



**TOWN OF ALPINE, WYOMING
RESOLUTION 2025-012**

**A RESOLUTION ESTABLISHING DESIGN AND CONSTRUCTION STANDARDS FOR
SEWER LINES, AND WATER LINES WITHIN THE TOWN OF ALPINE, WYOMING**

WHEREAS, the Town of Alpine, Wyoming has the authority to set design and construction standards for water lines, sewer lines and streets within the Town of Alpine to ensure and maintain the health, safety and general welfare of the residents of the Town of Alpine; and

WHEREAS, the Alpine Town Council has determined to establish the minimum design and construction standards for all phases of sewer line and water line construction installation within the Town for the purpose of ensuring proper, correct, and safe construction of all phases of sewer line, and water line construction within the Town and to ensure and maintain the health, safety and general welfare of the residents of the Town; and

WHEREAS, the Alpine Town Council desires to adopt Water and Sewer Design and Construction Standards as outlined in the attached document; and

NOW, THEREFORE, BE IT RESOLVED by the Town Council of the Town of Alpine, Wyoming, that:

The construction standards set out in the Town of Alpine Water and Sewer Design and Construction Standards Policy are hereby incorporated into the Town of Alpine Policy and Procedure Manual.

This resolution shall take effect immediately upon adoption.

PASSED, APPROVED AND ADOPTED this 9th day of April 2025.

Vote: _____ Yes, _____ No, _____ Absent, _____ Abstain.

SIGNED:

ERIC GREEN, MAYOR OF ALPINE

ATTEST:

MONICA L. CHENAULT, CLERK/TREASURER



7/1/2024

Water and Sewer

Design and Construction Standards

Alpine, Wyoming



Town of Alpine, Wyoming
Design and Construction Standards
July 2024

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1.0 General

1.1 Purpose

The purposes for establishing minimum design and construction standards for all phases of sewer line, water line and street construction within the Town are for the purpose of ensuring proper, correct, and safe construction of all phases of sewer line, water line, and street construction within the Town and to ensure and maintain the health, safety and general welfare of the residents of the Town.

1.2. Abbreviations

As used in this chapter, the following abbreviations apply:

- a. AASHTO - American Association of State Highway and Transportation Officials
- b. AML - The Town's Approved Materials List for water and sewer
- c. ASTM - American Society for Testing and Materials
- d. AWWA - American Water Works Association
- e. DSC- Deep Service Connection
- f. mg/l - milligrams per liter (*approximately the same as parts per million*)
- g. OSHA - Occupational Safety and Health Administration
- h. psi - pounds per square inch pressure (*In these standards it refers to gauge pressure which sets atmospheric pressure at zero.*)
- i. PVC - polyvinyl chloride
- j. SDR - Standard Dimension Ratio. The outside diameter of a pipe divided by the wall thickness. It is the same mathematical definition as "dimension ratio" (DR).
- k. AML - Town's Approved Materials List (*provides a list of requirements and specific materials to be used during installation.*)

1.3. Contractor

"Contractor," as used in this chapter, means whoever is in responsible charge for the construction.

1.4. Reference to Standard Specifications

When other specifications such as AWWA, ASTM and AASHTO are referred to, the latest revision of these specifications shall apply.

1.5. Standards Adopted

The most current edition of the "Wyoming Public Works Standard Specifications" is hereby adopted by the Town for the purpose of prescribing minimum standards and specifications for all phases of sewer line, water line, and street construction within the Town, a copy of which can be found on the Town's website: www.alpinewy.gov. In cases of conflict of information, the Town of Alpine Design and Construction Standards shall supersede.



1.6. Amendments to Standards

The minimum construction standards for all phases of sewer line, water line and street construction within the Town shall have such amendments, modifications, additions or deletions as the Town Council shall, from time to time, adopt by ordinance.

1.7. Filing of Standards and Amendments

At least one copy of the minimum design and construction standards, and any ordinance providing for amendments, modifications, additions or deletions in such minimum design and construction standards adopted by the Town Council, shall be maintained on file in the office of the Town and available for public inspection during the normal office hours of the Town. One copy of each ordinance providing for amendments, modifications, additions or deletions in such minimum design and construction standard shall be kept with each copy of such minimum design and construction standards and made available for public inspection at the same time as and in the same manner as such minimum design and construction standards.

2. General Requirements

2.1 In-state Contractor Preference

All Wyoming resident contractors involved in public work can apply for certification to receive a 5 percent bid preference when bidding on public work constructions projects.

2.2 Approval of Plans Before Start of Work

No work on a project within the Town limits may begin until the Town has approved the final plans, all required permits received, and all applicable fees satisfied.

2.3 Acceptance of Work

No work shall be accepted by the Town which does not meet the minimum design and construction standards set out in this chapter and/or the most current edition of the Wyoming Public Works Standard Specification. All infrastructure must be installed per appropriate specifications, standards detail drawings, manufacture recommendations and/or any other applicable documents.

2.4 Inspection Requests

At least one business days' notice is required to allow the Town inspector to schedule inspections.

2.5 Completion of Work Before Final Approval

Final approval will not be given until all phases of the work are complete and all applicable fees satisfied.



2.6 Underground Utility Acceptance

All underground utilities shall be completed, tested, and accepted before installation of surface improvements.

2.7 As-built Drawings

Upon completion of the project, as-built drawings must be submitted to the Town in a format approved by the Town. The drawings shall include measurements from stationary above-grade objects such as fire hydrants, power poles, pipelines, valves, manholes, and related items to simplify location in the field.

GPS Coordinates

All underground utilities shall collect survey grade (sub foot) GPS coordinates for all infrastructure including, but not limited to: manholes, cleanouts, fire hydrants, water meters, service lines (water and sewer), tees, crosses, etc.; and provide to the Town in a format compatible with the Town's current GIS system as determined by the Town.

Approved Materials List (AML)

All materials used for new water and sewer infrastructure to be owned and operated by the Town must utilize materials from the AML. Any deviation must be approved by the Town.

2.8 Frozen Ground Conditions

Because of frozen ground conditions, connections to the public water supply system, connections to the public sanitary sewer system, and all trench excavation and backfill operations on any public street or alley are prohibited in accordance with applicable Town Ordinance(s).

2.9 Safety and Care of Contractor

The contractor shall always safely guard property and utilities involved in construction from injury or loss. They shall always safely guard and protect their own work, and that of adjacent property, from damage. The contractor shall replace or make good any damage, loss or injury incurred during construction.

Pre-Site Recordings

For any projects that will disturb existing landscape or hardscapes, the contractor shall record preconstruction site conditions of the entire project boundaries and submit to the Town in a format approved by the Town. At the completion of the project, site conditions will be restored to at, or above preconstruction conditions as approved by the Town.



2.10 Guarantee

The Contractor shall guarantee the work against defective material and workmanship for a period of one year from the date of completion of the contract and/or of the work by the Town and filing of Notice of Substantial Completion. The Town may conduct a warranty inspection at any time during the warranty period and produce a punch list of defective items. When defective materials and/or workmanship are discovered, which requires repairs to be made under this guarantee, all such work shall be done by the Contractor at their sole expense and shall begin within five working days after written notice of such defects have been given by the Town. Should the Contractor fail to repair such defective materials or workmanship within five working days thereafter, the Town may cause the necessary repairs to be made and charge the Contractor with the actual cost of all labor, materials, and administrative costs incurred.

In emergencies demanding immediate attention, the Town shall have the right to repair the defects and charge the Contractor with the actual cost of the of all labor, materials, and administrative costs incurred.

3. **Sanitary Sewers**

Sanitary sewers are for sewage flow only. Discharge of sump pumps, water runoff from buildings and surfaces or connections other than explicitly designed to convey sewage flow is not permitted.

Design

The recommendations that follow are for preliminary design of interceptors, trunk sewers, force mains, and pumping stations.

Trunk and Interceptor Sewers

Trunk sewers and interceptors shall be designed with sufficient capacity to carry the peak flows from the ultimate development of the tributary area.

Sewer mains shall be designed to maintain a minimum velocity of 2 feet per second, which is generally considered to be the minimum which will keep pipe surfaces relatively free of deposited material. The following table presents the minimum allowable slope of various sizes of sewers to obtain a cleaning velocity under average flow conditions. Minimum slopes are not acceptable for all sewers. Sewers with low flow rates should have increased slopes or they may become maintenance problems due to deposition of solids.



MINIMUM PIPE SLOPES	
Pipe Size (inches)	Slope* (feet/foot)
8-dead end**	0.0075
8	0.0050
10	0.0028
12	0.0022
15	0.0015
* Minimum slope for various sized sewer pipe necessary to maintain a cleansing velocity of 2 fps, at full pipe conditions.	
** For a new sewer line that is going to a dead end, the minimum slope is increased	

3.1 Materials

Rubber gasket-type fittings manufactured by the pipe supplier shall be used on sanitary sewers.

3.2 Pipe Material

Sewer pipe for gravity lines may be of any of the following materials unless otherwise specified by the Town. The minimum diameter for gravity sewer mains shall be eight inches.

PVC sewer pipe

Polyvinyl chloride plastic sewer pipe shall be made specifically for the conveyance of sanitary sewerage and other liquids by gravity or pressure. Gravity sewer pipe shall meet the requirements of ASTM D 3034 and shall have a minimum of an SDR of 35 and colored green. All pipe shall have elastomeric gasket-type joints.

Ductile iron pipe (Force Mains)

Ductile iron pipe for sanitary sewers shall conform to AWWA C 151 for casting requirements and AWWA C 150 for thickness design. The pipe shall be bituminous coated. Pipe connections shall be bell and spigot with rubber rings or mechanical joint.

HDPE (Force Mains)

High-Density Polyethylene pipe for sanitary sewers shall conform to AWWA C901/906 for requirements.

3.3 Depth of Cover

Minimum depth of cover shall be six feet from top of pipe to finish grade for sanitary sewer lines. Anything less requires Town Engineer approval.



3.4 Trench Preparation

Trenches for sanitary sewers shall be constructed to line and grade. Where rock or hard pan is encountered, place four inches of one-inch-minus granular material below the pipe. The bottom of the trench shall be of stable material. Where groundwater is encountered, the bottom shall be stabilized with granular material of one-inch maximum particle size. Bell holes shall be excavated at each joint so that the bell hangs free, allowing the barrel of the pipe to rest on the bottom of the trench.

3.5 Laying Pipe

- a. Inspect all pipe and fittings prior to lowering into trench to ensure no damaged or defective materials are being used. Clean ends of pipe thoroughly and remove any foreign matter. Avoid any physical damage to the pipe. Remove all damaged pipe from the job site.
- b. Pipe shall be laid true to line and grade. Pipe-laying shall proceed upgrade with spigot ends pointing in direction of flow. Clean the inside of the joint immediately before joining the pipe. Install pipe in accordance with the manufacturer's recommendations for the type of pipe being used.
- c. After the joint has been made, check pipe for alignment and grade. The trench bottom shall form a continuous and uniform bearing and support for the pipe between joints. Place sufficient pipe zone material to secure the pipe from movement before the next joint is installed. At all times, when laying operations are not in progress, close and block the open end of the last section. Plug or close off any open connection with temporary plugs.

Location

In general, local trunk and interceptor sewers will be located in existing street rights-of-way or in proposed street areas. Certain sewers will have to be located on easements following natural drainage courses. The location of the sewer lines in relation to other utilities must also be considered. There may be some conflict in final sewer locations due to interference with water mains, drains and electrical conduits. In most cases, however, sewer lines would pass beneath the other utilities. Sewer mains shall be at least ten (10) horizontal feet from any existing or proposed potable water facilities.



3.6 Water Line Crossings

Where sanitary sewer lines cross water lines, and the sewer pipe is above the water main or less than 18 inches clear distance vertically below the water main, construct the crossing by the following method:

- a. Replace existing sewer with a twenty-foot length of SDR 21 PVC pipe centered on the intersection with the pipe installed in a casing/sleeve pipe.
- b. Maintain ten-foot clear distance between any joint in the sewer line and any joint in the water line.
- c. Use approved adaptors for joints between the replaced pipe and the existing sewer pipe.
- d. Place flowable backfill material around water pipe and up to the spring line of the sewer pipe.

3.7 Services

Sewer services shall use pipe with a minimum diameter of four inches. The service materials shall be a minimum of PVC SDR 35. No main line taps over four inches shall be permitted. Larger taps shall require a manhole and the service shall be considered a main line covered by applicable specifications. All service extensions from new mains shall be made from a service saddle.

3.7.1 Sewer Service Termination

All related sewer connections to the structure being demolished shall be sealed in a manner to prevent accidental or intentional infiltration or seepage of ground- or surface water or placement of other foreign matter into the Town's sewer system. The adequacy of the sealing method shall be determined by the Town's Public Works Director or their designer.



3.8 Manholes

3.8.1 Materials

Manhole materials shall be as follows:

- a. Base. Precast or poured in place.
- b. Concrete, 3,000 psi minimum.
- c. Reinforcement, Grade 40 ASTM A 615.
- d. Barrel and cone. ASTM C-478. Cone to be eccentric.
- e. Steps. Provide OSHA-approved steps on manholes three feet and deeper.
- f. Frame and lid. Heavy-duty cast iron designed for traffic. Minimum weight of lid shall be 160 pounds. The lid shall make 100% contact with the frame and shall have "sewer" cast in the top in raised letters. There shall be no vent holes in the lid.
- g. Seal. All connections between wall sections shall be joined in such a manner to ensure it is watertight as approved by the Town's Engineer.

3.8.2 Installation

- a. In-line manholes shall be constructed a maximum of 400 feet apart. Wherever the sewer line changes horizontal or vertical alignment, pipe size or material, a manhole shall be constructed at the connection. Sewer extensions more than 300 feet from a manhole, or any other extensions as directed by the Town Engineer, shall end in a manhole.
- b. The base shall be placed on a six-inch minimum layer of three-fourths - inch-minus gravel. The floor shall be shaped to drain into the manhole invert. The manhole invert shall be constructed with a smooth transition and with no sharp edges or rough sections which tend to obstruct flow.

3.8.3 Testing

The manholes shall be hydrostatically tested by the exfiltration method. A maximum leakage of 0.2 gallon per hour per foot of head above the invert will be allowed.

3.9 Cleanouts

3.9.1 Materials

Cleanout materials shall be of the same size and material as the pipe it is connected to.

3.9.2 Installation

A double sweep cleanout shall be installed at the property line, a maximum of 3 feet from the building and every 75 feet for service lines in excess of that length, and at all bends in excess of 30° regardless of service line length.



3.9.3 At Sewer Terminus

Any extension shall end in a manhole. A concrete collar is required in any installation in travel ways. Mains shall be extended to the furthest boundary of the Developer's property to allow for future extension by others, unless a more limited extension is approved by the Town.

3.10 Testing

It is understood that each installation may vary based on field conditions. The procedures below must be completed in the presence of the Town's assigned representative. Any deviation from these procedures must be approved by the Town representative.

Note: Until the procedures described below have been completed and approved by Town, the new sewer system shall not be permitted to discharge into the existing system. Appropriate means, as approved by the Town, shall be installed to ensure this.

After installation and prior to acceptance by Town, the following is to be completed:

- a. Flushing/Cleaning Utilizing a high-pressure vacuum jetter,
- b. All new appurtenances must be cleaned, and
- c. All debris and excessive water removed.

Leakage/Pressure

Testing Plugs used to close the pipe for the air test must be securely braced to prevent the unintentional release of a plug, which can become a high velocity projectile. Gauges, air piping manifold, and valves shall be located at the top of the ground. No one shall be permitted to enter a manhole where a plugged pipe is under pressure. Air testing apparatus shall be equipped with a pressure release device, such as a rupture disk or a pressure relief valve, designed to activate when the pressure in the pipe exceeds 2 psig above the required test pressure. Air shall be slowly supplied to the plugged pipe section until the internal air pressure reaches 4 psig. Wait at least 2 minutes to allow for pressure and temperature stabilization to occur within the pipe. When the pressure decreases to 3.5 psig, the air pressure test shall begin. The pipe shall be considered acceptable if no pressure drop is noted for the duration of the test. The test shall be conducted on no more than 400 feet of pipe tested for 15 minutes.

Television Inspection/Sag Allowance

All newly installed lines must be televised with a camera suited for pipeline inspection. A copy of the inspection is to be provided to the Town on a format approved by the Town. The camera must be able to clearly assess the condition of the main and record and display slope/grade of the pipe. Prior to televising the pipeline, enough contrasting dye must be poured into the pipeline. The camera inspection must utilize a method, as approved by the



Town, to determine sag in the pipe. 1/32" per inch of pipe diameter, with a maximum sag of 1/2" is acceptable. Any sag greater than this is considered a failure and requires that section, and any other affected section(s) of main, to be replaced and retested.

3.10.1 Testing Materials

The contractor shall supply all test materials needed.

3.10.2 Equipment

- a. The contractor shall furnish all necessary testing equipment and perform the tests in a manner satisfactory to the Town Engineer. Any arrangement of testing equipment which will provide observable and accurate measurements under the specified conditions will be permitted.
- b. Gauges for air testing shall be calibrated with a standardized test gauge set at the start of each testing day. The calibration shall be witnessed by the Town Engineer.

3.10.3 Time

Testing of sections of the constructed sanitary sewer for final acceptance will not be performed until all service connections, manholes and backfilling are completed between the stations to be tested.

3.10.4 Failures

Any section of line failing any of the required tests shall be repaired or rebuilt at the contractor's expense prior to the Town's acceptance.

3.10.5 Pipe Alignment

Sewer lines shall be laid in straight alignment and on grade between manholes so that when a bright light is placed in the end of the sewer pipe, it can be seen from the adjoining manhole by looking through the sewer pipe.

3.10.6 Deflection

Internal deflection of sanitary sewers shall not exceed 5% of the internal diameter. Testing for excessive deflection will generally be performed on 25% of the sewer lines. If deflections more than 5% are found, all lines may be tested. Sewer lines shall be tested by pulling a "go/no-go" gauge which is 95% of the pipe diameter through the line. If the gauge cannot pass through the line, the line shall be repaired.



3.10.7 Hydrostatic and Air

All sewers, manholes and appurtenances shall successfully pass a hydrostatic or air test prior to acceptance and shall be free of visual defects. Use either method of testing, except that when, because of grade, the hydrostatic head at the downstream manhole would be greater than 20 feet for a hydrostatic test, the air test shall be used.

3.10.8 Infiltration

The contractor shall determine the height of the water table at the time of the test by exploratory holes, as approved by the Town Engineer. When the groundwater table is a minimum of five feet higher than every section of pipe in the test section, the infiltration method may be used. The infiltration rate is determined by plugging the upstream manhole in the test section, and then measuring the flow through the downstream manhole using a weir or other device. The pipe and joints shall sustain a maximum leakage of 0.001 gallon per hour per inch diameter per foot of pipe.

3.10.9 Air

Determine the height of the groundwater over the test section at the time of the test. After all openings in the test section are plugged, introduce air slowly into the pipe. When the pressure in the line is five psi higher than the back pressure due to groundwater (0.433 psi per foot of water above the invert), maintain this pressure for at least two minutes to allow the temperature to stabilize. Then shut off the air supply allowing the pressure to drop. Clock the time required for the pressure to drop from 3.0 to 2.5 psi above the groundwater back pressure. The line shall pass the test if the time required for the 0.5 psi drop is greater than those shown as follows:

TIME REQUIREMENTS FOR AIR TESTING	
Pipe Diameter (inches)	Time (minutes:seconds)
4	2:32
6	3:50
8	5:06
10	6:22
12	7:39
15	9:35
For larger dimensions use: Time in seconds = 38.5 x pipe diameter in inches.	



3.10.10 Subsequent Failure

Infiltration of groundwater in an amount greater than specified in this article following a successful hydrostatic or air test as specified shall be considered as evidence that the original test was in error or that subsequent failure of the pipeline has occurred. The contractor will be required to correct such failures should they occur within the warranty period of one year.

3.11 Grease Traps

Grease trap installation is required in accordance with applicable Town Ordinance(s).

4. **Water**

Water Pressure

Water systems shall be designed to provide an adequate quantity of water at a positive pressure of at least 30 psi under peak hour demand flow conditions, measured at any customer's water meter. For fire flow, the distribution system shall be designed to provide the required fire flow at a residual pressure of 20 psi throughout the system during fire flows under peak hour flow conditions

4.1 Mains

4.1.1 Pipe Materials

Distribution Mains

Distribution water mains shall be in accordance with the Town's approved materials list. The minimum size of water mains shall be eight inches for dead-end mains service fire hydrants or six inches for looped mains or as determined by the Town's Engineer. All pipe connections shall be restrained bell and spigot with restraint rubber rings or mechanical joints.

Transmission Mains

Transmission water mains designed to solely transmit water with no service taps may be PVC or ductile iron. Prior to approval to utilize ductile iron, a soils corrosivity test will be required. Corrosive soil conditions will require non-native backfill material and any other protective means required by the Town's Engineer. The pipe shall conform to AWWA C 150 for thickness design. It shall have cement mortar lining conforming to AWWA C 104 and shall be bituminous coated. Pipe joints shall have ground straps, wedges (three minimum) or metal-tipped gaskets to provide electrical continuity throughout the line. All pipe connections shall be restrained bell and spigot with restraint rubber rings or mechanical joints.



4.2 Depth of Cover

Minimum depth of cover shall be six feet from top of pipe to finish grade for water mains.

4.3 Fittings

Fittings shall conform to AWWA C 110 and be cement mortar lined and restrained.

4.4 Valves

- a. Gate Valves. All gate valves shall conform with AWWA C 515. All exposed gate valves shall include an operating disc or wheel mounted for convenient operation. All buried gate valves shall have a standard two-inch operating nut and open counterclockwise. A two-piece adjustable valve box shall be installed with a cast iron lid with the word "water" cast into the lid and a concrete collar poured around the lid at grade. A mud plug shall be installed in each valve box to reduce debris.
- b. Air Relief Valves (ARV). ARV's shall be installed at peak elevations, crossings over/under bridges, creeks, rivers, etc., on a water main or areas prone to air accumulation or as directed by the Town's Engineer. All piping shall be sloped to permit the escape of any entrained air.

4.5 General Facility Placement

All piping, pumping, source, storage and other facilities shall be in public rights-of-way, dedicated utility easements, or on Town-owned property. Utility easements must be a minimum of 15 feet in width, and piping shall be installed no less than 5 feet from the easement's edge. Unrestricted access shall be provided to all public water system lines and their appurtenances and all public fire hydrants. Where existing utilities or storm drains are in place, new facilities shall conform to these standards as nearly as practicable and still be compatible with the existing installations. Where practical, there shall be at least 5 feet horizontal separation from other utilities. Mains shall be extended to the furthest boundary of the Developer's property to allow for future extension by others, unless a more limited extension is approved by the Town.

4.6 Fire hydrants

Hydrants shall be in accordance with AWWA C 502, with a cast-iron body, suitable for working pressures of 150 pounds per square inch. Hydrants shall be constructed in a manner permitting withdrawal of internal working parts without disturbing the barrel or casing. Hydrants shall be of five-and-one-half inch valve size with a six-inch shoe and six-inch gate valve. Hydrants shall be watertight when the upper portion of the barrel is broken off. The direction of opening shall be left (counterclockwise) and cast on the head of the hydrant. Two two-and-one-half-inch nozzles threaded with National Standard fire hose threads and one four-and-one-half-inch pumper port shall be furnished. The hydrant pump nozzle shall face the street. Hydrant caps shall be securely chained to the barrel. The height of the hydrant shall be 48" from the traffic flange to the operation nut. Hydrants shall



have a red painted steel 48" tall flag attached the hydrant. Hydrants shall be painted one coat of primer and two finishing coats of approved red paint in accordance with the manufacturer's recommendation, subject to the Town Engineer's approval. Any privately owned fire hydrants shall be painted yellow. All fire hydrants shall maintain a minimum 3' of clear space around the hydrant.

4.7 Looping of Water Mains.

All extensions of Town water mains shall be looped, and there shall be no dead-end extensions of mains. Where looping would be impractical, the Town Engineer, in its sole discretion, may grant an exception to this requirement and require a fire hydrant to be installed at the end of a dead end and/or impose any conditions on such exception as the Town Engineer may deem appropriate.

4.8 Layout and Support

All pipe shall be laid and maintained to the required lines and grades. Fire hydrants shall be spaced so that there is at least one hydrant within a three-hundred-foot radius, or as required by local fire code, from any point in the area served. Fittings, valves and other appurtenances shall be at the required locations with joints centered, and all valves and hydrant stem plumb. Temporary support, adequate protection, and maintenance of all underground utilities encountered in the progress of the work will be furnished by the contractor at his own expense. Where the grade or alignment of the pipe is obstructed by existing utility structures, the obstruction shall be permanently supported, relocated or removed by the contractor in cooperation with the owners of the utility structure.

4.9 Laying

Pipe shall be laid directly into the trench bottom containing coupling holes and shaped to provide continuous contact with the pipe between coupling holes. All foreign matter or dirt shall be removed from the interior of the pipe before lowering it into the trench. The pipe shall be kept clean by means approved by the Town Engineer during and after laying. When pipe laying is not in progress, the open ends of the installed pipe shall be closed by approved means to prevent entrance of trench water into the line. Pipe will be joined in accordance with the manufacturer's recommendation, subject to the Town Engineer's approval for the size and type of pipe being used.

4.10 Thrust Restraint

Thrust restraint shall be provided at all changes in direction or as required by the Town Engineer.



4.11 Sanitary Sewer Crossings

Where water lines cross sanitary sewer lines, and the sewer pipe is above the water main or less than 18 inches clear distance vertically below the water main, the crossing shall be constructed by the following method:

Replace the existing sewer with a twenty-foot length of SDR 21 PVC or ductile iron pipe centered on the intersection with the water main. Maintain a ten-foot clear distance between any joint in the sewer line and any joint in the water line. Use approved adaptors for joints between the replaced pipe and the existing sewer pipe. Place flowable backfill around the water pipe and up to the spring line of the sewer pipe. Water and sewer mains shall be placed no less than 10 feet apart horizontally.

4.12 Services

4.12.1 Materials.

Water-service materials shall be HDPE for sizes 2" and smaller and utilize compression style fittings installed with a tracer wire and appropriate grounding.

- a. Water services larger than 2" may be PVC C-900 or ductile iron. Three-inch water services are not permitted. If a three-inch water meter is to be used, a concentric reducer shall be installed.
- b. Tap. All taps require a hot top method if the water main is active and a tapping saddle.
- c. Corporation stops. Corporation stops shall be bronze or red brass threaded in accordance with AWWA C 800.
- d. Curb stops. Curb stops shall be bronze with compression fittings. Curb stops shall be installed in an adjustable curb box with a stationary rod.

4.12.2 Installation

When tapping a line, the drill shavings shall be prevented from entering the main line. The curb stop box lid shall be installed within 1/4 inch of finished grade.

4.12.3 Water Meters

All water must be metered by Town owned and issued meters. Temporary meters may be installed by the Town for temporary construction purposes.

4.12.4 Installation shall be in accordance with the Town Standard Drawings.



- 4.12.5 Service line sizes shall be 1", 2", 4", 6", or 8", depending on water demand.
- Any branched service lines must include a shut off and metered separately.
 - Domestic water service taps are prohibited on any line primarily designed to service fire sprinkler systems and/or fire hydrants.
 - Manifolding, combining, or connecting several smaller meters to meet a flow demand that could be provided by a single larger meter is not allowed.
 - Water service taps shall have a minimum three (3) feet separation between taps. Water meter type shall be determined by the Town based on application.
 - Water meters are to be supplied and installed by Town staff only after payment and completion of all requirements set forth by the Town.
 - Meter pits should be always installed in areas accessible. They should not be in driveways, sidewalks, manmade or natural drainage channels, retention basins, etc. and should be placed in the right-of-way.
 - In the case where a meter must be relocated, it may be relocated a maximum of five (5) feet from the original location. If the location is greater than five (5) feet, the service line must be severed at the corporation stop and a new service line installed.

4.12.6 Fire Lines

A dedicated fire line must be installed when required by the Fire Marshal or local building codes.

- All new installations of water service and remodeling requiring a building permit within the areas served by the municipal water system of the Town shall require the installation of a backflow prevention device approved by the Town. The device is to be obtained at the time a building permit is issued and is to be installed at the expense of the Owner. The installation must pass inspection by the Town and is subject to periodic inspection by the Town. All required maintenance and repair of an installed device will be the responsibility of the Owner.
- At the time of installation of any backflow prevention device as required by this section, a pressure relief valve and/or an expansion tank also must be installed. The device is to be obtained at the time a building permit is issued and is to be installed at the expense of the customer. All required maintenance and repair of a pressure relief valve will be the responsibility of the customer.
- All new installations of water service and remodeling requiring a building permit within the areas served by the municipal water system of the Town shall require the installation of a water meter, which meter must be purchased from the Town. The device is to be obtained at the time a building permit is issued and is to be installed at the expense of the customer. All new water services shall have the related water meter installed in a pit located on the subject property. All expenses associated with the installation, including but not limited to cost of



water meter, labor, materials and equipment, shall be at the expense of the Owner. The installation must pass inspection by the Town and is subject to periodic inspection by the Town.

- d. The backflow prevention device and water meter must be installed in such a way as to prevent freezing and to provide access for periodic inspection and maintenance.

4.12.7 Yard Hydrants

All yard hydrants shall have an approved backflow prevention device placed between the yard hydrant and the Town water service. Existing yard hydrants not having such approved backflow prevention device shall be retrofitted with such a device or removed at the direction of the Town at the property owner's expense. A failure to remove a noncompliant existing yard hydrant after direction by the Town may result in water service being shut off by the Town. The Town shall approve any backflow device used in all water systems.

4.12.8 Disconnect

All related water connections to the structure being demolished shall be sealed in a manner so as to prevent accidental or intentional infiltration or seepage of ground- or surface water or placement of other foreign matter into the Town's water system. The adequacy of the sealing method shall be determined by the Town.

4.12.9 New Water Main Chlorination, Flushing, Pressure/Leak Testing, Sampling and Tie-In

It is understood that each installation may vary based on field conditions. The procedures below must be completed in the presence of the Town's assigned representative. Any deviation from these procedures must be approved by the Town.

Note: Until the procedures described below have been completed, the new water main must be considered contaminated and maintain a physical separation from the existing water system. A temporary connection to the water system through an approved meter and backflow prevention assembly is allowed only during filling and flushing activities.

After approval by the Town and final tie into the existing water system, all new infrastructure is to be operated by Town staff only.



Chlorination

Calcium hypochlorite granules with ~65 percent available chlorine by weight shall be used for chlorination. During construction, calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft intervals. The quantity of granules placed at these intervals shall be as shown below.

CALCIUM HYPOCHLORITE GRANULES TO BE PLACED INSIDE NEW WATER MAIN AT SPECIFIED LOCATIONS	
Pipe Diameter (inches)	Calcium Hypochlorite Granules (oz)
4	1.7
6	3.8
8	6.7
10	10.5
12	15.1
For larger dimensions use: Time in seconds = 38.5 x pipe diameter in inches.	

Filling and Chlorine Contact

When installation has been completed, the main shall be filled with water at a rate to ensure that the water within the main will flow at a velocity no greater than 1 ft/sec (0.3 m/sec) (See Table Below)*. Precautions shall be taken to ensure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hr. If the water temperature is less than 41°F (5°C), the water shall remain in the pipe for at least 48 hr. Water used to fill the new main shall be supplied through a temporary meter connection that shall include an appropriate cross-connection control device to be supplied by the district upon payment of all prevailing fees. A detectable free chlorine residual (>0.2 mg/L) shall be found at each sampling point after the 24-hr or 48hr period.

**A special pipeline pig shall be used when the required flushing velocity cannot be achieved or when needed to conserve water.*

1 ft/sec FLUSHING VELOCITY	
Pipe Diameter (inches)	Gallons per Minute (GPM)
2	10
4	39
6	88
8	157
10	245
12	353



Hydrostatic Pressure Test/Leakage Test

After the chlorine contact time is completed and prior to flushing, a pressure test and leakage test are conducted concurrently. The temporary meter connection and backflow device are to be disconnected during the test.

All new infrastructure installed shall successfully pass a pressure test of 1.25 times the stated anticipated maximum sustained working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times the stated sustained working pressure at the lowest elevation of the test section. The minimum test duration shall be two (2) hours.

New infrastructure shall not exceed allowable leakage determined using the following formula:

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

Where:

L	Allowable leakage (GPM)	S	Length of pipe in (feet)
D	Nominal pipe diameter (inches)	P	Average test pressure (psi)

Flushing

Heavily chlorinated water must be neutralized to a level so as not to cause harm or damage to the environment. Flushing shall take place until chlorine measurements show that the concentration of the water leaving the new water main is no higher than that generally prevailing in the distribution system or that is acceptable for domestic use.

Bacteriological Testing

After flushing and before the new water main is connected to the distribution system, acceptable samples shall be collected from the new main following one of two options:

- Option A: Before approving a main for release, take an initial set of samples and then resample again after a minimum of 16 hr. Both sets of samples must pass for the main to be approved for release.
- Option B: Before approving a main for release, let it sit for a minimum of 16hr without any water use. Then collect samples without flushing the main, two sets of samples a minimum of 15 min apart while the sampling taps are left running. Both sets of samples must pass the main to be approved for release.



The number of samples shall be representative of the new infrastructure installed and at minimum be collected at/from:

- every 1,200 ft of new water main
- end of the of the new water main
- each branch

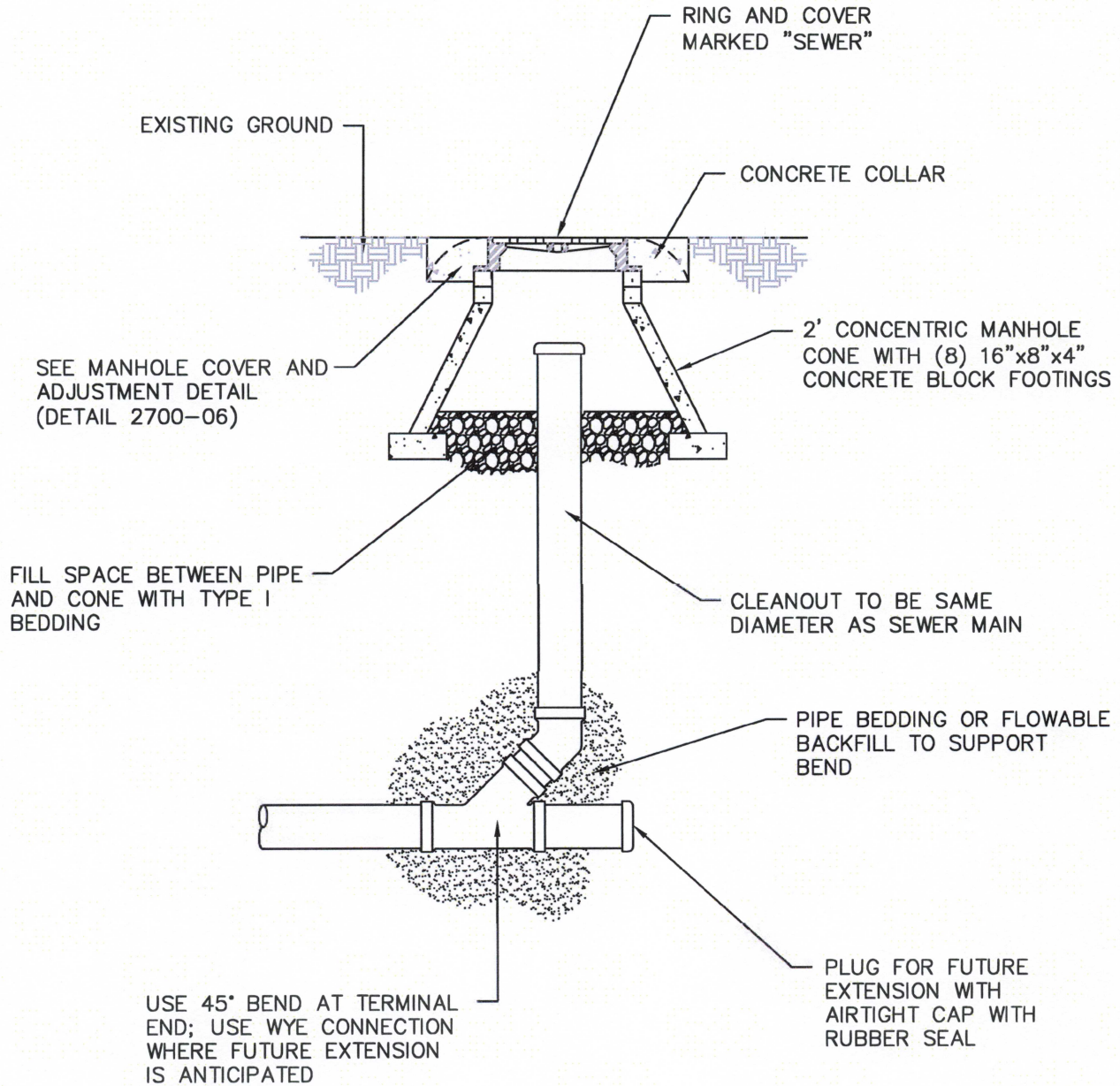
Sample collection and lab analysis is performed by the Town and its designated lab or under the direction and approval of the Town.

Final Connections to Existing Main, Flush and Bacteriological Sample

- Final pipe connections from the new water main to the existing water main shall be one pipe length, 20ft, or less. All pipe, fittings, valves, etc. are to be spray disinfected or swabbed with a minimum 1-5% solution of chlorine just prior to being installed.
- A final flush is to be completed to ensure air or foreign material in the main, because of the final connection, is expelled.
- A bacteriological sample shall be collected downstream of the nearest point from the final tie in connection on the new water main.
- All distribution gate valves shall be in the open position and any future operation of any part of the new infrastructure shall be performed by Town staff only.

Acoustic Leak Detection Survey

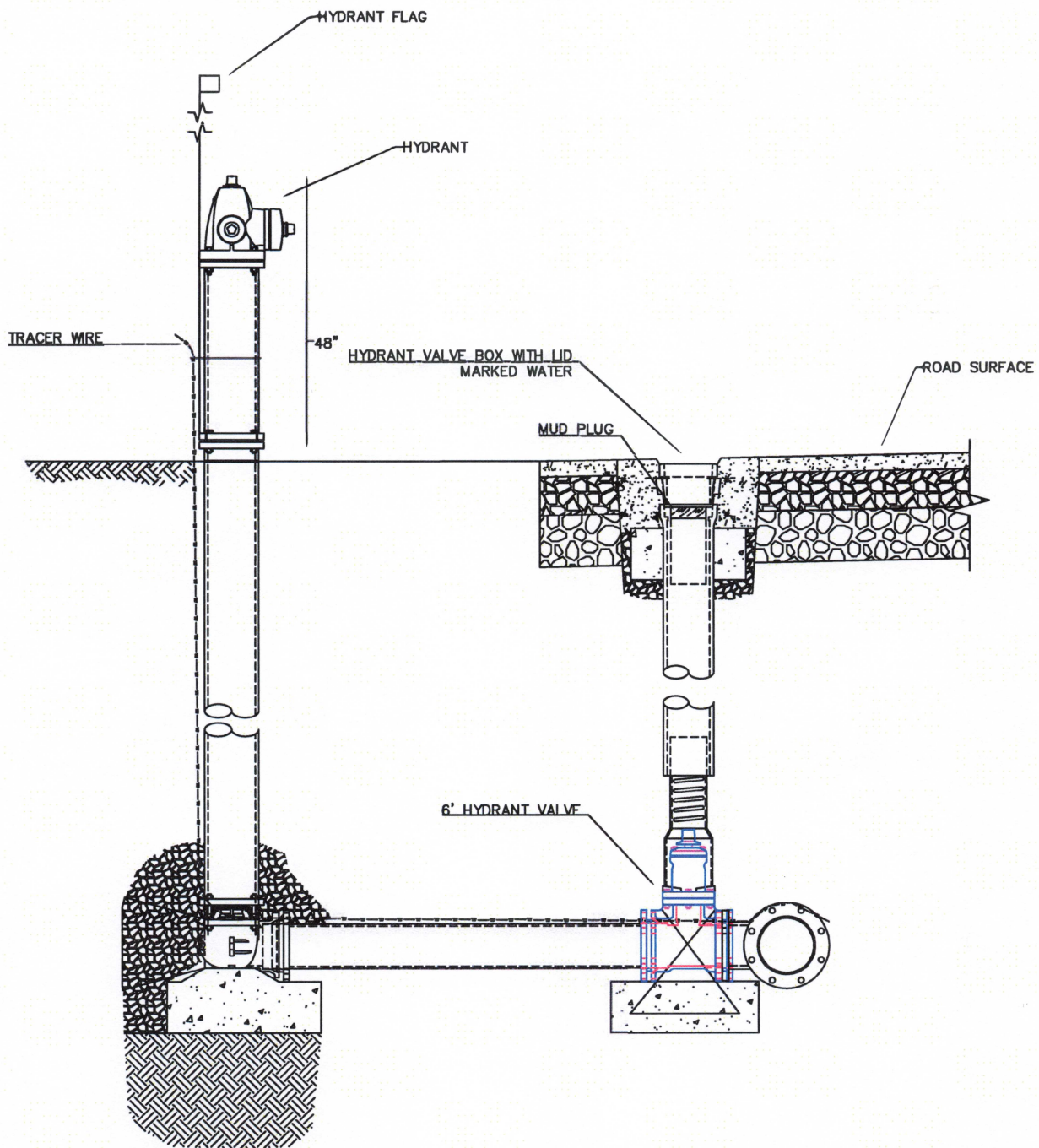
Prior to the expiration of the one-year warranty period, at the contractor's expense, an acoustic leak detection survey shall be conducted which utilizes recording devices installed for no less than 24 hours. A report, as approved by the Town, will be submitted and any suspected leaks investigated and/or repaired at the contractor's expense. Should the Contractor fail to complete the acoustic leak survey and/or repair defective materials or workmanship, the Town may cause the necessary repairs to be made and charge the Contractor with the actual cost of all labor, materials, and administrative costs incurred.



6" CLEANOUT FOR SERVICES WILL REQUIRE CAST IRON COVER AS SHOWN IF LOCATED IN A DRIVEWAY OR ROADWAY

CLEAN OUT DETAIL 6" AND LARGER

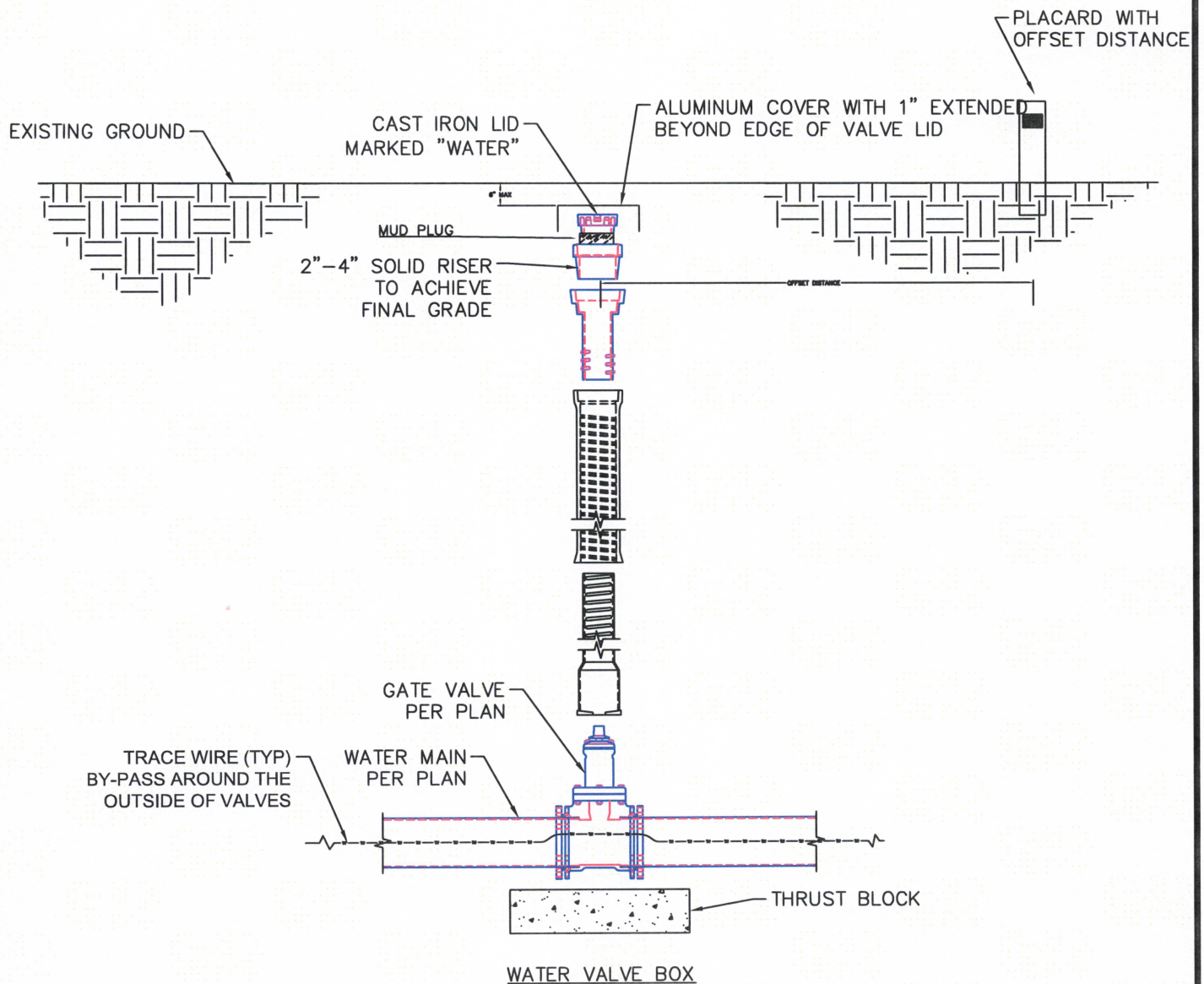
NO SCALE



NOTES:

1. MAINTAIN 3' CLEAR SPACE AROUND HYDRANT
2. CAPS MUST BE CHAINED TO BARREL
3. ALL PUBLIC FIRE HYDRANTS MUST BE PAINTED AN APPROVED RED

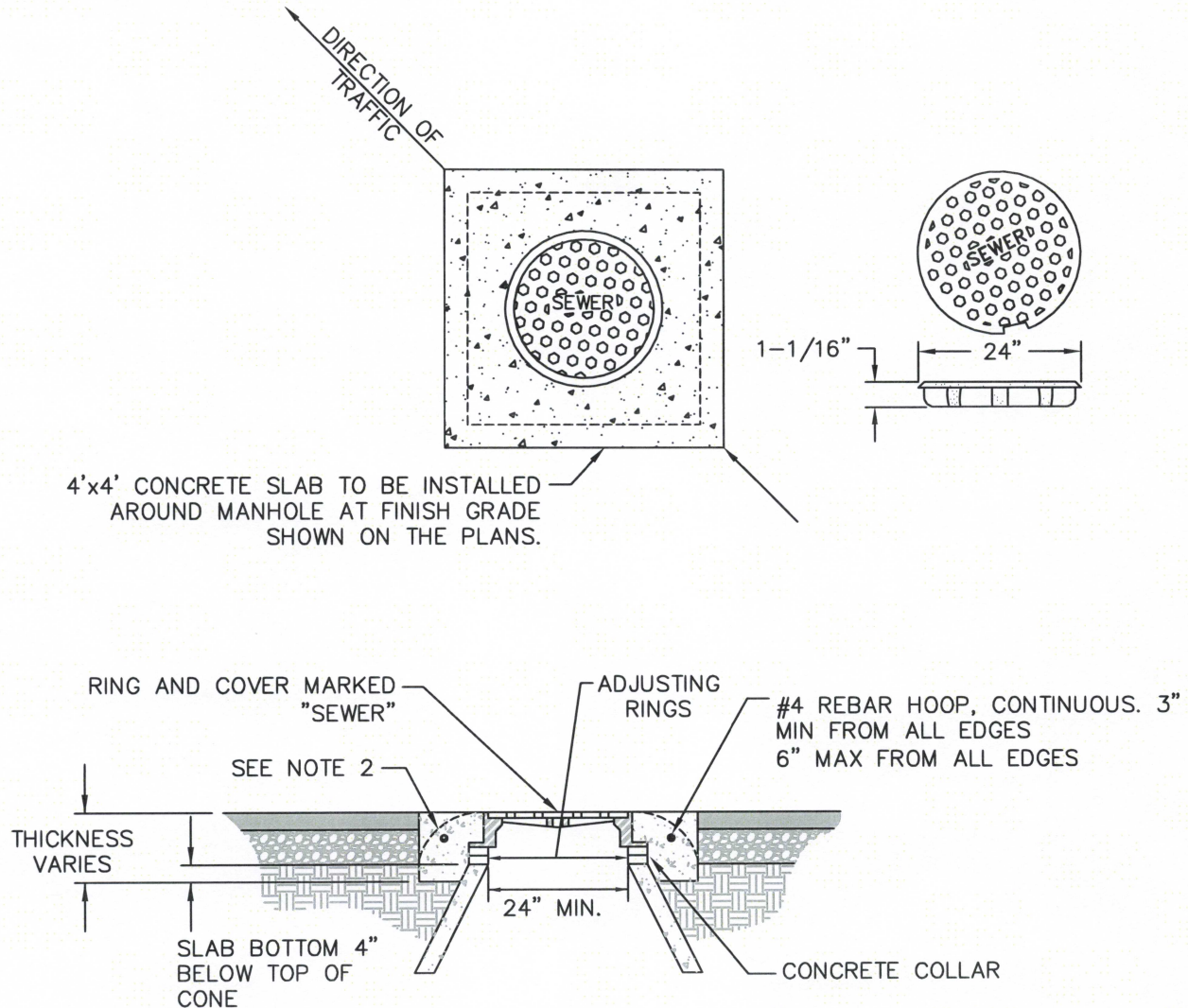
FIRE HYDRANT
NO SCALE



NOTES:

1. ADJUST WATER VALVE BOX UPWARD OR DOWNWARD AS REQUIRED. FINAL ADJUSTMENT SHALL BE MADE AFTER GRADES HAVE BEEN RE-ESTABLISHED.
2. **VALVE BOX DEBRIS CAP WITH TIGHTENING WHEEL AND RUBBER SEAL ARE REQUIRED TO BE PLACED IN ALL VALVE BOXES.**
3. FOR VALVES LOCATED UNDER ROADWAY SEE DETAIL 4.1.3
4. FOR VALVES LOCATED OUTSIDE OF ROADWAY SEE DETAIL 4.1.3
5. INSTALL PLACARD WITH OFFSET DISTANCE ON EDGE OF ROAD.
6. VALVE WILL TERMINATE BELOW GROUND WHEN UNDER THE ROAD WAY. SEE VALVE TERMINATION DETAIL FOR OUTSIDE ROADWAY.
7. A MUD PLUG SHALL BE INSTALLED IN EACH VALVE BOX TO REDUCE DEBRIS.

GATE VALVE DETAIL
NO SCALE

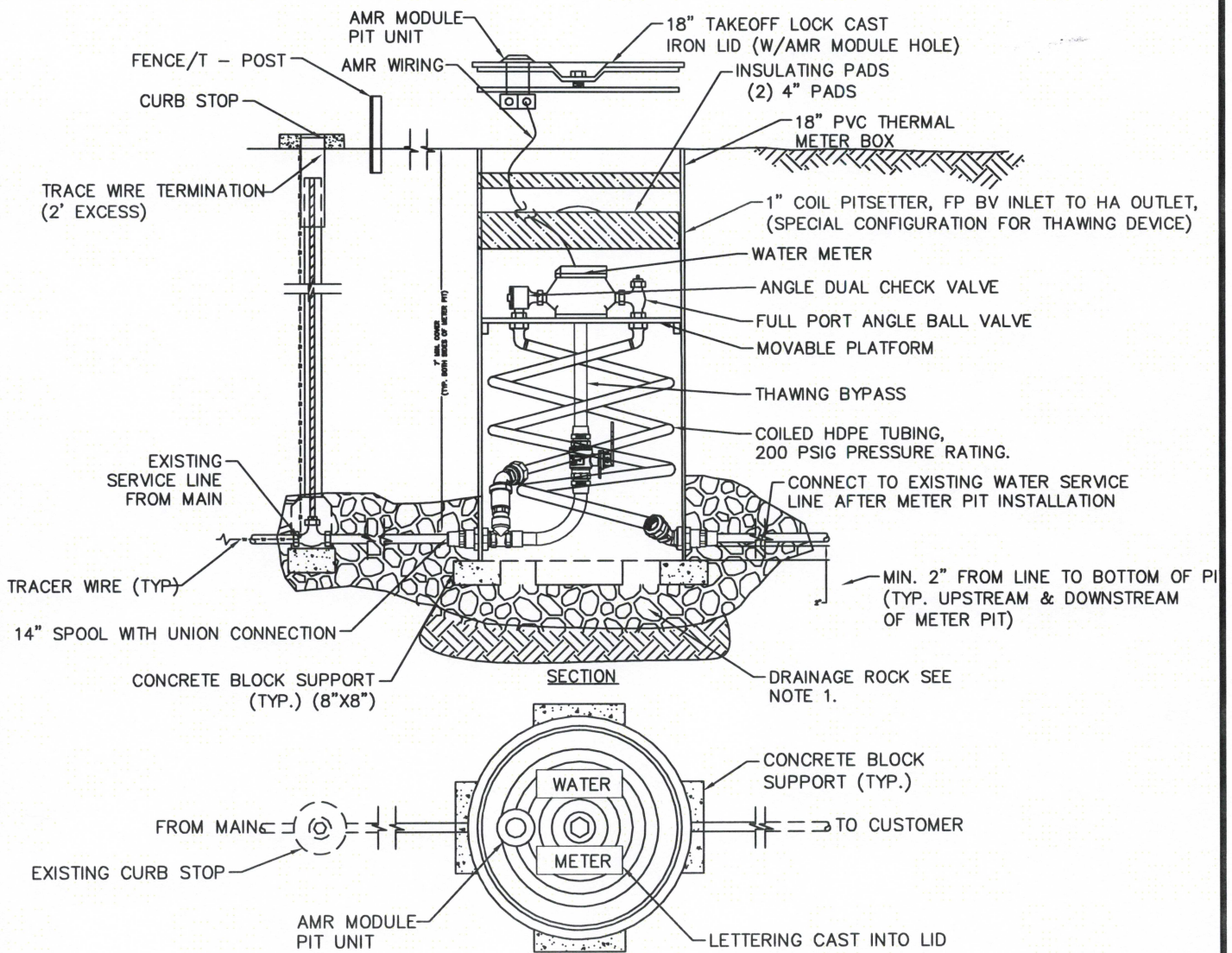


NOTES:

1. ADJUST MANHOLES UPWARD WITH ADJUSTING RINGS UNDER RING AND COVER (12" MAX). ADJUST MANHOLE DOWNWARD BY REMOVING A PORTION OF THE MANHOLE RISER AND REBUILDING TO PROPER DIAMETER. SLOPE MANHOLE RING AS REQUIRED TO MATCH STREET GRADE AND CROSS SLOPE. FINAL MANHOLE ADJUSTMENT WILL BE MADE AFTER PAVING AND BEFORE SEAL COATING.
2. ROUND EDGES OF CONCRETE COLLAR IN GRAVELED TRAFFIC AND NON-TRAFFIC AREAS.
3. PLACE AND FINISH CONCRETE PER THE SPECIFICATIONS.

MANHOLE COVER AND ADJUSTMENT DETAIL
NO SCALE

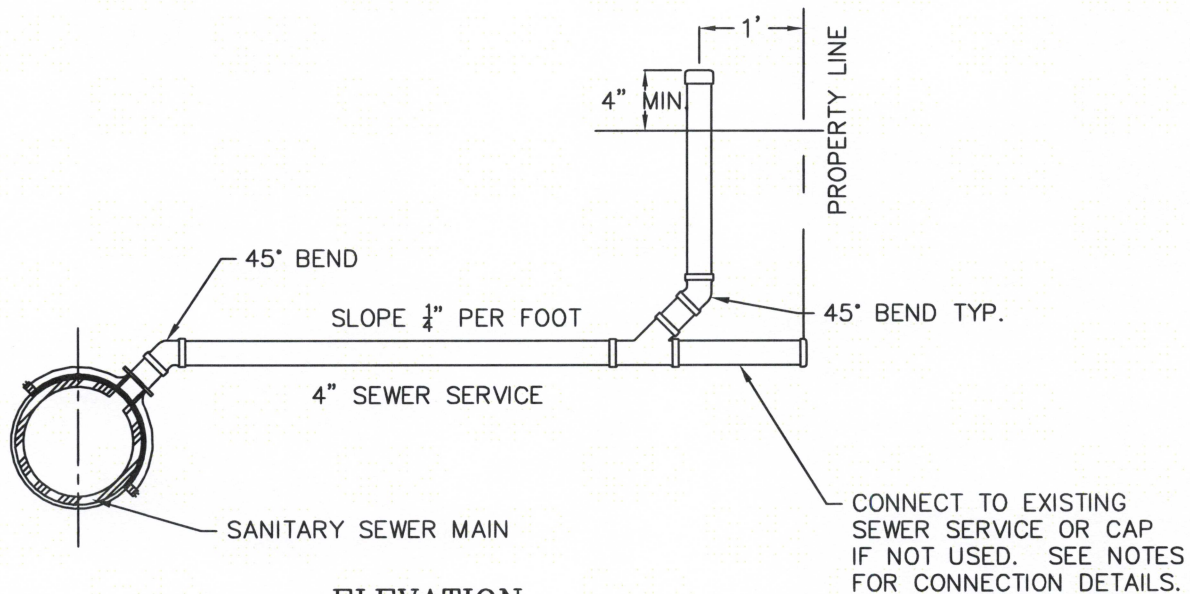
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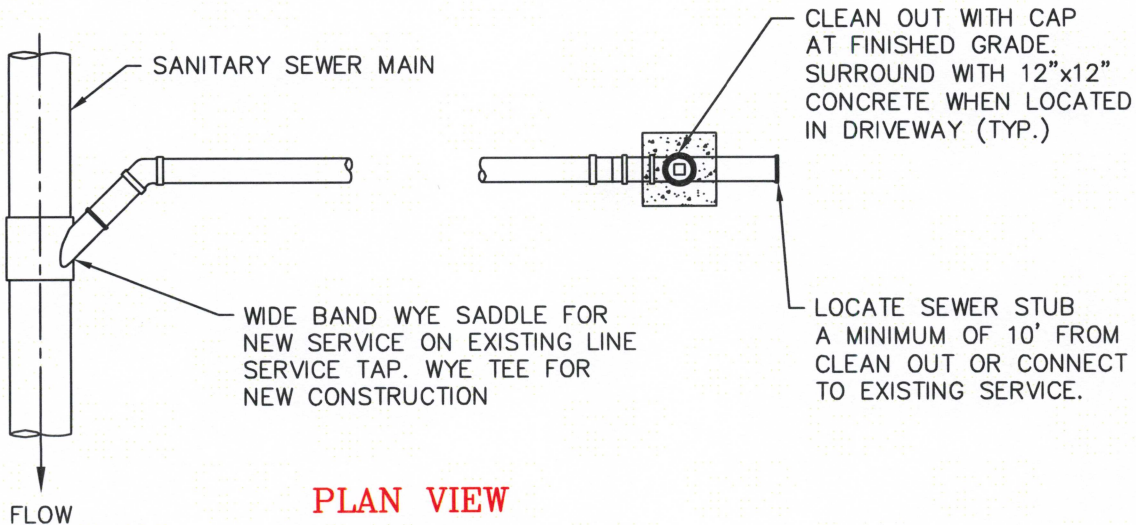
PLAN
METER BOX DETAIL
NO SCALE

NOTE:

1. Meter Pit shall not be installed within driveways or sidewalks for new construction.



ELEVATION



PLAN VIEW

NOTES:

1. ALL SEWER MAINS AND SERVICES SHALL BE BEDDED IN $\frac{1}{2}$ " to 1 $\frac{1}{2}$ " DRAIN ROCK BEDDING, UNLESS ALTERNATE APPROVED BY ENGINEER.
2. ALL SERVICES SHALL BE AT LEAST SDR 35 PVC PIPE.
3. PVC TO PVC/ABS SERVICE CONNECTIONS SHALL REQUIRE SMITH-BLAIR 226 FULL CIRCLE CLAMP OR EQUIVALENT.
4. PVC TO VCP SERVICE CONNECTIONS SHALL REQUIRE FERNCO 1002 SERIES COUPLING OR EQUIVALENT.

SEWER SERVICE DETAIL

NO SCALE

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TOWN OF ALPINE

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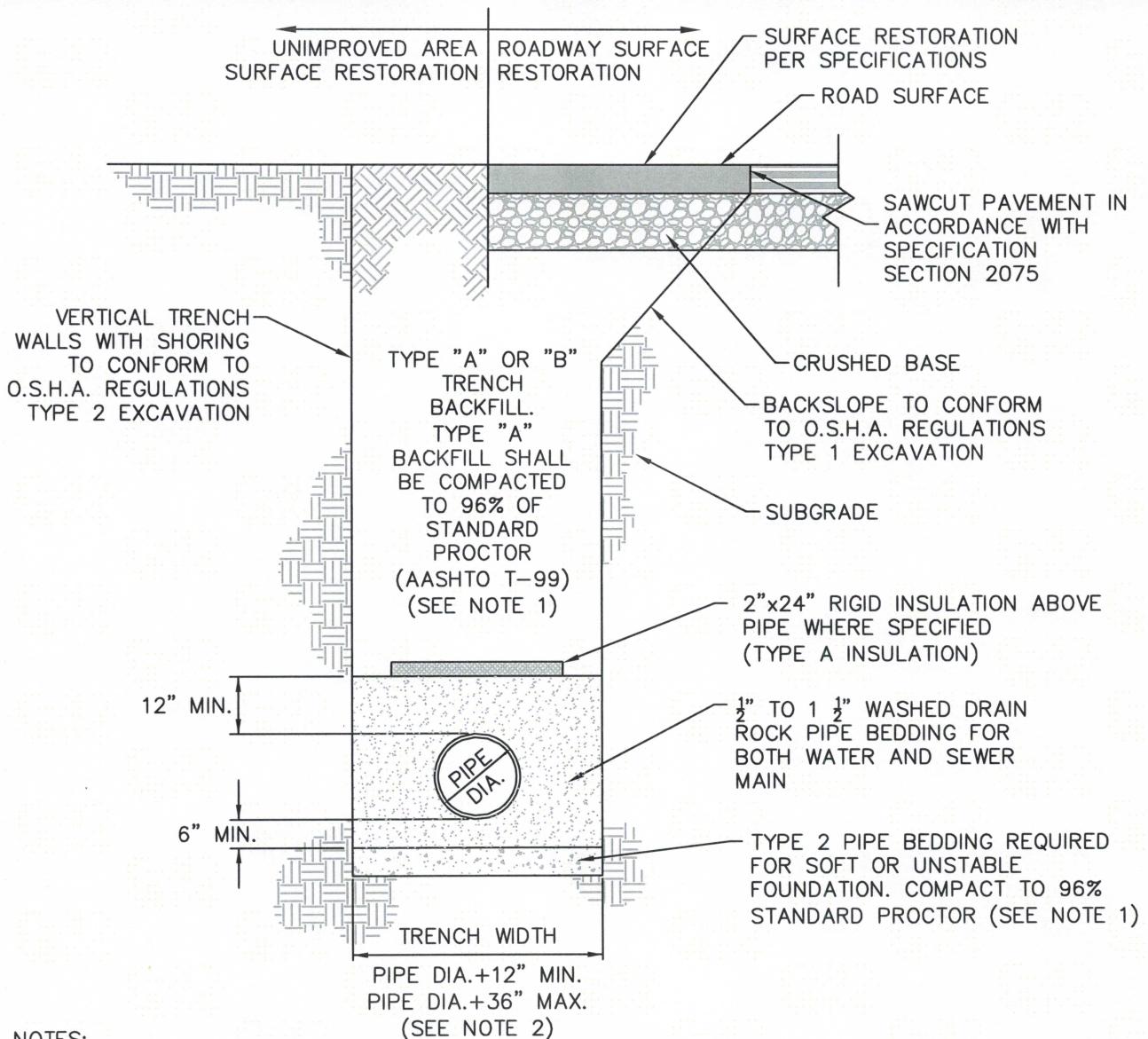
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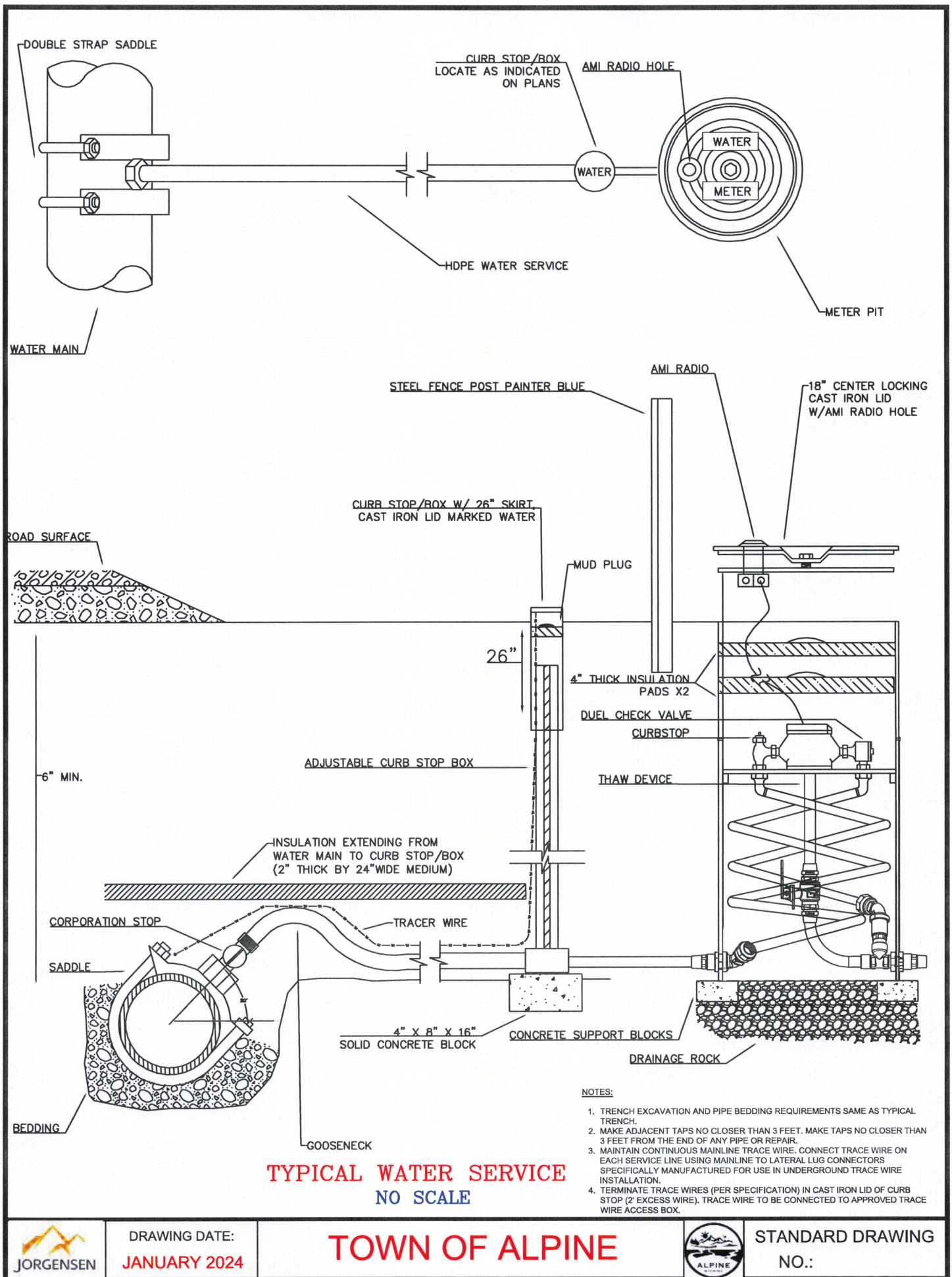
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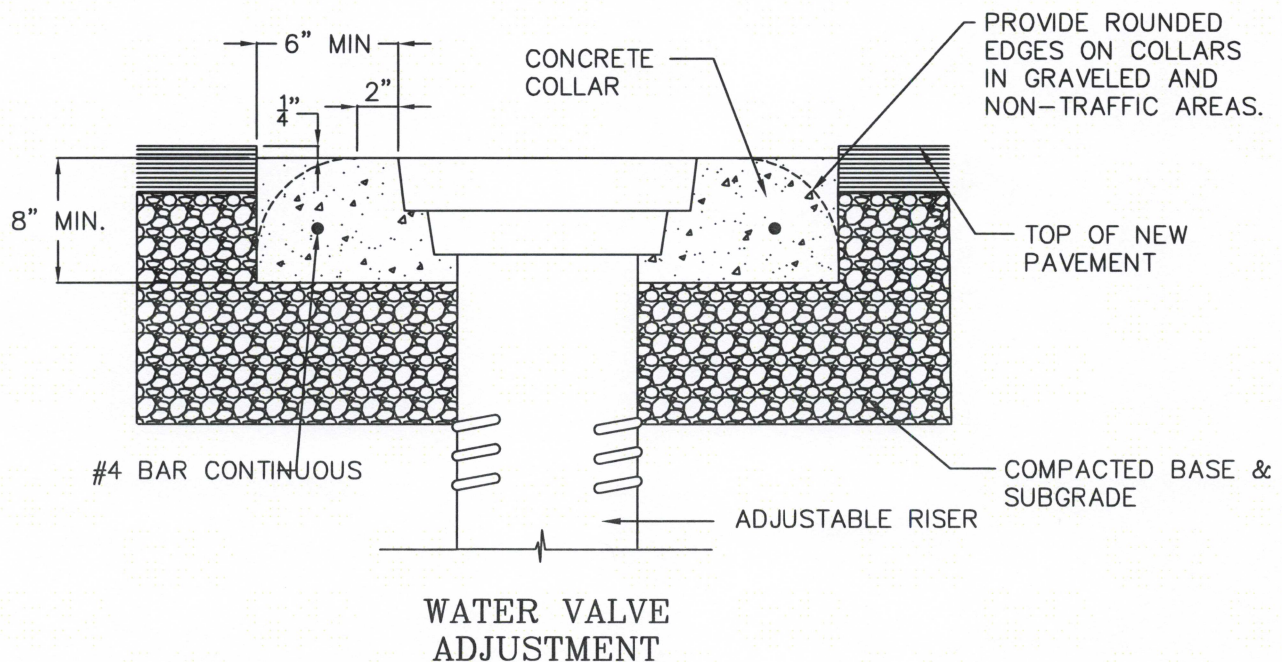
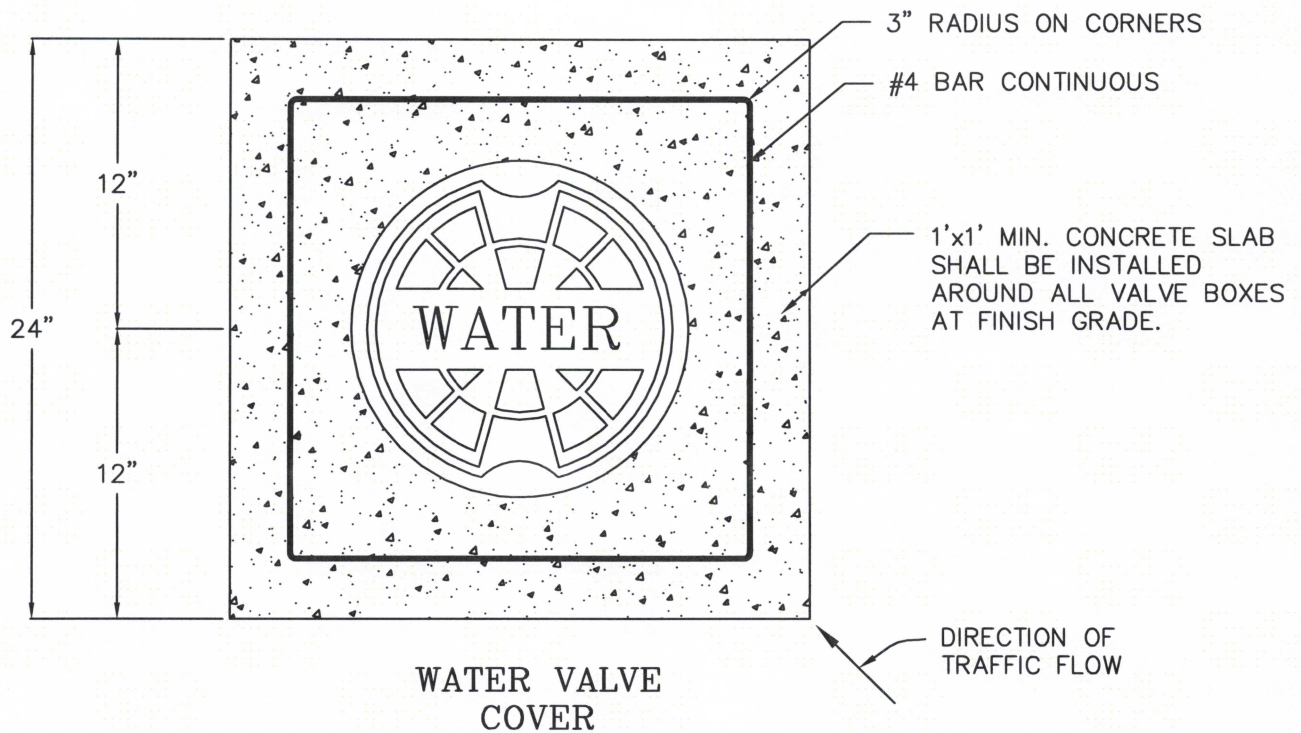


NOTES:

1. FOR TRENCHING, BEDDING AND BACKFILL REQUIREMENTS, SEE SPECIFICATIONS SECTIONS -----.
2. WHERE THE SPECIFIED MAXIMUM TRENCH WIDTH IS EXCEEDED, OR IF THE PIPE IS INSTALLED IN COMPACTED EMBANKMENT, THEN PIPE EMBEDMENT SHALL BE COMPACTED TO 96% OF STANDARD PROCTOR MAXIMUM DENSITY (ASTM D-698) TO A POINT AT LEAST 3 PIPE DIAMETERS FROM THE PIPE ON BOTH SIDES OF THE PIPE OR TO THE TRENCH WALL, WHICHEVER IS LESS.
3. WHERE TRENCH PASSES THROUGH EXISTING PAVEMENT, THE PAVEMENT SHALL BE CUT IN ACCORDANCE WITH SPECIFICATION SECTION -----.
4. PROVIDE 12" MINIMUM HORIZONTAL CLEARANCE BETWEEN PIPE WALLS FOR MULTIPLE PIPES INSTALLED IN SAME TRENCH. MATCH INVERT ELEVATIONS UNLESS OTHERWISE SPECIFIED.
5. PAVED ROAD SURFACING SHALL BE CUT AND REPLACED WITH A MINIMUM WIDTH OF 4'.

**TYPICAL WATER AND SEWER
TRENCH DETAIL
NO SCALE**

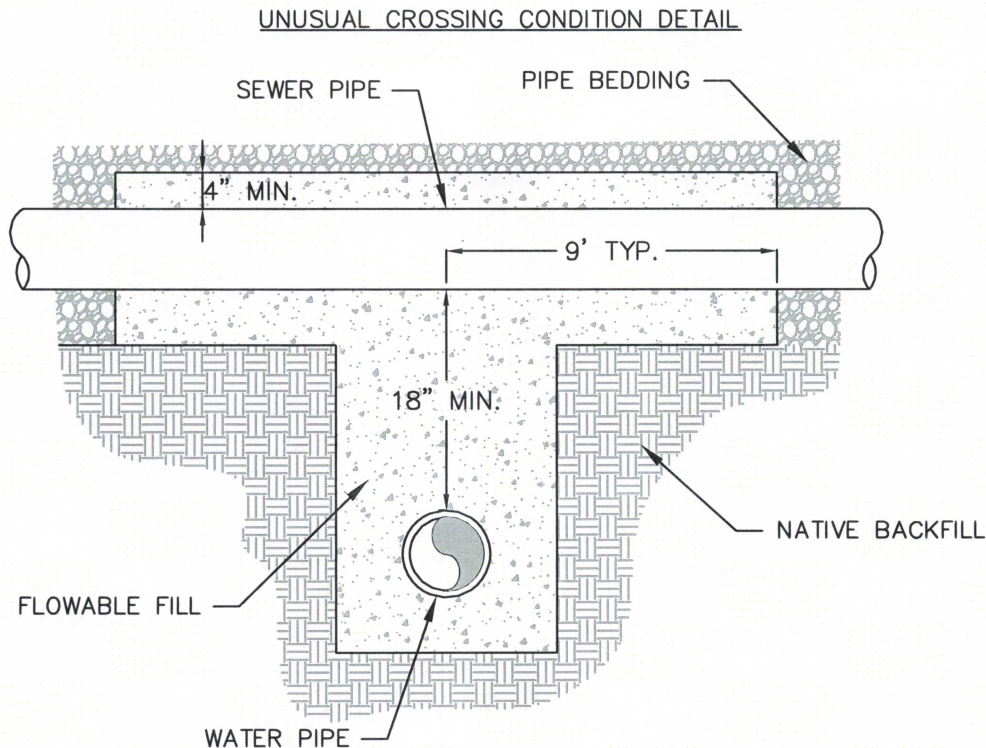




NOTES:

1. ADJUST WATER VALVES UPWARD OR DOWNWARD AS REQUIRED TO MATCH FINISH GRADE.
2. 3500 PSI CONCRETE WITH FIBER REINFORCEMENT MAY BE SUBSTITUTED FOR THE REBAR.

WATER VALVE ADJUSTMENT DETAIL
NO SCALE



NORMAL CONDITIONS – WATER MAINS CROSSING SANITARY MAINS, OR STORM SEWERS SHALL BE LAID ABOVE TO PROVIDE A VERTICAL SEPARATION OF AT LEAST EIGHTEEN (18) INCHES WHENEVER POSSIBLE. THE DISTANCE SHALL BE MEASURED FROM THE TOP OF THE SEWER PIPE TO THE BOTTOM OF THE WATER PIPE.

UNUSUAL CONDITIONS – WHEN LOCAL CONDITIONS PREVENT A VERTICAL SEPARATION OF AT LEAST EIGHTEEN (18) INCHES AS NOTED ABOVE, THE FOLLOWING CONSTRUCTION SHALL BE USED:

1. THE SANITARY SEWER SHALL BE ENCASED IN FLOWABLE FILL A MINIMUM OF TEN (10) FEET EACH SIDE OF THE CROSSING; OR
2. THE SANITARY SEWER, STORM SEWER OR WATER MAIN SHALL BE PLACED IN A SEPARATE CASING PIPE EXTENDING A MINIMUM OF TEN (10) FEET EACH SIDE OF THE CROSSING; OR
3. THE SANITARY SEWER OR STORM SEWER JOINTS SHALL BE CONSTRUCTED OF MATERIALS AND WITH JOINTS THAT ARE SDR 21 PVC OR DUCTILE IRON AND SHALL BE TESTED FOR WATER TIGHTNESS BY SEWER LINE METHODS.
4. WATER MAINS PASSING UNDER SEWER LINES SHALL IN ADDITION TO THE ABOVE REQUIREMENTS, BE PROTECTED BY PROVIDING FLOWABLE FILL BETWEEN WATER AND SEWER LINES FOR ADDITIONAL SUPPORT.
5. FLOWABLE FILL SHALL BEAR ON UNDISTURBED SOIL AND HAVE A 28 DAY COMPRESSIVE STRENGTH OF 30 psi TO 60 psi. REFERENCE SECTION 4.1.8.

WATER/SEWER CROSSING DETAIL
NO SCALE