satisfactory results are obtained.
2. Cost of Additional Disinfection: Any labor, materials, or equipment needed to rechlorinate or reflush water main shall be furnished by the Contractor at no additional cost.

3.4 PROTECTION

A. Discharge of Disinfected Water:

1. Discharge: The Contractor shall assume full responsibility for the discharge of disinfected water. Disinfected water with a free chlorine residual in excess of 2.0 mg/l shall not be discharged into the Town of Herndon's potable water distribution system. Prior to discharging disinfected water into the storm control system the Contractor shall ensure dechlorination to levels below 2.0 mg/l.
2. Controls: The Contractor shall provide siltation control as required to protect against soil erosion in accordance with Section 02370 - Erosion and Sediment Control.
3. Responsibilities: The Contractor shall be responsible for any damage to vegetation, trees, streams, ponds, and lakes caused by the discharge of heavily chlorinated water. The Contractor shall perform the necessary measures to dechlorinate the water prior to discharging water into any stormwater system, estuary, or other environmentally sensitive area, in accordance with AWWA C651. Damages or injury to customers served by the Town of Herndon resulting from discharges of disinfection water into the system shall be the responsibility of the Contractor and

shall be remedied at his expense. Acceptable chemicals used for dechlorination are listed in Appendix C, Table C-3, AWWA Standard C651 - "Disinfecting Water Mains".

*** END OF SECTION ***

SECTION 02514

LEAKAGE TESTS

PARAGRAPH INDEX

		<u>Page No.</u>
PART 1- GENERAL		
1.1	Summary	02514-1
PART 2 - PRODUCTS		
2.1	Measuring Devices	02514-1
PART 3 - EXECUTION		
3.1	General	02514-1
3.2	Testing	02514-2
3.3	Repairing Leaks	02514-3

SECTION 02514

LEAKAGE TESTS

1. GENERAL

1.1 SUMMARY

- A. This section includes requirements for hydrostatic pressure and leakage testing.

2. PRODUCTS

2.1 MEASURING DEVICES

- A. The Contractor will furnish all testing equipment and gauges for testing purposes. Equipment shall be submitted to the Town of Herndon for approval prior to the performance of any testing. The Contractor will be responsible for the cost of the water used for all phases of the testing process.

3. EXECUTION

3.1 GENERAL

- A. The Contractor shall test the water mains for leakage in the presence of the Engineer and the Town of Herndon and incur the cost of the test. All tests shall be conducted in a manner to minimize interference with the Contractor's Work or progress. A maximum of 2,500 linear feet of water main may be tested at one time.
- B. Test each section of water main between adjacent gate/butterfly valves separately. The maximum differential pressure across any gate/butterfly valve during testing shall not exceed the test pressure recommended by the valve manufacturer, or as specified by the Town of Herndon or the Engineer. The Contractor shall provide all temporary bulkheads and thrust restraints to isolate the water main test section, and shall provide all long solid sleeves necessary to make the permanent connection to the system at no additional cost.
- C. Notify the Town of Herndon and the Engineer when the Work is ready for testing. Make tests as soon thereafter as practicable under the direction of the Town of Herndon and the Engineer. Contractor shall provide all labor, equipment and materials necessary for testing. Representatives of the Town of Herndon

shall be present for the duration of testing. Contractor will allow Town of Herndon Representatives to directly observe testing methodology and readings from all meters, gauges, and other measuring devices during testing.

- D. Testing of the pipelines shall not be conducted until at least 7 days have elapsed after all concrete thrust blocking has been installed. The pipeline shall be adequately backfilled.
- E. The Town of Herndon and the Engineer reserves the right to check the completed pipeline for vertical alignment prior to filling with water and testing. The Contractor shall not allow water in any pipelines without the express written permission of the Town of Herndon. Operation of existing Town water system valves and fire hydrants shall be performed by Town personnel only.
- F. Install air valves as indicated on the Drawings and check each for proper operation prior to filling the water main for testing. If for any reason it is necessary to drain the water main, the Contractor shall take all precautions required to ensure the safety of personnel inspecting the water main. When draining the water main, all air valves shall be rechecked for proper operation. This is required to avoid the formation of vacuum lock that could prevent the water from properly draining and become a hazard to men working on the pipeline if released. Pipelines containing large orifice valves shall be filled at a maximum rate of 1 foot per second.
- G. Perform water main filling, flushing, disinfection and bacteriological sampling in accordance with Section 02513 – Disinfection of Water Distribution Systems.

3.2 TESTING

- A. Fill pipeline with water in accordance with Section 02513 – Disinfection of Water Distribution Systems for a minimum of 24 hours immediately prior to testing for leaking.
- B. Test piping under the greater of a hydrostatic pressure of 150 psi or 125 percent of the maximum expected working pressure at the high point of the line unless otherwise shown or directed by the Engineer. Purge air from the pipeline through taps in the pipe prior to testing. Apply test pressure to the piping by means of a hand pump or other approved method and maintain pressure for a minimum of two hours. Accurately measure the amount of water added to the pipe to maintain the test pressure throughout the term of the test. The test pressure shall not vary by more than plus or minus 5 psi at any time during the test. The leakage as determined

by the preceding test shall not exceed the allowable leakage as given by the following formula:

$$L = \frac{SD(P)^{0.5}}{133,200}$$

Where:

L = Leakage

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

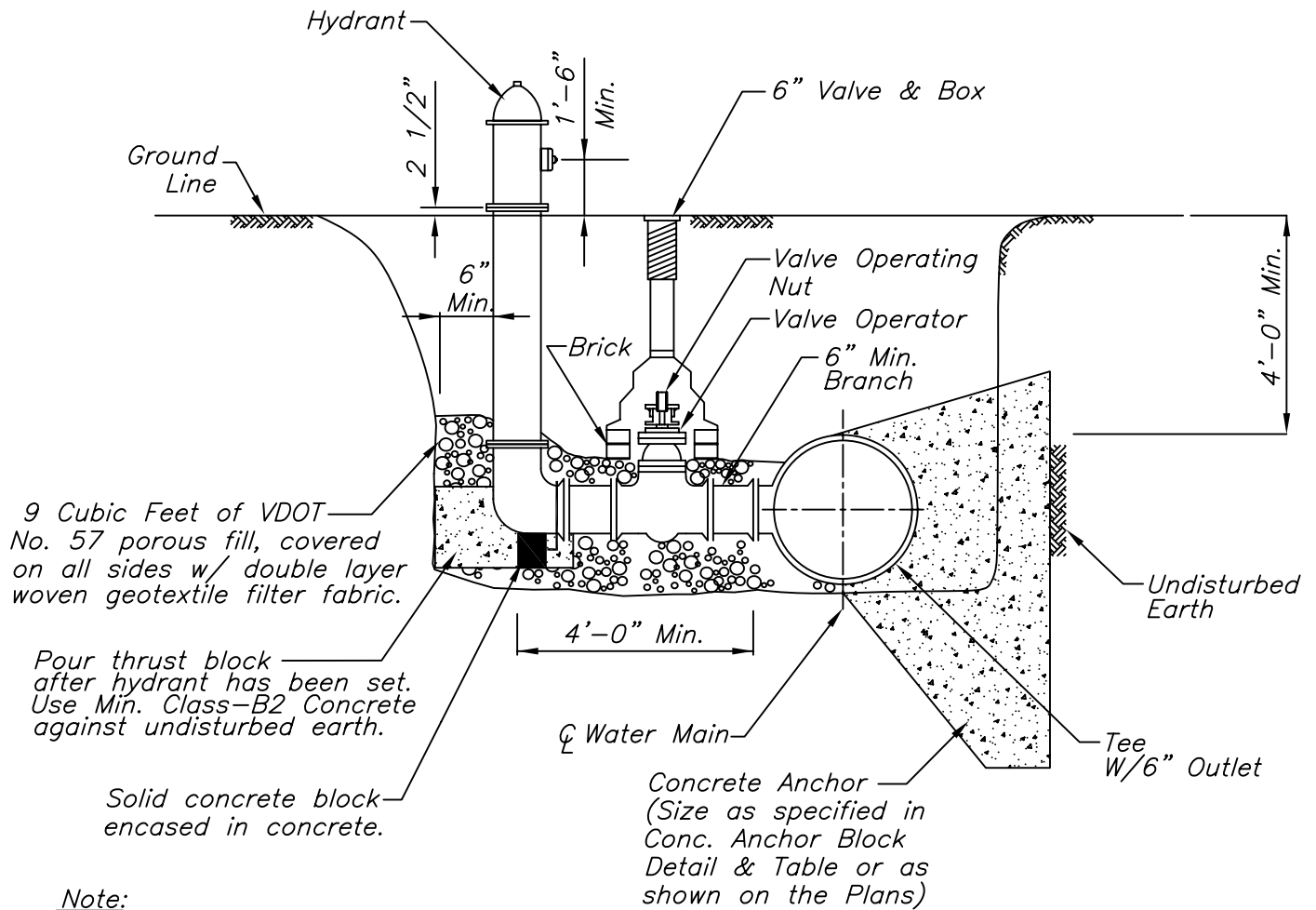
P = average test pressure during the leakage test, in pounds per square inch (gauge)

3.3 REPAIRING LEAKS

- A. When leakage occurs, defective pipe, valves, fittings, appurtenances or joints shall be located and repaired at the expense of the Contractor. If the defective portions cannot be so located, the Contractor, at his own expense, shall remove and reconstruct as much of the original Work as necessary to obtain a water main that does not exceed the allowable leakage upon retesting.

*** END OF SECTION ***

SECTION 4.0 STANDARD DETAILS



Note:

1. For Hydrant location in regard to face of curb, see Fairfax County Public Facilities Manual.
2. Fire hydrant shall be Mueller "Centurion" or Kennedy "K-81"
3. All valves shall be secured to tee.
4. Hydrants installed in fill or poor bearing soil shall be strapped to valve.

ADOPTED: FEBRUARY 2004
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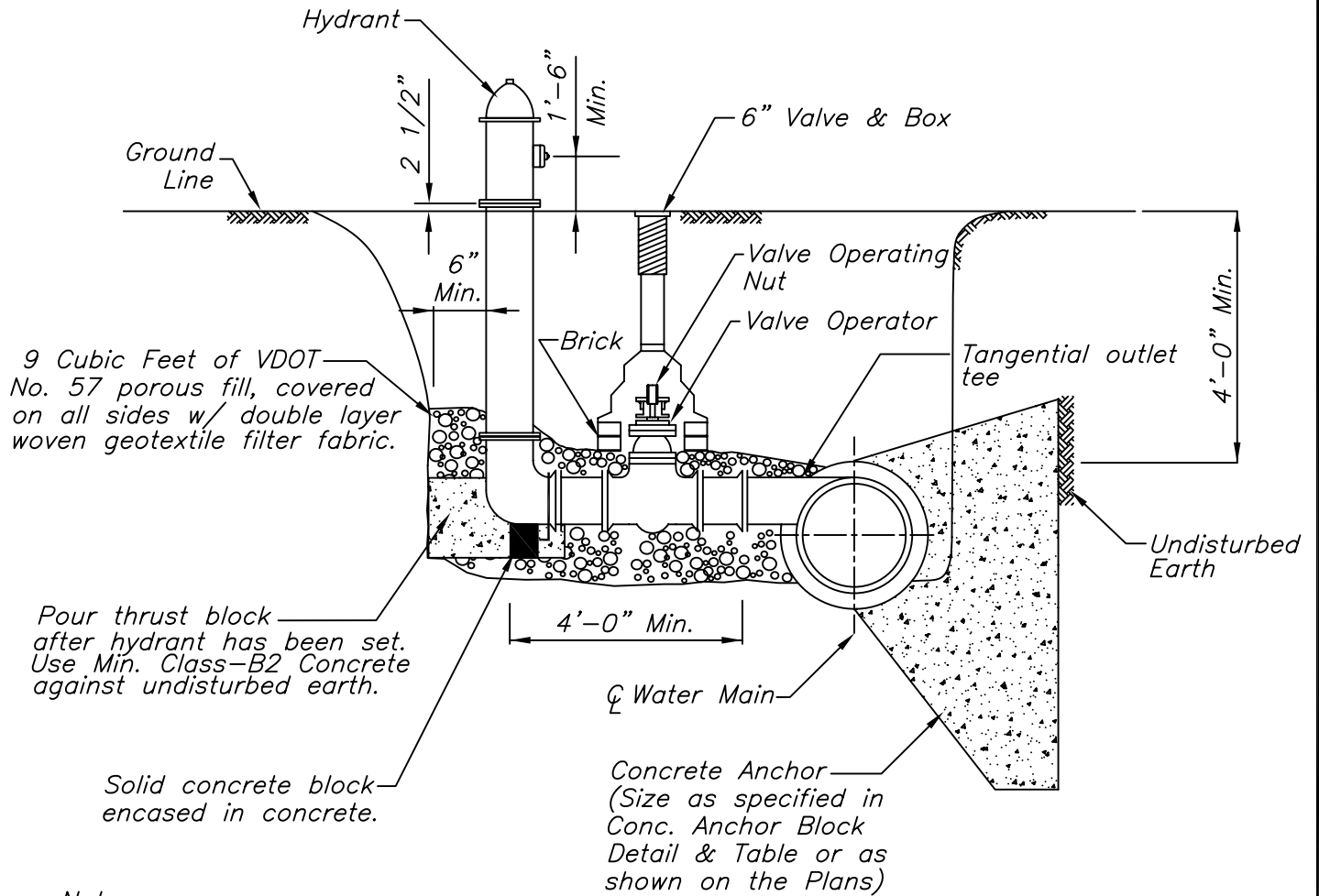
TOWN OF HERNDON

DEPARTMENT OF PUBLIC WORKS
 ENGINEERING DIVISION

TYPICAL HYDRANT
 INSTALLATION

SCALE:
 None

DWG. No.
 1



Note:

1. For Hydrant location in regard to face of curb, see Fairfax County Public Facilities Manual.
2. Fire hydrant shall be Mueller "Centurion" or Kennedy "K-81"
3. All valves shall be secured to tee.
4. Hydrants installed in fill or poor bearing soil shall be strapped to valve.

ADOPTED: FEBRUARY 2004
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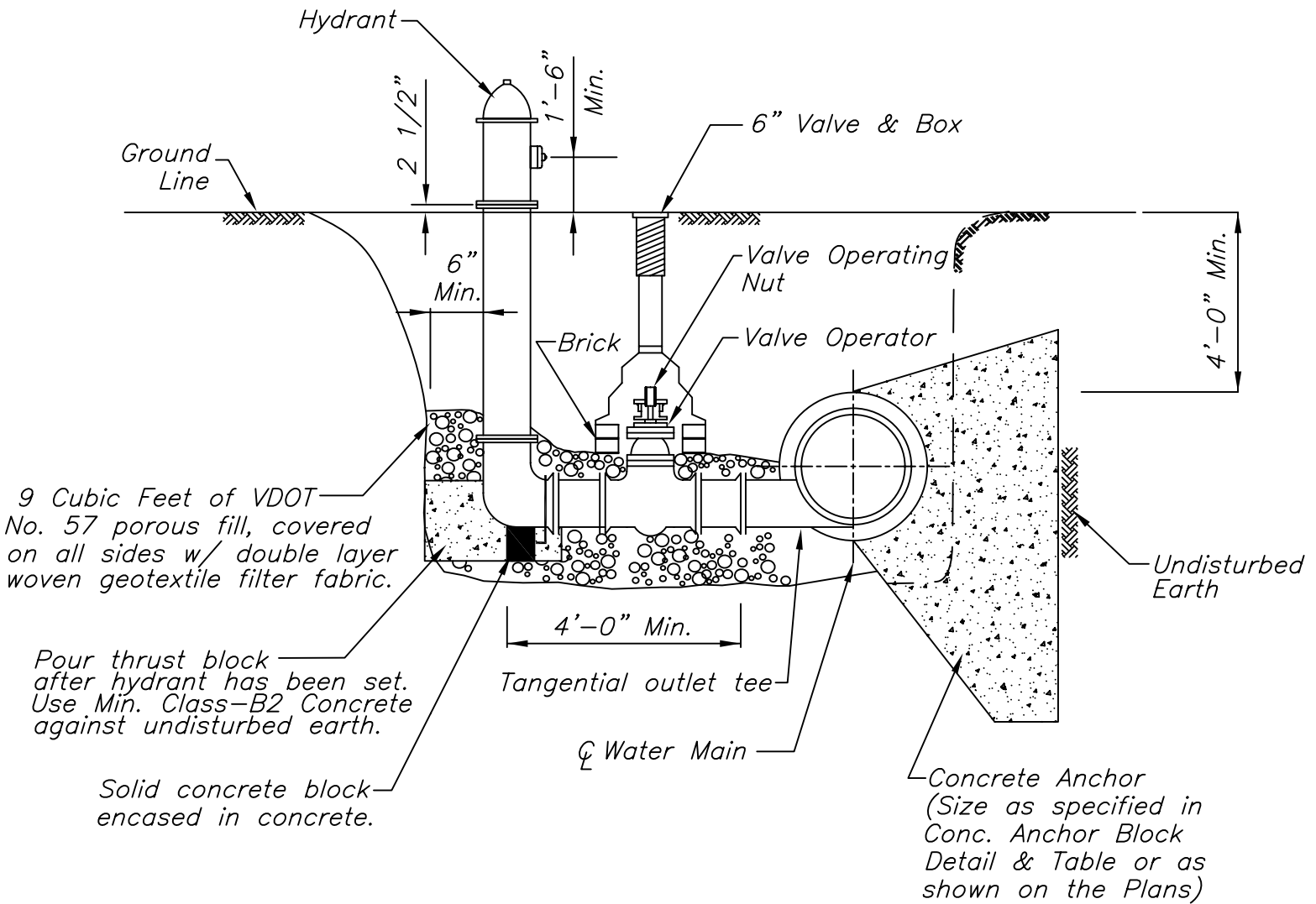
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TYPICAL AIR RELEASE HYDRANT
 INSTALLATION

SCALE: None
 DWG. No. 2



Note:

1. For Hydrant location in regard to face of curb, see Fairfax County Public Facilities Manual.
2. Fire hydrant shall be Mueller "Centurion" or Kennedy "K-81"
3. All valves shall be secured to tee.
4. Hydrants installed in fill or poor bearing soil shall be strapped to valve.

ADOPTED: FEBRUARY 2004
 REVISED: MAY 2009



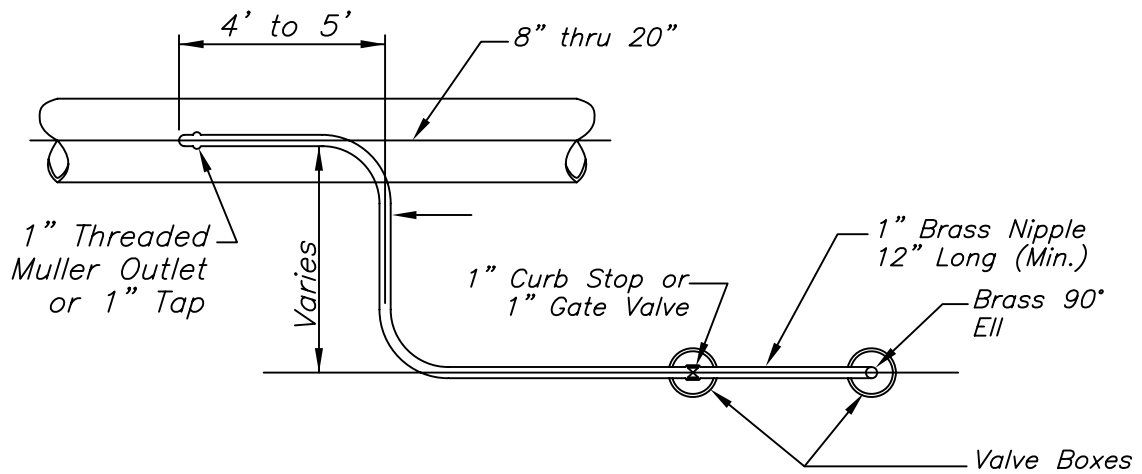
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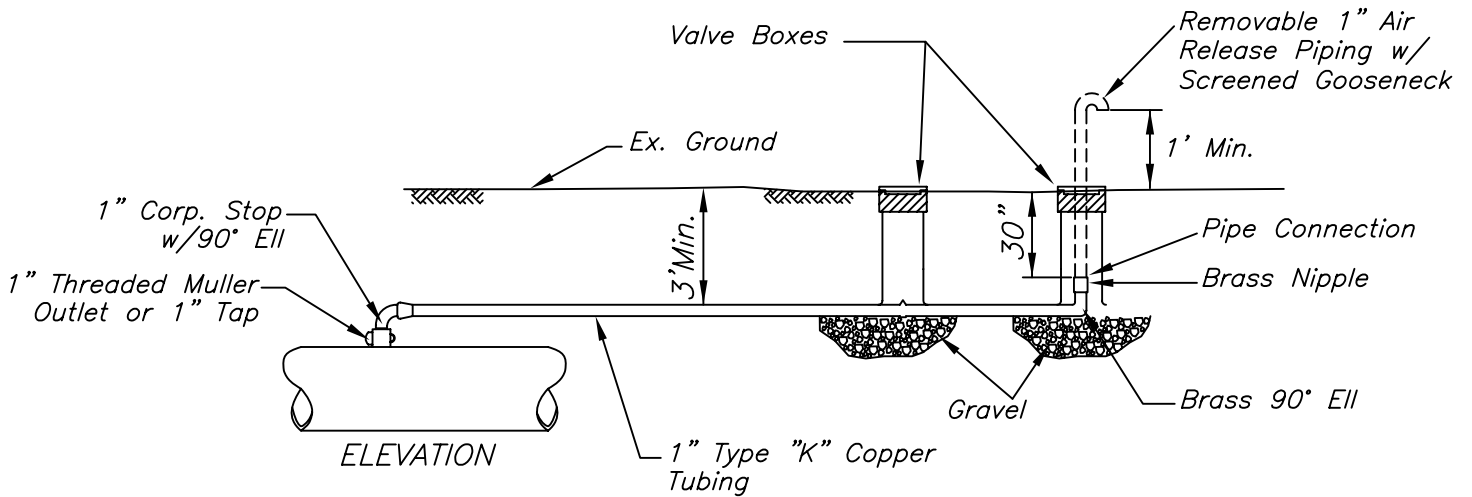
DEPARTMENT OF PUBLIC WORKS
 ENGINEERING DIVISION

TYPICAL BLOW-OFF HYDRANT
 INSTALLATION

SCALE:
 None
 DWG. No.
 3



PLAN



ELEVATION

Note: Prior to opening air release shutoff valve, the removable air release pipe with screened gooseneck should be connected by Town maintenance personnel. Disconnect and remove this piping after use.

ADOPTED: FEBRUARY 2004
 REVISED: MAY 2009



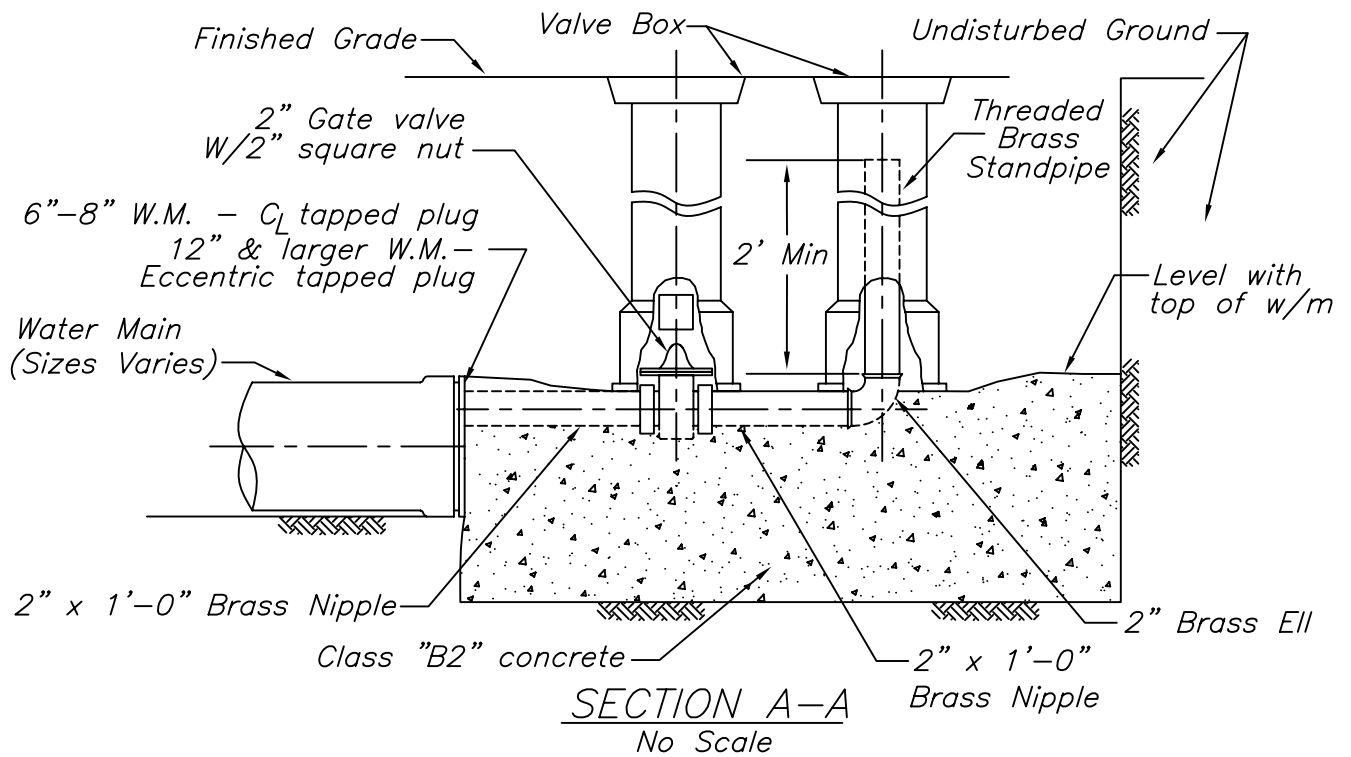
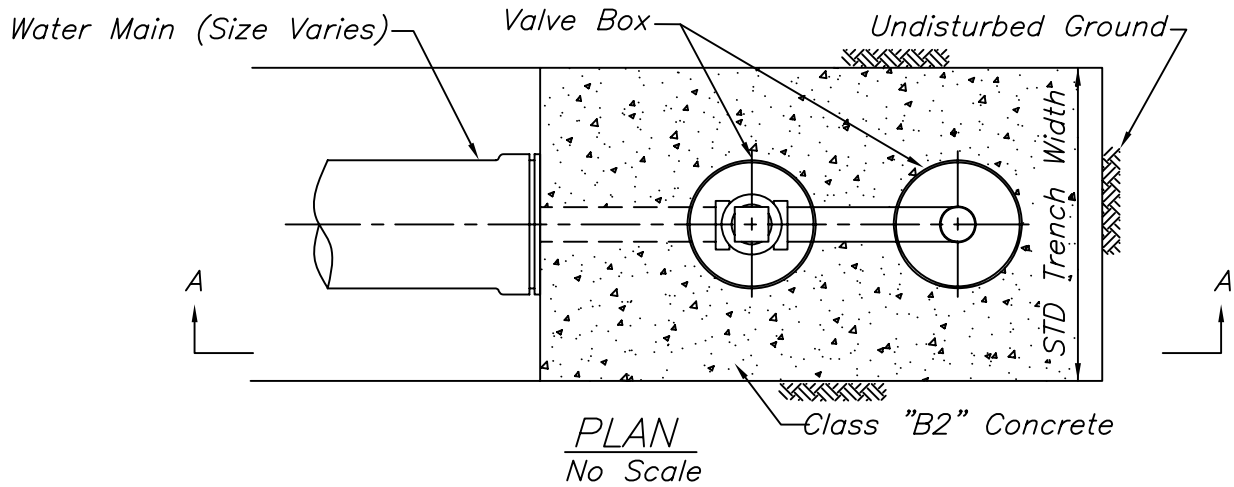
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1" AIR RELEASE DETAIL

SCALE:
 None
 DWG. No.
 4



1. Extended blocking beyond the water main to undisturbed ground.
2. Per VDOT requirements, blow-off valve boxes to be no closer than 5'-0" to edge of pavement in CUL-DE-SAC installation.
3. Connect 2" piping & drain hose to blowoff discharge and run hose to nearest storm drain inlet or drainage ditch during blowoff operation.

ADOPTED: FEBRUARY 2004
 REVISED: MAY 2009



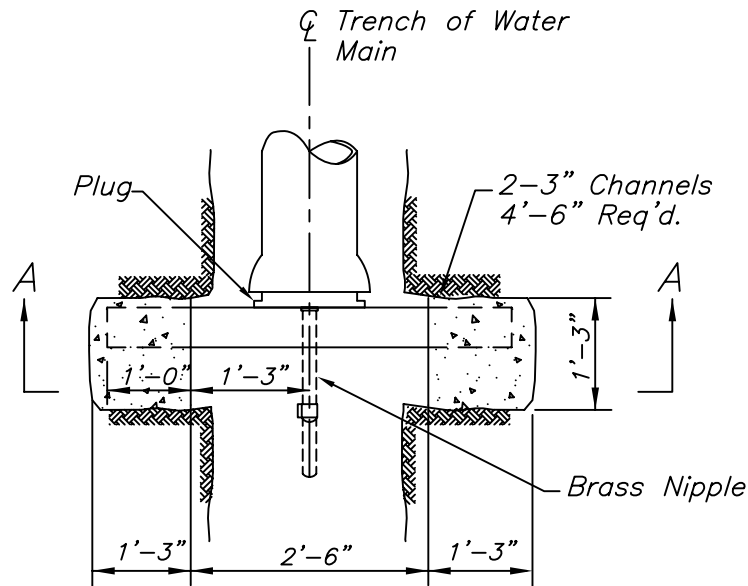
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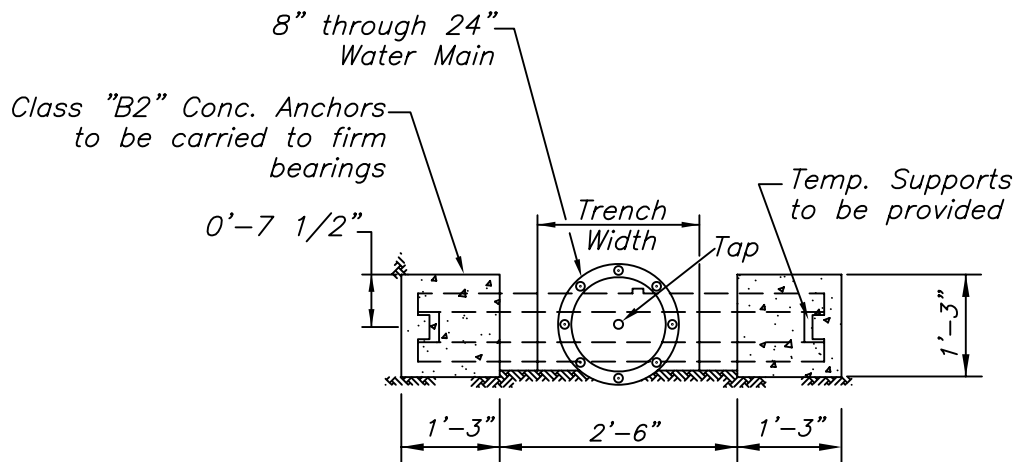
DEPARTMENT OF PUBLIC WORKS
 ENGINEERING DIVISION

2" BLOW-OFF DETAIL

SCALE:	None
DWG. No.	5



PLAN
No Scale



SECTION A-A
No Scale

Notes:

1. Place channels back to back against nipple flanges bearing on plug.
2. Paint exposed parts of channels with two coats of "VALDURA" asphalt paint or approved equal.

ADOPTED: FEBRUARY 2004
REVISED: MAY 2009



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ANCHOR DETAIL FOR
TAPPED PLUG

SCALE:

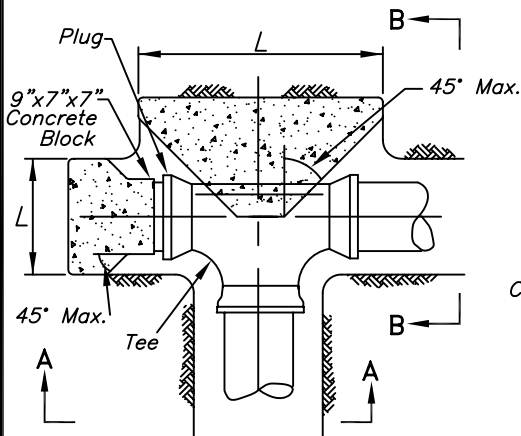
None

DWG. No.

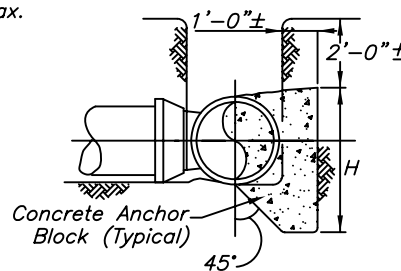
6

PIPE SIZE INCHES	DEGREE OF BENDS	MINIMUM CONCRETE ANCHOR BLOCK DIMENSIONS – FEET										VOLUME OF CONCRETE CU.YD. (1)
		WORKING PRESSURE										
		75 PSI		100 PSI		125 PSI		150 PSI		175 PSI		
		L	H	L	H	L	H	L	H	L	H	
6	90	2.5	1.0	2.5	1.5	2.0	2.0	2.5	2.0	3.0	2.0	0.24
	45	1.5	1.0	2.0	1.0	2.0	1.0	2.5	1.0	2.0	1.5	0.13
	22.5	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.0	1.5	1.0	0.06
8	90	2.0	2.0	2.5	2.5	3.0	2.5	4.0	2.0	4.0	2.5	0.40
	45	2.5	1.0	2.0	1.5	2.0	2.0	2.5	2.0	2.5	2.0	0.19
	22.5	1.5	1.0	1.5	1.0	2.0	1.0	2.5	1.0	2.0	1.5	0.10
12	90	3.0	3.0	4.0	3.0	5.0	3.0	5.0	4.0	5.5	4.0	0.78
	45	2.5	2.0	3.5	2.0	4.0	2.5	4.0	2.5	4.0	3.0	0.45
	22.5	2.5	1.0	2.5	1.5	2.5	2.0	2.5	2.0	3.0	2.0	0.24
16	90	5.0	3.5	5.5	4.0	6.0	4.5	7.5	4.5	7.5	5.0	1.43
	45	4.0	2.5	4.0	3.0	5.0	3.0	5.0	3.5	5.0	4.5	0.78
	11.25 / 22.5	2.5	2.0	3.0	2.0	3.0	2.5	3.0	3.0	4.0	3.0	0.39
20	90	5.5	4.5	6.5	5.5	7.5	5.5	8.5	6.0	9.5	6.0	1.99
	45	4.0	3.5	5.0	4.0	5.5	4.0	6.0	4.5	7.0	4.5	1.11
	11.25 / 22.5	3.0	2.5	3.5	3.0	4.0	3.0	4.5	3.0	5.5	3.0	0.58
24	90	6.5	5.5	8.0	6.0	9.5	6.5	11.0	6.5	13.0	6.5	2.37
	45	5.0	4.0	5.5	5.0	7.5	4.5	7.0	5.5	9.0	5.0	1.35
	11.25 / 22.5	3.5	3.0	4.0	3.5	5.0	3.5	5.0	4.0	6.0	4.0	0.69

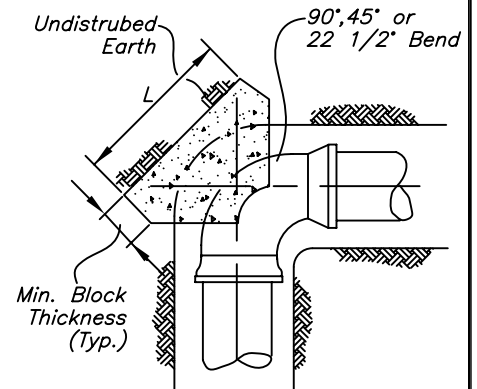
(1) Approximate volume of concrete required for various size bends at 100psi working pressure and minimum block thicknesses of 1'-9" for 6",8",12" and 16" pipes, 1'-6" for 20" pipe, and 1'-4" for 24" pipe.



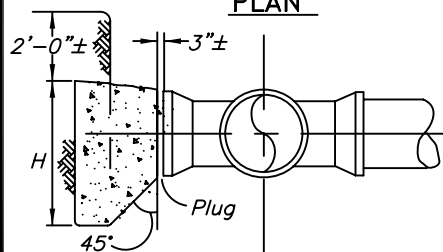
PLAN



SECTION B-B



PLAN



SECTION A-A

GENERAL NOTES:

- A. The above table is based on 2000psf soil bearing capacity, $R=2PA \sin \theta/2$ and for a test pressure = 1.5 x working pressure.
- B. Concrete Anchor Block dimensions for tees to be same as shown for 90° bends.
- C. Anchor Block Design for pipe larger than 24" shall be reviewed on an individual basis by the Town of Herndon.
- D. Height of Concrete Anchor Block above pipe centerline is 1/3 the H dimension.
- E. Provide form work where concrete not poured against undisturbed earth.

ADOPTED: FEBRUARY 2004
REVISED: MAY 2009



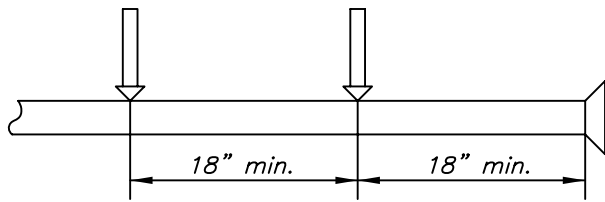
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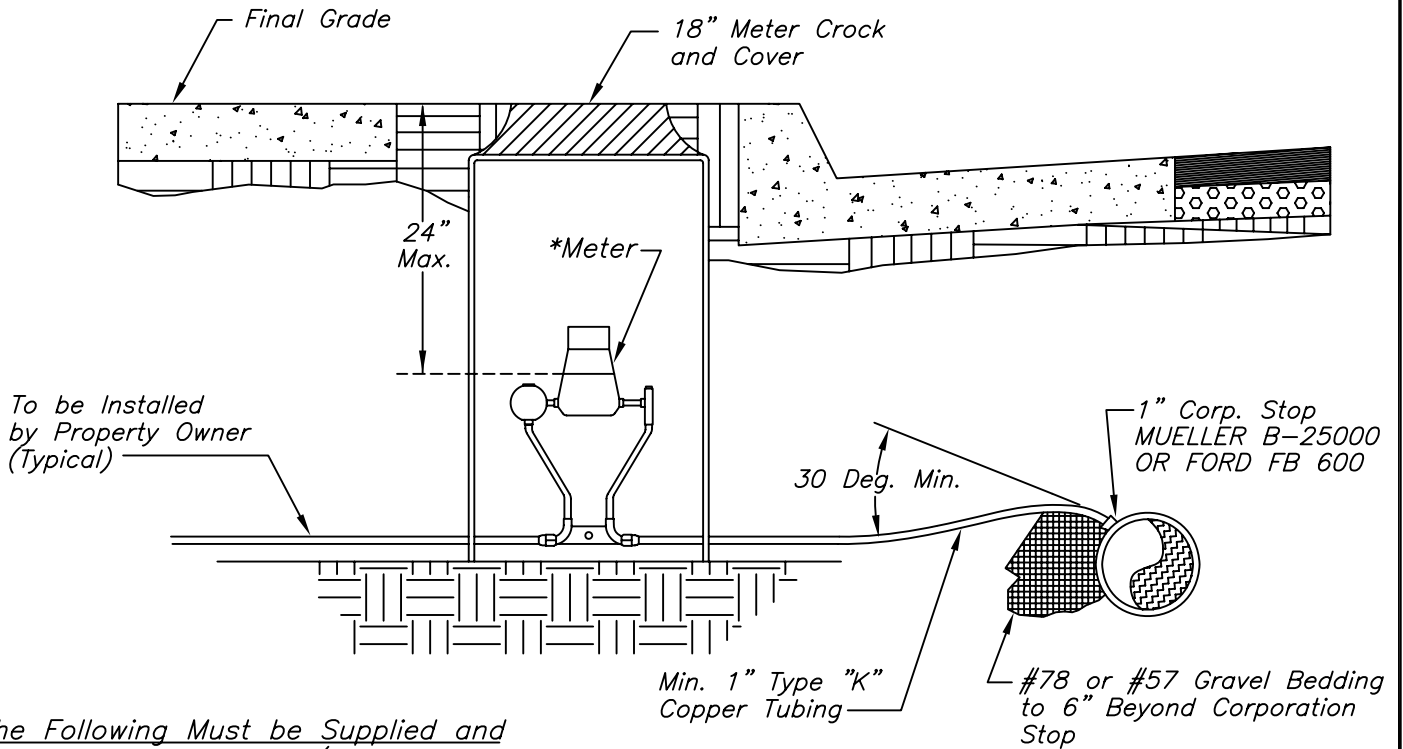
CONCRETE ANCHOR BLOCK

SCALE:
None
DWG. No.
7



Notes:

1. Tap location to be minimum 18" from nearest joint or coupling.
2. Vertical angles of corp. stops are to be staggered if more than one corp. stop is installed within 3 feet.



The Following Must be Supplied and Installed by the Owner/Developer:

*Metersetter.

Mueller H-1404-6D with dual check valve (Mueller M-98)
 1" copper inlet and outlet w/ lock wing ground key angle meter stop or equivalent. Top entry dual check valve must be ASSE approved.

Crock:

18X30 PVC Non-corrugated meter box, notched for service lines.

Lid:

Ford X32
 Tyler TX32

*Water meter will be purchased by the property owner from the Town and set by the Town.
 No bypass is permitted on any service stand or connection.

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 REVISED: MAY 2009



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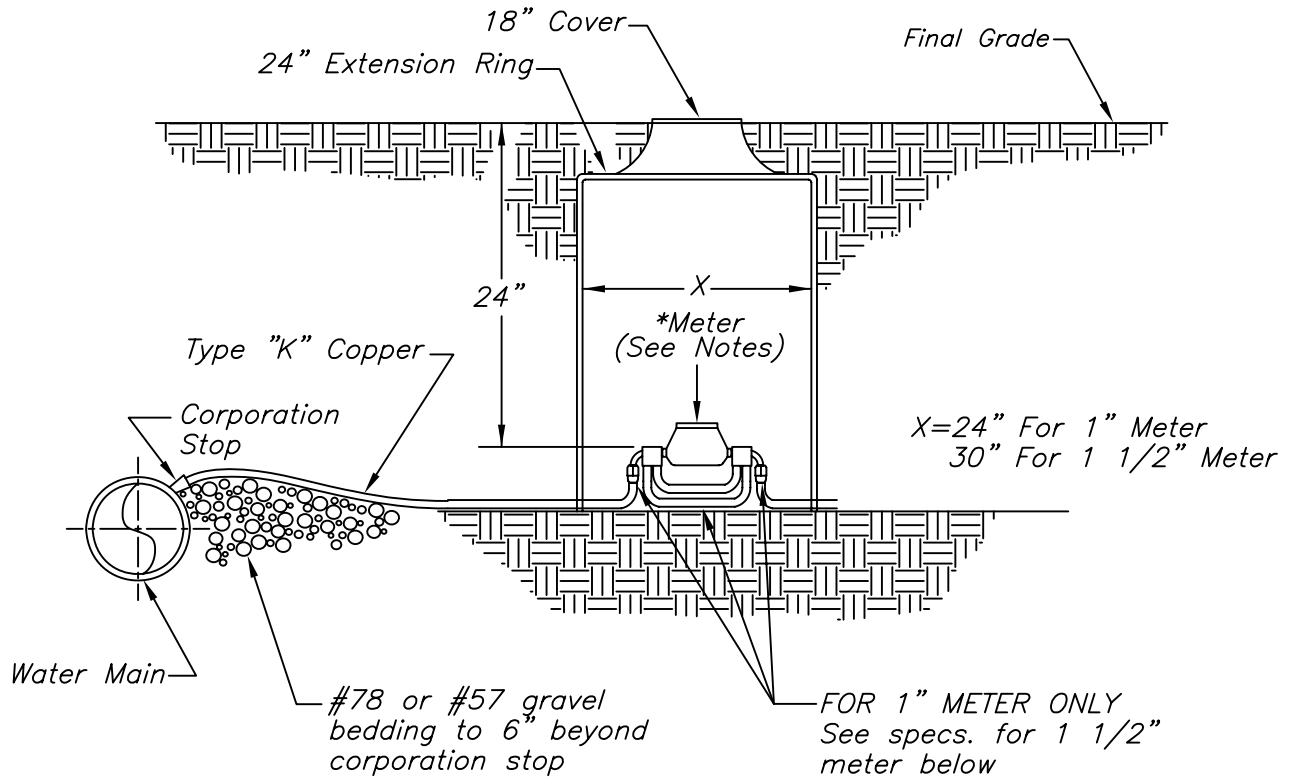
STANDARD WATER
 SERVICE CONNECTION
 FOR 5/8" x 3/4" METER

SCALE:

None

DWG. No.

8



Notes:

1. 1" water meter will be purchased from the Town of Herndon and set by the Town.
2. 1 1/2" water meter will be purchased from the Town of Herndon and set by the Contractor/Property Owner.

1" METER

Meter Yoke: Ford Y504
Mueller H5040

Angle Yoke Valve
(w/padlock wings): Ford BA 92-444W
Mueller B24264

Dual Cartridge: Ford HHCA-92-444
Mueller H14465A

Expansion Connection: Ford EC-4
Mueller H14234

Crock: PVC 24" Dia.

Lid: Ford X32
Tyler TX32

Extension Rings: Ford No.1

1 1/2" METER
Straight Connection

Flanged Meter Connections:

Ford Valve BF 23-666 for both sides
of Meter with 1 1/2" tubing

Ford Valve BF 23-676 for both sides
of Meter with 2" tubing

Crock: PVC 30" Dia.

Lid: Ford X32
Tyler TX32

Extension Ring: Ford No.3

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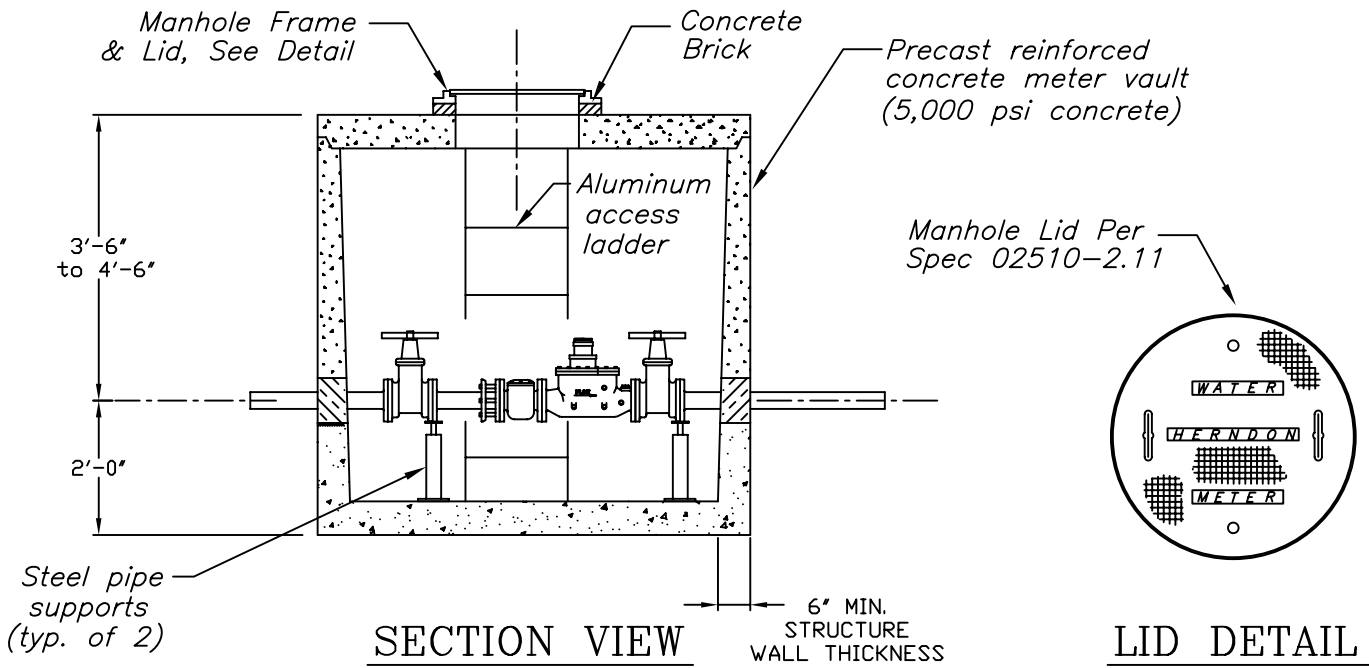
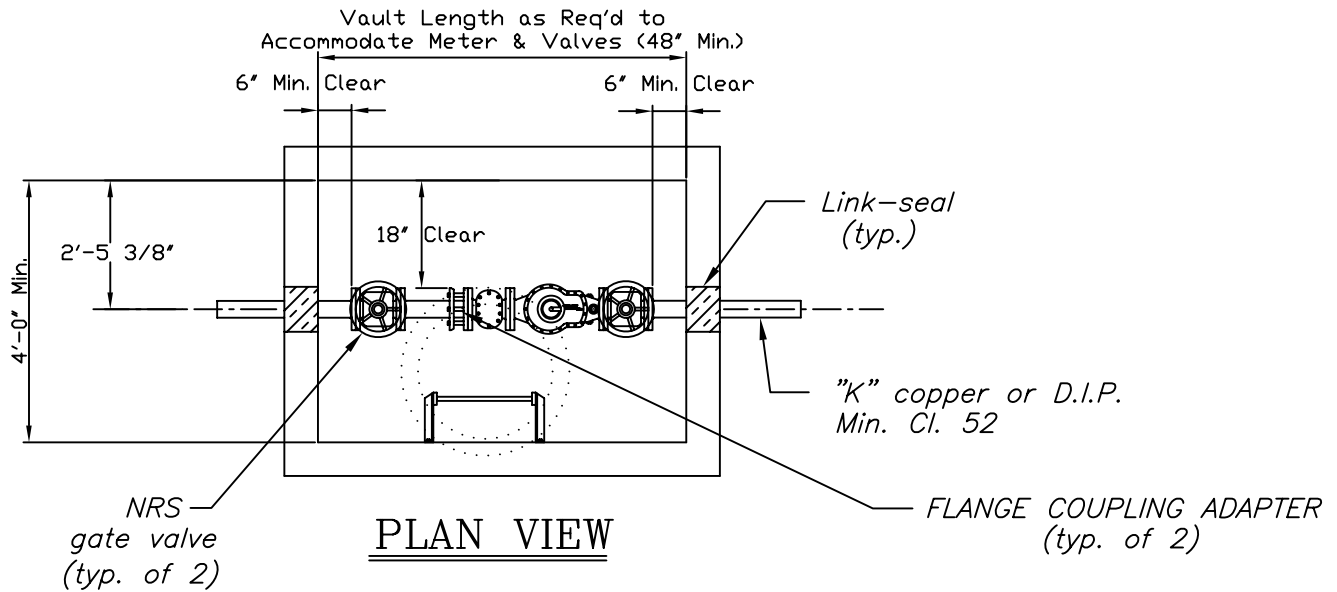
TOWN OF HERNDON

DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION

STANDARD WATER SERVICE
CONNECTION FOR 1" AND
1 1/2" METERS

SCALE:
None

DWG. No.
9



Notes:

1. Vault must be located out of traffic area.
2. For meters larger than 4", details of the proposed vault with the meter and fittings must be submitted to the Town for review with the site plans.
3. Water meter to be purchased from the Town of Herndon and set by the contractor.

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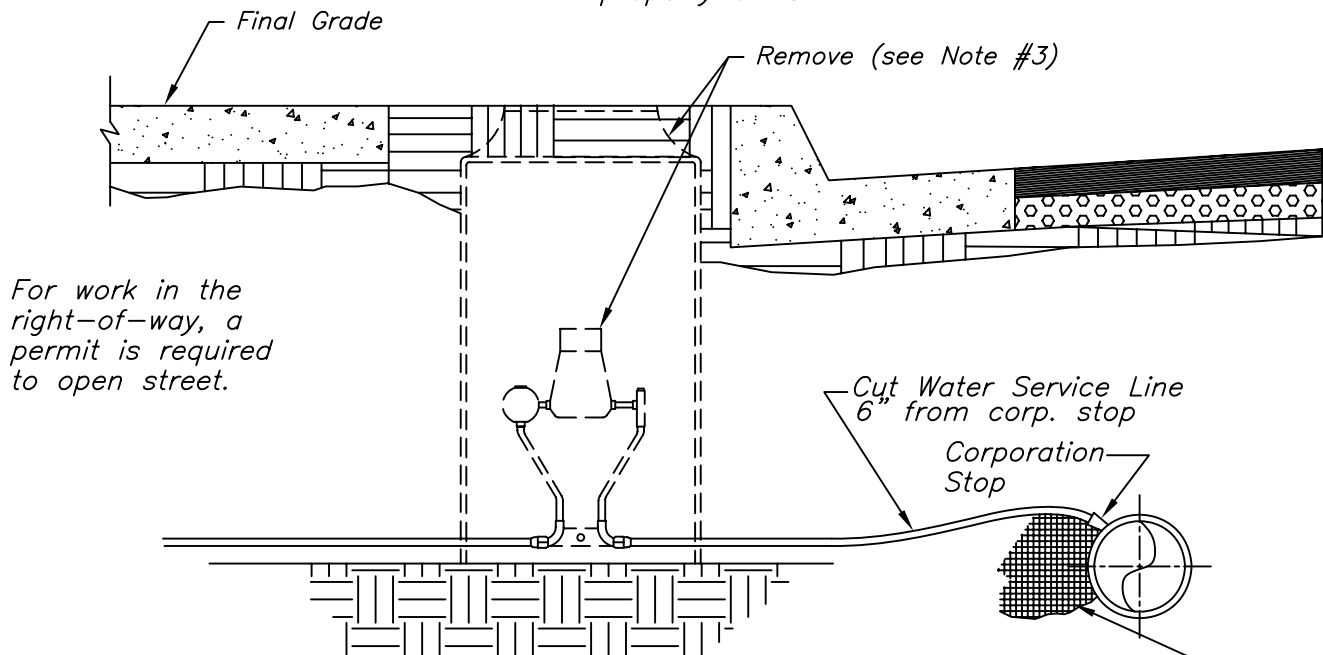
TOWN OF HERNDON

DEPARTMENT OF PUBLIC WORKS
 ENGINEERING DIVISION

STANDARD COMMERCIAL WATER
 SERVICE METER AND VAULT
 FOR 2"-4" METERS

SCALE:
 NONE
 DWG. No.
 10

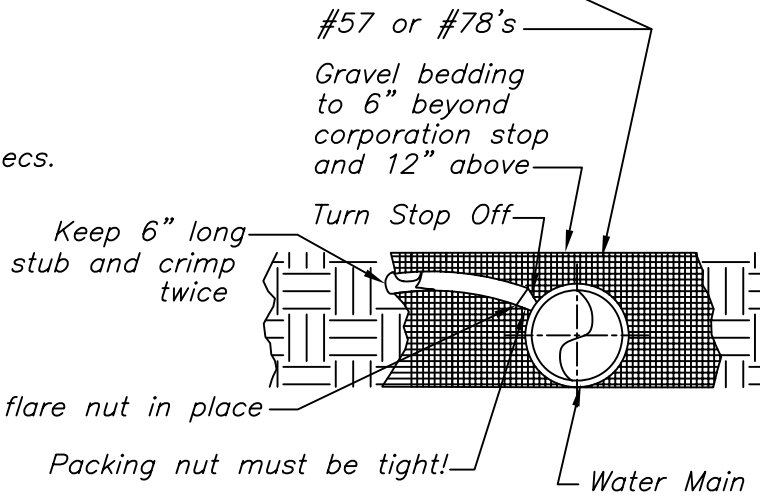
All street cuts are to be repaired within 7 days of initial cut. If permanent repair is not complete in the allotted time, the Department of Public Works will repair the cut. The cost for all repairs performed by the Town of Herndon shall be the responsibility of and borne by the Contractor/property owner.



For work in the right-of-way, a permit is required to open street.

Notes

1. Notify Building Inspection for permit requirements Beyond R/W Limits.
2. Town requires VDOT Street Cut/Repair Specs.
3. Existing meter and crock to be removed. Meter is to be returned to the Town of Herndon D.P.W. Water Maintenance.
4. Corporation stop must be inspected prior to backfill.



Detail at Water Main

ADOPTED: FEBRUARY 2004
 REVISED: MAY 2009



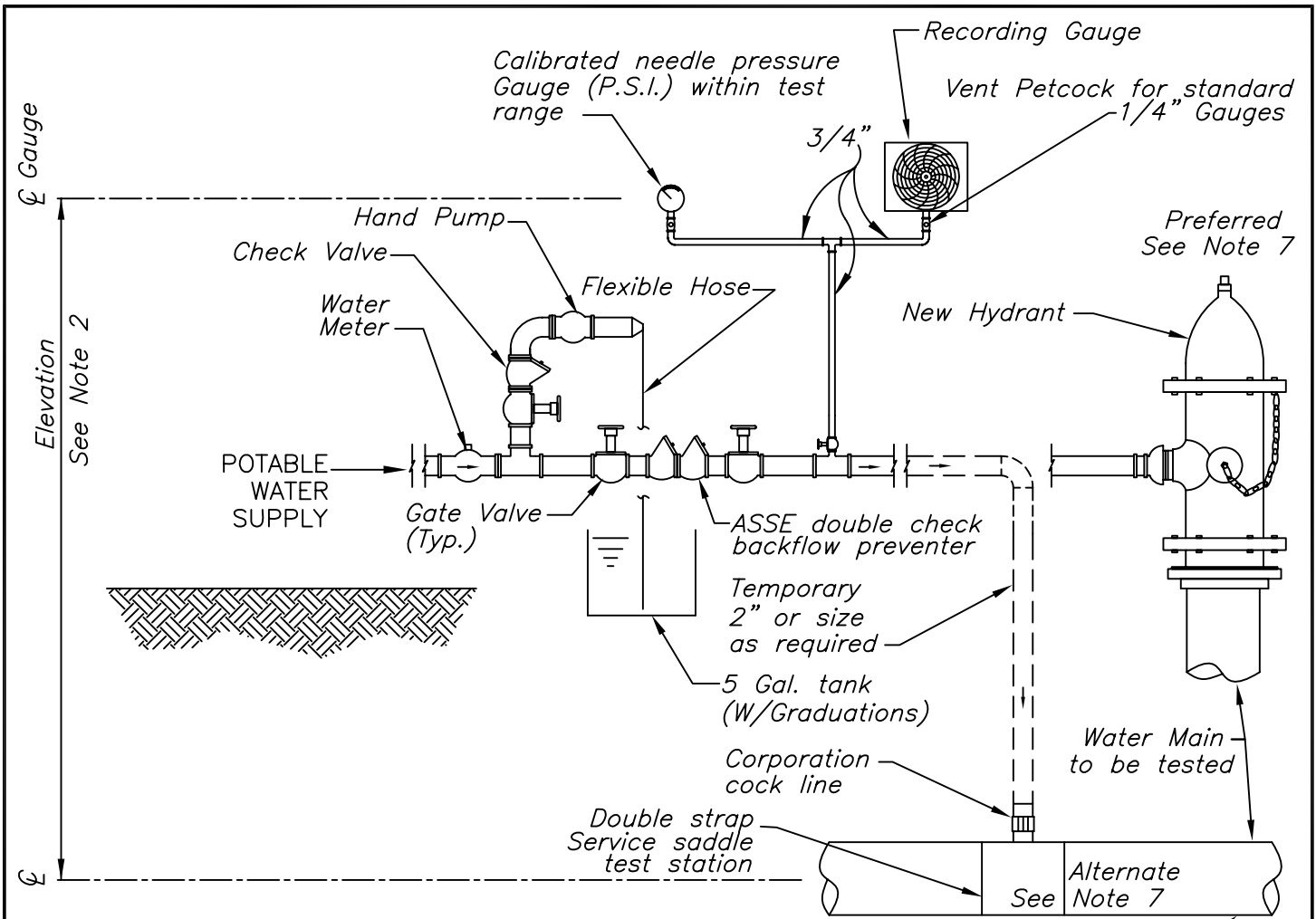
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 20172

TOWN OF HERNDON

DEPARTMENT OF PUBLIC WORKS
 ENGINEERING DIVISION

STANDARD WATER
 SERVICE DISCONNECT

SCALE:
 None
 DWG. No.
 11



NOTE:

1. All lines, fittings and test appurtenances shall be capable of withstanding maximum test pressure.
2. Elevation shall be determined prior to beginning work.
3. Provide adequate protection to all lines, fittings and test appurtenances when testing during freezing weather.
4. Pump must be capable of applying pressure within test range (provide for pressure relief on pump).
5. Apply required test pressure for minimum of 2 hours.
6. After test pressure has been applied, measure amount of water added by hand pump during test period to maintain test pressure.
7. Pressure test through a Hydrant located on the new water line when possible. Alternate may be used in the absence of a hydrant for testing.

ADOPTED: FEBRUARY 2004
 REVISED: MAY 2009

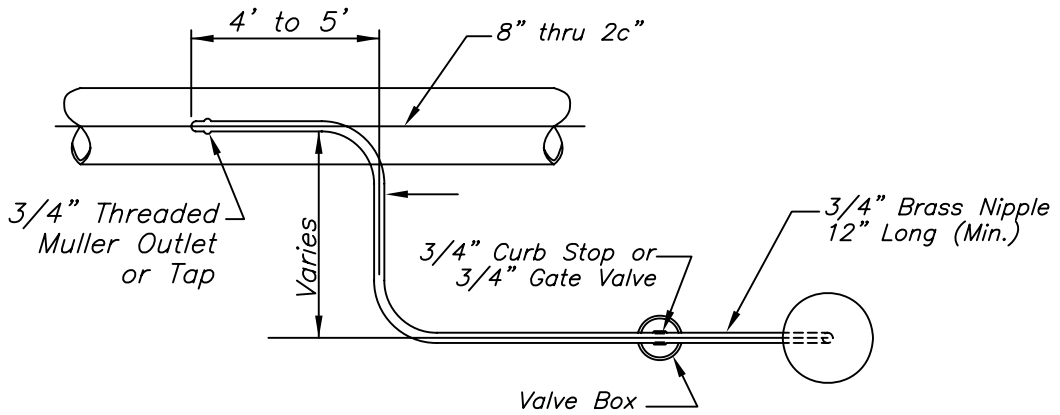


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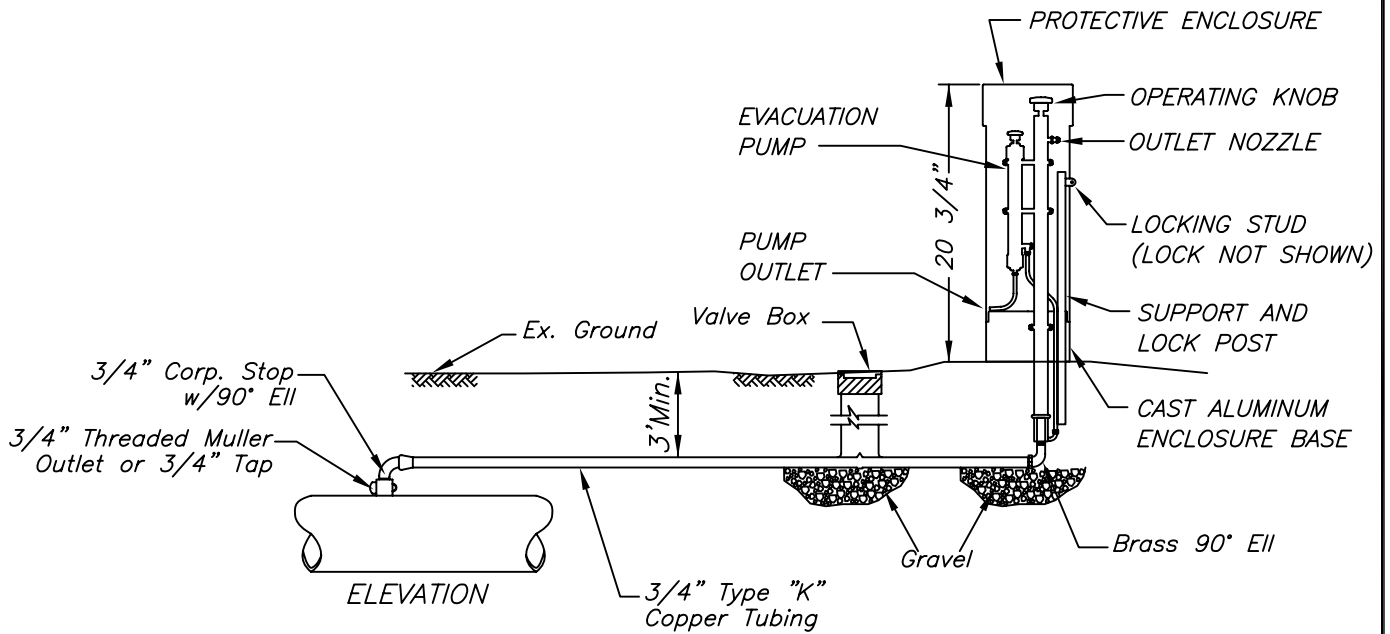
TOWN OF HERNDON
 DEPARTMENT OF PUBLIC WORKS
 ENGINEERING DIVISION

**METHODS OF TESTING
 WATER MAINS**

SCALE:
None
 DWG. No.
 12



PLAN



ELEVATION

SAMPLING STATION SHALL BE
 MODEL TF600 TRUFLO
 MANUFACTURING OR EQUAL

ADOPTED: FEBRUARY 2004
 REVISED: MAY 2009



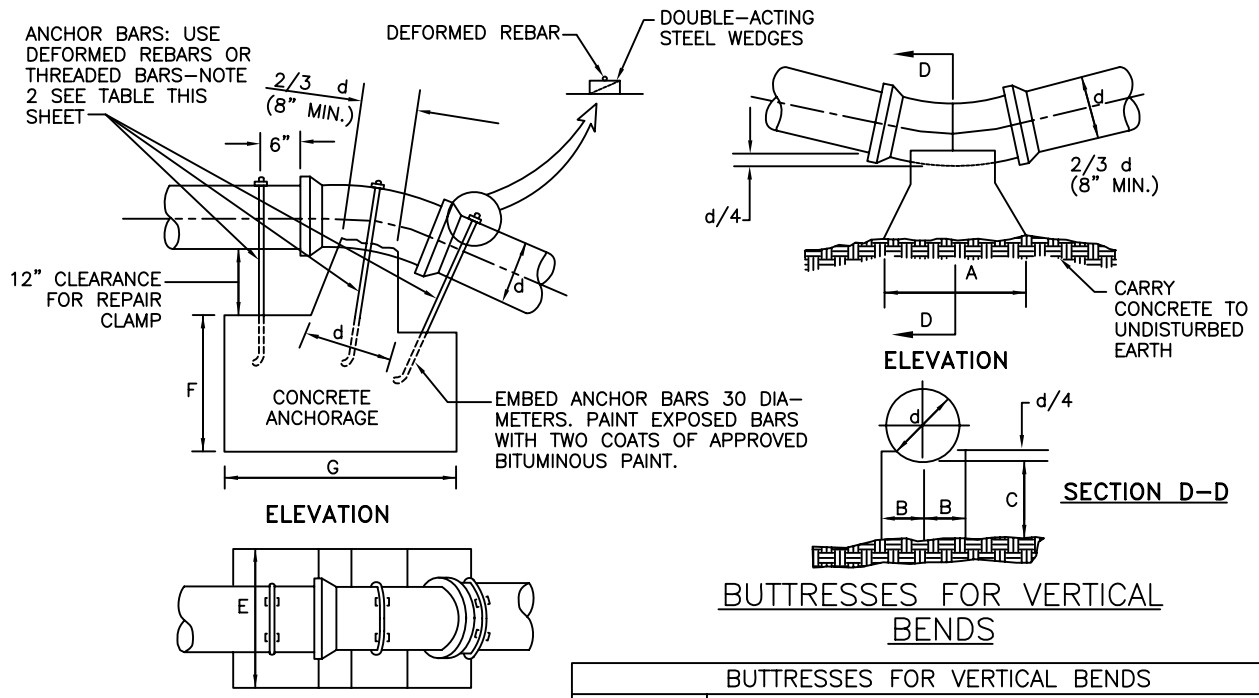
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TOWN OF HERNDON

DEPARTMENT OF PUBLIC WORKS
 ENGINEERING DIVISION

SAMPLING
 STATION DETAIL

SCALE:
 None
 DWG. No.
 13



ANCHORAGE FOR VERTICAL BENDS

NOTES:

1. ALL CONCRETE TO BE MINIMUM 3000 P.S.I.
2. BUTTRESS DIMENSIONS SHOWN ARE MINIMUM. DIMENSIONS ARE BASED UPON SOIL BEARING PRESSURE OF 3,000 P.S.F. AND STATIC WATER PRESSURE OF 150 P.S.I. WHERE PRESSURE EXCEEDS 150 P.S.I. OR WHERE SOIL BEARING PRESSURE IS LESS THAN 3,000 P.S.F. SPECIAL BUTTRESS DESIGN IS REQUIRED.
3. THREADED BARS MAY BE USED IN LIEU OF DOUBLE ACTING STEEL WEDGES AND REBAR.
4. ALTERNATE DESIGNS WILL BE CONSIDERED SUBJECT TO APPROVAL OF THE HERNDON DEPARTMENT OF PUBLIC WORKS.

PIPE SIZE	ANCHOR BARS *			
	5 1/8" BENDS	11 1/4" BENDS	22 1/2" BENDS	45" BENDS
6"		3-#6	3-#6	3-#6
8"		3-#6	3-#6	3-#6
10"		3-#6	3-#6	3-#6
12"		3-#6	3-#6	3-#6
16"		3-#6	3-#6	3-#6
20"	3-#6	3-#6	3-#6	4-#6
24"	3-#6	3-#6	3-#6	5-#6
30"	3-#6	3-#6	5-#6	5-#7
36"	3-#6	4-#6	5-#7	6-#7

* REBAR # AS INDICATED OR EQUAL DIAM. THREADED BAR.

		PIPE SIZE								
		6"	8"	10"	12"	16"	20"	24"	30"	36"
1/64 (5 5/8") BEND	A						1'-8"	2'-0"	2'-6"	3'-0"
	B						10"	1'-0"	1'-3"	1'-6"
	C						10"	1'-0"	1'-1"	1'-2"
1/32 (11 1/4") BEND	A	6"	8"	10"	1'-0"	1'-4"	1'-8"	2'-0"	2'-6"	3'-0"
	B	7"	8"	9"	10"	1'-0"	1'-2"	1'-4"	1'-7"	1'-10"
	C	7"	7"	8"	8"	9"	10"	1'-0"	1'-1"	1'-2"
1/16 (22 1/2") BEND	A	9"	1'-0"	1'-6"	1'-9"	2'-3"	3'-0"	3'-6"	4'-2"	5'-4"
	B	7"	7"	8"	10"	1'-0"	1'-2"	1'-4"	1'-7"	2'-0"
	C	7"	7"	8"	8"	9"	10"	1'-0"	1'-1"	1'-2"
1/8 (45") BEND	A	1'-3"	1'-8"	2'-1"	2'-6"	3'-4"	4'-2"	5'-0"	6'-3"	7'-6"
	B	7"	8"	9"	11"	1'-3"	1'-6"	1'-9"	2'-3"	2'-6"
	C	7"	8"	10"	11"	1'-3"	1'-6"	1'-9"	2'-3"	2'-8"

		PIPE SIZE								
		6"	8"	10"	12"	16"	20"	24"	30"	36"
1/64 (5 5/8") BEND	E						2'-2"	2'-6"	2'-6"	3'-6"
	F						2'-0"	2'-6"	2'-6"	3'-0"
	G						4'-6"	4'-0"	5'-0"	5'-0"
1/32 (11 1/4") BEND	E	1'-6"	1'-6"	1'-5"	3'-0"	3'-6"	4'-0"	4'-3"	4'-6"	5'-0"
	F	1'-3"	1'-9"	1'-3"	2'-0"	2'-0"	2'-6"	2'-6"	2'-8"	4'-0"
	G	2'-0"	2'-6"	2'-9"	3'-0"	4'-0"	5'-0"	5'-9"	6'-6"	7'-0"
1/16 (22 1/2") BEND	E	2'-0"	3'-4"	3'-8"	4'-0"	4'-4"	4'-8"	5'-0"	5'-4"	6'-0"
	F	1'-9"	2'-3"	2'-6"	2'-6"	2'-6"	2'-8"	3'-8"	4'-6"	5'-6"
	G	2'-6"	2'-8"	3'-10"	4'-0"	5'-6"	7'-6"	8'-6"	8'-6"	10'-0"
1/8 (45") BEND	E	2'-6"	3'-0"	4'-0"	4'-6"	5'-2"	5'-6"	6'-0"	6'-6"	7'-6"
	F	2'-6"	2'-9"	3'-0"	3'-6"	4'-0"	4'-6"	5'-6"	6'-0"	6'-6"
	G	3'-0"	4'-0"	4'-6"	4'-9"	6'-6"	8'-0"	9'-6"	11'-0"	11'-6"

ADOPTED: FEBRUARY 2004
REVISED: MAY 2009



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**VERTICAL THRUST
BLOCK DETAIL**

SCALE:
None
DWG. No.
14