Webster, MA

WEBSTER SEWER DEPARTMENT

Sewer Construction Standards

November 2024

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Webster Sewer Department Standards

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Appendices

Abbreviations and Terms

Whenever in these Standard Specifications the following abbreviations and terms are used, the intent and meaning shall be interpreted as follows:

Abbreviations:

ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
AWWA	American Water Works Association
cfm	Cubic feet per minute
DI	Ductile iron
DR	Dimension ratio
EPA	United States Environmental Protection Agency
ft.	Feet
I.P.	Iron pipe
lb	Pound
MassDEP	Massachusetts Department of Environmental Protection
psi	Pounds per square inch
PVC	Polyvinyl Chloride
SDR	Standard dimensional ratio
sf	Square feet
NPT	National Pipe Thread

Terms:

Contractor	The person, firm, or corporation entering into a contract with the owner, developer, or the Town of Webster for the performance of work required under said contract and the Town of Webster's ordinances, rules, regulations, and standards.
Customer	Any Person who is the owner of a property with an active sewer service and/or account.
Department	Webster Sewer Department
Drain Layer	A person or company trained to build or repair sewer mains.
Main	Any sewer line owned and used by the Department to convey wastewater from more than one person's property on more than one lot.
Owner	The owner of the property to be provided with new or modified sewer service.

Permit	The authorization by the Department to a licensed contractor to perform a specific task on the sewer system that has been approved by the Superintendent.
Service	All pipe, fittings, and appurtenances used for conveying wastewater from the Customer's property to the sewer main. The Customer owns the entire service lateral from the main to the Customer's property.

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Section 1
General Requirements

1.1 General

This document describes the Town of Webster's sewer construction requirements, including those related to materials, installation, and testing. These "Sewer Standards" shall be enforced and interpreted, when necessary, by the Department. The Sewer Standards shall be construed as the minimum requirements of the Department. Although the Sewer Standards are intended to apply to most construction work, there may be aspects of construction activities that will require further interpretation by and guidance from the Department. The Sewer Standards may be amended or superseded by the Department at any time.

The Contractor/Owner/Developer shall design and construct the proposed sanitary sewers and related items in accordance with the following:

1. TR-16, *Guides for the Design of Wastewater Treatment Works*, 2011 Edition, as revised in 2016, prepared by the New England Interstate Water Pollution Control Commission.
2. The most recent revision of the Town of Webster's *Sewer Use Regulations*.
3. Applicable Manufacturers' information and/or recommendations.
4. The construction and design requirements of the Massachusetts Department of Environmental Protection (MassDEP).
5. The construction and design requirements of the United States Environmental Protection Agency (EPA).
6. Construction and design practices that are accepted as "state of the art" in the Commonwealth of Massachusetts.
7. Drawings and Specifications authorized for the project.
8. The Town of Webster's Sewer Standards described in this document.

In the event of a conflict in the requirements listed above, the more restrictive requirements, as determined by the Department, shall govern in the design and construction of the sanitary sewers.

1.2 Building Sewer Connection Requirements

Any person proposing a new discharge into the sewer system or a substantial change in the volume or character of pollutants that are being discharged into the system shall notify the Department at least forty-five (45) days prior to the proposed change or connection. It is prohibited to make any connections with, alter, or disturb any public sewer or appurtenance without first obtaining a written Connection Permit from the Department.

There are 2 classes of Building Sewer Connection Permits:

1. A Residential and Commercial Service
2. An Industrial Waste Service

Both Permit classes require the owner or their agent to submit a Connection Permit Application to the Department. The Connection Permit should include plans, specifications and any other information considered pertinent to the Department.

The Owner is responsible for all expenses incidental to the installation of the sewer service. The Owner is responsible for costs related to any loss or damage that may be caused by installation of the building sewer service.

A separate and independent building sewer shall be provided for every building, except where 1 building stands at the rear of another on an interior lot, and no private sewer is available or can be constructed to the rear building through an adjoining alley, court, yard, or driveway. In such cases, the building sewer from the front building may be extended to the rear building, and the whole considered as 1 building sewer.

1.2.1 Prohibition of Connections

Connections of surface runoff or groundwater to a building drain or building sewer that is connected to the Webster sanitary sewer are prohibited. Connection of roof downspouts, exterior foundation drains, and subsurface drains to the Webster sanitary sewer is prohibited.

1.3 Construction of Building Sewers

The size, slope, alignment, and materials of construction of the building sewer shall conform to the requirements described herein. The excavation, pipe installation methods, testing, and backfilling shall all conform to the requirements of the building and plumbing code or other applicable regulations of the Town of Webster, including the Sewer Construction Standards.

The building sewer shall be brought to the building at an elevation below the basement floor. In cases where the drain is too low to permit gravity flow to the public sewer, sanitary sewage discharged by the building drain shall be lifted by a method approved by the Department.

Section 2
Standard Specifications

2.1 Gravity Sewer Piping and Fittings

Gravity sewers shall be constructed using polyvinyl chloride (PVC) pipe and fittings conforming to the latest revision of ASTM D3034, Type SDR 35 for diameters less than or equal to 15-inch diameter and ASTM F679 for pipe greater than 15-inch diameter. Joints shall be elastomeric gasket joints and shall provide a watertight seal. Gaskets shall be in accordance with ASTM F477. Assembly of joints shall be in accordance with ASTM D3212.

Pipe lengths and fittings to be used on the project shall be clearly marked on the outside in bold type with the name of the manufacturer, pipe size, pipe material, pipe class, and ASTM designation.

Gravity pipe building connection wyes and tees are to be laid in the run of the main pipeline. The wyes and tees shall be the same material as the main line and shall conform in material, joints, and class with the line into which they are to be laid. Eighth and sixteenth bends and end plugs are to be of the same material and class or strength designation as the pipe for the building connection.

Building service piping shall be 6-inch diameter, shall be of the same material as the main line PVC pipe, and shall meet the same standards described above, unless otherwise approved by the Department.

Recommended minimum slopes for all gravity sewer mains shall follow the latest edition of TR-16, *Guides for the Design of Wastewater Treatment Works*. The table below is a summary of minimum slopes according to the 2011 edition revised in 2016:

Sewer Size (inches)	Minimum Slope in Feet per Foot (ft/ft)
8	0.004
10	0.0028
12	0.0022
14	0.0017
15	0.0015
16	0.0014
18	0.0012
21	0.001
24	0.0008
27	0.00067
30	0.00058
36	0.00046
42	0.00037
48	0.00031

2.1.1 Underground Warning Tape

Metallic warning tape for underground piping shall be polyethylene tape with metallic core for easy detection and location of piping with a metal detector. Tape shall be 6 inches wide. Tape shall be manufactured by Seton Name Plate Corp., New Haven, CT; Presco Detectable Underground Warning tape, Sherman, Texas; Blackburn Manufacturing, Nelight, NE; Mercotape, Hachensach, NJ; or equal.

It shall be highlight visible, green, and have the phrase "CAUTION – SEWER LINE BURIED BELOW" stamped in black letters and repeated at a maximum internval of 40 inches. All buried pipe and fittings shall be installed with metallic-lined underground warning tape located no more than 24 inches below final grade to allow detection by a metal detector.

2.1.2 Sewer Service Reconnections

Straight pipe, adapters and fittings are to be of a type and class equivalent to the lateral pipe. Furnish adapter couplings as necessary to connect 1 pipe material to another or to connect 1 pipe size to another. The adapter couplings shall be constructed of elastomeric plastic with stainless steel clamp bands on each end, they shall be used only for the specific function intended as per the manufacturer's recommendations. The couplings shall be capable of sealing against infiltration, exfiltration and roots. The couplings shall be as manufactured by Can-Tex Industries, Clow Corporation, Fernco Joint Sealer Co., General Engineering Co. or approved equal.

Complete service reconnection work on the day on which it was started. Control and/or divert flow using portable pumps, plugs, etc. during this work, as required to prevent the discharge of wastewater flow to the ground surface and to prevent flow backups into buildings. Provide written notification to each property owner at least 24 hours prior to the reconnection of the house service so that the owner may make arrangements to suspend use of the service during reconnection. After the section of pipeline has been satisfactorily tested and when the Department informs the Contractor that the system is ready for operation, reconnect all service connections to the new sewer.

2.1.3 Gravity Sewer Bedding Material

All PVC gravity pipe shall be installed on a bed of 3/4-inch crushed stone borrow having a minimum depth of 6 inches. The 3/4-inch crushed stone borrow shall also completely encase the pipe and cover the pipe to a grade 6 inches over the top of the pipe for the entire width of the trench. Bell holes shall be made in the 3/4-inch crushed stone borrow bedding such that the pipe shall be uniformly supported throughout the entire length of the barrel section.

Crushed stone borrow shall consist of 1 of the following materials:

9. Durable crushed rock consisting of the angular fragments obtained by breaking and crushing solid or shattered natural rock, and free from a detrimental quantity of thin, flat, elongated or other objectionable pieces. A detrimental quantity will be considered as any amount in excess of 15% of the total weight. Thin stones shall be considered to be such stones whose average width exceeds 4 times their average thickness. Elongated stones shall be considered to be stones whose average length exceeds 4 times their average width.
10. Durable crushed gravel stone obtained by artificial crushing of gravel boulders or fieldstone with a minimum diameter before crushing of 8 inches.

The crushed stone shall be free from clay, loam or deleterious material and not more than 1.0% of satisfactory material passing a No. 200 sieve will be allowed to adhere to the crushed stone. The crushed stone shall have a maximum percentage of wear as determined by the Los Angeles Abrasion Test (AASHTO-T-96) as follows:

1. For Class 1 Bit. Conc. 30%**
2. For Cement Concrete Aggregate 45%***
3. Crushed Stone for Subbase 45%

**Crushed stone for this use shall consist of crushed or shattered natural rock only. Crushed gravel stone will not be permitted.

***Except for 5,000 psi or greater cement concrete and prestressed concrete which shall be 30%.

The crushed stone shall conform to the grading requirements shown in the following grading Table.

¾-Inch Crush Stone Grading Requirements

	Percent by Weight Passing Through	
Sieve Size	**Minimum**	**Maximum**
1″	100	--
¾″	90	100
½″	10	50
3/8″	0	20
No. 4	0	5

2.1.4 Gravity Pipe Leakage Testing

Test all gravity sewers for allowable leakage by low pressure air test as described below. No building shall be connected to a newly installed sewer until the sewer has been satisfactorily tested.

After completing backfill of a section of pipe, including laterals, conduct a line acceptance test using low-pressure air. Perform the test under the supervision of the Department.

Seal-test pneumatic plugs before use in the actual test installation. Lay 1 length of pipe on the ground and seal at both ends with the pneumatic plugs to be checked. Introduce air into the plugs to 25 psi. Pressurize the sealed pipe to 5 psi. Satisfactory pneumatic plugs will hold against this pressure without bracing and without movement of the plugs out of the pipe.

After a manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs have been checked, place a plug in each end of the line (at each manhole), and inflate the plugs to 25 psi. Introduce low pressure air into this sealed line until the internal air pressure reaches 4 psi greater than the average back pressure of any groundwater that may be over the pipe. Allow a minimum of 2 minutes for the air pressure to stabilize. After the stabilization period (3.5 psi minimum pressure in the pipe), disconnect the air hose

from the control panel to the air supply. The portion of the line being tested has passed the test if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psi (greater than the average back pressure of any groundwater that may be over the pipe) is not less than the time shown for the given diameters and lengths in Table A-1 in Appendix A.

Air tests shall cover a 1.0 psi pressure drop; 0.5 psi pressure drop tests are not acceptable.

In areas where groundwater is known to exist, install a ½ inch diameter capped pipe nipple, approximately 10 inches long, through the manhole wall on top of 1 of the sewer lines entering the manhole. The nipple shall be installed at the time the sewer line is installed. Immediately prior to the line acceptance test, determine the elevation of the groundwater by removing the pipe cap, blowing air through the pipe nipple to remove any obstructions, and then connecting clear plastic tube to the nipple. Hold the hose vertically and measure the height after the water has stopped rising in this plastic tube. Divide the height in feet by 2.3 to establish the pressure in pounds per square inch (psi) that will be added to all readings. (For example, if the height of water is 11.5 feet, then the added pressure will be 5 psi. This increases the 3.5 psi to 8.5 psi, and the 2.5 psi to 7.5 psi. The allowable drop of 1 pound per square inch and the timing remain the same.)

The maximum starting test pressure should not exceed 9 psi, regardless of groundwater level above the pipe. If the groundwater level is such that the added pressure would be greater than 5.5 psi (12.7 feet), the pipe section may be tested using a starting pressure of 9 psi. Each pipe nipple installed to measure groundwater levels should be recapped subsequent to the air testing procedure to prevent future infiltration. As an alternative to installing a pipe nipple in a manhole to measure the height of groundwater, excavate a test pit over the pipe to determine the height of groundwater.

In case leakage exceeds the above specified amount, locate the failure and repair it in accordance with applicable Sections of these Standards. Pipelines with shear-type breaks, "fishmouths" or damaged gaskets, cracked bells or couplings, hairline fractures, or structural damage shall be replaced. Mechanical sleeve couplings, poured concrete collars or similar repairs are not permitted. After repairs have been made, re-test the line and repeat the process of repairing and re-testing until satisfactory test results, as specified in this Section, are obtained.

2.1.5 Gravity Pipe Deflection Testing

Pipe deflection measured not less than 45 days after the backfill has been completed shall not exceed 5 percent. Deflection shall be computed by multiplying the amount of deflection (average outside diameter less twice the average wall thickness diameter when measured) by 100 and dividing by the nominal diameter of the pipe.

Deflection shall be measured with a rigid mandrel (Go-No-Go) device cylindrical in shape and constructed with a minimum of 9 or 10 evenly spaced arms or prongs. Hand-pull the mandrel through all new sewer lines.

Uncover any section of pipe not passing the mandrel and replace the bedding and backfill to prevent excessive deflection. Replace sections of the pipe as necessary. Retest repaired pipe immediately upon backfilling of trench until acceptable. Retest the repaired section of pipeline again, from manhole to manhole, after the 45-day backfill period, until acceptable.

1.2 Gravity Pipe Alignment Testing

Lay gravity sewers accurately to line and grade. After the pipe is laid and backfill complete, TV inspect the interior of the pipe from manhole to manhole. If excessive deviation in either the horizontal or vertical alignment is observed by the Department, the alignment is considered unacceptable. If the alignment is unacceptable due to horizontal displacement, the Contractor will be allowed to construct intermediate manholes at its own expense. If the alignment is unacceptable due to vertical displacement, remove and replace the pipe to the proper grade.

2.3 Gravity Sewer Service Chimneys

Pipe and fittings shall be 6-inch diameter and be of the same material as the main line PVC pipe. Construct service chimneys with precast concrete sections. Cast-in-place chimneys will not be acceptable. Concrete chimneys shall be designed so that the weight of the chimney is not transferred onto the main line pipe or tee. Concrete used for construction of the chimneys shall have a compressive strength of 5,000 psi at 28 days.

2.4 Pressure Sewer Piping and Fittings

Buried pressure sewers shall be constructed of Polyvinyl Chloride (PVC) pipe or ductile iron (DI) pipe. Pressure sewers shall be constructed with a minimum cover of 5 feet. Pressure sewers installed in vaults or above grade shall be DI, as described below.

Install air release, test connections, and blow offs in the piping for pressure testing at locations to be determined by the Contractor and approved by the Department. Corporation cocks shall be in accordance with ANSI/AWWA C800 and shall be ¾ inch diameter with CC thread on inlet by iron pipe thread flare on outlet as manufactured by Mueller, Ford, McDonald or approved equal. Copper tubing shall be annealed Type K soft tubing and shall conform to the requirements of ASTM B88. Upon completion of testing, remove the corporation cock and replace with a brass plug and the copper tubing removed.

2.4.1 PVC Pressure Pipe

PVC pipe shall conform to the requirements of the AWWA C900 Standards for PVC900 DR 18 Pressure Pipe for Water with ductile iron pipe equivalent outside diameters. Joints shall use elastomeric gaskets and be in accordance with ASTM D3139. Gaskets shall conform to ASTM F477. The standard laying length shall not exceed 20 feet.

The minimum "pipe stiffness" (load divided by change in inside diameter in direction of load application) at 5% deflection shall be at least 46 psi for pipe tested in accordance with ASTM Specifications D2412.

Fittings shall be constructed of cast iron or ductile iron in accordance with AWWA C110/A21.10 or AWWA C153/A21.53, with mechanical joint ends.

Pipe and fittings shall be clearly marked on the outside indicating the name of the manufacturer, nominal diameter, and the ASTM or AWWA designation or both for the DR18 Polyvinyl Chloride Pressure Pipe.

2.4.2 DI Pressure Pipe

Buried Piping

Buried DI Pipe shall be Class 52, cement lined (where hydrogen sulfide is not a concern), with push-on joints. DI pipe shall be designed in accordance with AWWA C150 and shall be manufactured in accordance with AWWA C151. The cement lining shall be provided with a seal coat; both the cement lining and the seal coat shall be provided in accordance with AWWA C104. Cement mortar lining shall be twice the standard thickness; tolerance shall be minus 0 inches, plus 1/8 inch. The exterior of the pipe shall have an asphaltic coating in accordance with AWWA C151.

In areas where hydrogen sulfide is a concern, ductile iron pipe shall be epoxy lined with Protecto 401 or Tnemec Perma-Shield 431, or equal.

In areas with corrosive soils, ductile iron pipe shall be installed in polyethylene encasement. Polyethylene incasement shall be installed in accordance with AWWA C105. Contractor shall slip the polyethylene tube over the exterior of the pipe and/or fittings prior to placement in the trench. Allow a minimum of 1 foot overlap at each joint and secure with compatible polyethylene adhesive tape at several locations along the barrel of the pipe. At each pipe connection, overlap the wrap and secure with a non-corrosive strap behind the pipe bell, and overlap with the new section of wrap and secure in place with a strap on the spigot end. Install wrap in accordance with Method "A" or "C" of AWWA C105 and encase all pipe, fittings, valves and appurtenances. Provide polyethylene encasement as directed by the Sewer Department.

Ductile iron piping shall be manufactured by American Cast Iron Pipe Company, U.S. Pipe, or approved equal.

Restrained joint pipe, where required and approved by the Department, shall be Flex-Ring®/Lok-Ring® Joint by American Cast Iron Pipe Company, TR FLEX® by US Pipe and Foundry Co., or approved equal. Restrained gasketed joints for rubber push-on joint pipe shall be Fast-Grip® by American Cast Iron Pipe Company, Field Lok 350® by US Pipe and Foundry Co., or approved equal.

Fittings shall be ductile iron or gray iron. Fittings less than or equal to 12 inches in size shall conform to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 and shall have a 350 psi pressure rating. Fittings greater than 12 inches in size shall conform to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 and shall have the following pressure ratings:

1. Fittings greater than 12 inches and less than or equal to 24 inches - 350 psi
2. Fittings greater than 24 inches - 250 psi

Fittings shall have mechanical joint ends. Mechanical joint retainer glands shall be installed on all mechanical joints. Retainer glands shall be specifically designed to fit standard mechanical joint bells with corrosion resistant, high strength, low-alloy T-head bolts conforming to ANSI/AWWA A21.11/C-111 and ANSI/AWWA A21.53/C-153. Retainer glands shall be manufactured of ductile iron conforming to ASTM A536-80, grade 60-42-10. Wedges shall be of hardened ductile iron and require the same torque in all sizes. These devices shall have a minimum 250 psi pressure rating with a minimum safety factor of 2:1 and shall be EBAA IRON, Inc., Megalug® series 1100 or equal. Glands shall be listed with Underwriters Laboratories and/or approved by Factory Mutual.

Piping in Vaults or Above Grade

Ductile iron pipe and fittings installed above ground and/or in buried vaults shall be as described above, except that the piping shall be Class 53 with flanged joints. Exposed piping shall be shop primed and painted in the field. Exposed piping to be painted shall not have an asphaltic exterior coating applied. Exposed piping shall be shop primed and painted in accordance with the following requirements:

Painting Requirements for Exposed Piping

Surface	System Surface Preparation	System Finishes		
		Primer	2nd	Final
		DFT = Dry Film Thickness, Mils		
Ductile Iron Pipe, Interior and Exterior, Non-Submerged	NAPF 500-03-04 / SSPC-SP-6	Series 66HS (3.0-5.0 DFT)	Series 66HS (3.0-5.0 DFT)	Series 73 (2.5-5.0 DFT)
		Macropoxy 646 FC Epoxy or approved equal	Macropoxy 646 FC Epoxy or approved equal	Acrolon 218 HS Polyurethane or approved equal

Flanged joints shall be assembled with bolts and nuts, bolt studs with nut on each end, or studs with nuts in tapped flanges. Bolts and nuts shall be manufactured in accordance with ASTM A325, Type 1, Grade 5, hot-dipped galvanized finish, heavy hex head, 120,000 psi minimum tensile strength with X-Heavy nuts. Nuts and bolts shall be provided with an anti-seize, thread lubricating compound. Gaskets for flanged joints shall be full face, 1/8-inch thick red rubber. Gaskets shall conform to the dimensions of Table A.1 of ANSI/AWWA C115/A21.15. Ring gaskets shall be provided for piping 14 inches in diameter and larger.

Fittings shall be as described above under Buried Piping, but with flanged joints.

2.4.3 Trench Backfill and Compaction for Pressure Pipe

All pressure sewer pipe shall be installed with proper bedding using compacted native materials which provide uniform longitudinal support under the pipe. When an unstable subgrade material is encountered which will provide inadequate pipe support, additional trench depth should be excavated and refilled with suitable material. Initial backfill material should be placed to a minimum 1 foot over the top of the pipe. Pipe backfill material should be selected and placed carefully, avoiding stones, frozen lumps, and debris.

Bedding and fill material are subject to the approval of the Department and may be either material removed from excavations or borrow from off site. Bedding and fill material, whether from the excavations or from borrow, shall be of such nature that after it has been placed and properly compacted, it will make a dense, stable fill. Satisfactory fill and bedding materials shall include materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, SW, and SP. Satisfactory bedding and fill materials shall not contain trash, refuse, vegetation, masses of roots, individual roots more than 18 inches long or more than 1/2 inch in diameter, or stones over 6 inches in diameter. Organic matter shall not exceed minor quantities and shall be well distributed. Satisfactory bedding

and fill materials shall not contain frozen materials nor shall backfill be placed on frozen material.

Backfilling, compaction, and soil testing shall be performed as described under the Gravity Sewer Piping and Fittings section of these Standards.

2.4.4 Pressure Pipe Leakage Testing

All pressure testing must be completed by a third party.

After the pipeline is constructed, fill force mains with water and test the pipe. Air testing is not allowed. Provide all water required for tests. Provide all temporary plugs, valves, gauges, and connections required for making the tests, and remove such appurtenances at the completion of the test. Install temporary supports, blocking, bracing or ballast as necessary for the stability of the line.

Conduct a pressure test and a leakage test simultaneously. The pressure for these 2 tests shall be measured at the lowest part of the line and shall be either 100% higher than normal operating pressure or 150 psi if the former exceeds 150 psi. Conduct the test for a period of 2 hours or until the Department accepts of the pipeline. On pipelines where the elevation along the route of construction varies substantially, the Department reserves the right to require the Contractor to valve off and test portions of the line separately. The Department may also require the testing of individual portions of the line as construction proceeds rather than await completion of the entire project to perform a pressure or leakage test.

No pipeline is to be placed under pressure or subjected to hydrostatic pressure until at least 5 days have elapsed after the concrete thrust blocks have been installed. If high early strength concrete is used in the concrete thrust blocks, the hydrostatic pressure can be applied to the main after 2 days have elapsed after thrust block construction.

Rubber jointed pipelines may be subjected to hydrostatic pressure and inspected for leakage at any time after the trench has been partially backfilled. Partial backfilling shall consist of backfilling along the center of the pipe length and leaving the joints open for inspection.

For pipelines using a rubber type joint, and on other pipelines or at locations approved by the Department, the Contractor will be allowed to complete backfilling, prior to undertaking the leakage and pressure tests. Backfilling prior to testing will be the Contractor’s option, except for intersections, driveways, crosswalks and other such locations where holding open the trench could adversely affect the public.

Slowly fill each section of pipeline to be tested with water up to normal operating pressure. Expel all air from the pipeline. Make taps at points of highest elevation in the pipeline in order to completely remove all air. After the line has been placed under normal operating pressure and all air has been expelled, start the pressure and leakage test. Raise the pressure of the pipeline under test to the specified pressure. Furnish a pump, pipe connections, gauges and necessary apparatus and connections to the new main. Raise the pressure in the main to the specified test pressure by means of the pump and maintain the specified pressure for a period of 2 hours or until the Department indicates that the pipeline is satisfactory.

Carefully examine all exposed pipes, fittings, valves, and joints during the open-trench test. Remove and replace any cracked or defective pipes, fittings, or valves discovered in consequence of this pressure test with sound material and then repeat the test until satisfactory to the Department.

Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section thereof, necessary to maintain the maximum specified leakage test pressure after the pipe has been filled with water and the air expelled. No pipe installation will be accepted until the leakage is less than the number of gallons per hour as determined by the formula:

$$Q = \frac{LD\sqrt{P}}{148{,}000}$$

in which Q equals the allowable leakage, in gallons per hour; L is the length of the pipe section being tested in feet; D is the nominal diameter of the pipe, in inches; and P is the average test pressure during the leakage test, in pounds per square inch gauge. (The allowable leakage according to the formula is equivalent to 10.5 U.S. gal. per 24 hours per mile of pipe per inch nominal diameter, evaluated on a pressure basis of 150 psi.)

In case leakage exceeds the above specified amount, locate the failure and repair it in accordance with applicable Sections of these Standards. Pipelines with shear-type breaks, "fishmouths" or damaged gaskets, cracked bells or couplings, hairline fractures, or structural damage shall be replaced. Mechanical sleeve couplings, poured concrete collars or similar repairs are not permitted. After repairs have been made, re-test the line and repeat the process of repairing and re-testing until satisfactory test results, as specified in this Section, are obtained.

2.5 Low Pressure Sewer Piping and Fittings

Polyvinyl Chloride (PVC) pipe for low pressure sewers shall be PVC, Type 1120, ASTM D2241, Class 200 (SDR-21). Joints shall use elastomeric gaskets conforming to ASTM D1869. The standard laying length shall not exceed 20 feet. Pipe and fittings shall be clearly marked on the outside indicating the name of the manufacturer, ASTM designation and the nominal diameter. Solvent weld piping and fittings are not acceptable.

2.5.1 House Connections and Valves

Low pressure sewer connections from each sewage grinder pump station shall be PVC, Type 1120, ASTM D2241, Class 200 (SDR-21). Joints shall use elastomeric gaskets conforming to ASTM D1869. Connections to tees, brass fittings and end caps shall be made using PVC compression fittings. The standard laying length shall not exceed 20 feet. Pipe and fittings shall be clearly marked on the outside indicating the name of the manufacturer, ASTM designation and the nominal diameter. Solvent weld piping and fittings are not acceptable.

Bends shall use elastrometric gaskets and shall have a poured in-place concrete thrust block bearing against undisturbed soil. Bends shall be SDR-21, Class 200 and capable of withstanding pressure surges.

Service connections to the low-pressure sewer shall use tees. Tees shall be of the same class and size as the mainline pipe for the location to be installed and shall have a female threaded I.P. branch tap of 1½ inch in size for accepting a male threaded compression adapter fitting. Elastomeric joints shall be used in the mainline run. An end cap shall be provided, suitable for withstanding the line test pressure.

Curb stops shall be threaded bronze ball valves and shall open left. Curb stops shall not be stop/waste-type. Valves shall be Red Head Model B2230, Mueller, Ford or approved equal.

A 1½ inch redundant brass check valve shall be installed as part of the low pressure sewer service connection, installed on the house side of the curbstop. The valve shall be gravity-operated, flapper type. Additional brass check valves will also be required at each additional low pressure connection where a common service line from the street branches to serve multiple grinder pump stations.

All PVC compression fittings used for low pressure sewer services shall be from a single manufacturer and similar in quality to those manufactured by Flow Control, Inc., Burbank, CA, or approved equal.

Each curb stop shall be provided with its own extension type cast iron 3-inch road box and lid assembly. The lid shall have the word "sewer" imprinted on it. Box extensions for deep installations shall also be provided as required. Curb stops shall be provided with male I.P. thread x PVC compression adaptors for connecting to the PVC services connection.

2.5.2 Trench Backfill and Compaction

Trench backfill, compaction, and soil testing shall be provide as described under the Pressure Sewer Pipe and Fittings section of these Standards.

2.5.3 Low Pressure Pipe Testing

Low pressure pipe testing shall be performed in accordance with the Pressure Sewer Pipe and Fittings section of these Standards.

2.6 Temporary Bypass Pumping

Bypass pumping equipment shall be automated and capable of functioning without the assistance of an operator.

Controls shall be provided to operate pump(s) as required based on liquid level in the suction manholes. A high-level alarm shall be provided. A backup pump activation alarm shall also be provided. Alarm shall notify personnel of a high level in the suction manhole or backup pump activation and shall require immediate response by the Contractor to determine cause and implement measures to ensure pumping is at the maximum specified rate. The high level and backup pump alarms shall be capable of notifying the Contractor and the Department via telephone.

Pumping equipment shall be capable of operating for an extended period of time running dry. After this period of time, the pump shall have the capability of pulling a 25 inch Hg vacuum without adjustment or repair. The entire bypass system including all pumps, pipe, hose, valves, and fittings shall be provided by 1 bypass pumping company who is responsible for the operation of the entire system.

Pumps shall be centrifugal, end suction, fully automatic self-priming low noise pumps that do not require the use of foot-valves, vacuum pumps, diaphragm pumps, or isolation valves in the priming system. Pumps must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flow pumps and shall immediately develop 25-inch Hg vacuum without adjustment or repair or employ level control devices to regulate on/off or variable speed of the pump. Hydraulic, submersible, electric, or wellpoint type pumps are prohibited. Pumps shall be low noise sound attenuated, critically silenced units.

Seals shall be high pressure, mechanical self-adjusting type with silicon carbide faces capable of withstanding suction pressures to 100 psi running. The mechanical seal shall be cooled and lubricated in an oil bath reservoir, requiring no maintenance or adjustment. Pump shall be capable of running dry, with no damage, for extended periods of time. All metal parts shall be stainless steel. Elastomers shall be Viton. Pump ends shall be manufactured to meet ISO 9002 certifications.

Provide the necessary start/stop controls for each pump. Include 1 stand-by pump of each size to be maintained on site and a standby power source. Back-up pumps shall be on-line, isolated from the primary system by a valve.

Pumps shall not be connected by a common suction manifold. The use of PVC or Steel Pipe with Dresser Couplings will not be accepted. All pipe or hose will be rated for 25 inch Hg Vacuum.

In order to prevent the accidental spillage of flows, all discharge systems must be constructed of high density polyethylene pipe with fused joints or quick disconnect pipe with positive restrained joints, and leak proof connections. Discharge hose will only be allowed by specific permission of the Department. PVC pipe with glued joints, aluminum "irrigation pipe", steel pipe or PVC pipe with Dresser couplings will not be accepted. All joints must be 100% restrained. All discharge pipe must have a minimum working pressure of 50 psi. All force main connections shall be made by using flanged composite hose with a working pressure of 150 psi.

Allowable piping materials will be fused, high density polyethylene pipe, acceptable disconnect pipe, or flanged composite pressure class hose. SDR of discharge piping shall be suitable for the calculated discharge pressures. The vendor fusing the pipe must have a minimum of 5 years of experience fusing HDPE pipe of the same diameter required for the project.

Provide all pipeline plugs, pumps of adequate size to handle peak flow, and temporary discharge piping to ensure that the total flow of the main can be safely diverted around the section to be repaired. Bypass pumping systems will be required to be operated 24 hours per day.

Have adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each size pump utilized shall be installed at the mainline flow bypassing locations, ready for use in the event of primary pump failure. Also, a back-up power supply source shall be provided.

Bypass pumping system shall be capable of bypassing the flow around the work area and of releasing any amount of flow up to full available flow into the work area as necessary for satisfactory performance of work.

Make all arrangements for bypass pumping during the time when the pump station is shut down for any reason. System must overcome any line pressure on discharge.

Provide all necessary means to safely convey the sewage past the work area. The Contractor will not be permitted to stop or impede the main flows under any circumstances. Maintain wastewater flow around the work area in a manner that will not cause surcharging of sewers, damage to sewers and that will protect public and private property from damage and flooding. The bypass system shall not require excavation to reduce the suction lift without the specific approval of the Department prior to the bid. Protect water resources, wetlands, and other natural resources in accordance with the appropriate project permits.

Meet noise limits of 69dbA @ 30 feet. All diesel driven standby pumps and/or back-up power supplies shall be sound attenuated. The use of Critical Silenced Canopy pumps or acoustical enclosures for sound attenuation is required.

2.7 Thrust Blocks

Concrete thrust blocks shall be provided at all pressure sewer fittings and shall be constructed as shown on the Sewer Department's Standard Details. Concrete shall have a 28-day compressive strength of 3,000 psi.

Protect pipeline materials and fittings from direct adherence of the concrete thrust block by wrapping in plastic, roofing felt, reinforced manila paper or similar material. The thrust block shall not bear directly on the joint and shall not interfere with future adjustments, tightening, or removal of the joint. Thrust blocks shall bear against undisturbed soil at the side or end of the trench and this undisturbed surface shall be carefully cleaned off so as to be vertical. The thrust blocks shall have a minimum horizontal thickness of 2 feet and shall have the minimum bearing area as determined by the Department, measured perpendicular to the direction of thrust.

2.8 Sewer Manholes

2.8.1 Precast Sections

Precast concrete barrel sections and transition top sections, shall conform to ASTM C478 and the following requirements:

1. The wall thickness shall not be less than 5 inches for 48-inch diameter reinforced barrel sections, 6 inches for 60-inch diameter reinforced barrel sections and 7 inches for 72-inch diameter reinforced barrel sections.
2. Top sections shall be eccentric except that flat top sections shall be used for shallow structures.
3. Barrel sections shall have tongue and groove joints.
4. All sections shall be cured by an approved method and shall not be shipped nor subjected to loading until the concrete compressive strength has attained 3,000 psi and not before 5 days after fabrication and/or repair, whichever is longer.
5. Precast concrete barrel sections with precast top slabs and precast concrete transition sections shall be designed for a minimum of AASHTO HS20-44 loading plus the weight of the soil above at 120 pcf.

6. The date of manufacture and the name and trademark of the manufacturer shall be clearly marked on each precast section.
7. Precast concrete bases shall be monolithically constructed. The thickness of the bottom slab of the precast bases shall not be less than the barrel sections or top slab whichever is greater. Precast concrete bases shall be constructed with a 6 inch extended base, unless otherwise shown on the Department's Standard Details.
8. Knock out panels for piping shall be provided in precast sections. They shall be integrally cast with the section, 2½ inches thick. There shall be no steel reinforcing in knock out panels.
9. The side wall height of the base section shall be a minimum of 12 inches above the top of the pipe coming into the manholes.
10. Tongue and groove joints of precast manhole sections shall be sealed with a preformed flexible joint sealant. The preformed flexible joint sealant shall conform to ASTM C990.

Construct manholes to the dimensions shown on the Department's Standard Details and as described in the Department's Standards. Protect all work against flooding and flotation. Set precast concrete barrel sections so as to be plumb and with sections in true alignment with a maximum allowable tolerance of ¼ inch.

Install the precast sections in a manner that will result in a watertight joint. Seal the joints of precast concrete barrel sections with the preformed flexible joint sealant used in sufficient quantity to fill 75% of the joint cavity. Fill the outside and inside precast section joints with hydraulic cement and finish flush with the adjoining surfaces. Plug holes in the concrete barrel sections required for handling or other purposes with a hydraulic cement or concrete and rubber plugs, and finish flush on the inside.

Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides. Place and compact backfill around manholes in 6 inch layers unless satisfactory compaction is demonstrated otherwise to the Department through field-testing, from a point 1 foot over the pipe. Exercise care to protect and prevent damage to the structures. Backfilling, compaction, and soil testing shall be performed as described in the Gravity Sewer Pipe and Fittings section of these Standards.

2.8.2 Brick Masonry

Bricks shall be good, sound, hard and uniformly burned, regular and uniform in shape and size, of compact texture. Underburned or salmon brick will not be acceptable and only whole brick shall be used unless otherwise permitted. In case bricks are rejected by the Department, they shall be immediately removed from the site of the work and satisfactory bricks substituted.

Bricks for the channels and shelves shall comply with the latest specifications of ASTM C32 for Sewer Brick, Grade SM. Bricks for building up and leveling manhole frames shall conform to ASTM C32 Grade MS. Poured concrete inverts will not be allowed.

Mortar used in the brickwork shall be composed of 1 part Type II portland cement conforming to ASTM C150 to 2 parts sand to which a small amount of hydrated lime not to exceed 10 lbs. to each bag of cement shall be added.

Sand used shall be washed, cleaned, screened, sharp and well graded as to different sizes and with no grain larger than will pass a No. 4 sieve. Sand shall be free from vegetable matter, loam, organic or other materials of such nature or of such quantity as to render it unsatisfactory.

Hydrated lime shall conform to ASTM C207, Type S.

Mix mortar only in such quantity as may be required for immediate use and use before the initial set has taken place. Do not retain mortar for more than one and one-half hours and constantly work over with a hoe or shovel until used. Anti-freeze mixtures will not be allowed in the mortar. No masonry shall be laid when the outside temperature is below 40°F unless provisions are made to protect the mortar, bricks, and finished work from frost by heating and enclosing the work with tarpaulins or other suitable material. The Department's decision as to the adequacy of protection against freezing shall be final.

Construct channels and shelves of brick as shown in the Department's Standard Details. The brick channels shall correspond in shape with the lower half of the pipe. The top of the shelf shall be set at the elevation of the crown of the highest pipe and shall be sloped 1/4 inch per foot to drain toward the flow through channel. Construct brick surfaces exposed to sewage flow with the nominal 2-inch by 8-inch face exposed (i.e., bricks on edge).

Set manhole covers and frames in a full mortar bed and bricks, a maximum of 12 inches thick for conical tops and 6 inches thick for flat top sections, utilized to assure frame and cover are set to the existing grade. Reset the manhole frames and covers to final grade prior to placement of final paving.

2.8.3 Manhole Frames and Covers

Manhole frames and covers shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind. Manhole covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30B or ASTM A48, Class 35B.

Manhole covers shall have a diamond pattern, pickholes and the word "SEWER" cast in 3 inch letters. Manhole frame and covers shall be manufactured by East Jordan Iron Works; Mechanics Iron Foundry; Neenah Foundry or equal.

Manhole frames and covers shall be designed for a minimum of AASHTO HS20-44 loading.

Watertight manhole frames and covers shall be bolted and gasketed.

2.8.4 Manhole Rungs

Manhole rungs shall be drop front design, 14 inches wide with an abrasive step surface, steel reinforced, copolymer, polypropylene, plastic. Manhole rungs shall conform to OSHA requirements. Steel reinforced copolymer polypropylene plastic steps shall be press fitted by hand driven hammer into preformed holes in cured precast sections, on 12 inch centers, by the precast concrete manufacturer.

2.8.5 Flexible Pipe to Structure Connectors

The flexible pipe-to-structure connectors shall be designed to provide a positive seal between the connector and the structure wall and between the connector and the pipe. The flexible boot shall be manufactured of EPDM synthetic rubber in accordance with ASTM C443 and C923 and shall be 3/8 inch thick or greater. The external bands shall be made entirely of 304 series non-magnetic stainless steel. The flexible connectors shall be provided with a wedge-type or toggle-type expander to secure the pipe in the structure opening. The flexible connectors shall meet the following criteria, in accordance with ASTM C923:

1. Shall not leak when subjected to a head pressure of 10 psi for 10 minutes.
2. Shall have the ability to deflect 7 degrees in any direction without leakage under the head pressure conditions described above.
3. Shall not leak when subject to a load of 150 lbs./in. pipe diameter and the head pressure conditions described above.

For pipes with smooth exterior surfaces (PVC, ductile iron, HDPE pressure pipe, steel, etc.), use flexible pipe-to-structure connectors.

Where flexible pipe-to-structure connectors cannot be used, such as pipes with rough, irregular, or corrugated exterior surfaces (concrete, corrugated metal, HDPE drainage pipe, etc.):

1. After the new pipe has been set in place, completely fill the hole around the new pipe and structure with non-shrink, hydraulic cement.
2. Place a 6-inch thick concrete encasement a total of 12 inches in length around the pipe stub adjacent to the exterior wall of the structure. Concrete shall have a 28 day compressive strength of 3,000 psi.

2.8.6 Manhole Chimneys

Manhole chimneys shall be inside type, unless otherwise approved by the Department, constructed in accordance with the Department's "Interior Manhole Chimney" detail. Pipe and fittings for the chimneys shall be of the same type and class as the mainline. Pipe straps for inside manhole chimneys shall be constructed of aluminum alloy 6061-T6. Anchor bolts shall be 3/8" stainless steel.

Where approved for use by the Department, outside manhole chimneys shall be integrally cast with the precast concrete manhole.

2.8.7 Dampproofing

Dampproofing is required for all sanitary sewer structures. Provide 2 coats of bituminous dampproofing on outer surfaces of precast manholes at the rate of 20-25 square feet per gallon in accordance with manufacturer's instructions. Dampproofing coating shall be a factory-applied asphalt compound specially made to adhere to below grade concrete structures. The dampproofing shall be Sonoshield semi-mastic, as manufactured by BASF; Dehydratine 4 by Euclid Chemical; RIW Marine Liquid by Toch Brothers; or approved equal.

2.8.8 Non-Shrink Hydraulic Cement

Hydraulic cement shall be non-shrink, fast-setting, complying with ASTM C1157. Hydraulic cement shall have a minimum 7-day compressive strength of 3,000 psi and a minimum 28-day compressive strength of 5,000 psi. Hydraulic cement shall be as manufactured by UGL (Drylock Fastplug), Quikrete, Kryton, or approved equal.

2.8.9 Manhole Testing

After a manhole has been constructed, conduct a manhole acceptance test using the following vacuum test procedure:

1. Plug all lift holes with an approved non-shrink grout.
2. Plug all pipes entering the manhole, taking care to securely brace the plug from being drawn into the manhole.
3. Place the test head at the inside of the top of the precast concrete cone section and inflate the seal in accordance with the manufacturers' recommendations.
4. Draw a vacuum of 10 inches of mercury and shut off the vacuum pump. With the valves closed, measure the time for the vacuum to drop to 9 inches. The manhole shall pass if the time is greater than:
    a. 1 min. 0 sec. for 0-ft. to 10-ft. deep manholes
    b. 1 min. 15 sec. for 10-ft. to 15-ft. deep manholes
    c. 1 min. 30 sec. for 15-ft. to 25-ft. deep manholes

If the manhole fails the initial test, make repairs with a non-shrink grout. Re-test until a satisfactory test is obtained.

Clean new manholes of silt, debris and foreign matter of any kind, prior to final inspection.

2.9 Breaking Into Existing Manholes

The flexible pipe-to-structure connectors and non-shrink hydraulic cement used for this construction task shall be as described in the Sewer Manholes section of these Standards.

Core drill into existing structures in such a fashion as to make an opening of suitable size to accommodate the connecting pipe without excessive damage to the existing structure. For manholes, break out and rebuild existing inverts as required to provide an adequate base under the new channels being installed, and shaped to provide smooth continuous hydraulic flow through the manhole.

Control existing flows as required during the period of construction. No sewage will be permitted to flow directly against concrete or other masonry work until it is at least 48 hours old. Temporary handling of sewage flows may be accomplished by inserting pipes from the inlet to the outlet of the manhole and by using temporary plugs, where appropriate, provided that such pipes do not interfere with satisfactory completion of the work and shaping of the inverts, nor cause excessive backing-up in the existing system upstream of the diversion. In cases where this type of temporary handling of flows is not possible, provide the necessary dams, plugs, etc., as required in upstream manholes, and pump the flow around the structure under construction. When sewage is pumped or otherwise diverted around a particular structure, it shall be discharged back into the

sewage system through existing downstream manholes. Under no circumstances shall sewage be permitted to run onto the surface of the ground.

Rebuild and tightly close existing manhole walls and inverts to provide an integral, water-tight structure around the new pipes. For pipes with smooth exterior surfaces (PVC, ductile iron, HDPE, steel, etc), use flexible pipe-to-structure connectors. Where flexible pipe-to-structure connectors cannot be used, such as pipes with rough, irregular or corrugated exterior surfaces (concrete, corrugated metal or HDPE, etc):

1. After the new pipe has been set in place, completely fill the hole around the new pipe and structure with non-shrink, hydraulic cement.
2. Place a 6-inch thick concrete encasement a total of 12 inches in length around the pipe stub adjacent to the exterior wall of the structure. Concrete shall have a 28-day compressive strength of 3,000 psi.

2.10 Valves

2.10.1 Gate Valves

Gate valves shall be resilient seat type suitable for underground service and complying with the requirements of AWWA C509. AWWA C509 gate valves shall be cast iron or ductile iron. Gate valves shall be designed to be bubble tight at a 250 psi working pressure with no leakage past the seat from either side of the disc, and shall be hydrostatically tested to 500 psi.

Gate valves shall be set vertically, nut-operated, opening to the right (clockwise), non-rising stem and suitable for direct burial with "O" ring stem seals. Direct buried gate valves shall have mechanical joint ends complying with ANSI/AWWA C111/A21.1185.

Internal and external exposed ferrous surfaces of the valves shall be coated with a fusion-bonded, thermosetting powder epoxy coating conforming to AWWA C550. Coatings shall be non-toxic and shall impart no taste to water. Coating thickness shall be nominal 10 mils.

Gate valves shall be as manufactured by Mueller Co. or approved equal.

2.10.2 Sewage Combination Valves

Provide sewage combination valves at pressure sewer high points and at locations directed by the Department. Valves shall automatically release air in pipelines during filling, and allow air to enter the pipeline during draining. After operating, the valve shall automatically re-seat tightly. The compound lever shall allow air in or out, depending on conditions.

Valve shall have a cast iron body, stainless steel float, rubber-viton seat, and composition cover gasket. Float, stem, and plug shall be stainless steel. The overall height and width of the valve, complete with backflush assembly, shall be no more than 26 inches and 12 inches, respectively. Provide a screwed end at the inlet. The backflush assembly shall include a 5 foot fabric-reinforced nitrile hose, bronze shut-off valves, and galvanized quick connects. Provide inlet and outlet shutoff valves.

Acceptable manufacturers include:

1. Golden-Anderson (Model 2SAV).
2. Flomatic Corporation (Universal Sewer Valve – Sewair Combo – Model 6650).
3. APCO Valve & Primer Corporation (Model 443).
4. Crispin (Universal Sewer Valve –Model US3621)
5. Val-Matic (Wastewater Combination Air Valve – Model 801ABW)

There shall be no spilling or spurting at pressures equal to or less than 20 psi.

Paint exterior with universal metal primer.

Provide inlet and blow-off valves with a single body and double orifice at each sewage combination valve. The inlet shall be 2 inch NPT and the outlet shall be 1 inch NPT. The small orifice shall be 7/32 inches in diameter and rated for a maximum working pressure of 150 psi.

Provide an interior epoxy coating for corrosion protection for sewage installations.

2.10.3 Plug Valves

Plug valve body casting shall be ASTM A126 CL B cast iron using high pressure molding techniques. Plug valves shall have flanged ends and a flange diameter, the thickness and drilling shall confirm to ANSI B16.1 Class 125. The plug shall be supported on integral trunnions, with the plug face covered with a elastomer that is molded (2 ½ inches to 12 inch) or vulcanized (on 14 inches and larger) to the casting providing tight shut off in either direction including under vacuum conditions. Provide Buna-N trim. Plug valves shall open right (clockwise) and shall be manufactured by DeZurick, Milliken, Valmatic, or equal.

Appendix A

Gravity Pipe Low Pressure Air Test Summary Table

TABLE A-1
Specification Time Required for a 1.0 PSIG Pressure Drop
For Size and Length of Pipe Indicated for Q=0.0015 cfm/sf of internal pipe surface area

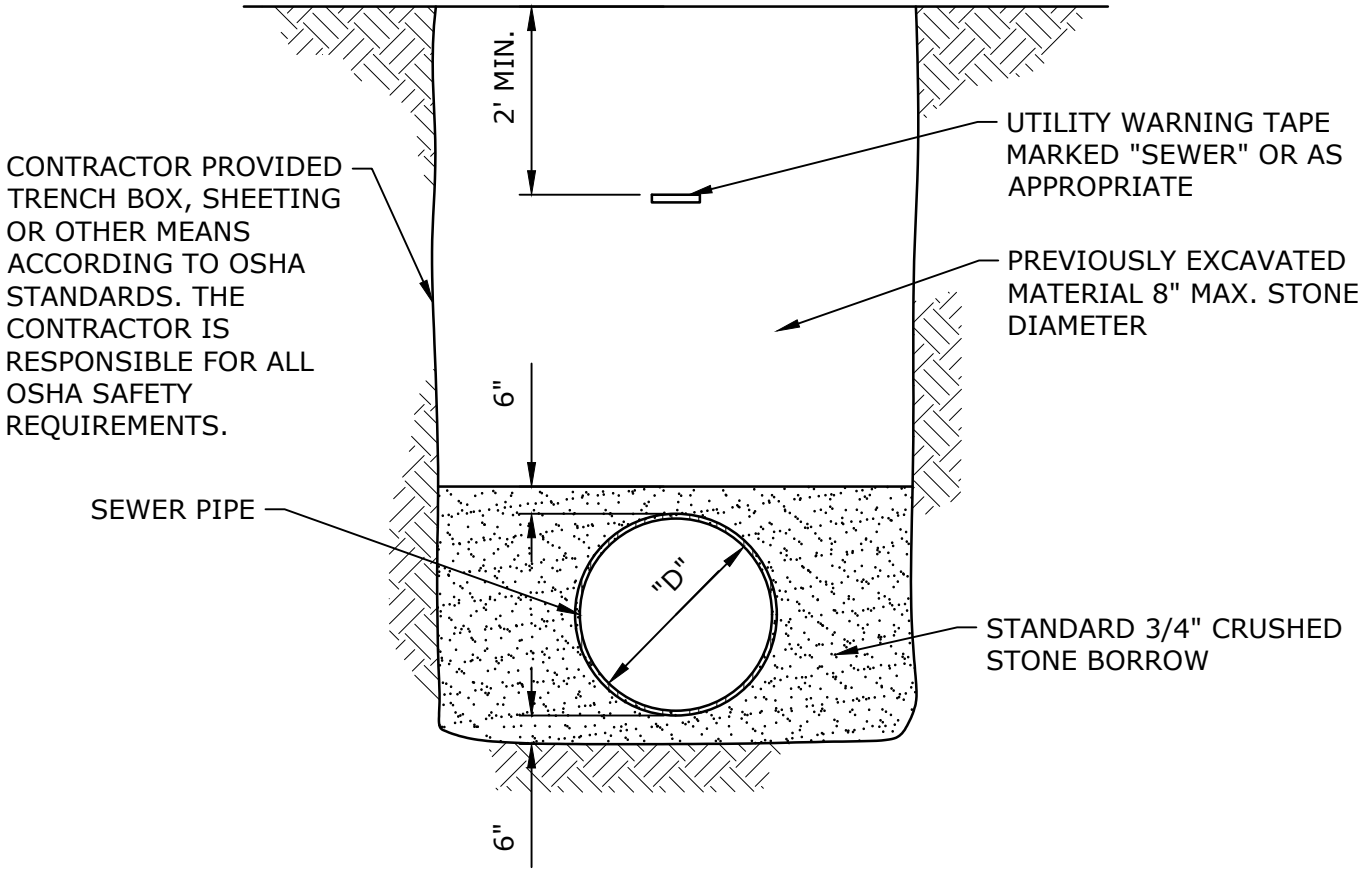
1	2	3	4	Specification Time for Length (L) Shown (min:sec)							
Pipe Diameter (in.)	**Minimum Time (min:sec)**	**Length for Minimum Time (ft)**	**Time for Longer Length (sec)**	**100 ft.**	**150 ft.**	**200 ft.**	**250 ft.**	**300 ft.**	**350 ft.**	**400 ft.**	**450 ft.**
4	3:46	597	0.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	0.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	114	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	88	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	80	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	72	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	66	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46

Uni Bell PVC Pipe
Association Publication
Uni-B-6-90

Appendix B

Standard Sewer Construction Details

November 2024



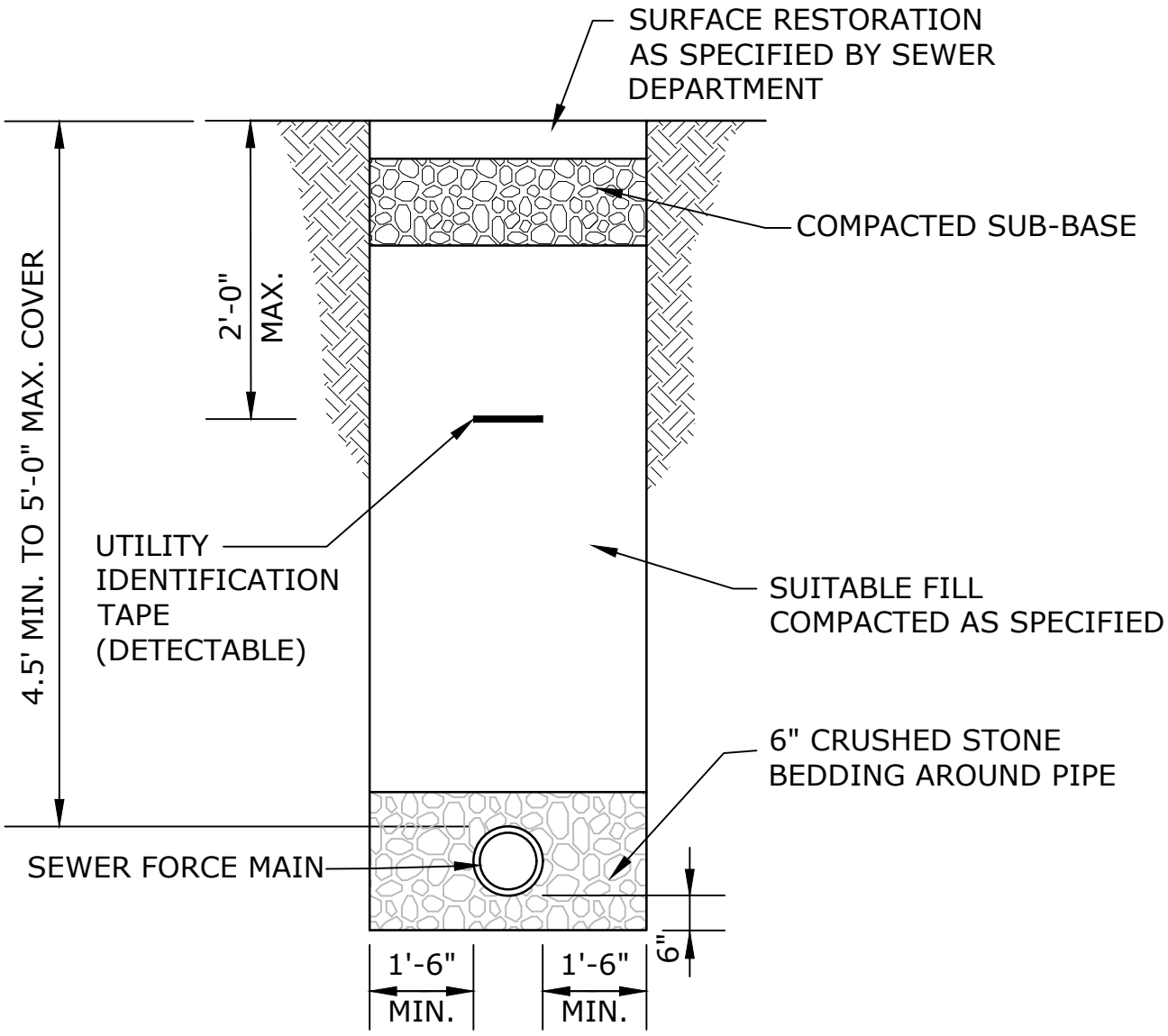
TYPICAL GRAVITY SANITARY SEWER TRENCH SECTION

NO SCALE

NOTES:

1. PLACE BACKFILL MATERIAL IN MAXIMUM ONE FOOT LIFTS.

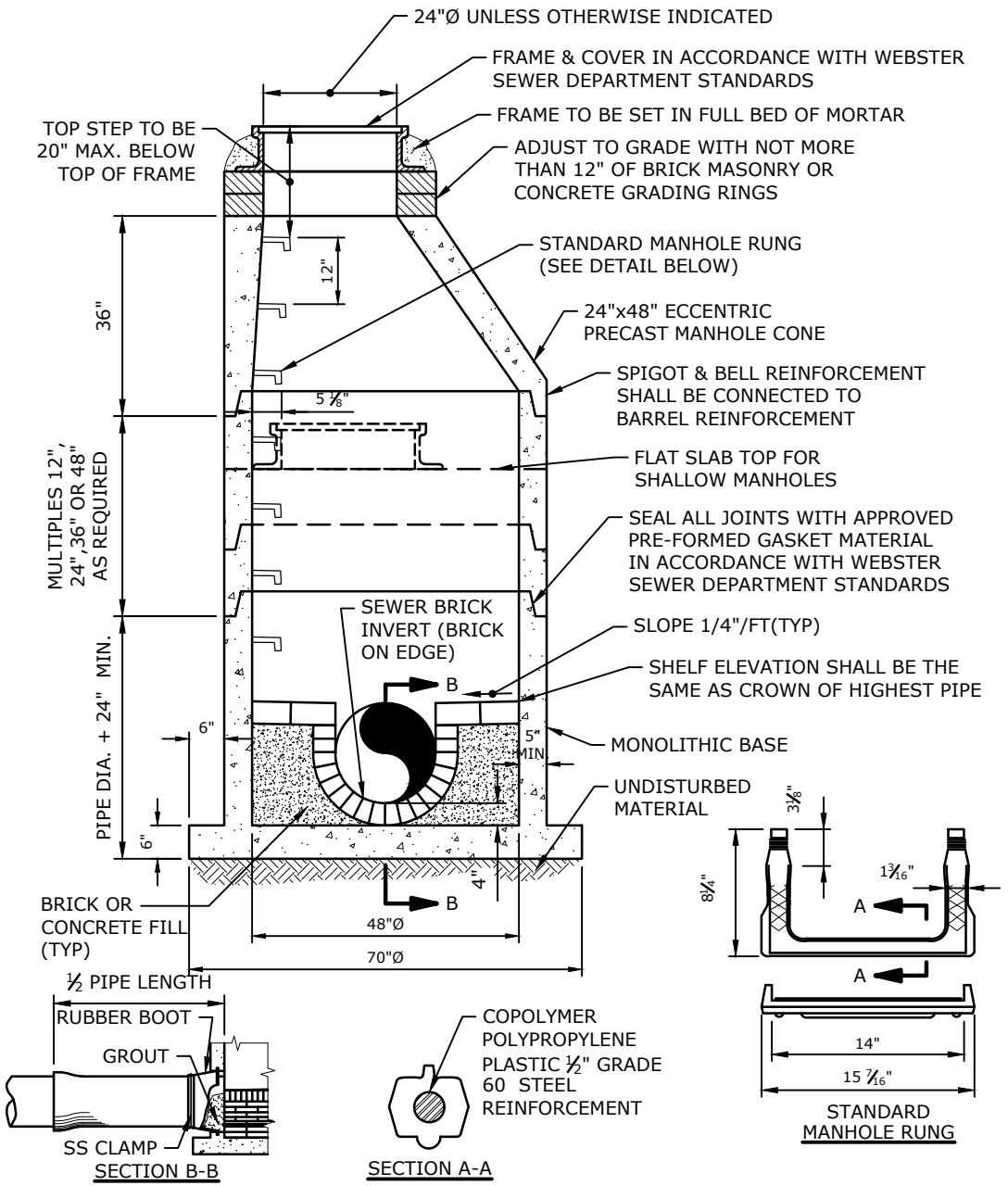
1. TYPICAL GRAVITY SANITARY SEWER TRENCH
WEBSTER SEWER DEPARTMENT



TYPICAL SEWER FORCE MAIN TRENCH

NO SCALE

2. TYPICAL SEWER FORCE MAIN TRENCH
WEBSTER SEWER DEPARTMENT

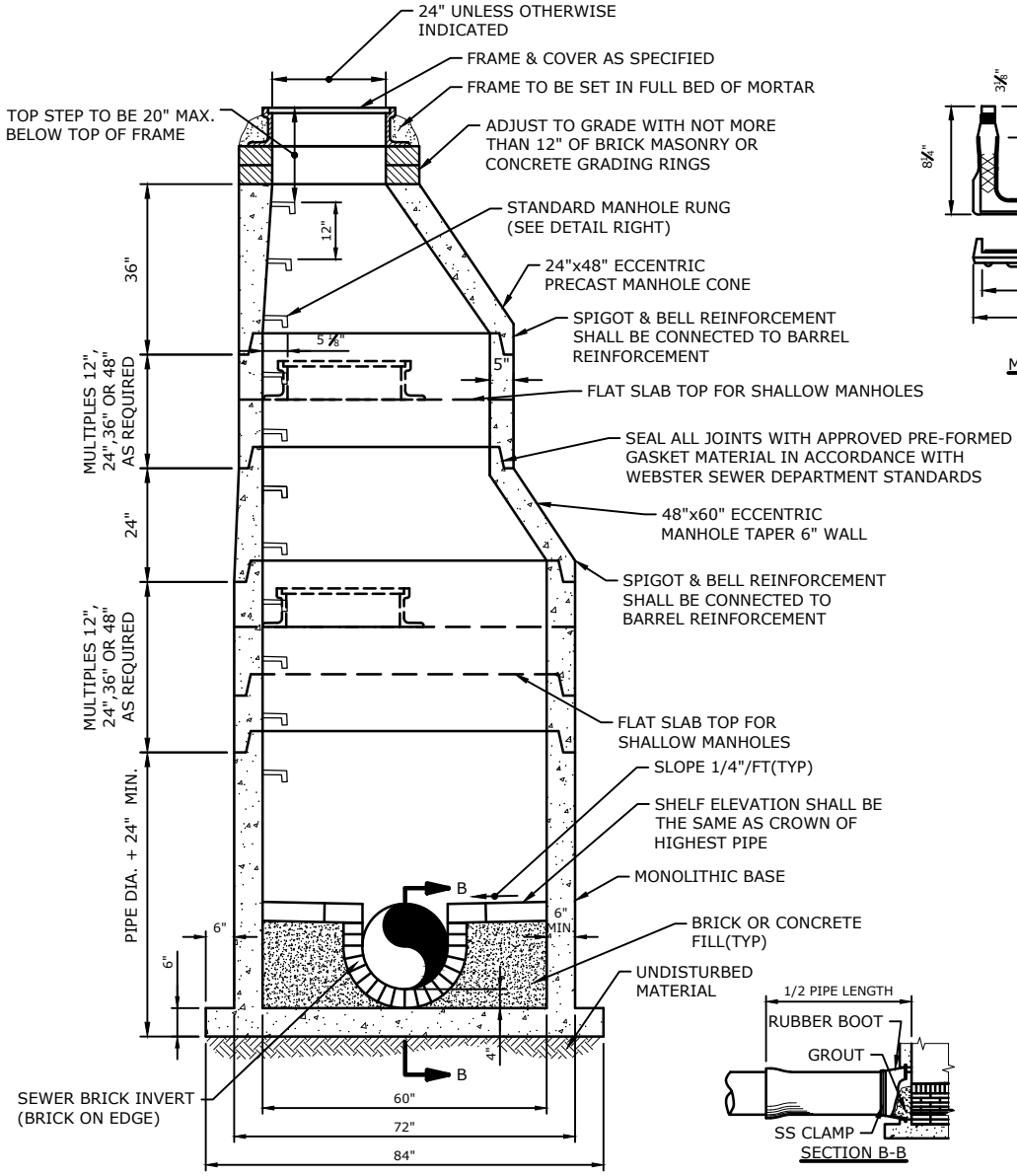


48" PRECAST SANITARY SEWER MANHOLE

NO SCALE

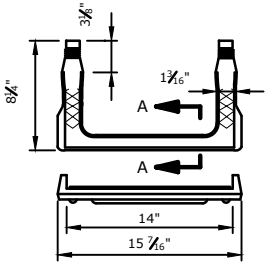
3. 48-INCH DIAMETER PRECAST SANITARY SEWER MANHOLE

WEBSTER SEWER DEPARTMENT



60" PRECAST SANITARY SEWER MANHOLE

NO SCALE



STANDARD MANHOLE RUNG

SECTION A-A

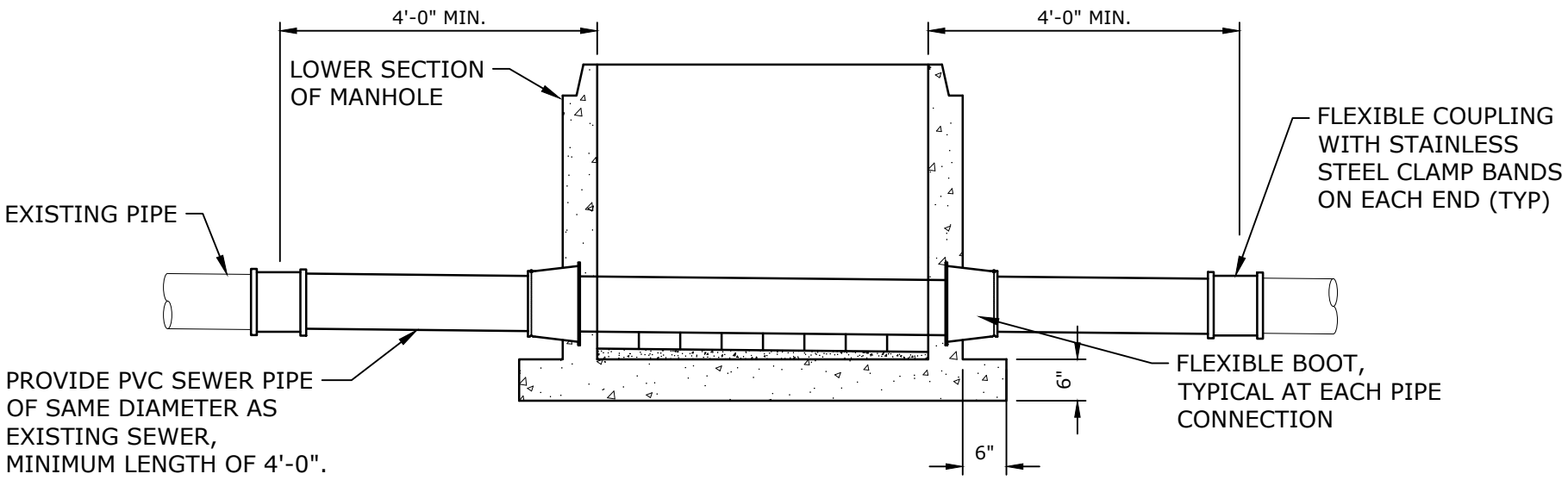
SECTION B-B

NOTES:

1. THE MINIMUM ELEVATION DROP FROM INVERT IN TO INVERT OUT SHALL BE 0.10 FEET.
2. GROUT THE ENTIRE INSIDE AND OUTSIDE SURFACES OF ALL MANHOLE SECTION JOINTS.
3. GROUT THE INSIDE AND OUTSIDE SURFACES OF THE LIFTING HOLES.
4. WHERE MANHOLES ARE INSTALLED IN CROSS COUNTRY EASEMENT AREAS, THE FRAMES AND COVERS SHALL BE 6" TO 12" ABOVE FINISHED GRADE.

4. 60-INCH DIAMETER PRECAST CONCRETE SANITARY SEWER MANHOLE

WEBSTER SEWER DEPARTMENT



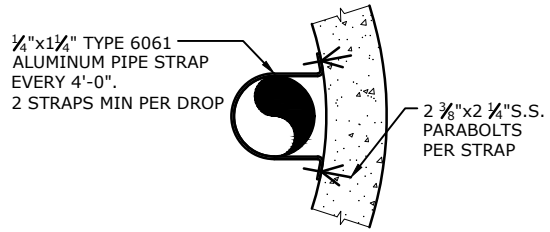
NOTES:

1. CUT-IN MANHOLES SHALL BE USED AT ALL LOCATIONS WHERE MANHOLES ARE TO BE PLACED ALONG AN EXISTING PIPE RUN.

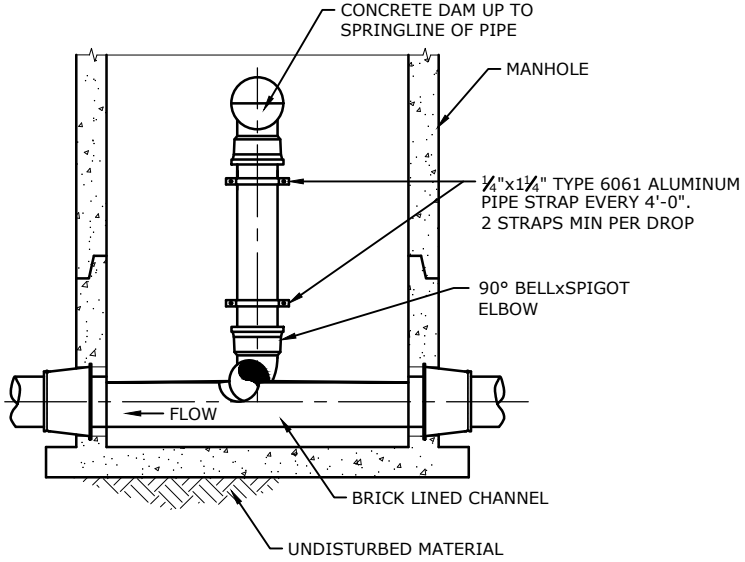
2. MANHOLE BASE SECTION SHOWN, ALL OTHER SECTIONS AND CONSTRUCTION DETAILS SHALL COMPLY WITH THE APPROPRIATE MANHOLE DETAIL.

5. CUT-IN MANHOLE

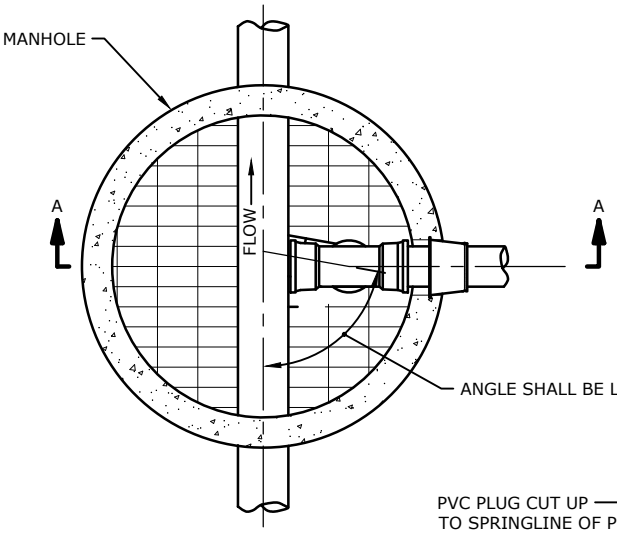
WEBSTER SEWER DEPARTMENT



PIPE STRAP DETAIL

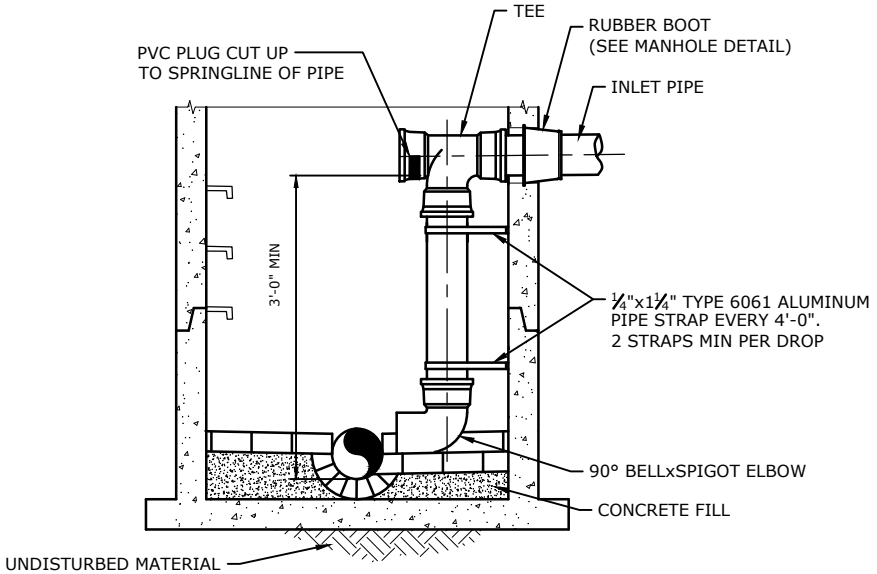


ELEVATION



PLAN

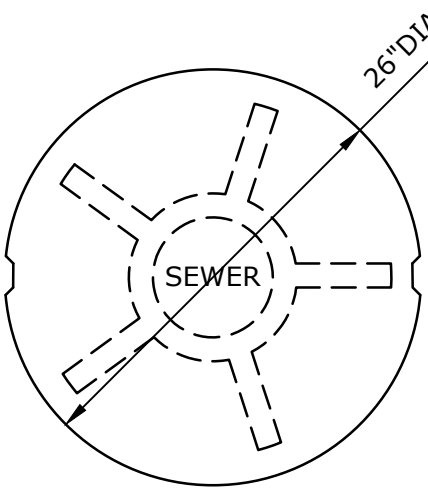
NOTES:
1. RISER PIPE AND FITTINGS SHALL BE THE SAME DIAMETER AS THE INLET PIPE AND SHALL BE CONSTRUCTED OF SDR35 PVC PIPE.
2. INTERIOR MANHOLE CHIMNEYS SHALL ONLY BE INSTALLED IN 60" DIAMETER OR LARGER MANHOLES. SEE MANHOLE DETAIL FOR FURTHER INFORMATION.
3. INTERIOR CHIMNEYS SHALL ONLY BE USED FOR PIPES LESS THAN 12" IN DIAMETER.
4. INSTALL CHIMNEY WHEN VERTICAL DROP IS 3'-0" OR MORE.

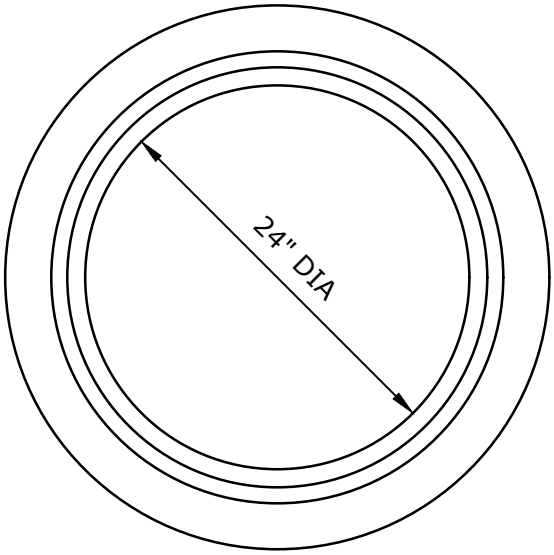


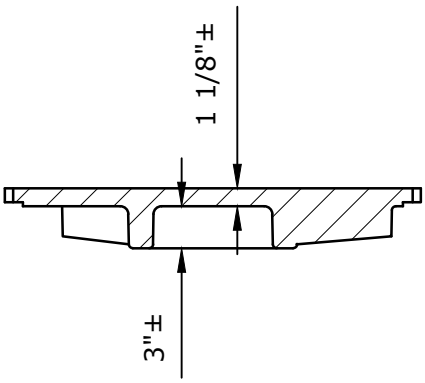
SECTION A-A

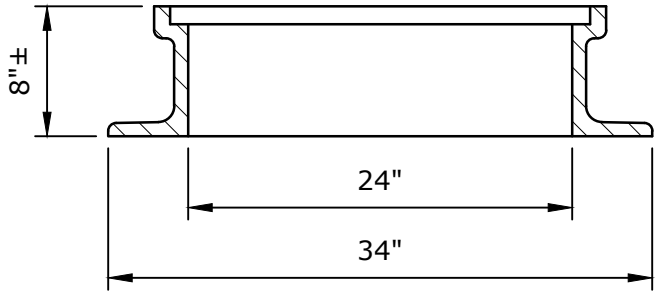
6. INTERIOR MANHOLE CHIMNEY

WEBSTER SEWER DEPARTMENT









STANDARD MANHOLE COVER

MINIMUM WEIGHT: 200 LBS.

STANDARD MANHOLE FRAME

MINIMUM WEIGHT: 240 LBS.

NOTES:

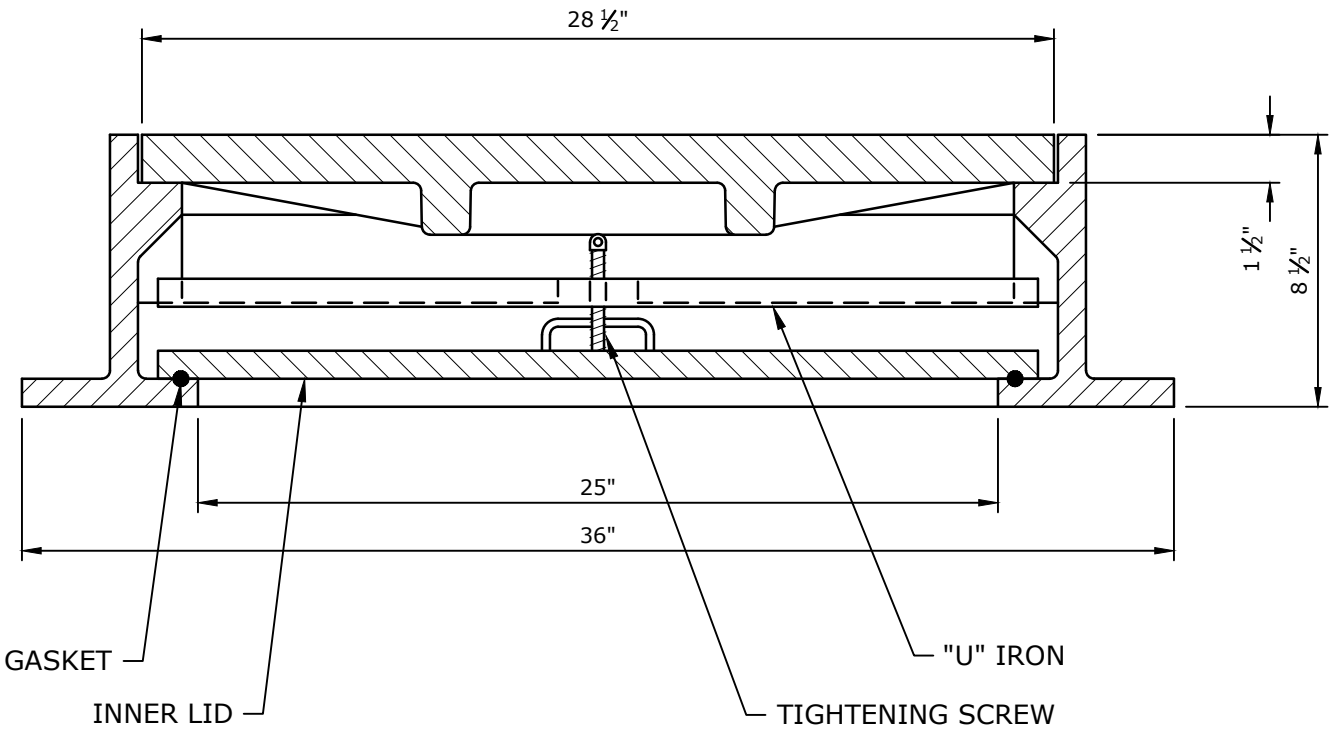
1. FRAME AND COVER SHALL BE PROVIDED FROM THE SAME MANUFACTURER.
2. THE WORD "SEWER" SHALL BE CAST INTO THE COVERS.

MANHOLE FRAME & COVER

NO SCALE

7. MANHOLE FRAME AND COVER

WEBSTER SEWER DEPARTMENT



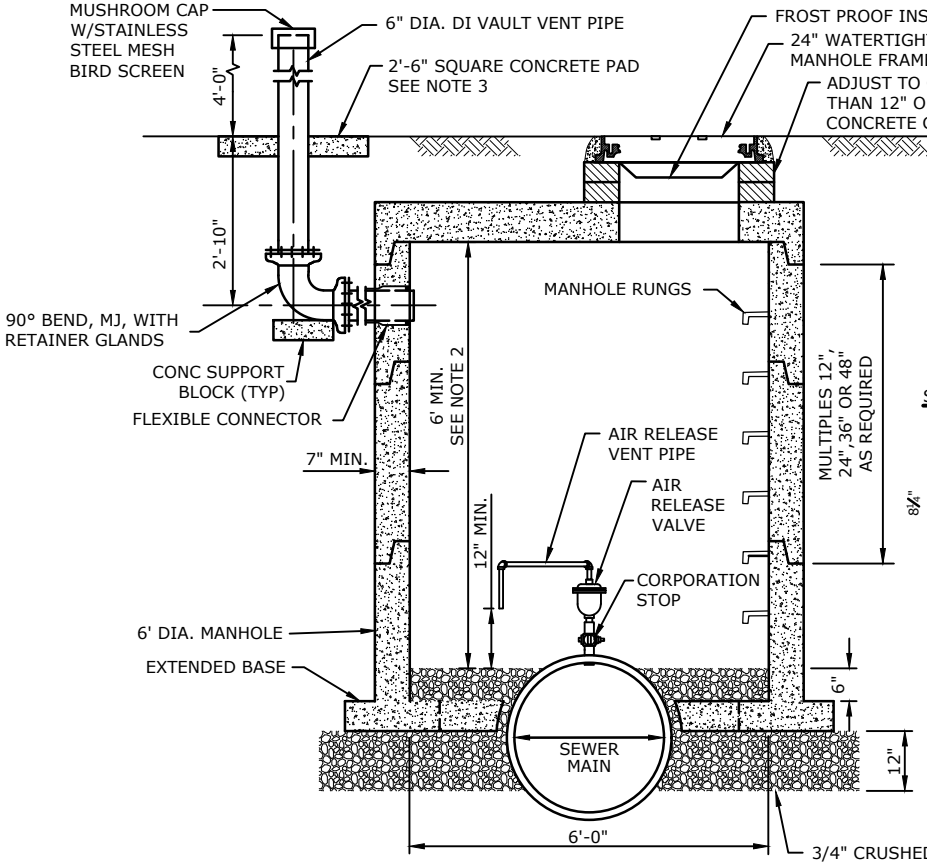
TOTAL WEIGHT: 570 LBS.

NOTE:
DIMENSIONS ARE APPROXIMATE.

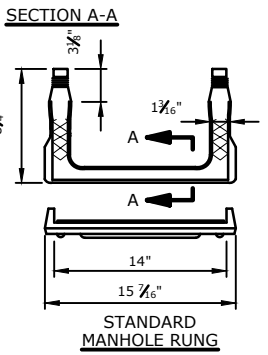
WATERTIGHT MANHOLE FRAME & COVER

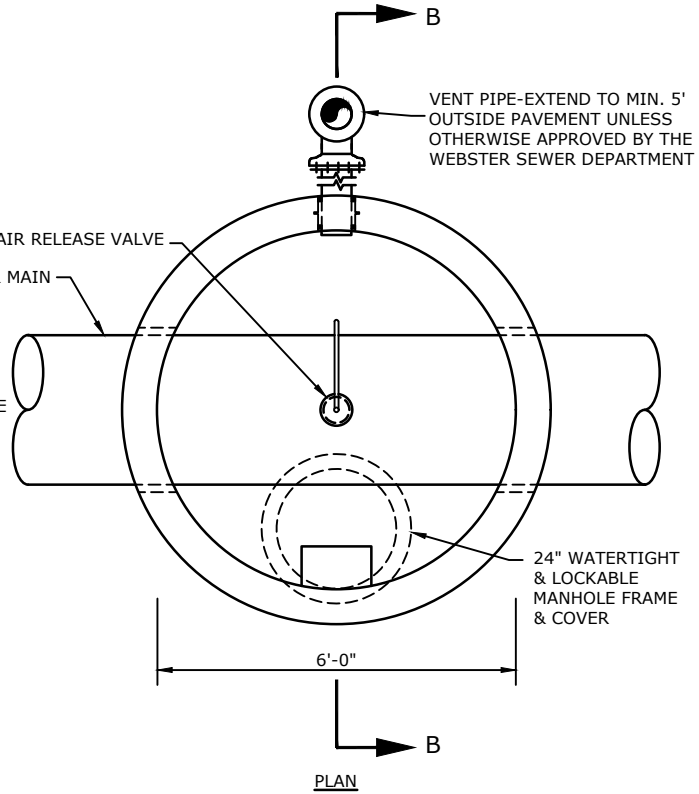
NO SCALE

8. WATERTIGHT MANHOLE FRAME AND COVER
WEBSTER SEWER DEPARTMENT



SECTION B-B





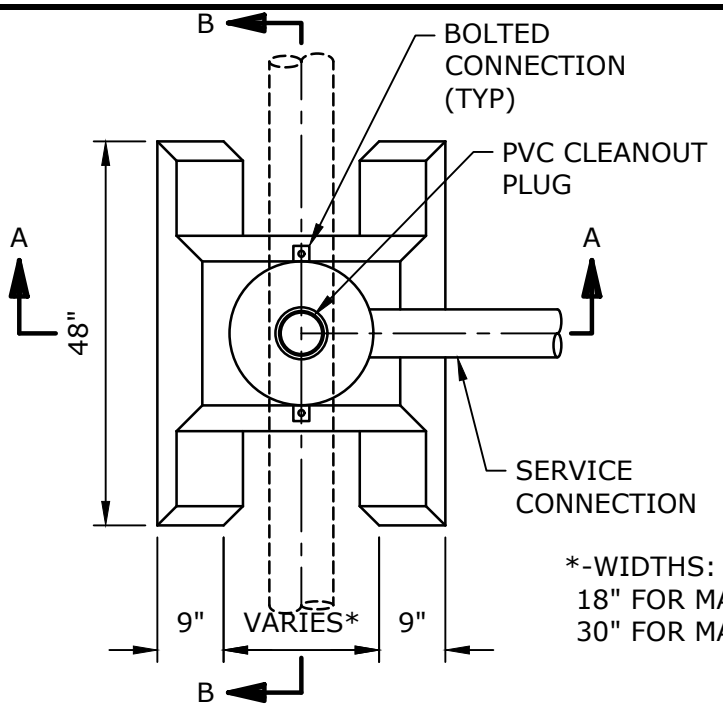
PLAN

NOTES:

1. VAULT VENT PIPE SHALL BE LOCATED OFF ROADWAY AS DIRECTED BY THE WEBSTER SEWER DEPARTMENT.
2. COORDINATE DEPTH OF STRUCTURE PER FIELD CONDITIONS AND AS DIRECTED BY THE WEBSTER SEWER DEPARTMENT.
3. CONCRETE FOR PAD SHALL BE IN ACCORDANCE WITH SECTION M4 OF MASSDOT'S STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, LATEST EDITION, AND SHALL HAVE A COMPRESSIVE STRENGTH OF 4,000 PSI AND # 4 AT 12" OC REINFORCING BARS.
4. COORDINATE AIR RELEASE VENT PIPE, SIZE, MATERIAL, AND ORIENTATION WITH THE WEBSTER SEWER DEPARTMENT.

9. AIR RELEASE VALVE STRUCTURE

WEBSTER SEWER DEPARTMENT

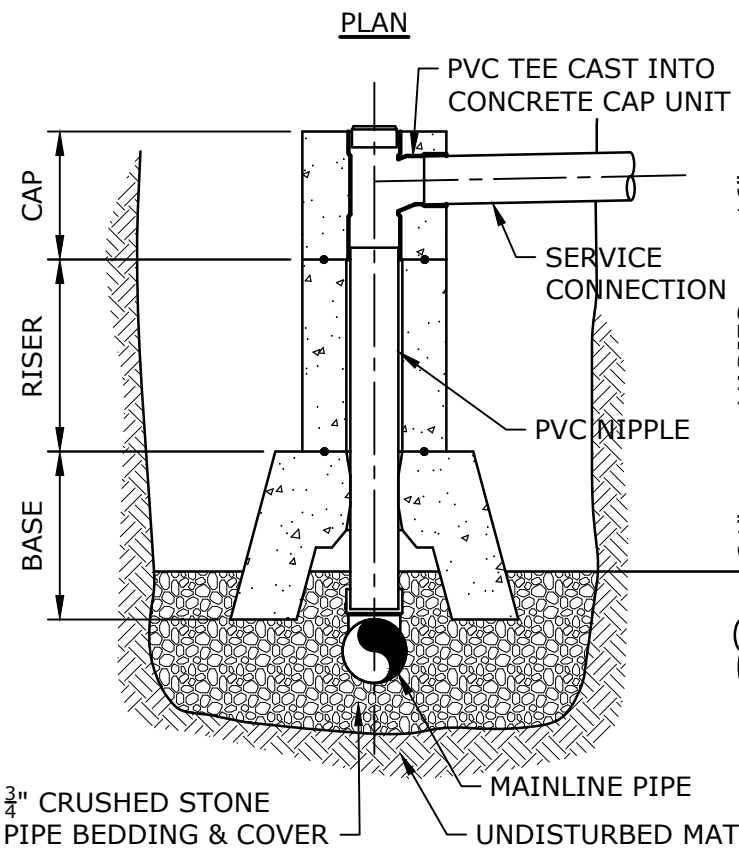


PLAN

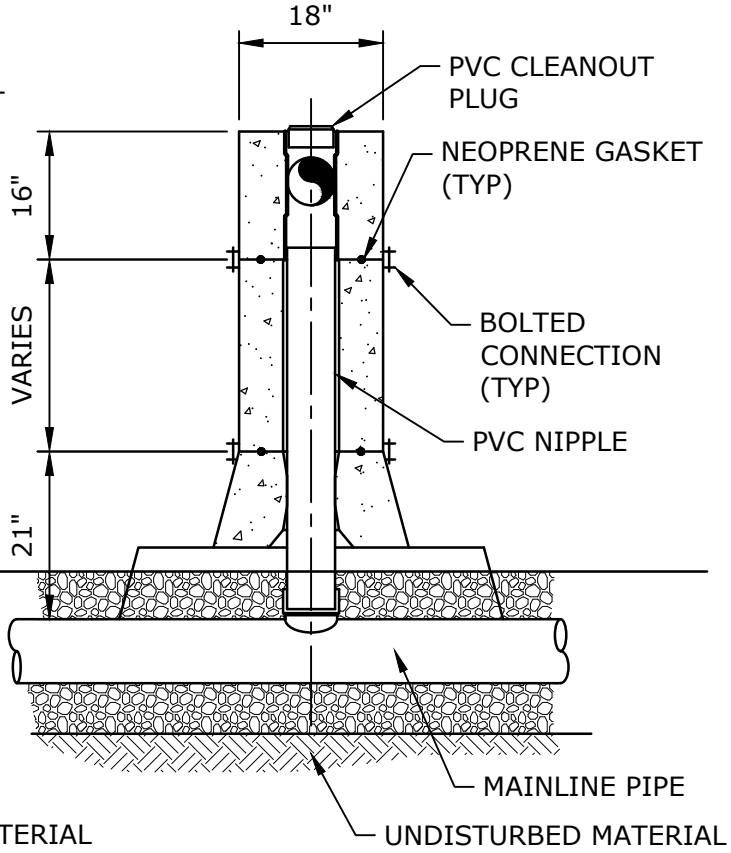
NOTES:

1. CONCRETE STRENGTH SHALL BE 5000 PSI AT 28 DAYS.
2. REINFORCING STEEL PER ASTM A615.
3. FILL VOID BETWEEN PIPE AND CHIMNEY WITH BEDDING MATERIAL.
4. THE SERVICE CHIMNEY SHALL TRANSFER LOADS AT THE TOP OF THE CAP AWAY FROM THE MAINLINE PIPE.
5. SERVICE CHIMNEYS SHALL ONLY BE USED AT THOSE LOCATIONS APPROVED BY THE WEBSTER SEWER DEPARTMENT.

*-WIDTHS:
18" FOR MAINLINE PIPE THRU 15" DIA
30" FOR MAINLINE PIPE >30" DIA

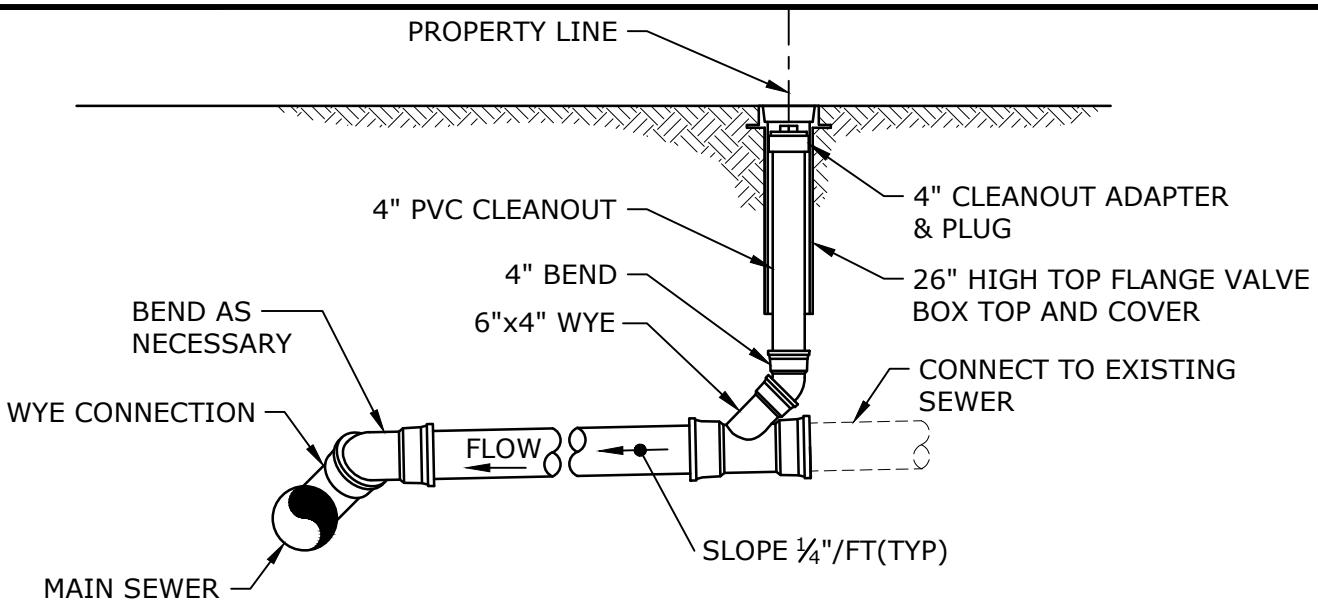


SECTION A-A

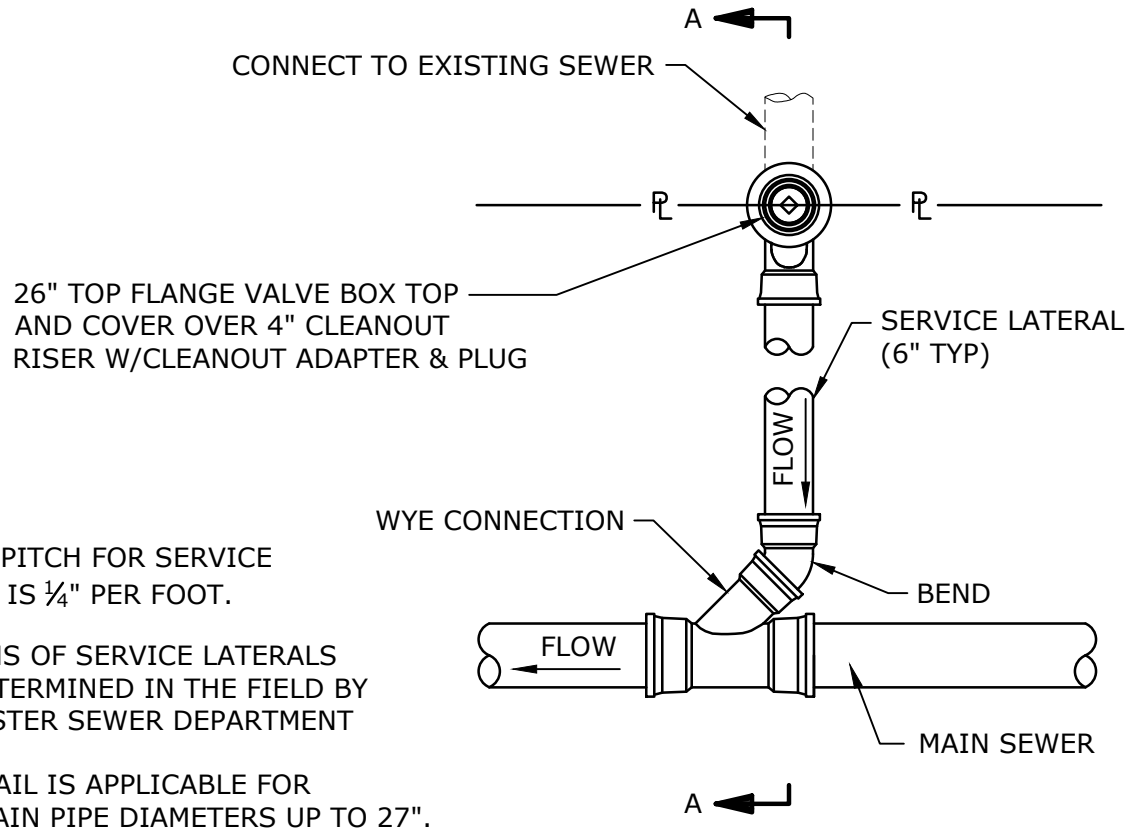


SECTION B-B

10. SEWER SERVICE CHIMNEY
WEBSTER SEWER DEPARTMENT



SECTION A-A



PLAN

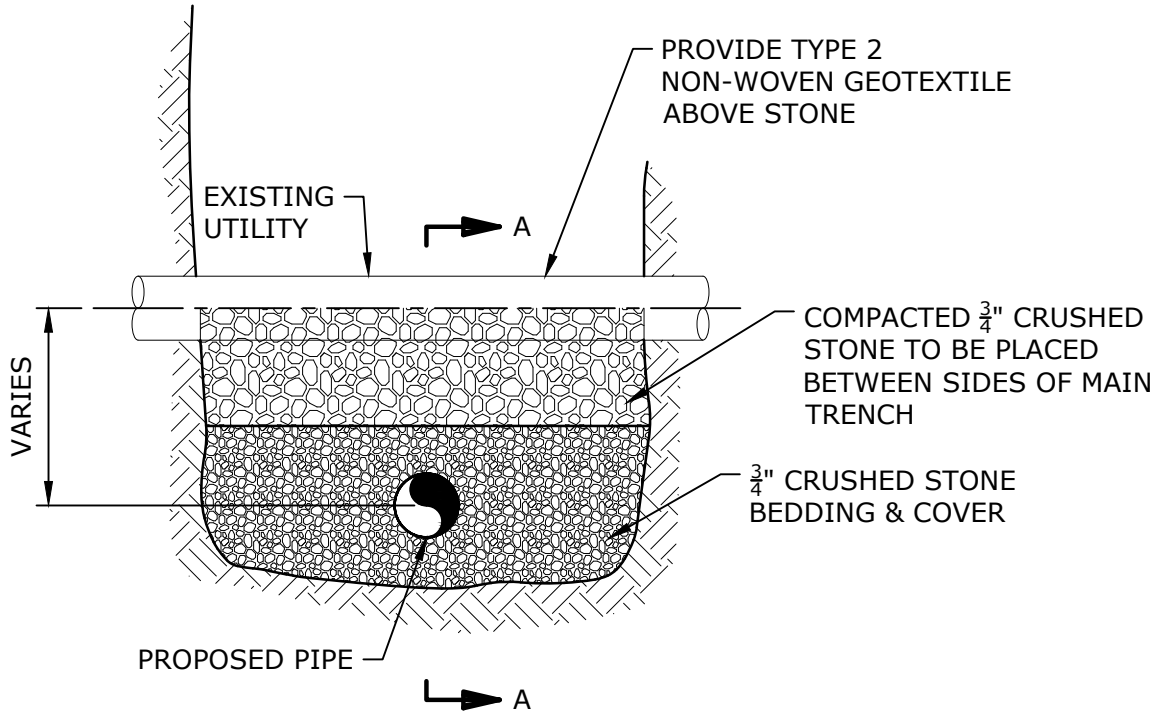
NOTES:

1. MINIMUM PITCH FOR SERVICE LATERALS IS ¼" PER FOOT.
2. LOCATIONS OF SERVICE LATERALS TO BE DETERMINED IN THE FIELD BY THE WEBSTER SEWER DEPARTMENT
3. THIS DETAIL IS APPLICABLE FOR SEWER MAIN PIPE DIAMETERS UP TO 27". FOR LARGER PIPE THE CONTRACTOR SHALL PROVIDE 6" CONNECTION WITH SADDLE AND TAP.

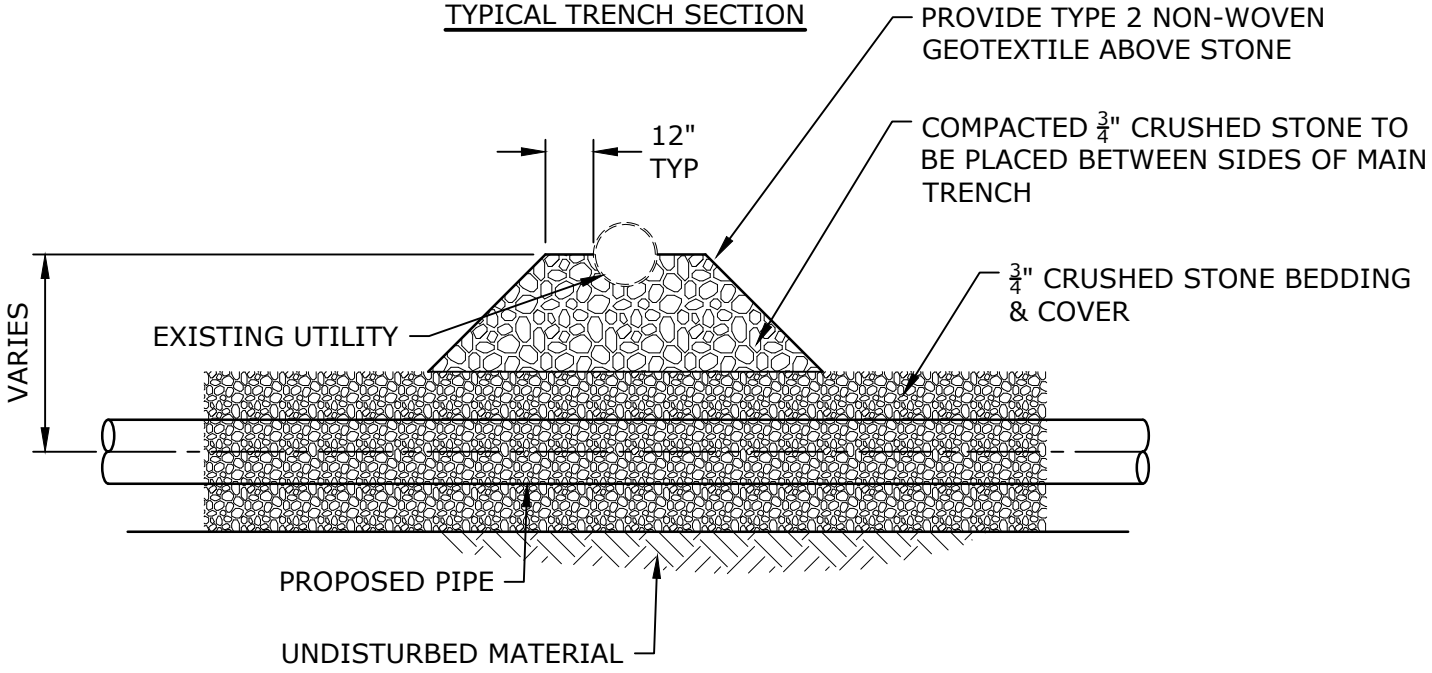
SANITARY SERVICE LATERAL WITH CLEANOUT

NO SCALE

11. SEWER SERVICE LATERAL CONNECTION WITH CLEANOUT
WEBSTER SEWER DEPARTMENT



TYPICAL TRENCH SECTION



SECTION A-A

NOTES:

1. THIS UTILITY CROSSING DETAIL IS FOR UTILITIES THAT ARE LESS THAN OR EQUAL TO 2 FEET APART VERTICALLY, BUT MAY ALSO BE USED WHERE DIRECTED/APPROVED BY THE WEBSTER SEWER DEPARTMENT.

2. IF SEWER MAIN IS TO CROSS OVER AN EXISTING WATER MAIN, SEE WEBSTER WATER DEPARTMENT DETAIL FOR WATER MAIN CROSSING EXISTING SEWER MAINS.

12. UTILITY CROSSING DETAIL
WEBSTER SEWER DEPARTMENT