

TOWN OF BOONSBORO



BOONSBORO

Maryland

SPECIFICATIONS FOR WATER SYSTEM CONSTRUCTION

2019

This document shall be incorporated, by reference, into any development agreement, development plan, and/or development related documents to be recorded (i.e. plats, etc.). Any reference shall include the name of the developer and the Town of Boonsboro. These Specifications, as revised and updated from time to time, are binding on any property developer and require a property developer to be compliant with all contents herein, unless otherwise determined and specified, in writing, by the Town of Boonsboro. All reference of this document shall refer to it as the *“Town of Boonsboro Specifications for Water System Construction.”* Recipients of this document must keep themselves informed of any revisions which may be made to the Specifications from time to time.

TOWN OF BOONSORO
Washington County, Maryland
SPECIFICATIONS FOR WATER SYSTEM CONSTRUCTION
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SECTION 1 - GENERAL REQUIREMENTS

1.1. Applicant/Owner.

All references to the Applicant or Owner in these specifications pertain to the individual, organization, company or developer who makes application to construct or install water lines, water systems and water services in the Town's water service areas.

1.2. Town's Right of Inspection.

- a. The Town shall have the right to inspect any water system construction being carried out by the Applicant, including the right to inspect the preparation, fabrication and manufacture of the materials to be used. The inspector shall have the authority to reject materials or suspend the work until any questions or issues can be referred to and decided by the Town. Inspectors shall perform their duties at such times and in such manner as will not unnecessarily impede progress on the Contract.
- b. The Inspector is not authorized to revoke, alter or waive any requirements of the Contract. The inspector shall in no case act as foreman or perform other duties for the Contractor nor interfere with the management of the work by the latter. Any advice which the Inspector may give the Contractor shall not be construed as binding the Town in any way or releasing the Contractor from fulfilling all the terms of the Contract.
- c. Where there is disagreement between the Contractor (or his representative) and the Inspector, the Inspector will immediately direct the Town's attention to the issues of disagreement and if the Contractor still refuses to make corrections, comply or suspend work, the Town will prepare and deliver to the Contractor a written order suspending the work and explaining the reason for such suspension. As soon as the Inspector is advised of the delivery of the suspension order, the Inspector shall immediately leave the site of the work and any work performed during the Inspector's absence will not be accepted or paid for.
- d. Should the inspected work prove to be unsatisfactory, the cost of removing and replacing, renewing and making good the unsatisfactory work shall be borne by the Applicant. No water service facility shall be placed in service until it has been successfully tested in the presence of an authorized Town representative.

1.3 Working Conditions.

No night, Saturday, Sunday or National Holiday work subject to Town inspection will be permitted except in cases of emergency with written Town consent or if it is specifically outlined in the Contract. No work shall be done when, in the opinion of the Town, the weather is unsuitable.

1.4 Standard Specifications.

Standard specifications of societies, associations, institutes, etc., referred to in these Specifications, shall be the latest edition of such Specifications unless otherwise noted.

1.5 Work Area Traffic Control and Maintenance.

- a. Traffic in work areas shall be controlled to protect the public and workmen, while minimizing the inconvenience to the public. Traffic control devices shall conform to the Maryland State Highway Administration (MD SHA) Temporary Traffic Control Typical Application, Standards MD 104.00 through 104.06. Traffic control measures shall be coordinated with the Town of Boonsboro.
- b. Unless authorized by the Town to completely close the road, the contractor must take the necessary measures to keep the road open for traffic, at his own expense. When vehicles must be stopped for short periods, work shall be performed during other than peak traffic periods. During progress of work, sidewalks and crossings must be kept open for pedestrians, unless otherwise authorized. Access to residential and business establishments shall be maintained, except when work is actually being performed in the area.
- c. All sidewalks, roadways and private property shall be kept clear of excessive dust, dirt, mud or other excavated material. The Town shall be empowered to require the cleaning and/or dampening of any area, if in its judgment such action is necessary for the safety and accommodation of traffic and the public. Trenches across driveways, side streets, alleys and entrances shall be maintained after backfilling.

1.6. Compliance with Provisions of Maryland Title 12: Underground Facilities.

Subtitle 1: Excavation or Demolition Near Underground Facilities. Maryland Title 12, Subtitle 1 sets forth requirements designed to protect underground utility lines from damage during excavation. Generally, it requires that the location and type of utility lines at the work site be ascertained and detailed information from each user (utility owner or operator) be requested at least 48 hours before beginning work, excluding weekends and legal holidays. In Maryland, the organization to contact is MISS UTILITY. The telephone number is 1-800-257-7777.

1.7. Permits.

- a. The Applicant shall secure, in the name of the Town, all permits that are required from the Maryland Department of Environment, Maryland State Highway Administration, and Washington County. The Applicant shall secure, in his own name, all required construction permits such as local street opening permits. Any existing street, highway or other improvements disturbed during construction shall be restored to the satisfaction of the Town before the facilities will be accepted for final acceptance by the Town. All costs of such permits, including any and all bonds required, shall be the sole expense of the Applicant.
- b. The Applicant shall acquire all necessary permits for blasting and for special equipment. Any provisions in these permits shall supersede the above provisions.

c. Approval by the Town inspector of all or part of any work performed under permit issued by an independent agency, shall not constitute acknowledgement that the work was performed in accordance with such permit; nor shall such approval by the inspector be construed as a release of the applicant from his obligations to meet the requirements of the permit, or that such approval be a waiver of the Town's right to seek enforcement from the permitting agency.

1.8 Special Requirements.

- a. All water lines shall be extended to the furthest property lines or corners of the development under consideration. The exception shall be where lines cannot be further extended at the sole discretion of the Town. The size and location of the water mains, pumping stations, pressure boosting stations, pressure reducing stations, water storage tanks, fire hydrants, valves and other appurtenances shall be determined or approved by the Town's authorized representative so as to comply with the Town's long-range facilities planning.
- b. All water mains to be dedicated to the Town shall have a 20' right-of-way.
- c. Gas utility mains shall be shown on water and sewer plan and profile sheets during the design phase of the project for Town approval prior to construction.
- d. Construction of water mains and appurtenances shall conform to the requirements of the Occupational Safety and Health Act (OSHA).
- e. Water mains, service lines, water meters and appurtenances shall be designed and constructed to prevent freezing.
- f. All equipment used on roadways shall be equipped with rubber tires or treads. If other than rubber tires or treads are used, the pavement shall be protected by heavy rubber belting. If pavement, curb and/or sidewalk is damaged or marked by construction equipment, the areas shall be restored by the developer at no cost to the Town.
- g. Backfill material shall not be removed from the lines of work before the excavation is refilled, except with Town approval.
- h. The work shall be protected from damage during storms.
- i. A competent person shall be made available in case emergency situations arise during non-working hours.
- j. The local police and Fire Departments shall be informed of the work schedule and of possible street obstructions.
- k. For any water main not following a roadway, and all weather access lane must be provided and at a minimum shall include compacted base, geotextile, and 4" of crusher run stone.

1.9 Separate Water Supply System.

The construction of separate public water supply systems will not be permitted except under unusual circumstances and by written approval of the Town. If the Town permits an Applicant to design and construct a separate water supply system, the Applicant shall maintain close contact with the Town to insure that the design satisfies all Town requirements. In addition, each new water supply system shall satisfy the following requirements:

- a. Permits: The project shall comply with all requirements of the Maryland Department of Environment and the Interstate Commission on the Potomac River Basin for public water systems, and the necessary permits shall be obtained by the applicant from each agency.
- b. Sources: Two (2) separate or independent sources of supply shall be required for each water supply system. A distribution storage reservoir is not considered a source of supply.
- c. Treatment: Water quality and treatment facilities shall comply with the requirements of the Maryland Department of Environment and the United States Environmental Protection Agency.
- d. Distribution Storage Capacity: Useful, or effective, distribution storage capacity shall be at least equal to the sum of: 25 percent of average daily demand as operating storage; 25 percent of average daily demand as emergency reserve; and the fire reserve storage based on fire flow and duration requirements in accordance with Insurance Services Office (ISO) methodology. Only stored water that can be delivered to each customer with adequate residual pressure is considered useful storage.
- e. Auxiliary Power: Auxiliary generating or drive equipment shall be provided to insure adequate source capacity during an electrical power failure. The size and extent of equipment shall be approved by the Town.
- f. Metering: Approved metering shall be provided for each source of supply.

1.10. Construction Water Usage.

Connection to town of Boonsboro fire hydrants and any other unmetered usage of Town water for construction (and any other) purposes is prohibited. Should the contractor wish to establish a connection to the Boonsboro water system to provide water supply during construction operations, a request shall be made of the Town and approved with the following conditions:

- a. The water shall be delivered through a tap of a Town water main in accordance with the provisions of the following sections.
- b. All usage shall be metered with a meter acceptable to the Town and paid for.
- c. The water supply shall be isolated by gate valves on both sides of the meters.
- d. A check valve / backflow prevention shall be utilized.
- e. Water must be paid for at current Town rates.

1.11 Materials.

The brass alloy used for all surfaces coming in contact with potable water shall meet the requirements of ANSI/AWWA C800 Standard and the products produced with this alloy shall meet the ANSI/NSF Standard 61 and/or ANSI NSF Standard 372 as applicable, complying with the Safe Drinking Water Act. Weighted average lead content of the wetted surface area shall not be more than 0.25%

1.12 Hydrants and Valves.

All Hydrants and Valves within a subdivision shall be consistent and shall be of the same manufacturer and model, Namely Mueller.

1.13 References.

ANSI/AWWA C800 - Underground Service Line Valves and Fittings.

ANSI/AWWA C901 - Polyethylene (PE) Pressure Pipe and Tubing for 1/2-inch through 3-inch, for Water Service.

ASTM B88 - Standard Specification for Seamless Copper Water Tube.

NSF/ANSI Standard 61

ANSI/AWWA C651 - Standard for Disinfecting Water Mains.

ANSI/AWWA C110 - Ductile-Iron and Gray-Iron Fittings for Water.

ANSI/AWWA C104 - American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

AWWA C508 - Swing-Check Valves for Waterworks Service 2-In Through 24-In.

AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances

SECTION 2 - SERVICE LINES

2.1 DESIGN CRITERIA

2.1.1 General.

The sizing of customer service lines shall be in accordance with AWWA Manual of Water Supply Practice M22 Sizing of Water Service Lines and Meters and is subject to Town approval. The Applicant shall provide justification for water service line and meter sizing for Town review and approval. Residential service lines shall normally be 1.5 inches in size. The service line setting shall normally consist of a corporation stop, HDPE service line in a PVC casing, Tracer wire, and a meter setting in a meter pit.

2.1.2 Minimum Cover over Pipes.

The minimum depth of backfill over pipes shall be 3.5 feet (42 inches). When the minimum depth of cover cannot be provided, insulated construction approved by the Town shall be employed.

2.1.3 Underground Pipe and Fittings.

- a. Service lines shall be of Type K copper water tubing. Buried fittings must be compression type fittings.
- b. Polyethylene (PE) pipe and tubing may be used for service lines with special permission from the Town. PE tubing shall be sleeved in min. diameter 3" PVC pipe from the water main to the meter. (Tracer wire required min. 8 AWG copper)

2.1.4 Protective Sleeve.

At the entry of the service line into the building a protective sleeve shall be provided through the wall of the building. The sleeve shall span across the excavated area outside the wall and at least two feet of the end of the sleeve shall rest on virgin soil. The service connection pipe shall be threaded through the sleeve and the annular space at both ends of the sleeve sealed with non-corrosive silicon based sealant.

2.1.5 Backflow Preventer.

A double backflow preventer with shutoff valve must be installed adjacent to and downstream of the water meter.

2.1.6 Pressure Reducing/Regulating Valve.

When pressures exceed 60 psi, the Applicant shall, at his own expense, install on the house side of the meters, pressure regulating valves. The pressure regulating valves shall be maintained by the Applicant or subsequent property owner.

2.1.7 Booster Pumps.

In areas where the static water pressure in the distribution system is less than 40 psi, booster pumps will be required. The provision of booster pumps is the Applicant's responsibility. Connections will not be permitted if distribution system static pressure in the area is less than 20 psi.

2.1.8 Meters and Meter Boxes.

Meter boxes shall normally be located between the curb and sidewalk. The meters shall be set 18 to 20 inches below grade. Meter boxes shall not be located in driveways or sidewalks. If approval is granted by the Town, meter boxes located in driveways, parking lots, or where subject to vehicular traffic shall be designed for a H-20 wheel loading. Meter pits shall normally be 30" min. in diameter and as manufactured by Oldcastle/Carson or approved equal.

2.2. MATERIALS AND EQUIPMENT

2.2.1 Small Valves.

a. General.

Small valves are defined as 3-inch or smaller valves and shall be gate valves or ball valves, unless specified otherwise.

b. Gate Valves.

Gate valves shall be the 125 psi resilient seated, rising stem type and be handwheel operated. Valve bodies shall be bronze and have screw ends. Valves shall be **Mueller, Ford** or approved equal.

c. Ball Valves.

Ball valves shall be the 125 psi heavy brass type with screw ends. The valves shall be **Mueller, Ford** or approved equal.

2.2.2 Service Pipe.

a. Copper Pipe.

Copper tube shall conform to the requirements of ASTM B88, with Type K for underground installations and Type L in exposed locations. The water service copper tubing must be one continuous piece with no fittings or splices in lengths less than 100 feet.

b. Polyethylene Pipe

Polyethylene pipe and tubing shall be made from polyethylene extrusion compound which complies with the applicable requirements for PE 3408 high molecular weight polyethylene material as described in ASTM D1248. Polyethylene tubing shall be rated for use with water at 73.4 °F at hydrostatic design stress of 800 psi and a maximum working pressure of 200 psi SDR 9 ASTM D2737. The tubing shall be homogeneous throughout and free of visible cracks, holes, foreign inclusion, or other defects. It shall be uniform in color, opacity, density, and other physical properties. Tubing shall be manufactured with consistent outside diameters to insure the compatibility of C800 service line fittings. The Applicant must be able to furnish a certification from the manufacturer of the tubing that the manufacturer is fully competent and capable of extruding PE tubing of uniform texture and strength that will fully comply with the properties specified herein. Tubing shall be as manufactured by **Appalachian Pipe** or approved equal.

Tracer wire (min. 8 AWG copper) shall be installed with plastic piping and terminate in the meter setting box for connection to a line locator.

2.2.3 Service Line Fittings.

- a. Fittings for copper tubing shall be the compression type conforming to AWWA C800 with a pressure class of 150 psi. All service fittings shall be compression connection.
- b. Service line fittings shall be manufactured from AWWA C800 red brass. Certifications of compliance with AWWA C800 shall be required on all service line equipment. Brass fittings shall be so designed and manufactured to provide full flow with minimum restrictions. All threads shall be accurately machined and gauged to insure a perfect fit with pipe. Nipples shall be available in various lengths as required. Fittings shall be similar to those manufactured by the **Ford Meter Box Co., Inc., Mueller, or A.Y. McDonald.**
- c. For copper tubing, fittings shall be compression pack joint type. For copper tube size (CTS) and iron pipe size (IPS) poly tubing, fittings shall be compression type. Compression joint shall consist of a compression nut sealed by a beveled Buna-N-Gasket locked in place by a stainless steel set screw. Compression nut for C.T.S., I.P.S., and copper tubing shall be machined with grooves in a split-clamping device for gripping tubing and tapped for a stainless steel slotted set screw.
- d. All fittings shall be so designed as to permit full continuity on metal tubing or galvanized pipe. When poly tubing is installed, stainless steel insert stiffeners shall be used. Refer to service tubing specifications and/or plans for type and size of service lines required.
- e. Service Saddles: EPOXY coated Ductile Iron Saddle with Single 3 1/4" wide four bolt Stainless Steel Band. Studs utilize 5/8" UNC threaded bolts of 304L Stainless Steel.

2.2.4 Corporation Stops.

- a. Ball corporation stops shall be of the ball valve type. The ball, stem, nut, and body shall be of a red brass. The ball shall be fluorocarbon coated and shall be held in position by, and seal against, seats of Buna-N Rubber. Seats shall be secured in place by an epoxy adhesive.
- b. Corporation stops shall be designed to create minimum resistance to flow. The waterway shall be no smaller than the nominal size of the valve. Valves shall be watertight at any pressure up to 300 psi. Each stop shall be designed so that they may be installed in mains under pressure using standard tapping machines.
- c. Corporation stops in sizes 1" through 2" shall be available from the same manufacturer. Corporation stops shall have threads conforming to AWWA standard C800. The inlet threads shall be AWWA. The outlet connections shall be compression fittings. Ball-Corp corporation stops shall be manufactured by **Ford Meter Box Co., Inc., Mueller, or A.Y. McDonald** or approved equal.

2.2.5 (if required) Curb Stops and Boxes.

- a. (if required) Curb stops shall be Ford B44 Series.
- b. (if required) Curb boxes shall be two-piece, screw type, cast iron and be operable with a 6-foot long wrench. They shall be manufactured by Bingham & Taylor Corp. with 2½-inch shaft and shall be provided with a lid with the word "WATER" cast in.

2.2.6 Backflow Prevention (Non-Residential).

- a. A backflow prevention device shall be installed at each customer service where the Town determines that potential cross-connection may exist. The number size, location, and type of backflow preventer shall be approved by the Town.
- b. Reduced Pressure Backflow Preventers: This device shall be used a connections where toxic chemicals, sewage, or other substances determined by the Town to be hazardous, might enter the distribution system. It shall conform to AWWA C506, shall be minimum 150 psi design pressure, and shall be equipped with suitable test cocks. The device consists of an automatic pressure differential relief valve located in the zone between two or more independently acting check valves, which in turn are located between two tightly-closing shutoff valves. All reduced pressure backflow preventers shall be CLA-VAL model RP2M, Watts Water Technologies, Inc. Series LF909, or approved equal.
- c. Double Check Valve Assemblies: This device shall be used at connections where nuisance materials, such as food and beverages, or other materials that do not constitute a health hazard, might enter the distribution system. It shall conform to AWWA C506, shall withstand a 150 psi design pressure, and shall be equipped with suitable test cocks. The device consists of an assembly of independently acting check valves located between two tightly-closing shut-off valves but without a pressure differential relief valve. All double check valve assemblies shall be Watts Water Technologies, Inc. Series 007, or approved equal.

2.2.7 Pressure Regulating Valves.

- a. The installation of pressure regulating valves may be required by the Town to prevent excessive pressures at customer services or other locations. Pressure regulating valves required at customer services are to be installed and maintained by the customer.
- b. Pressure regulating valves 2 inches and smaller shall be diaphragm-type with cast-bronze body and galvanized iron strainer. They shall be manufactured by Watts Regulator Co., Cla-Val or approved equal.
- c. Pressure regulating valves 2-1/2-inch and larger shall be manufactured by by Cla-Val or approved equal.

2.2.8 Clamping Devices.

Socket clamps, anchor, straps, and tie rods, used to anchor pipe fittings, shall be as manufactured by the Ford, Ebaa or approved equal.

2.2.9 Encasement Pipe and Protective Sleeve.

Encasement pipes and protective sleeves shall be welded and seamless black steel pipe or Schedule 40 PVC pipe. No sleeving of copper tubing will be allowed.

2.2.10 Meters and Meter Boxes.

(1) The Town installs and maintains water meters and external reader boxes. Neptune T-10 meters shall be used with R-900i Radio Frequency Pit Meter Interface Units.

(2) Meter settings for Standard 3/4" Residential Meters.

- a. Water meter pits shall be as shown in Detail 6. All wetted brass components will be of no-lead brass material conforming to Federal regulations and shall be so identified with the casting mark of "NL".

Single meter setting shall be of iron yoke style for full size 3/4" meter, with yoke bar being epoxy powder coated on all sides for rust protection. Each setting will be 27" in height from centerline of service line to centerline of meter. Inlet side of meter will include a 1-1/2" service line with "tighten to stop" style copper tube sized compression connection and 300 PSI rated lockable ball valve. Outlet side of the meter will include a UFR style dual check valve with test port and a 1" service line connection with the same tighten-to stop style connection as the inlet. Meter setting shall be A.Y. McDonald Mfg. model 714G327JDQQ 64X971 or approved equal.

Dual meter setting shall be of iron yoke style for two full size 3/4" meters, with yoke bar being epoxy powder coated on all sides for rust protection. Yoke bars will have a coated support bar joining the two yokes for consistent spacing of meters. Each setting will be 27" in height from centerline of service line to centerline of meters. Inlet side of meters will include an 1-1/2" service line with "tighten to stop" style copper tube sized compression connection and two 300 PSI rated lockable ball valves. Outlet side of the meters will include a UFR style dual check valve with test port and two 1" service line connections with the same tighten-to stop style connection as the inlet side. Dual meter setting shall be A.Y. McDonald Mfg. model 714H327JDQQ 64X971 or approved equal.

Pit shell will be of rigid polyethylene with a minimum thickness of 0.5" as manufactured by Carson/Oldcastle Model 0030-B or approved equal.

Each pit will include a 30" x 18" extension ring (AY McDonald 74MX3) cast iron locking style lid with 27/32 standard pentagon lock (AY McDonald 7432ARG). Lid will include a recess for the meter antennae. Pit setting will also include a 4" thick insulating pad to help guard meter from frost.

(3) Custom meter setters for 2" meters shall be equipped with the following features.

Setters shall be approved with a ball valve with padlock wings. The outlet shall have a dual check. Optional features of bracing eye, seal holes, padlock wings, and meter support brackets shall be furnished on each setter. The height of the setter shall be 15". Setters shall have type K copper tubing sized to allow a full flow to and from the meter. The inlet connection shall be F.I.P. with and outlet connection of F.I.P. Each setter shall have a built-in by-pass valve with ASSE cartridge dual check, and piping located at the brass of each setter. The valve shall be a ball valve equipped with padlock wings. Two-inch setters shall be VBHH77-15BHC-11-77, and one and one half setters shall be VBHH76-15BHC-11-66 as manufactured by the Ford Meter Box Co., Inc.

(4) For 1 1/2" and 2" meters, meter box shall be 36"x36" for 1 1/2" and 2" meters, meter box covers shall be monitor covers Ford MC36T. Light traffic shall be Ford MC36T with RML 12-T.

- (5) (IF required) Meter box cover extension rings for use with 24"x30" diameter meter boxes, shall be made of cast iron. Standard meter box frames and covers shall be used in conjunction with extension rings to extend the diameter of meter boxes to accommodate meter setting requirements. Extension rings shall be similar to the Ford Meter Box Co. Inc. Style A32.
- (6) For meters larger than 2-inches or where required by the Town, meter pits shall be as depicted in the detail drawings and be approved by the Town. Meter pits shall have a minimum 4-inch floor drain equipped with a ball-float check. Meter pits shall be provided with Touch Read feature for meter reading. Large meters shall be the HP Prospectus III fire and domestic combination meter as manufactured by Neptune (NECO Water).

2.3 CONSTRUCTION METHODS

- 2.3.1 Water service lines should be buried at least 3'-6" below finished grade. Backfill materials with particle size recommended in ASTM 2774 should be used and compacted per that standard.
- 2.3.2 When installing corporation stops, the main shall be tapped at a 45 degree angle with the horizontal.
- 2.3.3 Where service lines cross highways or streets, a 3-inch (for 1-inch service pipe) encasement pipe shall be installed across the street by boring, jacking, augering, or drilling, and the service line encased therein. Town approval shall be obtained before proceeding with an alternative method of installation.
- 2.3.4 Service lines crossing State highways are subject to State approval and are normally installed in a casing pipe which shall be bored, jacked, or augered under the highway, all in accordance with MD SHA requirements and specifications.
- 2.3.5 Copper service lines shall be bedded in silica sand (free of limestone) or crushed recycled glass.
- 2.3.6 Service lines at meters in areas subject to freezing (e.g. crawl space, unheated basement, etc.) shall be heat traced to prevent freezing as approved by the Town and the plumbing inspector.
- 2.3.7 Meter boxes shall be installed to manufacturer's recommendations. Backfilling around the meter pit must be done uniformly and with care to prevent distortion of the boxes.

2.4 DISINFECTION

Service connections shall be part of the testing and disinfection program specified in Section 3 per AWWA standards. The chlorine from the service connections shall be flushed and drained. If necessary, the Applicant shall request service customers to run spigots in the dwelling to remove chlorine from the lines. The Town shall not be responsible for any damage to customer service lines.

2.5 INSPECTION and TESTING

- a. Before backfilling the trench or covering any work, an inspection by the Town from the Main to the water meter setting, must be performed.
- b. A hydraulic pressure test shall be performed in the presence of the Town's designated official. Testing equipment shall be provided by the Applicant. The test pressure shall be 100 psi.

2.6. DETAIL DRAWINGS LIST

Relevant Detail Drawings are:

No. Description

6. Typical Water Service Connection
7. Lateral Connection (2" or Larger)
- 16A. Typical Meter Pit for Large Meters (Plan)
- 16B. Typical Meter Pit for Large Meters (Elevation)

END OF SECTION

SECTION 3 - WATER MAINS

3.1. DESIGN CRITERIA

3.1.1 General.

The following design criteria shall be used unless exceptions are approved in writing by the Town. Where special design criteria are required, the Applicant must consult the Town prior to the preparation and submission of plans.

3.1.2 Water Pressures.

a. General.

Water pressure should normally be maintained in the range from 35 pounds per square inch (psi) to 100 psi at ground elevation. The required minimum pressure at ground elevation shall be 30 psi during maximum hourly flows and 20 psi during fire flows. In areas where the static water pressure in the distribution system is less than 40 psi, booster pumps will be required. The provision of booster pumps is the Applicant's responsibility. Connections will not be permitted if distribution system static pressure in the area is less than 20 psi.

b. Design Pressure.

The design pressure for equipment and materials shall be at least equal to 150 psi plus a 100 psi surge allowance.

c. Pressure Reducing/Regulating Valves.

A pressure reducing/regulating valve may be required due to excessive pressure and/or to regulate a more uniform pressure in the Town's system. The Town must be consulted regarding this requirement.

d. Fire Demands.

Where only hose streams are required, fire flow requirements shall be satisfied while maintaining 20 psi residual pressure at hydrants in the immediate vicinity of the fire. Where automatic sprinkler systems are involved, residual pressures must be adequate for their proper operation.

e. Booster Pumping Station.

The necessity of, design of, and construction of main line booster pumping stations shall be subject to Town approval.

3.1.3 Size of Mains.

Adequacy of main sizes shall be determined based on a total flow requirement of fire demand in accordance with ISO methodology plus maximum daily demand plus special requirements. A maximum C value of 120 is permitted for cement-lined ductile iron pipe. Required minimum diameter is 8 inches, 6-inch minimum diameter mains will be permitted under certain circumstances as approved by the Town. Fire hydrant branches shall be not less than 6-inch diameter and no longer than necessary. The maximum permissible length is 50 feet unless a longer length is approved by the Town. A gate valve shall be provided on each fire hydrant lateral at the hydrant as depicted in the detailed drawings.

3.1.4 Location of Mains.

a. General:

Mains shall normally be located within the right-of-way lines of public streets. If it is necessary to locate a main on private property, the Applicant shall provide a water main easement in the name of the Town. The easement shall consist of a 20-foot wide permanent easement, normally centered on the pipeline, and an additional 20-foot wide temporary construction easement. The easement must be improved for all weather access.

Distribution main networks shall be looped and dead-end mains shall be avoided. When dead-end mains cannot be avoided, blow-off connections or hydrants shall be provided at the ends of the mains.

Distribution mains shall be located not less than 15 feet from buildings, except as approved by the Town.

Design of the horizontal and vertical layout of water mains shall follow sound engineering principles. Utility crossings and localized high spots shall be minimized. Maximum horizontal separation of utilities shall be provided for ease of future maintenance and health and safety reasons.

b. Water Mains near Sewers.

(1) Water main installation near sewers shall conform to Maryland's Design Guidelines for Sewerage Facilities.

(2) Parallel Installation: Water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer. The distance shall be measured edge to edge. In cases where it is not practical to maintain 10 feet separation, the Town may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.

(3) Crossings: Whenever water mains must cross building drains, storm drains, or sanitary sewers, the water main shall be laid at such an elevation that the bottom of the water main is 18 inches above the top of the drain or sewer. This vertical separation shall be maintained for the portion of the water main located within 10 feet horizontally of any sewer or drain it crosses. The 10 feet is to be measured as a perpendicular distance from the drain or sewer line to the water line.

(4) Exception: When it is impossible to obtain the proper horizontal and vertical separation as stipulated in Items (2) and (3) above, both the water main and sewer line shall be constructed of ductile iron pipe having mechanical joints. Other types of joints of equal or greater integrity may be used at the discretion of the Town. Where water mains must cross under a sewer, additional protection shall be provided by:

(a) A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water line;

(b) Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line; and

(c) Centering the length of the water line at the point of the crossing so that the joints are equidistant and as far as possible from the sewer.

The Town shall be consulted when any of the above conditions cannot be met, to discuss the use of double casing or concrete encasement of sewer and/or water lines as possible alternatives.

No water pipe shall pass through, or come into contact with, any part of a sewer manhole.

c. **Water Mains near Gas Mains and Other Utilities.**

(1) **Parallel Installation:** Water mains shall be laid at least 10 feet horizontally from any existing or proposed gas main or other utility. The distance shall be measured edge to edge. In cases where it is not practical to maintain a 10 foot separation, the Town may allow deviation on a case-by-case basis, if supported by data from the design engineer.

(2) **Crossings:** Whenever water mains must cross gas mains or other utilities, a minimum vertical separation of 18 inches shall be provided measured edge to edge. This vertical separation shall be maintained for the portion of the water main located within 10 feet horizontally of any gas main or other utility it crosses. The 10 feet is to be measured as a perpendicular distance from the gas main or other utility to the water main. Where the water main must cross under a gas main or other utility, adequate structural support for the gas main or other utility shall be provided to prevent excessive deflection of the joints and the settling on and breaking of the water line.

The Town shall be consulted when any of the above conditions cannot be met, to discuss possible alternatives.

3.1.5 Cross-Connections.

No water source of any type, other than the Town water supply, shall be connected to customer piping served from the Town water system. All potential cross-connections shall be eliminated. Backflow prevention devices shall be installed on all connections.

3.1.6 Minimum Cover over Pipes.

The minimum depth of backfill over pipes shall be 3 feet 6 inches (42 inches). When the minimum depth of cover cannot be provided the pipe shall be insulated to prevent freezing by laying it in a steel casing pipe or by other methods approved by the Town.

3.1.7 Location of Valves.

- a. Generally, a minimum of three valves shall be used at crosses and two valves at tees. The Town reserves the right, however, to require the installation of four valves at each cross and three valves at each tee. Valves shall be placed at least every 1,000 feet on arterial mains and minor distributors, or at other selected points throughout the distribution system.
- b. All water mains shall extend at least forty (40) feet beyond each valve located on a dead-end main, unless restrained properly or approved otherwise by the Town.
- c. A valve shall be installed on each hydrant branch pipe between the main and the hydrant and near the end of any main which may be extended.

3.1.8 Air Release and Vacuum Valves.

Air release and vacuum valves shall be installed at all high points on supply or transmission mains and on distribution mains as directed by the Town. Air valves shall be installed in concrete manholes as depicted in the detail drawings.

3.1.9 Blowoffs.

In dead-end mains or where required by the Town, a blowoff connection or fire hydrant shall be installed for flushing the main.

3.1.10 Fire Hydrants.

Fire hydrants are required and the following hydrant spacing guidelines shall apply:

- a. In residential areas, all parts of any existing or proposed building shall be within 300 feet of a hydrant.
- b. In industrial areas, hydrants should be spaced according to the latest requirements of the Insurance Services Office.
- c. Generally, a hydrant should be placed at each street intersection, and intermediate hydrants shall be installed if the distance between intersections exceeds 500 feet.
- d. In checking distances between hydrants and buildings, measurements should be made along public streets, except where private entrances or parking areas are available for access.

3.1.11 Cathodic Protection.

Water mains installed near utilities having cathodic protection shall themselves be protected. The methods of protection, which may include insulating couplings, polyethylene encasement, electrical connectors, test stations, and other facilities, shall be subject to Town approval.

3.1.12 Customer Metering.

Each customer shall be metered. The Town installs and maintains water meters.

(See Section 2 - Service Lines)

3.1.13 Borings.

Bored crossings shall be done in accordance with MD SHA requirements.

3.2 MATERIALS AND EQUIPMENT

All materials shall be domestic unless otherwise approved by the Town

3.2.1 Ductile Iron Pipe and Fittings.

(References to ASTM, AWWA and ANSI Specifications imply Latest Edition.)

a. Ductile Iron Pipe.

Ductile iron pipe shall be in accordance with the standard specifications as set forth in ASTM A746 and ANSI/AWWA C151/A21.5. Pipe shall be cement mortar lined in accordance with ANSI/AWWA C104/A21.4 and double lined and epoxy coated. Ductile iron, for use as restrained joint, shall be mechanical joint pipe using wedge action restraining glands. Pipe shall be used as indicated on drawing or details. Pipe larger than 12" shall be shipped with an appropriate percentage of fully gauged pipe to facilitate fitting requirements. Pipe shall be manufactured by Griffin Pipe Products Co. or approved equal.

Flange joint fabricated pipe shall be manufactured in accordance with ANSI/AWWA C115/A21.15 and have a minimum wall thickness of CL 53. Unless otherwise shown on the drawings, pipe shall be cement mortar lined in accordance with the requirements of ANSI/AWWA C104/A21.4 and double lined. All fabricated flange piping in size 3" through 24" shall be manufactured of ductile iron, and must meet all the requirements listed above. Flange pipe shall have an outside coating of primer or epoxy as required.

b. Joints.

Joints shall be of the push-on type or mechanical joint type in full accordance with ANSI A21.11 or AWWA C111 Specifications and shall be of the "TYTON" variety. Restrained joints shall be push-on restrained joints (Field Lok 350 Gaskets or equal) as manufactured by the pipe supplier or manufacturer subject to the Town's approval. The restraint provided shall be standard restrained joint or bolt-less, integral restraining system. Restrained joints shall be suitable for the specified test pressure. Mechanical joint retainer glands ("Megalug") as manufactured by EBAA Iron Inc. can be selected for restraining the mechanical joint of ductile iron pipe for field closures or as approved by the Town. The minimum number of restrained joints required for resisting forces at fittings and changes in direction of pipe shall be determined from the length of restrained pipe on each side of fittings and changes in direction necessary to develop adequate resisting friction with the soil. Flange joints shall conform to class 125 lb, as shown in ANSI B16.1. Bolt circle and holes shall be compatible with class 125 B16.1, or class 150 ANSI B16.5 (steel) flanges. Flanges requiring greater pressures, class 250 to class 350, shall meet the appropriated standards with the requirements indicated on the contract drawings.

c. Cement Mortar and asphaltic seal coat Linings.

Cement mortar linings shall be in accordance with ANSI Specification A21.4 or AWWA C104, except the thickness of the linings shall not be less than the following:

<u>Pipe Diameter</u>	<u>Lining Thickness</u>	Asphaltic Seal coating is also required
3" through 12"	1/8"	
4" through 24"	3/16"	

d. Minimum Thickness.

Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50, and shall be based on laying conditions and internal pressure. Minimum wall thickness shall be CL 52, except for flange joint fabricated pipe which shall have a minimum wall thickness of CL 53.

e. Laying Length.

Laying lengths shall be either 18 ft. or 20 ft. nominal lengths.

3.2.2 Fittings.

Ductile iron fittings shall be used for ductile iron pipe. Ductile iron fittings shall have a minimum pressure rating of 350 psi, and shall conform to ANSI A21.10 (AWWA C110). All fittings shall be cement-mortar lined as specified in 1.c. above, paint seal coated inside, and epoxy or bituminous coated outside, conforming to AWWA C104. Certification from the manufacturer that all fittings comply with the ANSI/AWWA Standards shall be submitted.

a. Mechanical Joint Fittings.

Fittings used with ductile iron pipe shall be furnished with mechanical joint ends conforming to ANSI A21.11. Mechanical joint fittings shall be furnished complete with either gray iron or ductile iron glands, carbon steel bolts and nuts as per ASTM A307, and plain rubber gaskets. Mechanical joint fittings in sizes 4" through 24" shall meet the requirements of AWWA C153. Fittings shall be manufactured from a high strength, impact resistant ductile iron, having a minimum tensile of 70,000 psi with a minimum yield of 50,000 psi and a minimum elongation of 5%. Fitting wall thickness shall be CL 54 through 12" diameters and CL 56 through 24" diameters. All fittings shall be listed with Underwriters Laboratories. All joint accessories, glands, bolts, and gaskets shall conform to ANSI/AWWA C111. Where fittings are to be used with PVC piping systems, appropriate gaskets shall be furnished if required. Fittings shall be as manufactured by Griffin Pipe Products Co. or approved equal.

b. Flanged Fittings.

Flanged fittings in sizes 3" through 24", for exposed piping and/or when specified, shall conform to ANSI A21.10 or ANSI B16.1. Fittings shall be manufactured of ductile iron and rated for 250 psi water working pressure. All elbows or bends (straight sizes), tees, crosses, concentric reducers, base elbows (except reducing sizes), and bottom base tees shall be manufactured to AWWA C110. Long radius and reducing elbows, reducing on the run tees, size outlet fittings, eccentric reducers, and laterals shall be in accordance with ANSI B16.1. All flanges shall be faced and drilled in accordance with ANSI B16.1 for 125 lb drilling pattern, unless otherwise shown on the drawings. Fittings shall have cement mortar lining. Fittings shall have a primer / epoxy coating. Flanged fittings shall be manufactured by Griffin Pipe Products Co. or approved equal. Flange bolt and gasket kits shall be furnished for each flange joint connection. Machine bolts and nuts for flanged fittings shall be steel, conforming to ASTM Designation A307, Grade B, or stainless steel, if indicated on drawings. Dimensions of bolts and nuts shall conform to ANSI B18.2. Threads of bolts and nuts shall conform to ANSI B1.1, Coarse-Thread Series, Class 2A fit on bolts, and Class 2B fit on nuts. Flange gaskets shall be full face red rubber, with a minimum thickness of 1/8". Gaskets shall be manufactured of styrene butadiene rubber. Dimensions of gaskets shall conform to ANSI B16.21.

3.2.3 Mechanical Joint Retainer Glands.

Retainer glands, when used for restraint, shall be manufactured of ductile iron, conforming to ASTM A536-80 and shall be heat-treated to a minimum hardness of 370 BHN. Dimensions of gland shall be such that it can be used with the standardized mechanical joint bell with tee-head bolts conforming to ANSI/AWWA A21-11 and ANSI /AWWA C153/A21.53. The design shall incorporate twist-off nuts to insure proper actuating of the restraining devices, leaving hex head nut for disassembly if required. Mechanical joint restraints for ductile iron fittings and pipe shall be incorporated in the design of the follower gland. Said gland shall include a restraining mechanism against the pipe, which increases its resistance as pressure increases. Glands shall be designed to allow flexibility of pipe joints after installation and backfill. The retainer glands shall be installed according to the manufacturer's standard recommendations. Where retainer glands are used, joint deflection shall not exceed 3 degrees. Approval from the Town for the use of retainer glands must be obtained.

Wedge action retainer glands will be used on all valves, hydrants, and fittings. Concrete thrust blocks shall also be required unless the approved by the Town and pipe joints are restrained an appropriate length from each fitting or valve, as recommended by the manufacturer. The mechanical joint restraining device in sizes 4" through 16" shall have a working pressure of 350 psi, with a safety factor of 2 to 1. In sizes 18" through 36" the working pressure shall be 250 psi with a 2 to 1 safety factor. Glands shall have U.L. listing through 12" in size and Factory Mutual approval through 12". Restraining glands shall be as manufactured by the Ford Meter Box Co., Inc., Uni-Flange Series 1400 or approved equal.

3.2.4 Valves, Hydrants, and Valve Boxes.

a. Gate Valves.

The resilient seat gate valves shall fully comply with the latest revision of AWWA C509, and shall also be UL listed and FM approved. The valves shall be tested and certified to ANSI/NSF 61.

The valve shall have a 250 psig working pressure rating.

The valve type shall be NRS (non-rising stem) or OS&Y (outside screw & yoke) as specified.

The valve shall have an arrow cast on the operating nut or handwheel showing opening direction. The direction of opening shall be counterclockwise.

The NRS valves shall be provided with a 2" square operating nut and OS&Y valves shall be provided with a handwheel. The bolt that attaches the operating nut to the stem shall be recessed into the operating nut so as not to interfere with valve wrench operation.

The valves shall have bolts and nuts for the stuffing box and bonnet with one of the following compositions: Steel, ASTM A-307, Grade B zinc plated, type 304 stainless steel, or type 316 stainless steel.

The valve stem shall be made of bronze ASTM B-138 alloy C67600 bar stock material. The stem shall have at least one "anti-friction" thrust washer above and below the stem collar to reduce operating torque. The design of the NRS valve stem shall be such that if excessive input torque is applied, stem failure shall occur above the stuffing box at such a point as to enable the operation of the valve with a pipe wrench or other readily available tool. The stem material shall provide a minimum 70,000psi tensile strength with 15% elongation and yield strength of 30,000psi. Valves with cast stems or two piece stem collars are not acceptable.

The NRS valves shall have a stuffing box that is o-ring sealed. Two o-rings shall be placed above and one o-ring below the stem thrust collar. The thrust collar shall be factory lubricated. The thrust collar and its lubrication shall be isolated by the o-rings from the waterway and from outside contamination providing permanent lubrication for long term ease of operation. Valves without a stuffing box are unacceptable. Valves without at least three stem o-rings are also unacceptable.

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

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

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

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

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

The NRS valves shall be MUELLER® A2360 series or approved equal, the OS & Y valves shall be MUELLER® R2360 series or approved equal, the NRS tapping valves shall be MUELLER® T2360 series or approved equal.

Valves and hydrants shall be of the same manufacturer, which shall be Mueller Co. or an approved equal.

b. Swing Check Valves.

Swing check valves in sizes 4" through 12" shall be manufactured in accordance with AWWA C508. Valves shall be rated for 200 psi water working pressure. Valves shall be coated with epoxy on all internal and external ferrous surfaces. The valve shall have a clear full opening waterway when disk is in the fully open position and be certified to ANSI/NSF 61, Valves shall be Mueller or approved equal.

c. Fire Hydrants.

Fire hydrant **COLOR** shall be **MUELLER YELLOW**

Fire hydrants purchased or installed shall meet or exceed all applicable requirements and tests of ANSI and the latest revisions of AWWA Standard C502. Fire hydrants shall meet all test requirements and be listed by Underwriters Laboratories Inc and shall meet all test requirements and have full approval of Factory Mutual. Fire hydrants shall meet the following requirements: Fire hydrants shall be rated for a working pressure of 250 Psig. (1725 kPa). Fire hydrants shall be of the compression type, opening against the pressure and closing with the pressure. Fire hydrants shall have a minimum 5-1/4" main valve opening and a minimum inside lower/upper barrel diameter (I.D.) of 7" to assure maximum flow performance. Pressure loss at 1,000 GPM shall not exceed the following values: 4.5" Pumper Nozzle: 2.50psi Fire hydrants shall be three-way in design, having one pumper nozzle (4 1/2 ") and two 2-1/2" hose nozzle(s). Nozzles shall thread counterclockwise into hydrant barrel utilizing "o" ring seals. A suitable nozzle lock shall be in place to prevent inadvertent nozzle removal. The bonnet assembly shall provide an oil reservoir and lubrication system that automatically circulates lubricant to all stem threads and bearing surfaces each time the hydrant is operated. This lubrication system shall be sealed from the waterway and any external contaminants by use of "o" ring seals. An anti-friction washer shall be in place above the thrust collar to further minimize operating torque. The oil reservoir shall be factory filled with a low viscosity, FDA approved non-toxic oil lubricant which will remain fluid through a temperature range of – 60° F. to +150° F.

The operating nut shall be a one piece design, manufactured of ASTM B-584 bronze. It shall be pentagon/square in shape and the nut dimensions shall be as specified by the Town of Boonsboro. The operating nut shall be affixed to the bonnet by means of an ASTM B-584 bronze hold down nut. The hold down nut shall be threaded into the bonnet in such a manner as to prevent accidental disengagement during the opening cycle of the hydrant. The use of Allen head set screws as a means of retention is unacceptable. A resilient weather seal shall be incorporated into the hold down nut, for the purpose of protecting the operating mechanism from the elements.

The direction of the opening shall be counterclockwise. An arrow shall be cast on the bonnet flange to indicate the specified opening direction.

The hydrant bonnet shall be attached to the upper barrel by not less than eight bolts and nuts and sealed by an "o" ring. Hydrants shall be a "traffic-model" having upper and lower barrels joined at the ground line by a separate and breakable "swivel" flange providing 360° rotation of upper barrel for proper nozzle facing. This flange shall employ not less than eight bolts. The safety flange segments shall be located under the upper

barrel flange to prevent the segments from falling into the lower barrel when the hydrant is struck. The pressure seal between the barrels shall be an "o" ring.

The proper ground line shall be cast clearly on the lower barrel and shall provide not less than 18" of clearance from the centerline of the lowest nozzle to the ground. The operating stem shall consist of two pieces, not less than 1 1/4" diameter (excluding threaded or machined areas) and shall be connected by a stainless steel safety coupling. The safety coupling shall have an integral internal stop to prevent the coupling from sliding down into the lower barrel when the hydrant is struck. Screws, pins, bolts, or fasteners used in conjunction with the stem couplings shall also be stainless steel. The top of the lower stem shall be recessed 2" below the face of the safety flange to prevent water hammer in the event of a "drive over" where a vehicle tire might accidentally depress the main valve. The lower barrel shall be an integrally cast unit. The use of threaded on or mechanically attached flanges is deemed unacceptable. The hydrant bury depth shall be clearly marked on the hydrant lower barrel.

Composition of the main valve shall be a molded rubber having a durometer hardness of 95 +/- 5 and shall be reversible in design to provide a spare in place. Plastic (polyurethane) main valves are unacceptable. The main valve shall have a cross section not less than 1".

Hydrants shall be equipped with (2) two drain valves which drain the barrel when the hydrant is closed and seal shut when the hydrant is opened. These drain valves shall be an integral part of the one piece bronze upper valve plate. They shall operate without the use of springs, toggles, tubes, levers or other intricate synchronizing mechanisms. The upper valve plate, seat ring and drain ring (shoe bushing) must be ASTM B-584 bronze and work in conjunction to form an all bronze drain way. A minimum of two (2) internal and two (2) external drain openings are required. Drains ported through an iron shoe must be bronze lined. The bronze seat ring shall thread into a bronze drain ring (or shoe bushing) providing a bronze to bronze connection. Seat rings shall be "o" ring pressure sealed. The shoe inlet size and connection type shall be as specified (flanged, MJ, etc.), having ample blocking pads for sturdy setting and the MJ connection must have two strapping lugs to secure the hydrant to piping. A minimum of six bolts and nuts is required to fasten the shoe to the lower barrel. If a stem cap nut is utilized, it must be locked in place by a stainless steel lock washer or similar non-corrosive device that will prevent the cap nut from backing-off during normal use.

Coating shall be high performance 2-part epoxy, Color Mueller Yellow, NSF61 listed and AWWA C550 complaint.

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

Hydrants shall be Mueller Super Centurion 250 or approved equal.

Hydrants shall also be furnished with a spring-mounted reflective fiberglass rod marker. The hydrant rod marker shall be Hydrofinder by Rodon Corporation.

d. Air Release and Vacuum Valves.

Combination air release and air vacuum valves shall have cast iron bodies with stainless steel floats. Other internal parts shall be either stainless steel or bronze. Combination valves shall conform to AWWA C512 specifications. Valves for lines 3" through 8" shall be 1" as manufactured by Val-Matic, Model No. 201 C, or approved equal. Valves for lines 10" through 24" shall be 2" as manufactured by Val-Matic, Model No. 202 C, or approved equal. Valves shall be sized according to manufacturer's recommendations based on main size, main capacity and pressure. Installation shall be per detail drawing. When curb stops are used as blow-off valves Ford B11 Series shall be used.

e. Pressure Regulating Valves.

The installation of pressure regulating valves may be required by the Town to prevent excessive pressures at customer services or other locations. Pressure regulating valves required at customer services are to be installed and maintained by the customer. Pressure regulating valves 2 inches and smaller shall be diaphragm-type with cast-bronze body and galvanized iron strainer. They shall be manufactured by Watts Regulator Co. or approved equal. Pressure regulating valves 2-1/2-inch and larger shall be manufactured by Cla-Val, Watts or Val-Matic.

f. Valve Boxes.

Underground valves shall have extension-type, roadway-type valve boxes with a drop-type lid. Valve boxes shall be cast iron with a minimum wall thickness of 1/4" and shall be two-piece telescoping screw-type construction. Valve boxes for valves between 4" and 30" shall have 5 1/4" shafts and a round bottom. Valve boxes for valves between 1 1/2" and 3" shall have 4 1/2" shafts for sizes 1 1/2" through 3" and an arched bottom. Valve box covers shall be marked WATER and be coated inside and out with a tar or asphalt compound. Valve boxes shall be manufactured by Bingham & Taylor or approved equal.

g. Blowoffs.

Permanent blowoffs shall be 2-inch Slim Line Hidden Hydrant manufactured by Gil Industries, Inc. Temporary blowoffs shall be as depicted on the detail drawings and shall only be used on a temporary basis (e.g. the end of an initial phase of a project that will be extended in the near future) as approved by the Town. Automatic flushers may be required where water quality issue could develop.

3.2.5 Stainless Steel Tapping Sleeves and Valves.

Stainless steel tapping sleeves shall be manufactured of 304 heavy gauge stainless steel. Sleeves shall be certified to ANSI/NSF 61. Sleeves shall incorporate a 3/4" NPT brass test plug. The use of stainless steel tapping sleeves shall not be allowed on a size on size application and only by written permission by the Town. Sleeves shall be as manufactured by Mueller Co. or approved equal. Valves shall conform to section 3.2.4.a. Gate Valves.

3.2.6 Backflow Prevention Devices.

a. General.

These devices are required on all service lines. Connections with private booster systems will require reduced pressure backflow preventers.

b. Reduced Pressure Backflow Preventers.

This device shall conform to AWWA C511, shall be minimum 150 psi design pressure, and shall be equipped with suitable test cocks. The device consists of an automatic pressure differential relief valve located in the zone between two or more independently acting check valves, which in turn are located between two tightly-closing shutoff valves. Reduced pressure backflow preventers shall be CLA-VAL Co. Clayton Model RP-2 or RP-1, or Watts Regulator Company Series 909. It is recommended that the reduced pressure backflow preventers have a drain line installed with an air gap.

c. Double Check Valve Assemblies.

This device shall conform to AWWA C510, shall withstand a 150 psi design pressure, and shall be equipped with suitable test cocks. The device consists of an assembly of independently acting check valves located between two tightly closing shutoff valves but without a pressure differential relief valve. Double check valves shall be as manufactured by Ford.

3.2.7 Steel Casing Pipe.

The steel casing pipe shall have a minimum yield strength of 35,000 psi, have a thickness as required but not less than 0.375 inches, be equipped with grout holes and conform to AWWA C200 and ASTM A53. Casing interior and exterior shall be painted with two coats bitumastic enamel coating in accordance with AWWA C203. Pipe cradles or isolators shall be as shown on the detail drawings, Advance Products & Systems, Inc. (APS) casing spacers, Model SSI, or approved equal.

3.2.8 Wall/Floor Sleeve.

Wall and/or floor pipe penetrations shall be made by means of a sleeve capable of being bolted directly to the formwork to prevent misalignment. Sleeve shall be standard schedule 40 wall thickness. Each floor/wall sleeve shall be manufactured with a two inch wide water stop that anchors the sleeve to prevent thrust movement and insure positive water sealing. Unless otherwise specified. Coating shall be fusion bonded polymer powder 10 to 15 mils thick, applied to oven heated wall sleeves via spraying method. Wall sleeves shall be as manufactured by Advance Products & Systems, Inc. or approved equal.

3.3 EXCAVATION, BEDDING, AND BACKFILLING

3.3.1 Excavation.

All excavation required will be unclassified as to character of materials, under various depth classifications and shall include and cover all materials encountered in the excavation whether dry or wet and regardless of the character of the material. The trench shall be excavated to a depth of six inches below the outside diameter of the pipe barrel, or deeper if so specified. The width of the trench shall be as shown on the detail drawings. Excavation shall be open cut. All of this excavation may be done by machine. See Maryland State Highway Administration Permit and/or Washington County Roads Permit whichever shall be applicable, regarding acceptable equipment. The resultant subgrade shall be undisturbed, or compacted as approved by the Town's authorized representative, or County's Engineer, if disturbed. When the pipe is to be laid in fill, bring the fill to two feet above the elevation of the top of pipe to be laid before excavation commences. The bottom of the trench shall be compacted to 95% of standard Proctor density prior to installation of the pipe bedding.

The excavation of all trenches, except those for water house connections, shall be fully completed at least 25 feet in advance of pipe laying, unless otherwise authorized. The Contractor shall keep all excavation free from water at his own expense while work is in progress. He shall dispose of water removed in such a manner as not to cause injury to public health, to public and private property and any impediment to the use of streets by the public. Cutters and drains shall be kept open at all times for surface drainage and the contractor shall be responsible for all diversion of drainage flows.

The Contractor shall remove paving for such width only as is necessary for the excavation of the trench, and in the event he removes the paving for a greater width than is deemed necessary, or in case he removes or disturbs any paving on account of settlement, slides, cave-ins or through movement of equipment, the Contractor shall make repairs and shall have no claim for extra compensation.

Before excavation of any portion of the trench in paved areas, the contractor shall cut through the paving to the underside of the base at both edges of the trench in such a manner that paving within the area trench shall be completely separated from the adjoining paving.

Rock shall be removed by hand-operated power tools, or by means other than explosives in the vicinity of existing structures and utilities as directed by the Town.

Rock appearing where future pipes are to connect with those constructed shall be removed a distance of four (4) feet from the pipe under construction in the direction of future construction.

All blasting shall be done under the supervision of a competent blasting expert and subject to the State, County, and Local regulations for blasting. The Town shall be empowered to regulate the character and strength of explosives used and the matter of their storage. All blasts shall be properly and securely covered. The Contractor shall be solely responsible for injury to persons or property that may result from his use of explosives and the exercise of or failure to exercise control on the part of the Town shall in no way relieve the contractor of responsibility for any injury or damage resulting from their use.

The manner of bracing excavations shall be set forth in the rules, orders, and regulation of the State of Maryland.

Test pits shall be dug by the contractor wherever directed by the Town. Test pits may be dug by the contractor without being directed to do so along the line of the trench, in advance of excavation for the purpose of satisfying himself as to the location of underground conditions.

In case the Town shall direct that the location of a trench be changed to a reasonable extent from that shown on the drawings on account of the presence of obstructions or from others causes, or if the contractor requests a change and it is authorized, the Contractor shall not be entitled to extra compensation, provided the change is made before excavation is begun.

Safe and suitable ladders which project 2 feet above the top of the trench shall be provided for all trenches over 5 feet in depth. One ladder shall be provided for each 100 feet of open trench, or fraction thereof and be so located that workmen in the trench need not move more than 50 feet to a ladder.

3.3.2. Bedding.

The pipe shall be bedded on six (6) inches of AASHTO No. 7 (stone, the full width of the trench, and shall be covered with AASHTO No. 7 stone to a height of 12" over the top of the pipe.

The bedding shall be thoroughly compacted. The bedding shall provide uniform and continuous bearing and support for the full length of the pipe.

a. Unstable Subgrade.

Where the bottom of the trench at subgrade is found to be unstable or to include ashes, cinders, any type of refuse, vegetable, or other organic material, or large pieces or fragments of inorganic material, which, in the opinion of the Town, should be removed, the Contractor shall excavate and remove such unsuitable material to the width and depth recommended by the Town. Before pipe is laid, the subgrade shall be formed by backfilling with AASHTO No. 7 stone in 3-inch (uncompacted thickness) layers thoroughly compacted to 95% of modified Proctor density and the bedding prepared as hereinbefore specified.

Flowable Ash Backfill may be used as an alternative to backfilling with stone. Material consists of a mixture of fly ash, cement and water which shall have a 28 day unconfined minimum compressive strength of 100 psi based on the manufacturer's certification, and shall be placed in accordance with the manufacturer's recommendations.

If potentially corrosive materials are encountered, polyethylene encasement shall be installed to protect the pipe in accordance with ANSI/AWWA C105/A21.5.

b. Special Foundations.

Where the bottom of the trench at the subgrade is found to consist of material which is unstable to such a degree that, in the opinion of the Town, it cannot be removed and replaced with an approved material thoroughly compacted in place to support the pipe properly, a suitable foundation for the pipe shall be designed and submitted to the Town for approval.

c. Concrete Encasement.

Pipes to be encased in concrete shall have minimum six inches of concrete above and below the pipe and the concrete shall be extended for the full width of the natural trench. No formwork to limit the concrete width shall be used. Flexible pipe joints shall be

provided in the pipe at a distance of three times the pipe diameter from the ends of the concrete encasement, to provide pipe articulation.

3.3.3 Backfilling.

The contractor shall refill all excavations as rapidly as possible after completion of the laying of pipe, or after the excavation has served its purpose. No connection, branch, fitting, valve or any part of pipe that needs to be located or measured shall be filled over until the required measurements have been made by the Town, and his permission to do so has been given, and any of such that are covered without authorization shall be uncovered by the Contractor at his expense.

The trench may be filled with excavated material above the bedding stone as specified above except that stones larger than eight (8) inches may not be placed in the trench and the fill shall not contain more than 20% stone in total volume. The trench shall be properly tamped in lifts not to exceed the maximum thickness (8 inches) for the type of tamping equipment being used. All bedding and backfilling shall be compacted to 95% of modified Proctor density. Backfilling shall not be done with frozen material. No backfilling shall be done if the material already in the trench is frozen.

Tracer wire (copper min. 8 AWG) shall be installed above all plastic piping. Two rows of Detectable Marking tape shall be installed two feet above pipelines. This tape shall be installed in conjunction with main lines, including service connections. Composition of tape shall be polyethylene and have a film thickness of 4.0 mil. nominal and a width of 6". Color shall be bright blue and reflective silver with black printed letters on one side stating: CAUTION WATER LINE BURIED BELOW. Tape shall be 6" as manufactured by Pro-Line or approved equal.

The Contractor shall supply all refill material required to complete this project. After completion of refilling, all material not used shall be removed and disposed of, and the line of work shall be left free, clean and in good order by the Contractor. The Contractor shall maintain, at his expense, all backfilled excavations in proper condition until the date of the end of the performance period, and, if he shall fail to do such work within reasonable time, it will be performed by the Town, and the cost shall be paid by the contractor.

Utility excavations in areas of streets, access drives, parking areas and loading areas shall be backfilled in accordance with the foregoing requirements with the following exception: the trench shall be filled with GAB stone above the AASHTO No. 7 pipe bedding. GAB shall be placed and compacted to the foregoing requirements. In State highways, all backfill shall be in accordance with the requirements of MD SHA.

3.3.4 Surface Restoration.

Paving damaged in any way by the construction operation shall be replaced by the Contractor. Damaged pavements or trenching through other areas not covered by these details shall be replaced by the Contractor to a condition equal to or better than that existing prior to damage and subject to the approval of the Town at the Contractor's expense.

In State highways surface restoration shall be in accordance with MD SHA requirements, or as specified in the MD SHA Permit issued for the subject project.

In County roads, Town roads, paved areas, or other traffic areas surface restoration shall be in accordance with Washington County Roads Department standards. The contractor shall be responsible for all injury or damage that may result from improper maintenance.

3.4 PIPELINE INSTALLATION

3.4.1. General.

This Section covers the installation of the water mains, complete, with all fittings, valves, reaction backings and/or harnessing, connections, and appurtenances. Installation shall be performed as specified in AWWA Standard for Installation of Ductile Iron Water Mains, C600, except where otherwise specified herein.

3.4.2 Responsibility for Material.

The Town shall not be responsible for materials, and materials found defective in manufacture or damaged in handling, as determined by the Town, and shall be replaced at no cost to the Town. Any materials found defective shall be promptly removed from the site. Defective pipe shall be classified as follows:

- a. Damage to interior or exterior paint seal coats.
- b. Damage to interior cement-mortar lining.
- c. Insufficient cement-mortar lining thickness.
- d. Poor quality interior paint seal coat causing a partial obstruction in the pipe round.
- e. Pipe out of round.
- f. Damaged pipe barrel area causing a reduction in effective pipe thickness.
- g. Any material that is dropped during handling, regardless of its apparent condition.

3.4.3 Transportation, Delivery, and Handling of Material.

During loading, transportation, and unloading, every precaution shall be taken to prevent injury to the pipe. Pipe shall be so handled that the coating and lining is not damaged. If any part of the coating or lining is damaged, the repair shall be made to the satisfaction of the Town. Valves and hydrants shall be stored and kept dry before installation. Any material that is dropped during handling is subject to rejection regardless of its apparent condition.

3.4.4 Alignment and Grade.

Where the proposed pipeline route is on a curve, the pipe may be deflected at the joints to published manufacturer's tolerances. Where underground conditions require a change of alignment or grade, such change shall be made only with the written consent of the Town. When a change in grade is indicated which will result in the pipe having more cover than originally anticipated, the class of pipe installed at the location shall withstand the new loadings.

Except at predesignated points, no high points shall be established where air can accumulate. If field conditions necessitate a change in the pipe profile and, in the opinion of the Town, the change requires the installation of an air release valve and manhole, installation of the same shall be ordered at no expense to the Town.

3.4.5 Lowering Water Main Material into Trench.

AWWA Specification C600 shall apply. Before any length of pipe is lowered into the trench, it should be inspected for damage and the inside of the pipe should be inspected for loose dirt and foreign objects such as tools, clothing, etc. If mud and trench water have been permitted to stand or flow through the pipe, the inside should be scrubbed with a strong chlorine solution and washed or flushed out. This precaution will save time and expense when disinfecting the completed water main. Pipe should be lowered into the trench with pipe tongs or slings. Under no condition should it be pushed off the bank and allowed to fall into the trench. Because of its weight, large pipe must be handled with power equipment. If a cable sling is used around the center of the pipe, a wooden block placed between the pipe and the cable will reduce the hazard of pipe slippage. Valves, fittings, and hydrants should be lowered into the trench with a rope or power hoist, depending on their sizes. The rope or sling should not be attached to the valve stem and, under no conditions, should these appurtenances be dropped or dumped into the trench.

3.4.6. Cleaning Pipe and Fittings.

The interior of the pipe shall be thoroughly cleaned of foreign matter before being lowered into the trench. All lumps, blisters, and excess coating shall be removed from the end of each piece of pipe and fitting. The outside of the spigot, the inside of the bell, and the gasket shall be thoroughly wiped clean and dry before the pipe is installed.

3.4.7 Laying Pipe.

The full length of each pipe shall rest solidly upon the pipe bed with recesses excavated to accommodate bells and joints. No pipe shall be laid when, in the opinion of the Town, trench or weather conditions are unsuitable. No wedging or blocking will be permitted unless permission is obtained from the Town. Water shall be kept out of the trench until the joint has been completed. When pipe laying is not in progress, the open ends of installed pipe shall be closed by approved means to prevent entrance of trench water and foreign material into the line. Enough backfill shall be placed in the center sections of the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and relaid. Any section of pipe found to be defective before or after laying shall be replaced with sound pipe without additional expense to the Town.

No pipe shall be installed until sufficient trench has been completely excavated to assure that no unforeseen obstructions of any kind are likely to be encountered. No pipe or fittings shall be brought into position until the preceding length has been thoroughly embedded and secured in place. No pipe shall be installed where the coating or lining shows cracks that may be harmful.

No pipe shall be laid upon a foundation into which frost has penetrated, nor at any time when the Town shall deem that is danger of the formation of ice or the penetration of frost at the bottom of the excavation, unless all required precautions as to the minimum length of open trench and promptness of refilling are observed. The ends of the pipe shall abut against each other in such a manner that there shall be no shoulder or unevenness on the inside of the main. Whenever a pipe or fitting requires cutting to fit in the line or to bring it to the required location, the work shall be done in a satisfactory manner without damage to the pipe so as to leave a smooth end and by means of an approved type of mechanical cutter. No springing of joints to effect a change in direction will be allowed, except by permission or direction, or as shown on the drawing.

When necessary a short pipe shall be provided to locate fittings in accordance with the contract drawing. When closures must be cut in the field, the work shall be done in a satisfactory manner to provide a smooth end.

a. Pipe Clearance in Rock.

Ledge rock, boulders and large stones shall be removed to provide a clearance of at least 6 inches below and on each side of all pipe and fittings for pipes 24 inches in diameter or less, and 9 inches for pipes larger than 24 inches in diameter. The specified minimum clearances are the minimum clear distances which will be permitted between any part of the pipe and/or fitting being laid and any part, projection or point of rock, boulder or stone.

b. Joints.

All pipes, fittings and valves and joining thereof shall be done by experienced pipe layers, to the satisfaction of the Town. All joints shall be made in accordance with the pipe supplier's specifications and in accordance with the following instructions:

(1) Push-on Type Joints.

Cleaning and assembly of push-on joints shall conform to AWWA C600.

(2) Mechanical Joints.

The cleaning, assembly, and bolting of the mechanical joint shall conform to AWWA C600.

(3) Flanged Joints.

- a. Flanged joints shall not be used for buried service.
- b. Flanges shall be wiped clean with a solvent-soaked rag prior to installation. The gasket shall also be wiped clean.
- c. The pipe, fittings, and valves shall be properly supported during installation.
- d. All flanges shall be properly aligned and checked with a spirit level, both horizontally along the pipe and vertically across the flange faces.
- e. With flanges secured in position, half the bolts shall be inserted at the bottom of the flange, the gasket inserted between the flanges, and the remaining bolts inserted.
- f. The threads of the bolts shall be given a light coating of thread lubricant, and the nuts shall be installed on the bolts and turned up by hand. The nuts shall be tightened with a wrench by the crossover method to load the bolts evenly until the joints are tight.

(4) Field Welding.

All field welding shall be performed in accordance with the latest accepted standards of good practice of the American Welding Society by operators who are qualified under standard qualification procedures of the American Welding Society.

3.4.8 Setting Valves and Valve Boxes.

All valves shall be set vertical and shall be provided with a valve box. If the valve is furnished with a bypass, a valve box shall also be furnished for the bypass valve. The tops of boxes shall be set to finished grade or 1/8" below finished asphalt surface in streets, unless directed otherwise by the Town. Any box which is found out of plumb, or which is not firmly supported, shall be dug up and reset in a satisfactory manner. Valve and fitting installation shall be in accordance with AWWA C600.

3.4.9 Setting of Hydrants.

Fire hydrants shall be installed as specified in AWWA C600. Where there is no sidewalk or curb, the hydrant shall be not less than 6 feet from the edge of paved road surface and as shown on the drawings. In no case will hydrants be located closer than 25 feet to a building except where building walls are blank fire walls. Hydrants shall not be located closer than 3 feet to any obstruction, or in front of entrance ways. All hydrants shall stand plumb, with the pumper nozzle facing the curb, and the hose nozzles parallel to the curb as shown on the detail drawings.

3.4.10 Anchorage.

All plugs, caps, tees, hydrants, and bends (both horizontal and vertical) shall be provided with concrete reaction backings, and approved restrained joint systems. These buttresses and anchorages shall be concrete or concrete and steel as required. They shall extend to solid undisturbed soil. Where the water mains must be tested before connections to existing mains can be installed, temporary reaction backings or restrained type plugs shall be installed. Buttresses shall be placed so that the joints will be accessible for repair, fittings and pipe shall be wrapped in poly film. The Town's approval shall be obtained for the anchorage of the pipe and fittings at each connection, or at any other locations designated by the Town. The Town reserves the right to require mechanical joint retainer glands in addition to concrete reaction backings. Hydrant bases shall be braced against undisturbed earth with reaction backings, or shall be restrained with tie rods, clamps, or restrained joints, in a manner approved by the Town. The approved hydrant installation is shown on the detail drawings.

3.4.11 Bored Crossings

Plan and Profile drawings are required for all bored crossings, and must be approved by the Town.

- a. Tolerances for installation of the casing pipes shall be as follows:
 - (1) Elevation: to grade or a maximum of 9 inches below grade.
 - (2) Plan Location: plus or minus 1 foot.
- b. The carrier pipes shall be supported within the casing pipes so that the pipe bells do not rest directly on the casing. The load of the carrier pipes shall be distributed along the casing by the method of support show on the detail drawings.
- c. All work shall be performed in conformance with the requirements of MD SHA or other regulatory agencies involved.

3.4.12 Notification, Operation of Water System, Connections to Existing System, and Interruptions of Service.

The Town shall be notified at least 10 working days before installing connections to the existing water system or shutting off a portion of the system. A permit is required.

Under no circumstances shall the valves on the existing system be operated, except under the direct supervision of a Town representative.

The Town reserves the right to designate the day and time when water mains may be shut off and may require that this work be done at night or on a weekend. In addition, the Town reserves the right to require that, where service to customers is interrupted, work is carried out continuously and expeditiously until water service is restored. The installation schedule and procedure shall be approved by the Town before the work is started, and all necessary materials, tools, and equipment shall be on hand before work is started.

All new water mains shall be tested, sterilized, and flushed prior to the installation of the connections.

Test pits to determine the exact location, elevation, diameter, and type of the existing pipe shall be excavated under the supervision of the Town.

3.5 TESTING & DISINFECTION

3.5.1 General.

This Section covers the testing and disinfection of the water mains. A schedule and procedure for the testing and disinfection of the different parts of the work shall be prepared and submitted to the Town for approval two weeks before beginning the testing and disinfection. Testing and disinfection shall be performed promptly and efficiently without interference to the system operation. 48 hours' notice shall be given before testing any main. Testing and disinfection of the various sections of water mains shall begin promptly upon the completion of a section of work, unless the Town approves otherwise. The Town reserves the right to limit the amount of water main to be tested.

3.5.2 Hydrostatic and Leakage Test.

Hydrostatic pressure tests shall not be made until at least 7 days after concrete reaction backings are installed. High early strength cement concrete for reaction backings may be used at no expense to the Town, in which case hydrostatic pressure tests shall not be made until at least 3 days have elapsed.

The trench shall be completely backfilled, or may be partially backfilled with the approval of the Town, prior to carrying out the pressure test.

The section of water main being tested shall be filled with water a minimum of 24 hours before the main is tested. Town personnel will slowly fill the main and record the time of filling. The Contractor is responsible for air removal while the main is being filled. The air shall be expelled from the pipeline in accordance with AWWA C600. Any taps necessary to release air or water from the main during testing shall be made at no cost to the Town unless retained by the Town for other use.

After the pipeline has been filled with water for 24 hours (48 hours if water temperature is below 41°F (5°C)), a hydrostatic or pressure test shall be conducted.

The duration of the pressure test shall be at least 2 hours. Each section of water main shall be tested under the design pressure or 150 psi, whichever is larger, measured at the low point of the section of main being tested. The test pressure shall be approved by the Town prior to testing, and shall not exceed the allowable pressure of any installed pipe, valves, or appurtenance. The section of pipeline shall be tested and examined in accordance with AWWA C600.

a. Leakage Test.

A leakage test shall be conducted concurrently with the pressure test. The Applicant shall furnish a laboratory calibrated test gauge and measuring device, and all necessary assistance to conduct the test.

(1) Leakage Definition.

Leakage is defined as the quantity of water that must be supplied into the newly laid pipe, or any valve section thereof, to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.

(2) Permitted Leakage.

No pipe installed will be acceptable until the leakage is less than the number of gallons per hour as determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133,200}$$

Where:

L - Allowable leakage, in gallons per hour

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)

Example: Diameter of water main = 6 inches

Length of water main = 1,600 feet

Test pressure = 150 psi

Allowable leakage, *L* = 0.88 gallons per hour.

- (a) The Town's representative will record both the makeup water and pressure at one-half hour intervals during the test period.
- (b) Should any test of pipe laid disclose leakage greater than that specified above, the Applicant shall, at his own expense, locate, repair, and replace the defective joints, pipe, or fittings until the leakage is within the specified allowance.

3.5.3 Disinfection.

a. General.

Before being placed in service, all pipe installed shall be disinfected in accordance with AWWA C651.

b. Preliminary Flushing.

Prior to disinfection, the sections of pipeline shall be flushed. The discharge of flushing water shall be reviewed with the Town's representative prior to disposal.

c. Form of Chlorine for Disinfection.

Either liquid chlorine, sodium hypochlorite solution or calcium hypochlorite granules or tablets shall be used for disinfection in accordance with AWWA C651.

d. Application of Chlorine.

One of the three methods of chlorination (continuous-feed method, tablet method and slug method) specified in AWWA C651 shall be used for disinfection. The method most suitable for the given situation shall be used and shall be reviewed with the Town's representative before application. The continuous-feed method is suitable for general application. The tablet method is suitable for use in pipes smaller than 24 inches in diameter and only if the pipe is kept clean and dry. The slug method is suitable for use in large diameter pipes where the volume of water involved makes the continuous-feed method impractical.

e. Point of Application.

The chlorine solution shall be applied at the high end of the pipeline section through a corporation stop inserted in the top of the new pipe. If the water for the chlorine solution is supplied from the existing pipeline, there shall be a physical break between the injector supply and the injector or pump.

f. Rate of Application.

The chlorine solution shall be pumped slowly into the new pipeline until the entire main is filled with the chlorine solution. If required by the Town, the chlorine residual shall be measured at several points along the main.

g. Point of Discharge.

The sterilizing solution shall be discharged through available outlets, or through taps in the main. The chlorinated water is extremely toxic, and the property and fish life shall be protected from damage due to the discharge. Where necessary, federal, state and local regulatory agencies shall be contacted to determine special provisions for the disposal of heavily chlorinated water. Chlorinated water shall be neutralized with a hydrant diffuser dechlorinator using sodium sulfite tablets. The local wastewater treatment plant operator shall be contacted in advance through the Town's representative to obtain approval prior to disposal to the sanitary sewer system. If discharged overland, check the downstream chlorine residual to determine if there is any chlorine present using a pocket colorimeter.

h. Flushing Water.

The Town will provide flushing water. No existing water system valves shall be operated without the presence of the Town's representative.

i. Water for Testing.

Town water can be provided at current Town rates.

j. Disinfection of Water Main Connections.

If it is not possible to disinfect the pipe, valves, and fittings in the manner specified above, with the Town's approval, the following procedure will be used:

The interior of all pipe, fittings, and valves shall be swabbed with a 5% hypochlorite solution which can be obtained by mixing 3 pounds of granulated calcium hypochlorite with 5 gallons of water. After the pipe, fittings, and valves have been swabbed, they shall be thoroughly flushed with water.

k. Bacteriological Tests.

After final flushing is completed and before the water main is put into service the Applicant shall have the replacement water tested for bacteriological quality. Bacteriological sampling and analysis shall be performed in accordance with AWWA C651 by an MDE certified laboratory.

Should the bacteriological test fail, new services may be installed but shall not be used until this test is acceptable.

Should all tests pass, service lines may be connected/reconnected for use.

APPENDIX A

APPLICATION FOR WATER SERVICE

Date _____ Lot # _____

Name _____

Address _____

Application is hereby made for the installation of a _____ (size) service connection for water at the above listed location.

Owner _____
Contractor _____

Present _____
Address of Owner _____

Charges to be paid when application is filed:

Connection Fee	\$ 8,550.00
Or	
Meter Fee	\$ _____
User Fee (Benefit Charge)	\$ _____
Water Supply Development Fee	\$ _____
Total	\$ _____

Applicant's Signature

Meter Number _____

Service Connection Date _____

Foreman _____

Account # _____ Book – Sequence _____

APPENDIX B

SANITARY SEWER CONNECTION PERMIT

Name of Applicant _____

Address _____

Subdivision _____ Lot # _____

Street Address _____

Type of Connection

Commercial: _____ Type of Business: _____

Residential: _____

Single House: _____

Apartment: _____ Number of Apartments: _____

Multiple Dwelling: _____ Number of Units: _____

Other: _____ Explain: _____

TYPE OF UTILITIES	IN USE	PLANNED
Full Bath (s):	_____	_____
Shower (s):	_____	_____
Commode (s):	_____	_____
Faucets (Hot & Cold):	_____	_____
Automatic Washer (s):	_____	_____
Garbage Disposal Unit (s):	_____	_____
Connection Fee		\$ _____ 13,500.00 _____
User Fee (Benefit Charge)		\$ _____
TOTAL		\$ _____

Applicant's Signature

Date _____

APPENDIX C

Boonsboro Municipal Utilities Commission Water and Wastewater Connection Permit		
21 N. Main St. Boonsboro MD 21713		
BMUC Permit #	Water	Wastewater
Address		
Subdivision/Lot#		
Parcel/Map		
Date of Application		
Account #		
Owners Name		
Owners Address		
Owners Telephone		
Owners Representative		
Contractors Name, Address, and MHIC#		
Type of Service		
Residential (# EDUs)	1	1
Multi Family (# EDUs)		
Commerical (# EDUs)		
Allocation (GPD)		
Service Size (in.)	1.5"	6"
Fees		
Benefit Charge (User Fee per EDU)	\$8,550.00	\$13,500.00
Connection Fee (per Application)	\$1,000.00	see Water Connection Fee
EDUs	1	1
Total Fees	\$9,550.00	\$13,500.00
Connection Fee Detail	\$1,000 flat fee per application	\$1,000 flat fee per application
Date Fee Paid / Supervisor		
Applicants Signature		
Date		
Approval Signature		
Date		
For Town Staff Only		
Date Installed and Name of Foreman		
Meter Number / Serial Number / RTU		
Service Connection Date		
Book / Sequence #		
Superintendent Approval		
Std Service Size	1.5"	6"

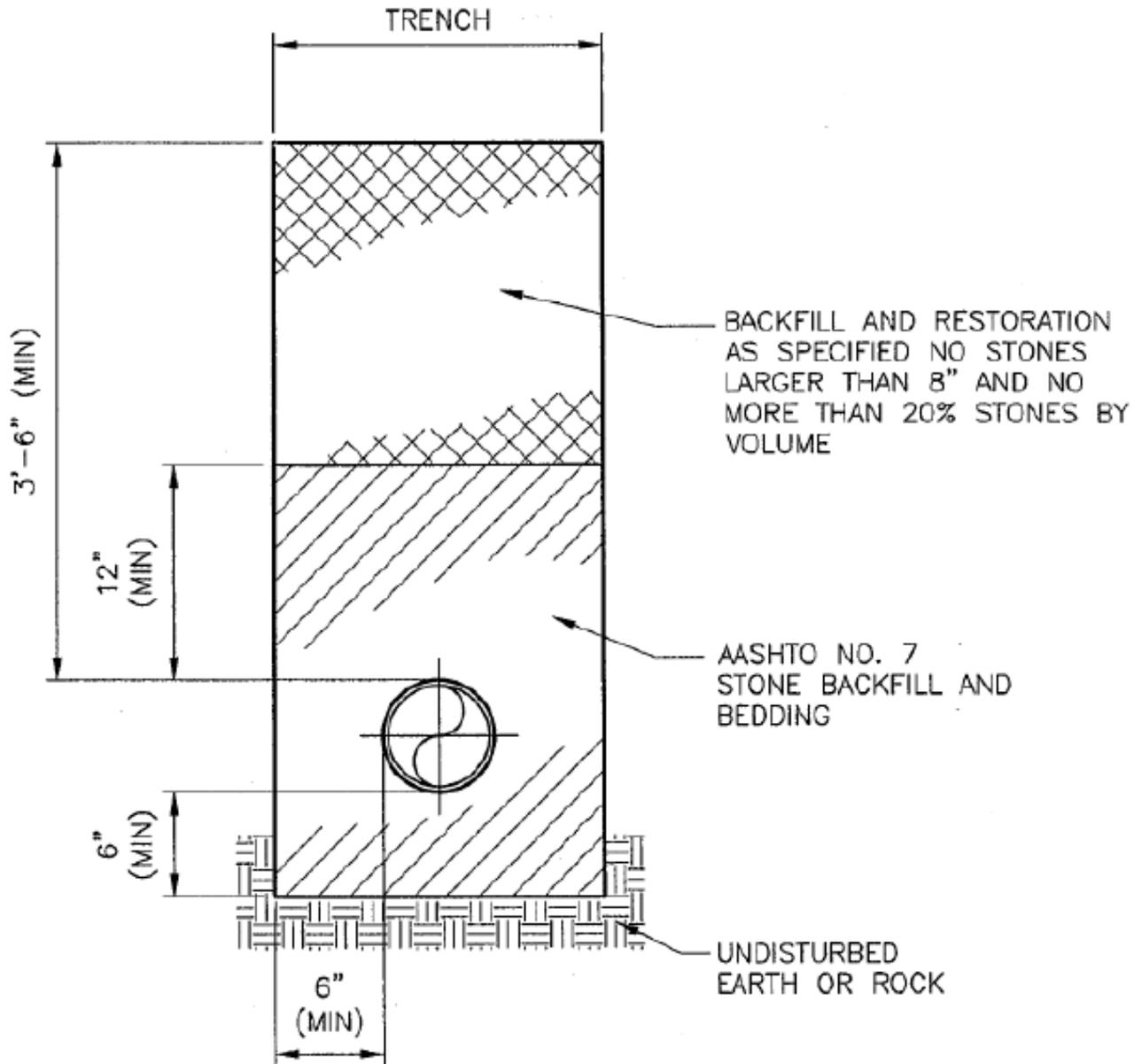
APPENDIX D DETAIL DRAWINGS

Relevant Detail Drawings are:

No. Description

1. Pipe Bedding
2. Concrete Encasement
3. Lawn Restoration
4. Pavement Restoration (State, County, and Township Roads)
5. Cutting & Repairing in Roadway Shoulder
8. Typical Blowoff Installation (Permanent)
9. Typical Blowoff Installation (Temporary)
10. Typical Fire Hydrant Setting
11. Air Release Valve Manhole
12. Steel Pipe Encasement for Water and Sewer Mains
13. Thrust Blocks for Tees, Caps and Plugs
14. Thrust Blocks for Horizontal Bends and Lower Vertical Bends
15. Restrained DI Pipe Length
16. Typical 4" Meter Vault

NOTE:
 BACKFILL TO BE COMPACTED IN 8" LAYERS
 (6" LAYERS FOR STATE ROADS) TO 95% OF
 MAXIMUM DENSITY AS DETERMINED BY ASTM D
 1557-70 OR AASHTO T-180, METHOD D
 (MODIFIED PROCTOR)

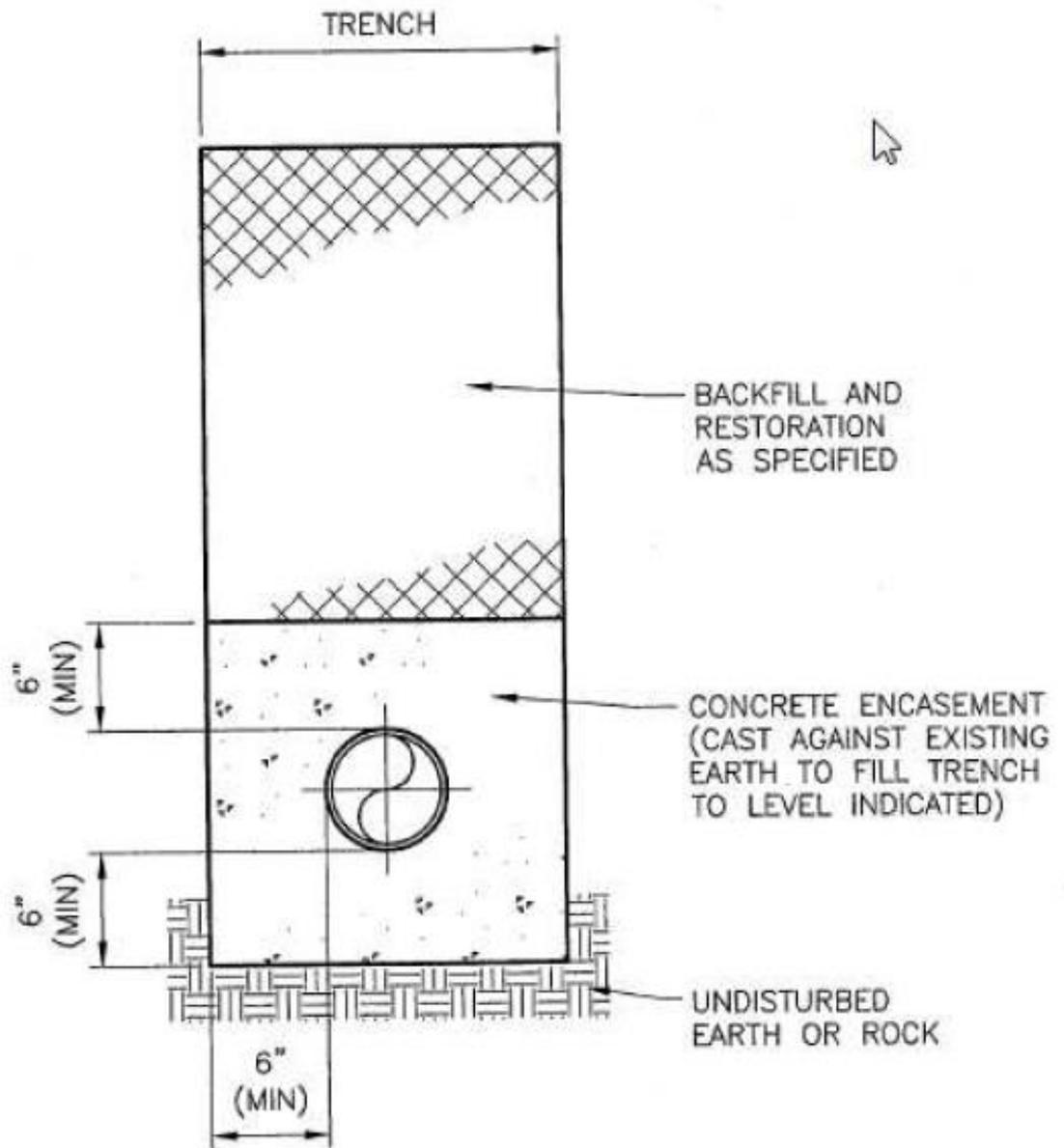


BOONSBORO
Maryland

Department of Planning, Zoning, and Engineering
 21 N. Main St. Boonsboro MD 21713

Design: BH
 Drawn By: BH
 Reviewed By: PL
 Date: 1/11/17
 Rev. _____
 Rev. _____
 Rev. _____

Detail 1 Pipe Bedding

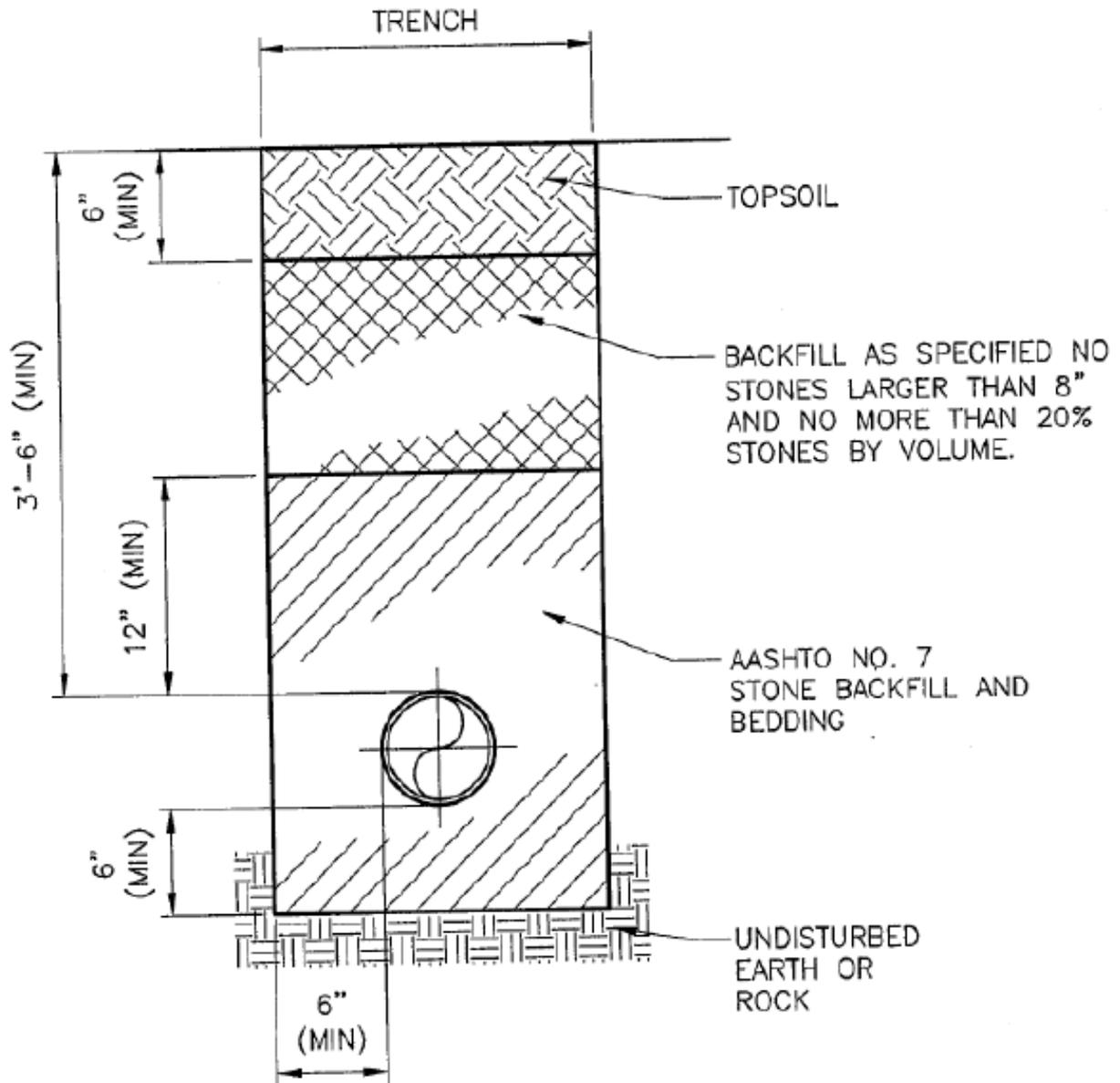


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21 N. Main St. Boonsboro MD 21713

Design: BH
Drawn By: BH
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Date: 1/11/17
Rev. _____
Rev. _____
Rev. _____

Detail 2 Concrete Encasement

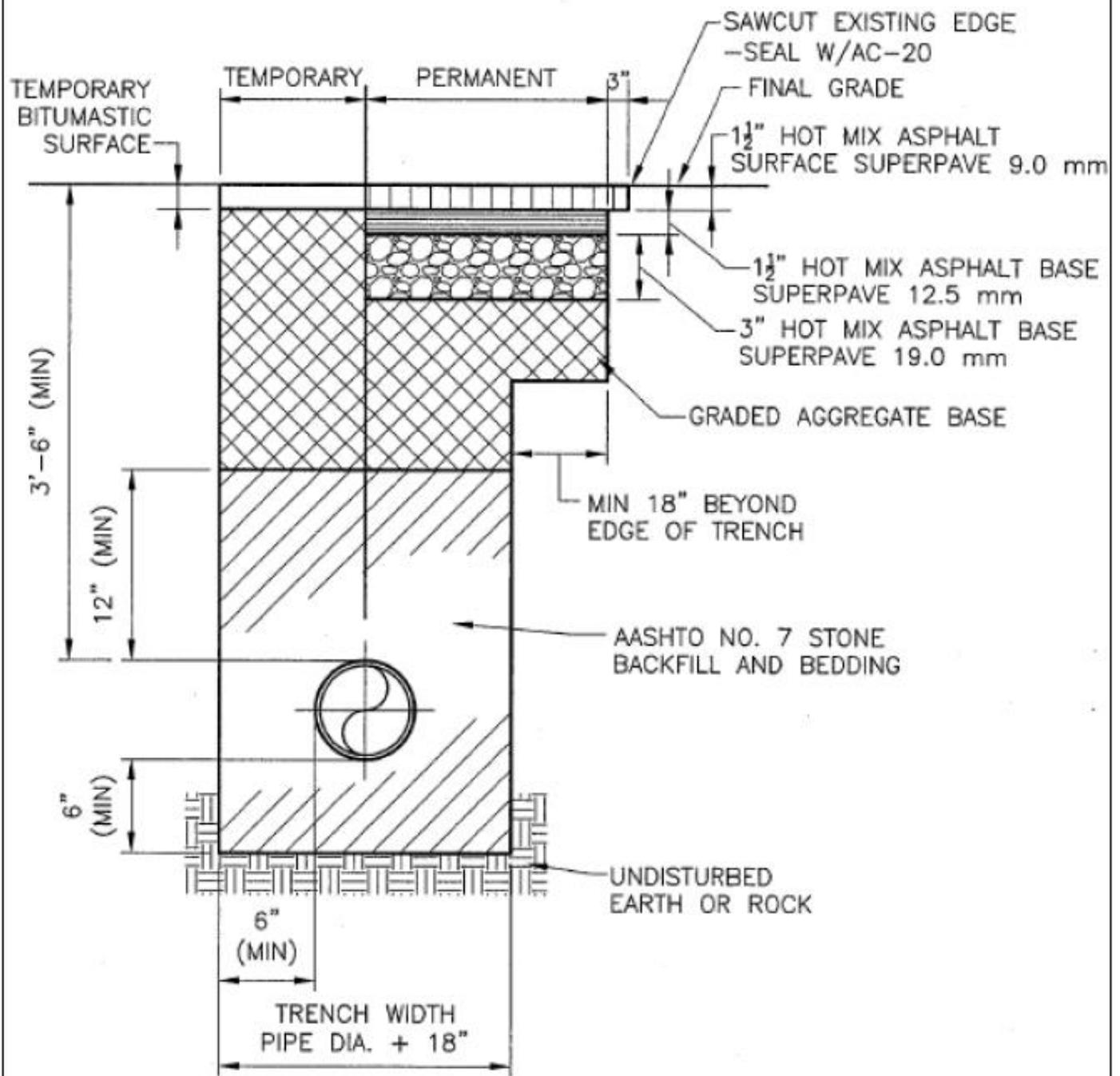


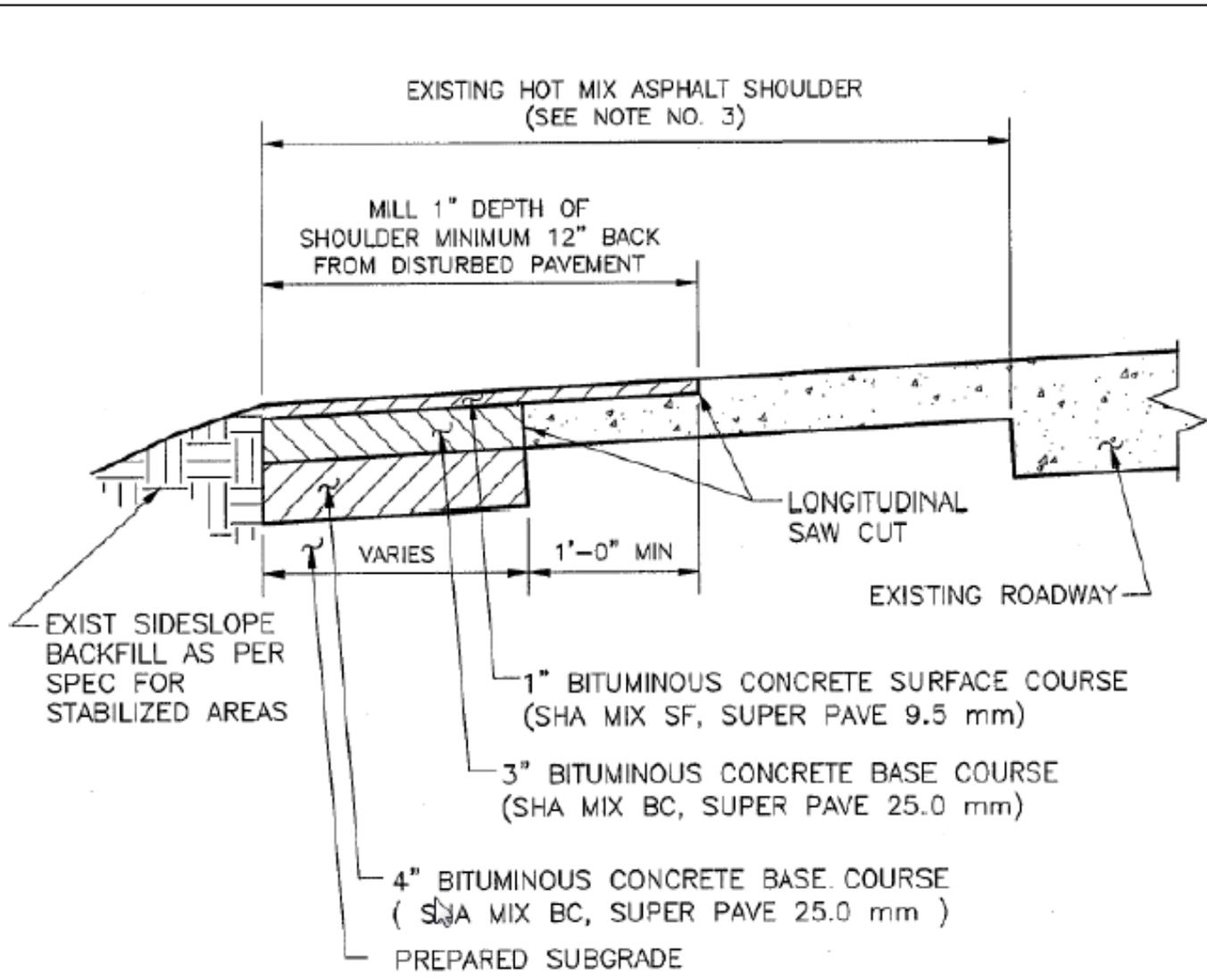
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21 N. Main St. Boonsboro MD 21713

Design: BH
 Drawn By: BH
 Reviewed By: PL
 Date: 1/11/17
 Rev. _____
 Rev. _____
 Rev. _____

Detail 3 Lawn Restoration





NOTES:

1. ALL MATERIALS AND METHODS SHALL COMPLY WITH MARYLAND STATE HIGHWAY ADMINISTRATION STANDARD SPECIFICATIONS OCTOBER, 1993 OR SUBSEQUENT.
2. MILLING SHALL BE UNIFORM IN WIDTH THE ENTIRE LENGTH OF THE REPAIR.
3. DOUBLE SURFACE TREATED SHOULDERS SHALL REQUIRE RECONSTRUCTION OF THE ENTIRE SHOULDER SURFACE.

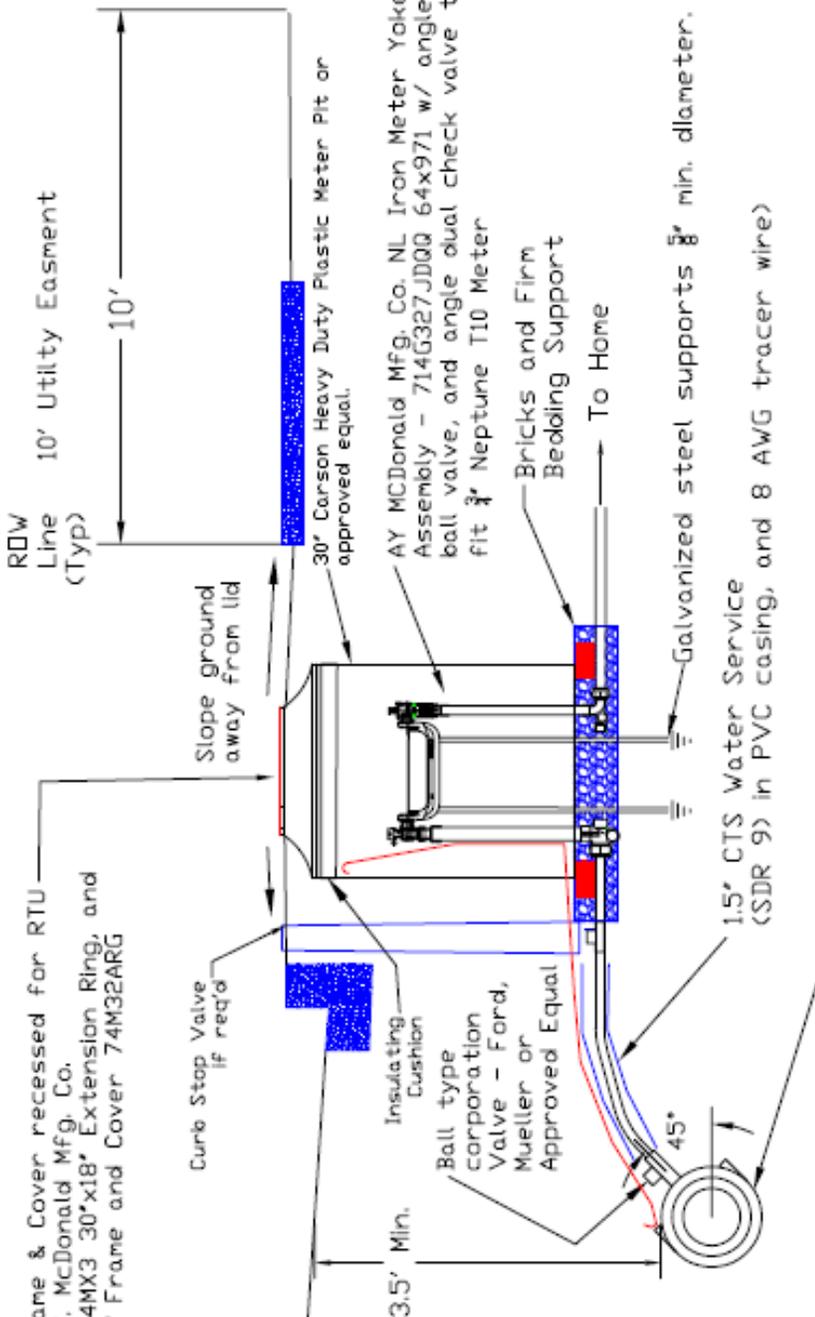


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21 N. Main St. Boonsboro MD 21713

Design: BH
 Drawn By: BH
 Reviewed By: PL
 Date: 1/11/17
 Rev. _____
 Rev. _____
 Rev. _____

Detail 5
Shoulder Restoration



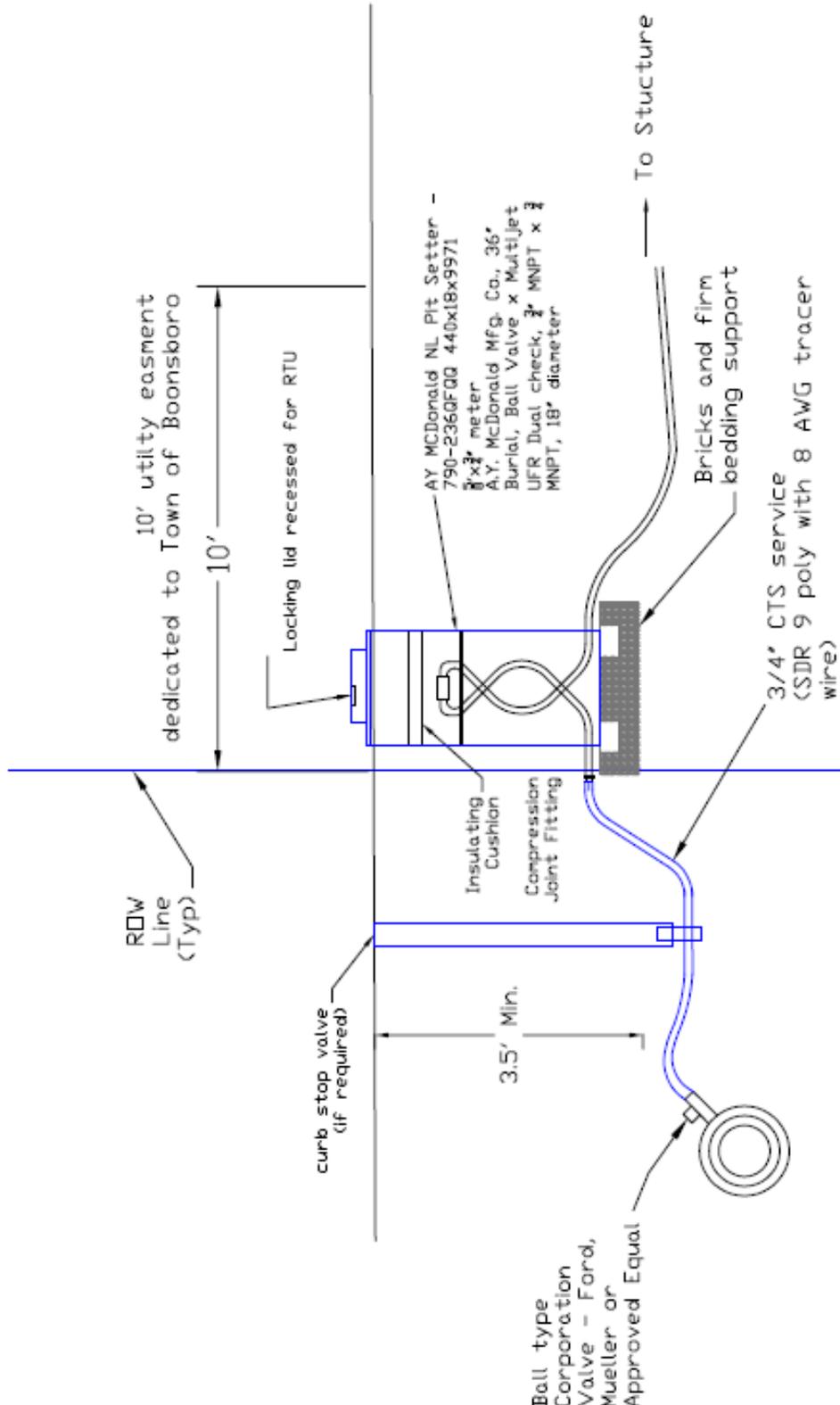
Notes:

1. Copper pipe to be bed in silica sand only and no casing allowed for copper pipe.
2. Casing and 8 AWG copper tracer wire to be used for plastic pipe.
3. The Town may require the water lateral to be extended no more than 10 feet from the curb toward the property line to accommodate future installation of the building service connection without undermining the sidewalk.
4. Must be installed in grassed area, no part of the meter pit shall be under Curb, Sidewalk or Driveway Slab.

Detail 6a Typical Water Service Connection

Design: BH
Drawn By: BH
Revised By: PL
Date: 2017
Rev. _____
Rev. _____
Rev. _____

BOONSBORO
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 Department of Planning, Zoning, and Engineering
 21 N. Main St. Boonsboro MD 21713



Ball type Corporation Valve - Ford, Mueller or Approved Equal

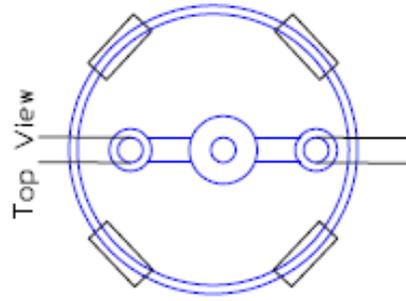
Note:

1. Copper pipe to be bed in silica sand only and no casing allowed for copper pipe.
2. Casing and 8 AWG copper tracer wire to be used for plastic pipe.
3. The Town may require the water lateral to be extended no more than 10 feet from the curb toward the property line to accommodate future installation for the building service connection without undermining the sidewalk.

Detail 6c

Retrofit Existing Setting - Non-sprinklered

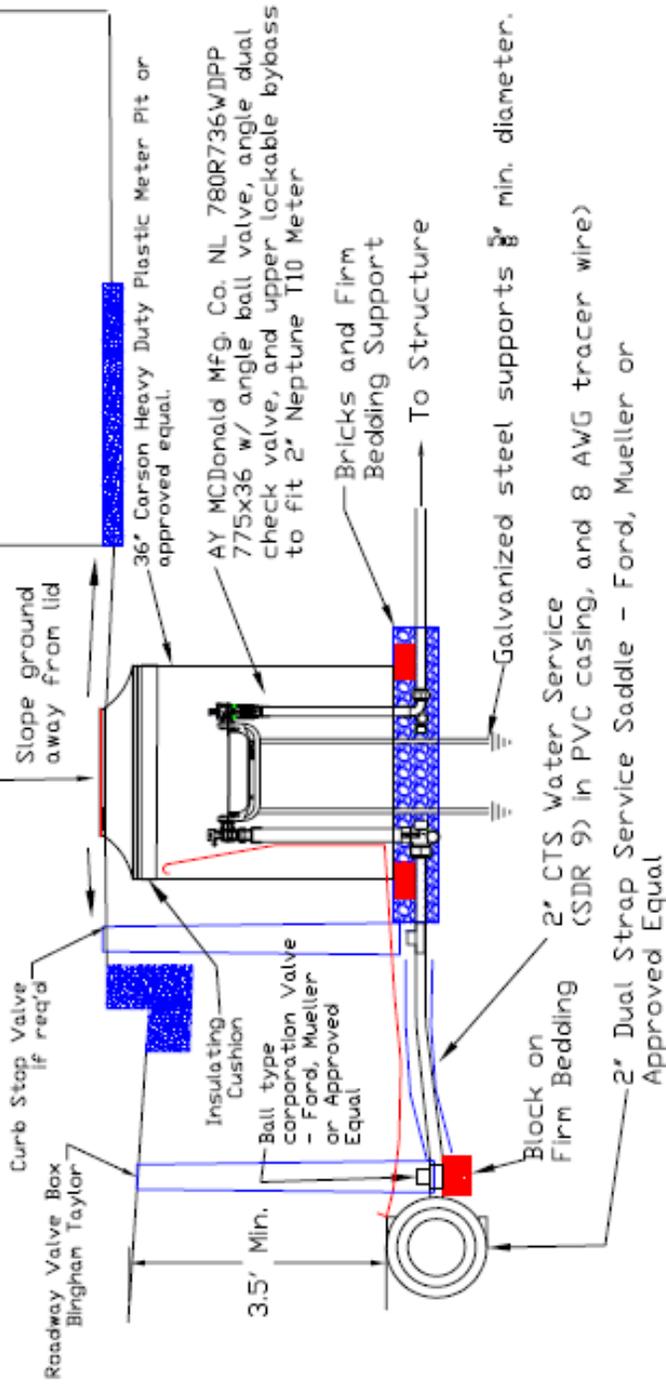
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RDW Line (Typ) 10' Utility Easment



Frame & Cover recessed for RTU
A.Y. McDonald Mfg. Co.
-74MX6 36"x18" Extension Ring, and
18" Frame and Cover 74M3EARG

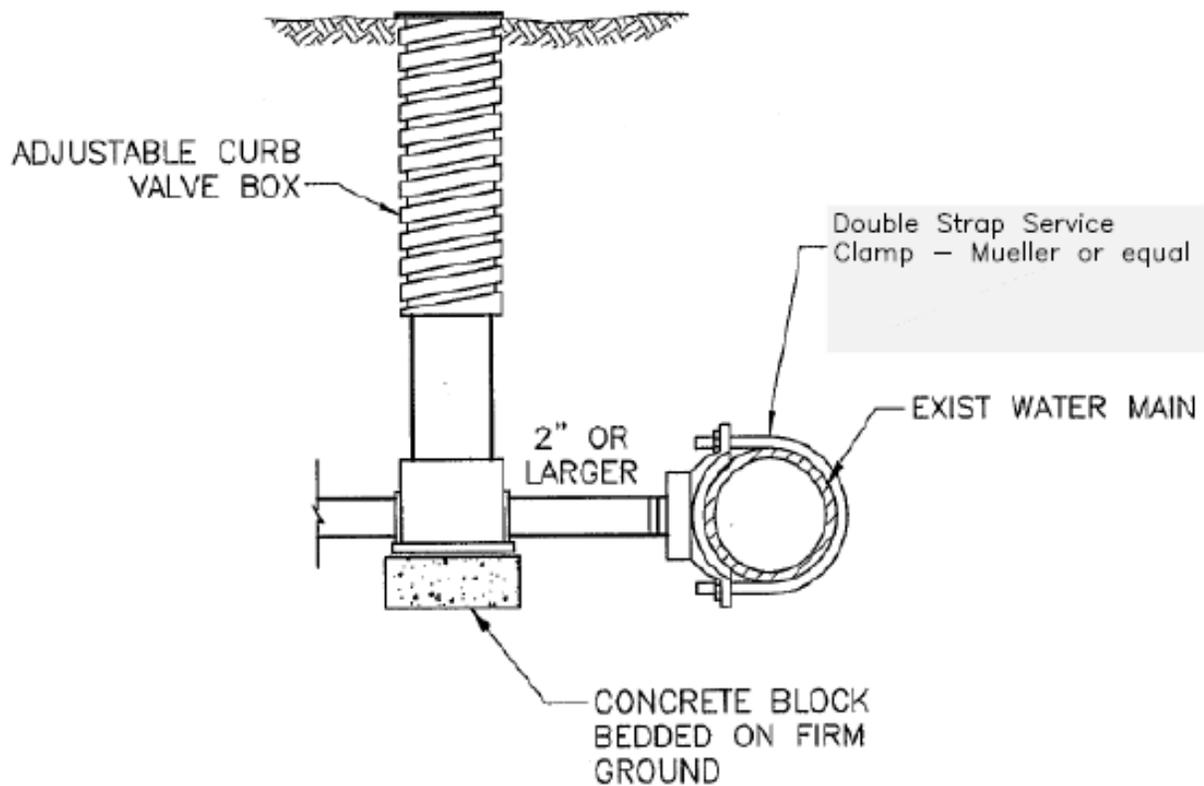


Notes:

1. Copper pipe to be bed in silica sand only and no casing allowed for copper pipe.
2. Casing and 8 AWG copper tracer wire to be used for plastic pipe.
3. The Town may require the water lateral to be extended no more than 10 feet from the curb toward the property line to accommodate future installation of the building service connection without undermining the sidewalk.
4. Must be installed in grassed area, no part of the meter pit shall be under Curb, Sidewalk or Driveway Slab.

Riser, Frame and Cover N.T.S.

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	<h2 style="text-align: center;">Detail 6d - Typical 2" Water Meter Setting - Commercial</h2>



LATERAL CONNECTION (2" OR LARGER)
NO SCALE

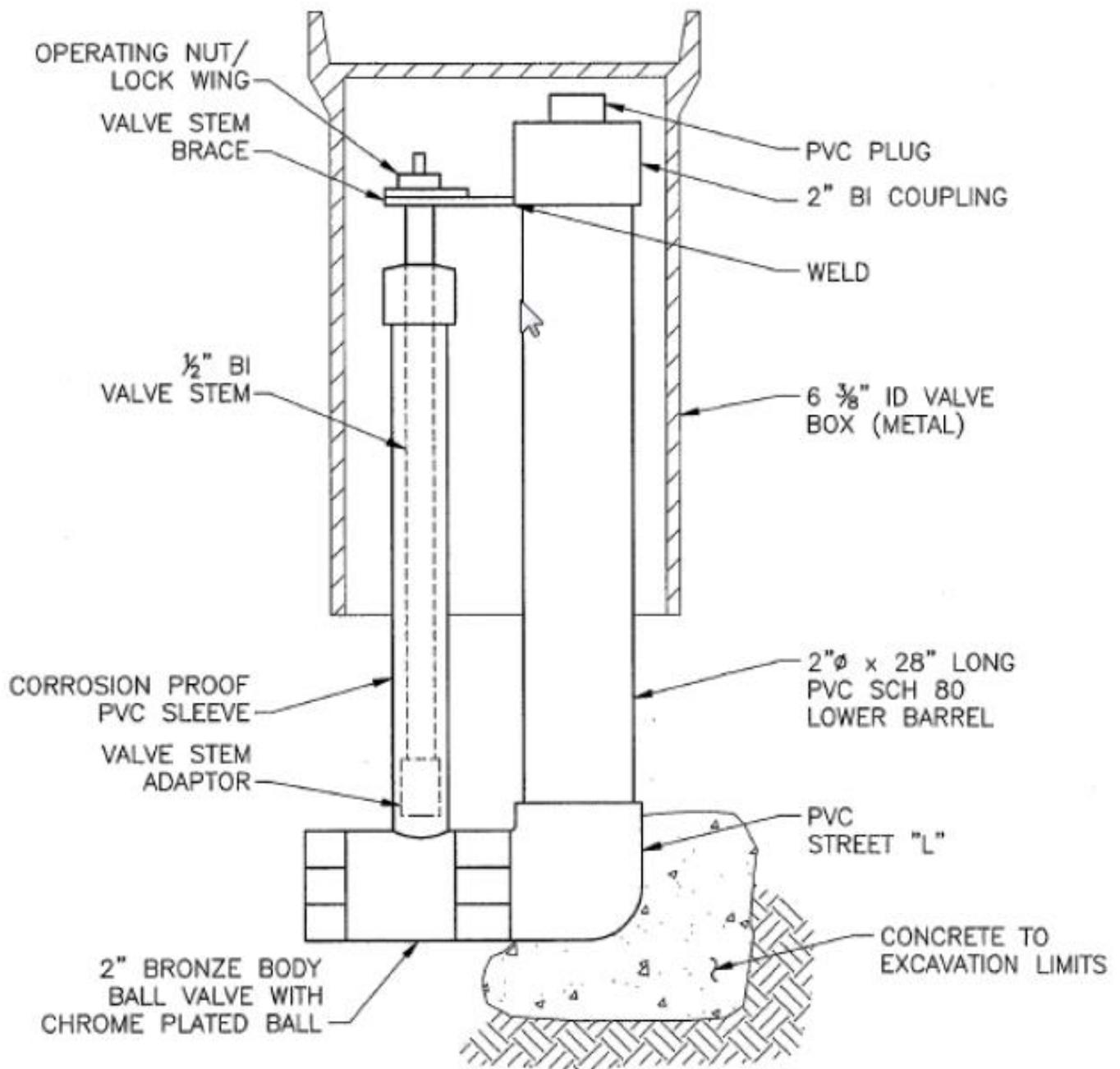


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Detail 7
Lateral Connection
(2 inch or larger)



NOTE:
 PERMANENT BLOWOFFS SHALL BE AQUARIUS
 ONE-O-ONE GHS 2" SLIM LINE HIDDEN HYDRANT.

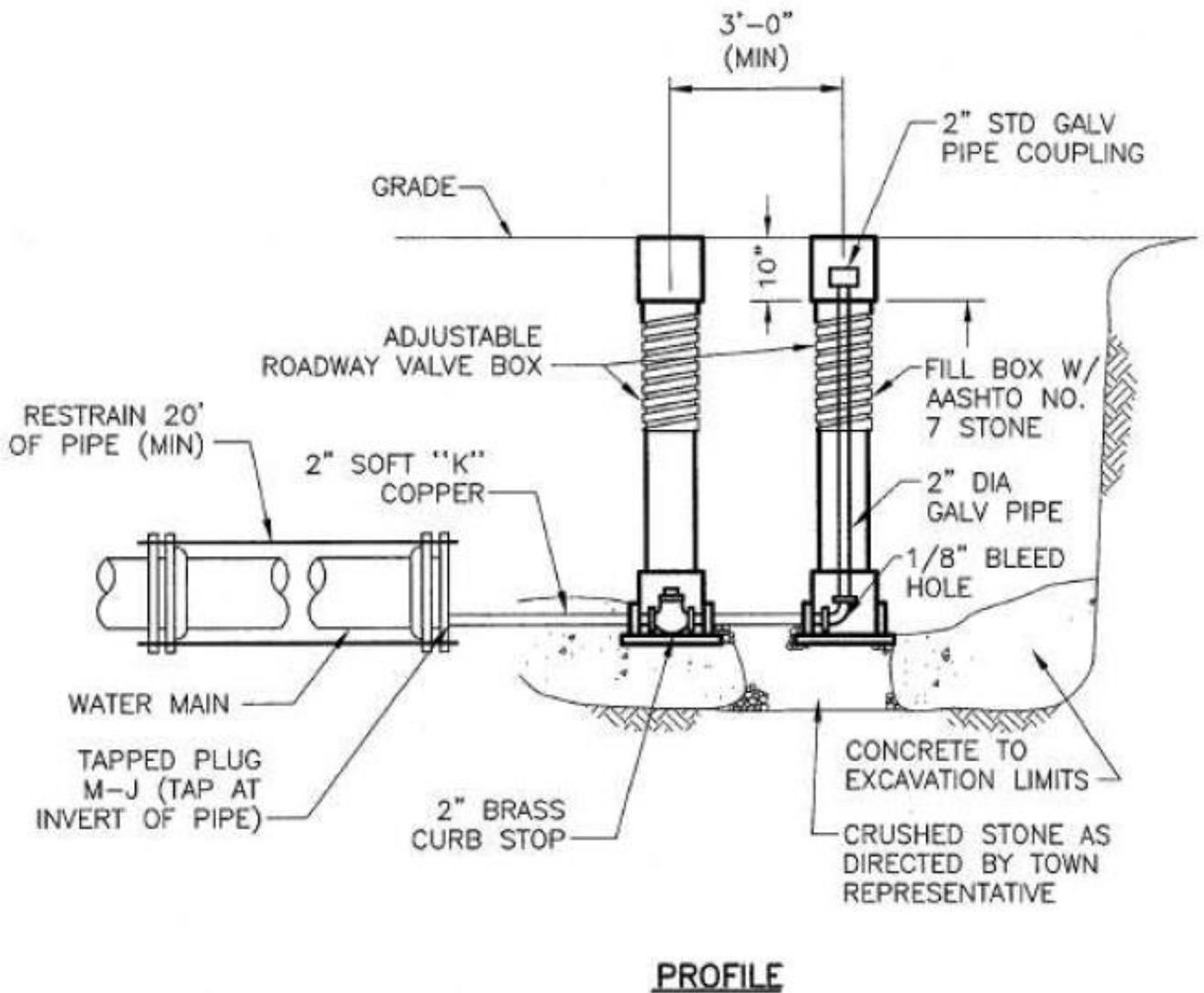


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Detail 8 Blow off



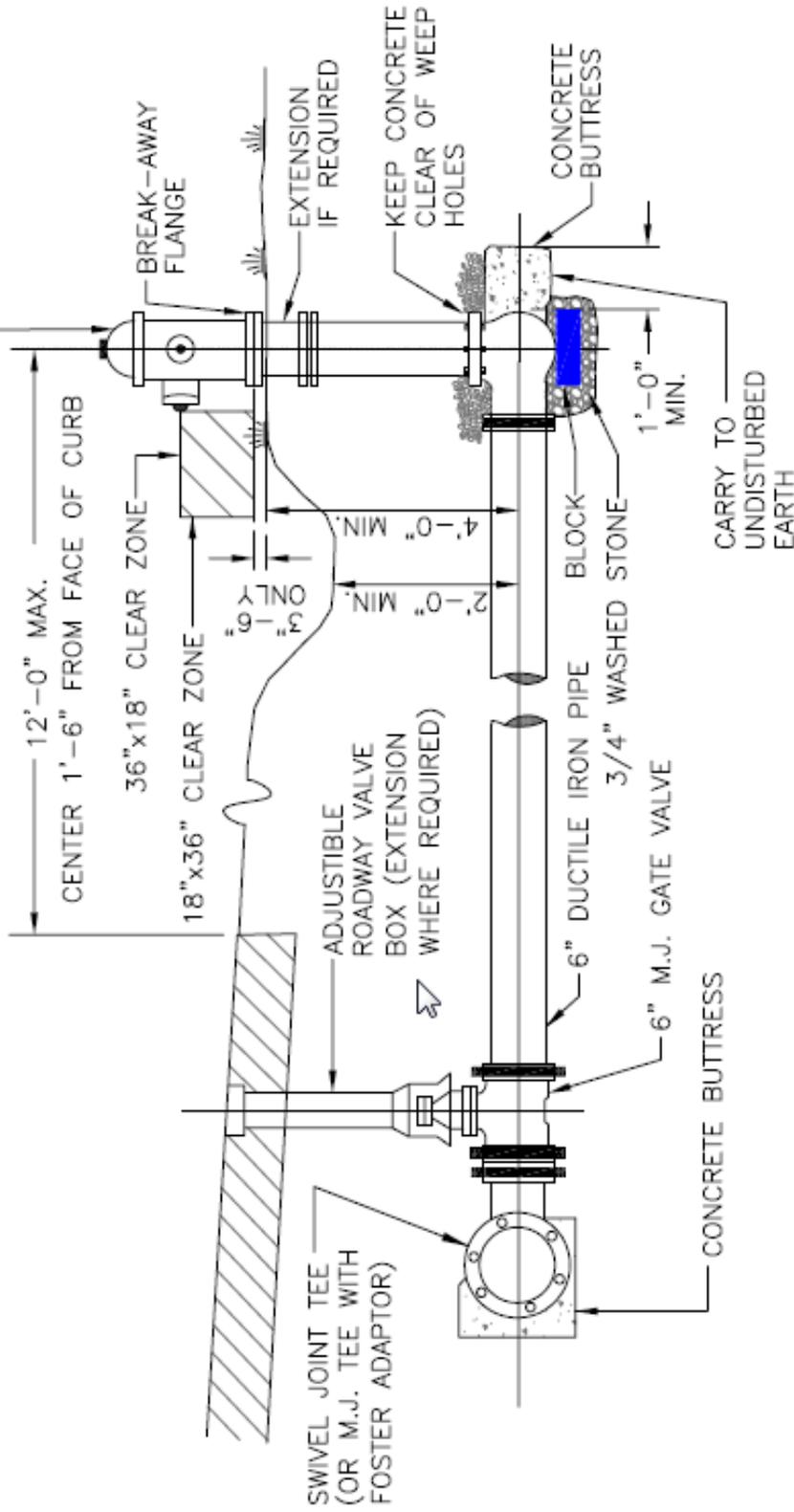
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Detail 9 Blow Off - Temporary

TOWN OF BOONSBORO STANDARD HYDRANT



NOTE:

1. ALL PIPE MUST BE RESTRAINED FROM MAIN TO FIRE HYDRANT AND HAVE CONCRETE BUTTRESS.
2. COVER FITTING AT CONCRETE BUTTRESSES WITH POLYETHYLENE WRAP 5 MIL. OR GREATER.
3. 3/4" CLEAN STONE SHALL BE PLACED FULL WIDTH OF TRENCH FROM FRONT CL OF HYDRANT TO TRENCH END, BOTTOM TO 4' ABOVE DRIP LINE.

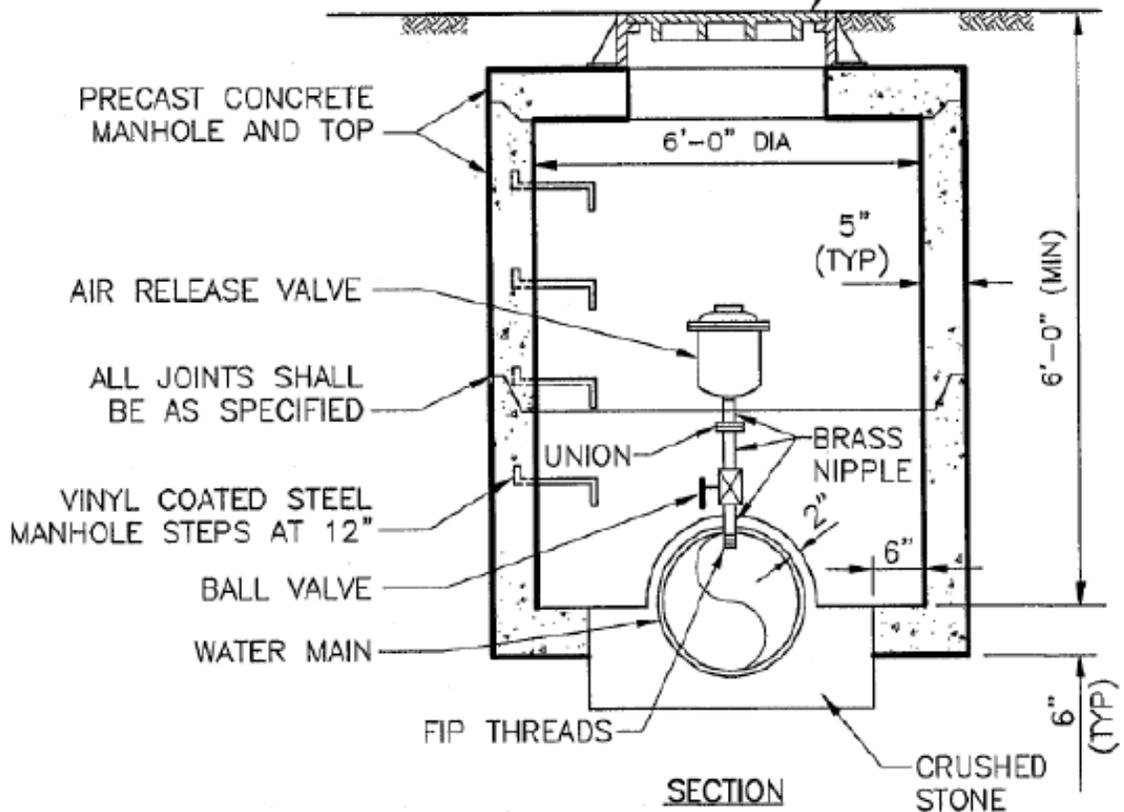
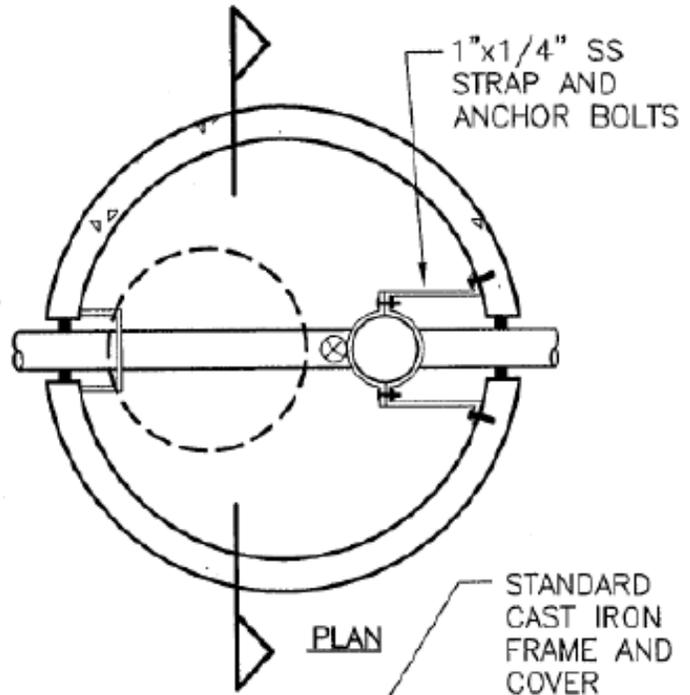
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Detail 10
Typical Fire Hydrant Setting

NOTES:

1. ALL PRECAST REINFORCED CONCRETE MANHOLE SECTIONS SHALL COMPLY WITH ASTM C-478.
2. CEMENT SHALL BE TYPE II OR III, AIR ENTRAINED; WITH $f'_c=3,000$ psi AT 28 DAYS.
3. REINFORCEMENT SHALL BE GRADE 60 PER ASTM A-615.
4. 24" DIA. CAST IRON FRAME AND COVER PER ASTM A-48, CLASS 30, FOR H-20 LOADING.
5. CAST IRON FRAME TO BE BOLTED TO MANHOLE WITH 5/8" ANCHOR BOLTS.
6. CASTING AND GRADE RINGS TO BE SEALED TO MANHOLE WITH PREFORMED PLASTIC SEALING COMPOUND.
7. ALL JOINTS SHALL BE SEALED WITH PREFORMED PLASTIC SEALING COMPOUND.



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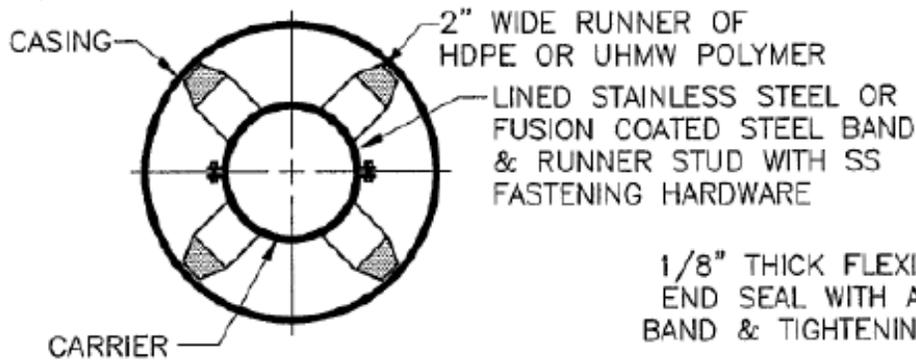
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Detail 11
Air Release Valve

PIPE INSULATOR SHALL CENTER THE CARRIER PIPE & FIT TO RESTRAIN AGAINST MOVEMENT

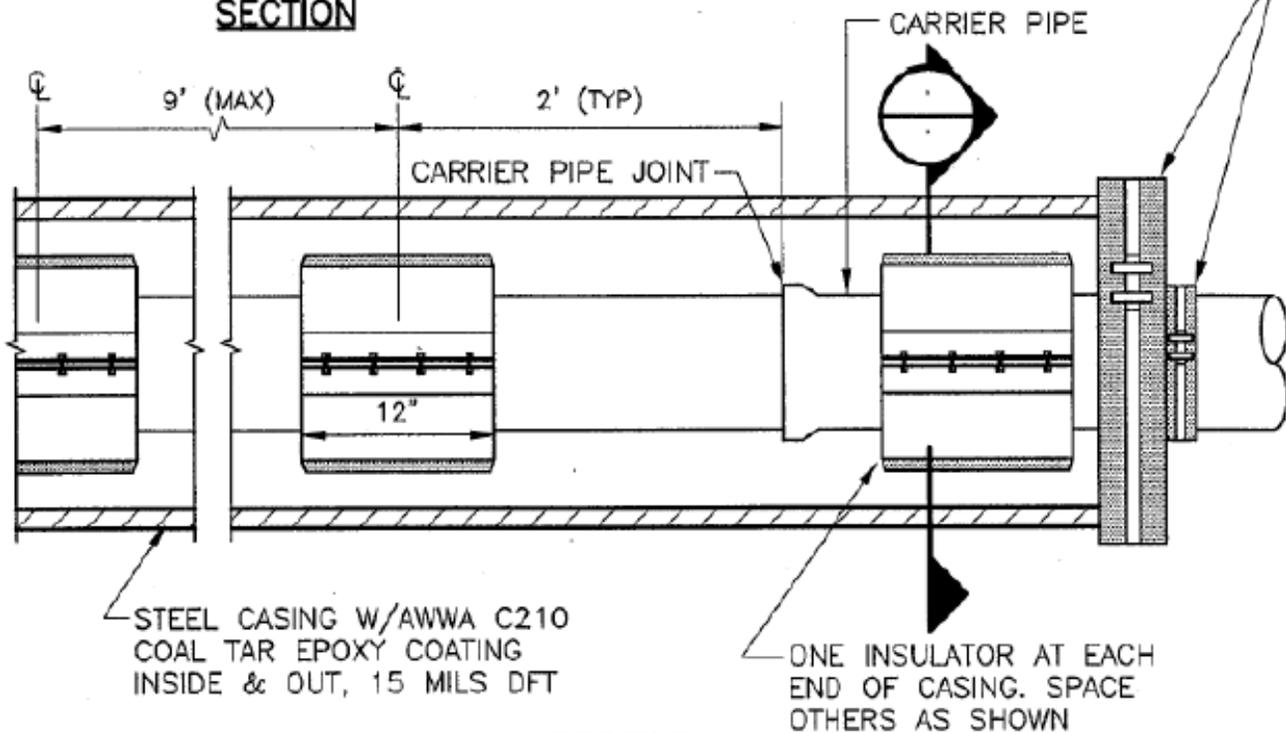
NOMINAL DIAMETER (INCHES)



CARRIER PIPE	CASING PIPE
8"	18"
10"	20"
12"	24"

1/8" THICK FLEXIBLE RUBBER CASING END SEAL WITH ALL STAINLESS STEEL BAND & TIGHTENING DEVICE HARDWARE

SECTION



PROFILE

NOTES:

1. CASING PIPE SHALL CONFORM TO AWWA C200. WELD JOINTS SHALL BE CONTINUOUS & WATERTIGHT. PIPE SHALL BE A139 GRADE 36.
2. WALL THICKNESS FOR ALL CASING SIZES SHALL BE STANDARD 0.375 INCH MIN.
3. FOR PIPES CROSSING STATE ROADS OR RAILROADS ADDITIONAL REQUIREMENTS (IF ANY) IMPOSED BY HIGHWAY OR RAILROAD OWNER MUST BE MET.



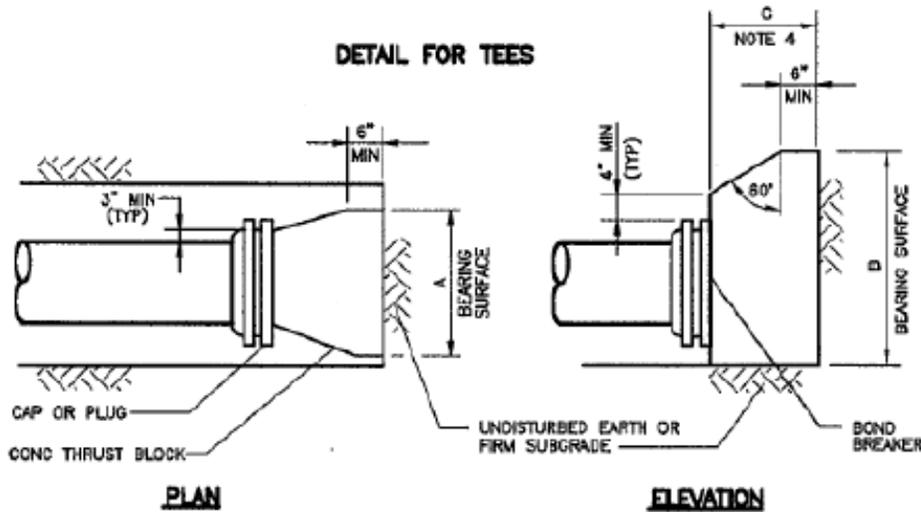
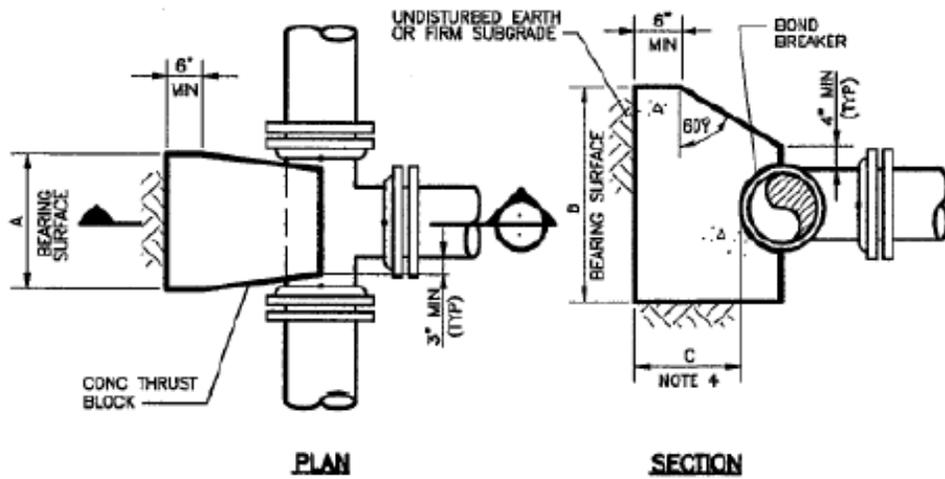
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Detail 12
Casing



DETAIL FOR CAPS OR PLUGS

NOMINAL PIPE SIZE (IN)	MAXIMUM PIPE OD (IN)	REQUIRED BEARING AREA (SQ FT)
3	3.96	1.4
4	4.80	2.0
6	6.90	4
8	9.05	7
10	11.16	11
12	13.20	15
14	15.30	21
16	17.40	27
18	19.50	34
20	21.60	41
24	25.80	60
30	32.00	90
36	38.30	130

NOTES:

1. MAXIMUM TEST PRESURE = 1.50x150 PSI
2. MINIMUM ALLOWABLE SOIL BEARING PRESSURE = 2000 PSF
3. BEARING AREA = A x B
4. C SHALL BE GREATER THAN A/2 AND B/2.

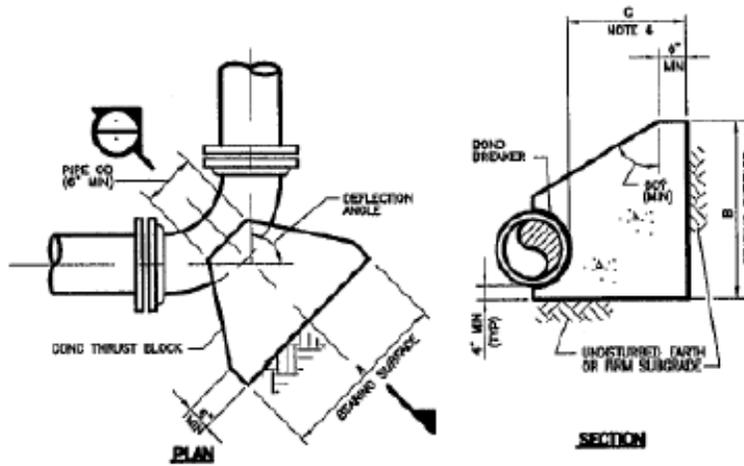


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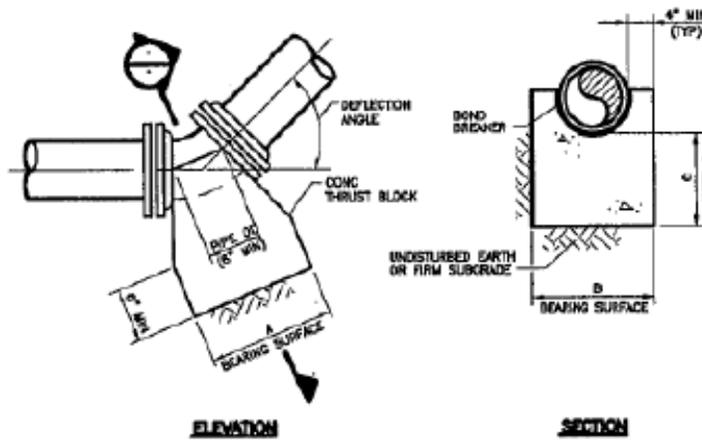
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Detail 13
Thrust Block - Tees, Caps, Bends



DETAIL FOR HORIZONTAL BENDS



DETAIL FOR LOWER VERTICAL BENDS

NOMINAL PIPE SIZE (INCHES)	MAXIMUM PIPE OD (INCHES)	REQUIRED BEARING AREA (SQ FT)					
		90 DEG	85 DEG	45 DEG	30 DEG	22.50 DEG	11.25 DEG
3	3.90	2.0	1.4	1.1	0.7	0.5	0.3
4	4.50	2.8	2.0	1.6	1.1	0.8	0.4
6	6.90	6	4	3	2.2	1.6	0.8
8	9.05	10	7	6	4	3	1.4
10	11.10	15	11	8	6	4	2.1
12	13.20	22	15	12	8	6	3
14	15.30	29	21	16	11	8	4
18	17.40	38	27	20	14	10	5
18	19.50	48	34	26	17	13	7
20	21.60	56	41	30	21	16	8
24	25.80	83	60	45	30	23	12
30	32.00	125	90	69	47	35	18
36	38.30	183	130	99	67	51	25

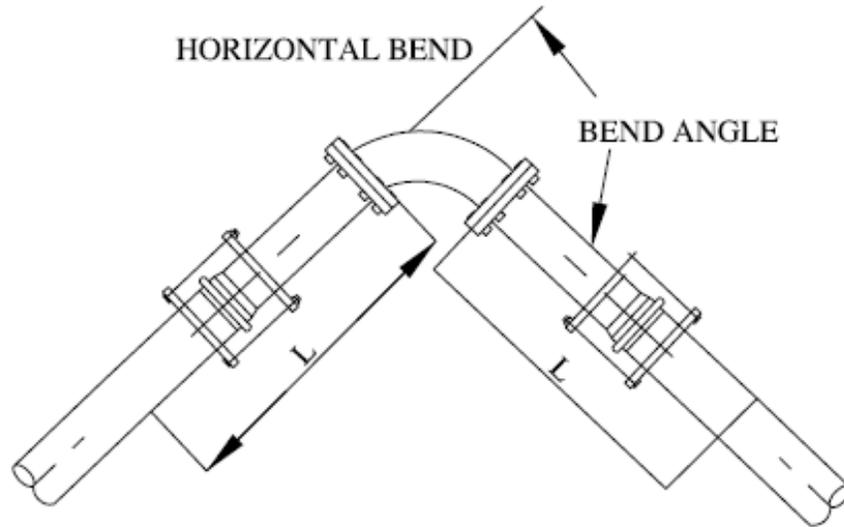
- NOTES:
 1. MAXIMUM TEST PRESSURE = 1.5 x 150 PSI
 2. MINIMUM ALLOWABLE SOIL BEARING PRESSURE = 2000 PSF
 3. BEARING AREA = A x B
 4. C SHALL BE GREATER THAN A/2 AND B/2.



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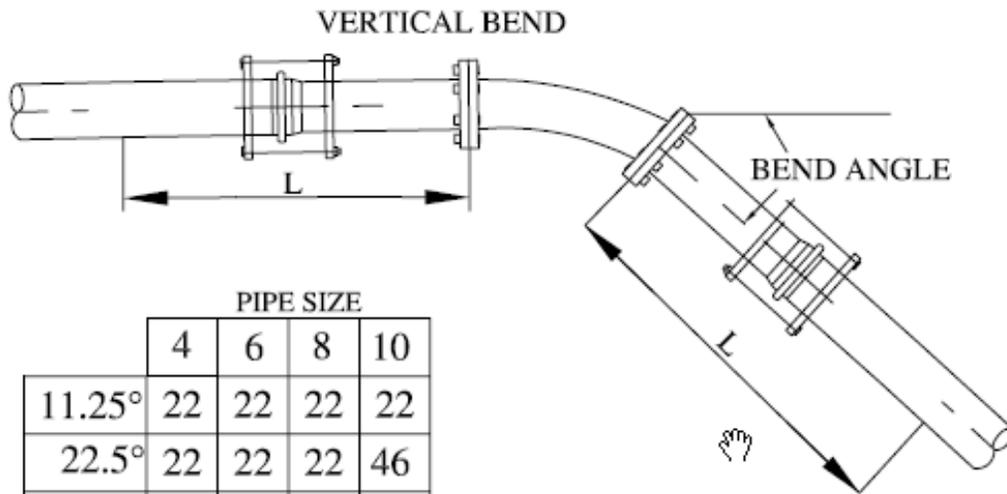
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Detail 14 Thrust Blocks for Bends



	PIPE SIZE			
	4	6	8	10
11.25°	22	22	22	22
22.5°	22	22	22	22
45°	22	22	22	30
90°	30	44	50	80

RESTRAINED LENGTHS "L" IN FEET



	PIPE SIZE			
	4	6	8	10
11.25°	22	22	22	22
22.5°	22	22	22	46
45°	30	40	60	80

RESTRAINED LENGTHS "L" IN FEET



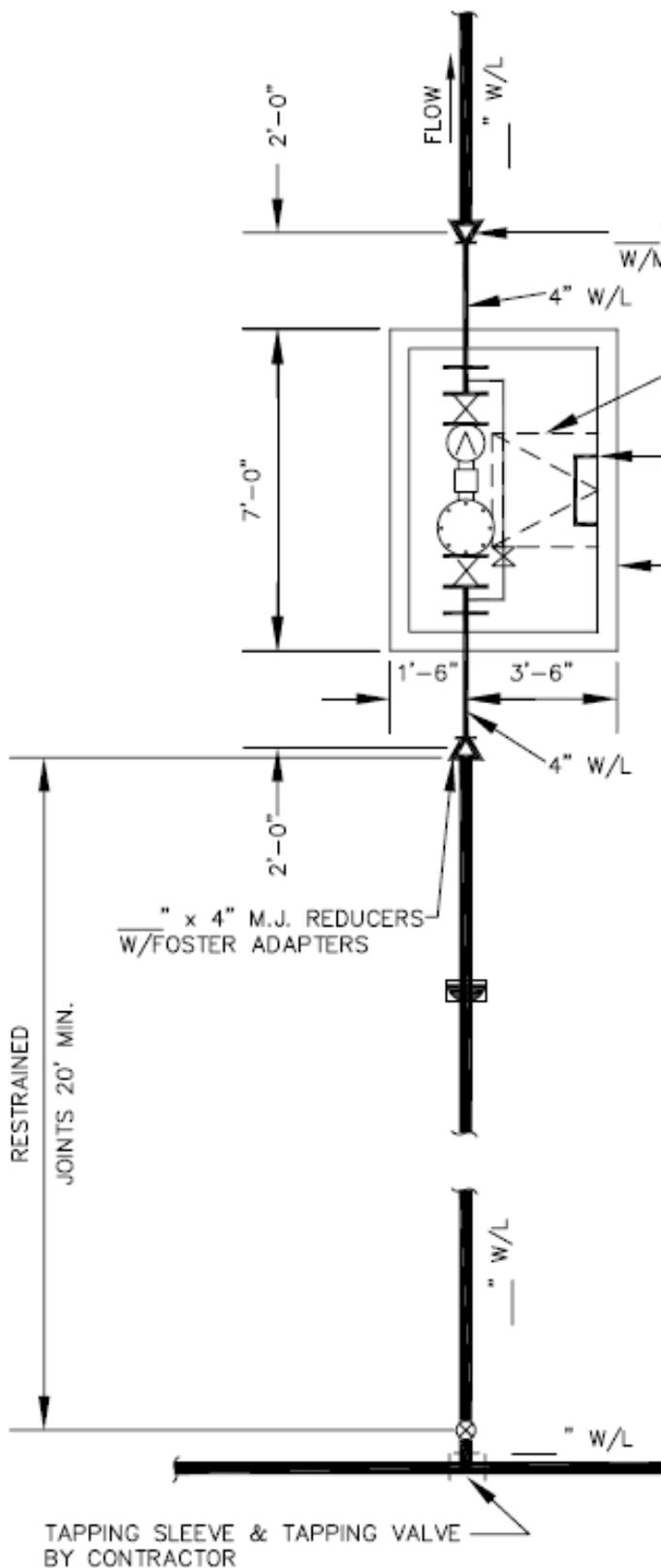
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Detail 15

Joint Restraint for Water Mains



NOTES:

1. VAULT, LADDER AND DOOR TO BE ACQUIRED BY OWNER/DEVELOPER AND DELIVERED TO SITE AND SET THE VAULT. (USE A.C. MILLER OR SEMLER ONLY). THE TOP OF THE VAULT NEEDS TO BE REMOVABLE.
2. CONTRACTOR TO INSTALL ALL VALVE BOXES, PIPE TO VAULT AND PRECAST VAULT.
3. CONTRACTOR TO BACKFILL AROUND VAULT UP TO BOTTOM OF PIPE IMMEDIATELY AFTER VAULT IS SET.
4. NO BENDS PERMITTED BETWEEN THE MAIN VALVE AND VAULT.
5. ENTIRE ASSEMBLY TO BE PRESSURE TESTED FROM THE MAIN TO UPSTREAM O.S.&Y. VALVE TO TOWN OF BOONSBORO UTILITIES COMMISSION STANDARDS.
6. ALL JOINTS BETWEEN THE MAIN AND METER ASSEMBLY TO BE RESTRAINED.
7. TOP OF VAULT EXCLUDING THE TOP SLAB TO BE LEVEL IN ALL DIRECTIONS $1'' \pm$. PIPING AND VAULT TO BE PERPENDICULAR TO WATER MAIN. MAXIMUM ALLOWABLE HORIZONTAL OR VERTICAL DEFLECTION IS $1''$ PER $10'-0''$.
8. CONTRACTOR SHALL CORE DRILL THE PIPE INTO AND OUT OF THE VAULT FOR THE METER INSTALLATION. THE METER SHALL SET $1'-0''$ OFF OF THE FLOOR OF THE VAULT.
9. VAULT SHALL BE SEALED WATER TIGHT.
10. NEPTUNE PROTECTUS III METER TO BE PROVIDED AND INSTALLED BY THE CONTRACTOR.



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Detail 16
4" Meter Vault