



STANDARD DESIGN SPECIFICATIONS

for

WATER SYSTEM ADDITIONS

December 2022

DW20221425

APPROVED WATER SPECIFICATIONS

THE DOCUMENT BEARING THIS STAMP HAS BEEN RECEIVED AND REVIEWED BY THE

TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION

DIVISION OF WATER RESOURCES

AND IS HEREBY APPROVED FOR USE IN CONSTRUCTION BY THE COMMISSIONER

01/17/2023

THIS APPROVAL SHALL NOT BE CONSTRUED AS CREATING A PRESUMPTION OF CORRECT OPERATION OR AS WARRANTING BY THE COMMISSIONER THAT THE APPROVED FACILITIES WILL REACH THE DESIGNED GOALS.

APPROVAL EXPIRES FIVE YEARS FROM ABOVE DATE



STANDARD DESIGN SPECIFICATIONS

These specifications provide guidance on the acceptable materials and their installation for developments inside the boundaries of Savannah Valley Utility District (SVUD). Equipment, materials, installation practices, and applicable codes and/or regulations not addressed herein are to be brought to the attention of SVUD as soon as possible. Lack of inclusion in these Standard Design Specifications does not mean SVUD has no regulations or criteria for equipment, material or construction practices. In all instances, the more stringent of these standard specifications or the regulations of the Tennessee Department of Conservation and Environment apply.

Plans must be approved by the local governing body, the state of Tennessee Department of Conservation and Environment (TDEC) and SVUD. **SVUD reserves the right to disallow any Contractor from working within its boundaries.**

All ANSI/AWWA standards are to be the latest revisions thereof.

INTRODUCTION

The objective of these specifications is to define a minimum Standard of Care expected of developments and their engineering resources in the design, construction, and incorporation of water supply and facilities for connection to the water system operated by SVUD.

These specifications contain requirements and guidelines intended to assist in the preparation of construction plans and are not intended to supersede the requirements of TDEC.

The following design requirements shall apply to any development that proposes to connect to the water system operated by SVUD.

These requirements should not be interpreted as being the total requirements. SVUD may require additions or modifications to be made where circumstances warrant, including larger facilities in order to adequately serve future development in the area. There has been no attempt to address every development situation. Cases where criteria will not apply will be handled on an individual basis and will consider the development's Preliminary Engineering Report for the project.

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1. SCOPE OF WORK

The work covered by these Standard Design Specifications consists of the furnishing, by an approved licensed Contractor, of all labor, materials, equipment, and services (flushing, testing, sterilization, etc.) necessary for the construction of water lines and all accessories located in the service area of SVUD for Bradley County, Hamilton County, and Meigs County, Tennessee, per these specifications laid out in this document.

2. LOCATION OF WATER MAINS

The approximate location of the water mains in relation to the Limits of Right-of-Way (ROW), pavement, etc., shall be shown on Plans submitted by a licensed Engineer and approved by SVUD and TDEC. The final location of the water mains shall be constructed by the Contractor as close to that shown on the approved Plans. The final location as constructed may be revised by the Contractor with the approval of SVUD provided (1.) the proposed location is within the ROW or construction easement shown on the approved Plans, and (2.) the proposed location is approved by the Tennessee Department of Transportation (TDOT), Bradley County, Hamilton County, and Meigs County Highway Department, or other agency or legal entity having any jurisdiction. The final location in any event may be revised by necessity due to construction conditions at the direction of SVUD per the requirements of TDOT, Bradley County, Hamilton County, and Meigs County Highway Department, or any other agency or legal entity having jurisdiction.

If the planned development is to have sidewalks, all water mains are to be constructed adjacent to sidewalks within the development. No water mains are to be constructed beneath sidewalks or road corridor curb and gutters.

SVUD REQUIRES A PRE-CONSTRUCTION MEETING TO VERIFY THE LOCATION OF ALL SIDEWALK DISTANCES FROM EDGE OF CURB AND LOCATION, SIZING, AND SERVICE REQUIREMENTS FOR ALL OTHER UTILITIES PROPOSED FOR THE DEVELOPMENT. COPIES OF ALL PERMITS FROM APPLICABLE FEDERAL, STATE, AND COUNTY AUTHORITIES FOR ROAD AND/OR STREAM CROSSINGS, AND/OR STORAGE FACILITIES WILL BE PROVIDED AND DISCUSSED AT THIS MEETING.

ALL SERVICE LINES SHALL BE SET ON THE OPPOSITE SIDE OF THE LOT AWAY FROM OTHER UTILITIES, IF POSSIBLE. WATER SERVICE LINES SHALL NOT BE INSTALLED NEAR OR IN THE SAME TRENCH WITH ANY OTHER TYPE OF UTILITY SERVICE LINE.

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3. MATERIALS FOR WATER MAINS AND APPURTENANCES**a. Air Release Assembly and Box**

The air release assembly shall include a Mueller Company H-15008N corporation stop, a Mueller Company Model B-25146N brass in-line cut-off valve (compression), and a Crispin-Multiplex Manufacturing Company Model AR8. All valves and fittings shall be 3/4-inches for 6-inch and 8-inch pipe. All valves and fittings shall be 1-inch for 10-inch and larger pipe and shall use a Crispin-Multiplex Manufacturing Company Model AR10 air release valve.

All connection piping shall be PEX or Type K copper.

The air release assembly and cut-off valve shall be installed in a meter box with the appropriate extensions as specified in Section 3.i., Meter Stub Out – Meter Boxes, of these specifications.

A Diagram can be found at the end of these specifications.

b. Blow Off

A blow-off assembly requires a mechanical joint fitting, typically a MJ cap with a 2-inch tap attached to the straight cut end of pipe, restrained with a mega lug, followed by the necessary 2-inch brass nipples to accommodate a 2-inch isolation gate valve (female x female with 2-inch operating nut) and an Eclipse #2 Post Hydrant. A valve box, installed with the top flush with the finished grade, shall be centered over the 2-inch isolation gate valve. An appropriately sized thrust block is to be used. Blow offs are to be installed as indicated on the approved plat.

A Diagram can be found at the end of these specifications.

c. Casing Pipe

Where required by the governing agency, water main road or railroad crossings shall be bored or tunneled to prevent interruption to traffic and to prevent later settlement of the roadway or railroad bed. The Casing Pipe used shall be according to the specifications of the governing agency.

Any water mains, excluding service laterals, inside casing pipes shall use locking gaskets from the pipe's manufacturer, BWM SS-8 casing spacers, and 304 stainless steel bolts to uniformly support the ductile pipe and prevent movement inside the casing.

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- **Schedule 80 PVC Casing Pipe for service laterals**

Schedule 80 PVC casing pipe for service lines 3/4-inches through 2-inches shall be manufactured and tested in accordance with ASTM Specifications D1784-20 and D1785-21a.

PVC CASINGS MUST BE APPROVED BY SVUD.

d. Fire Hydrants

Fire hydrants shall be dry-barrel type in accordance with the requirements of AWWA Standard C 502-18. They shall be a Mueller 4-1/2-inch Super Centurion and red in color.

The hydrants shall have a 6-inch mechanical joint shoe, 4-1/2-inch valve opening, minimum 30-inches of bury, standard operating nut opening left (counter-clockwise), and safety "breakable" flange located within 2-inches of the final grade. (Where needed, Mueller fire hydrant extensions will be the responsibility of the Contractor.) The hydrant shall be equipped with two (2) 2-1/2-inch hose nozzles and one (1) 4-1/2-inch pump nozzle.

Each fire hydrant shall be installed with a MJ tee with a rotating gland (fire hydrant tee), a 6-inch MJ isolation gate valve, an anchor coupling, and a valve box. Concrete blocking shall not obstruct weep holes.

An illustration can be found in the Diagrams at the end of these specifications.

e. Fittings – Mechanical Joint

Fittings are to be:

- Ductile-iron (ANSI/AWWA C110/A21.10-21)
- Cement-lined (ANSI/AWWA C104/A21.4-16)
- Mechanical joint (ANSI/AWWA C111/A21.11-17)
- Compact (ANSI/AWWA C153/A21.53-06)
- Asphaltic coated (ANSI/AWWA C153/A21.53-06) **or**
- Epoxy coated (ANSI/AWWA C116/A21.16-15)
- Domestic

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f. Foster Adapters

Foster adapters, a compact restraint device, shall be used to connect two (2) mechanical joint pieces. They are typically used between a mechanical joint fitting and a mechanical joint valve but do have other applications. For more information, please visit: http://www.infactcorp.com/index_files/Page556.htm.

g. Locking Gaskets

When called for, the Locking Gaskets must be from the same manufacturer as the ductile iron pipe.

h. Mega Lugs

When a mega lug is called for, one manufactured by EBAA is to be used.

i. Meter Stub Outs**• Materials**

The necessary corporation stops and all other fittings and accessories shall be furnished as shown in the Diagrams at the end of these specifications. At a minimum each meter setting shall be installed with a H-15008N corporation stop and a B-2470R-2N yoke; both manufactured by Mueller Company, for 5/8-inch by 3/4-inch meters. End connections shall be compression. The service lines shall be REHAU Municipex mentioned below.

• Meter Boxes

All meter boxes shall be a Carson Industries Model 00152002 round plastic with extensions when needed and a Sigma LC-217 cast iron meter lid with a 2-inch hole for the meter antenna as shown in the Diagrams at the end of these specifications.

• Service Connection Piping

Service connection piping between the main line and the meter shall be a minimum of 3/4-inch REHAU Municipex meeting the latest requirements of ASTM F876-22ae1 and AWWA C904-16. Fittings shall meet all applicable ANSI requirements. The service piping shall be of the length necessary to run a direct line from the main to the site of the meter at the property line. A 14-gauge insulated copper wire must be placed along with the pipe in the ditch line to provide for future location of the service line. Special care shall be taken to

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protect the service piping within earthen material from sharp and hard objects. Cover is to be at least 24-inches at all points. **(All service lines crossing under any roadway shall be installed inside a 2-inch Schedule 80 PVC casing pipe.)** The Contractor will be responsible for providing and installing all service connections to the meter box or shall provide the curb stop at the end of the water line where the meter box is to be placed. Services to be installed per the approved plat.

ALL SERVICE LINES SHALL BE SET ON THE OPPOSITE SIDE OF THE LOT AWAY FROM OTHER UTILITIES, IF POSSIBLE. WATER SERVICE LINES SHALL NOT BE INSTALLED NEAR OR IN THE SAME TRENCH WITH ANY OTHER TYPE OF UTILITY SERVICE LINE.

j. Pipe – Ductile Iron

Only **DOMESTIC** ductile iron pipe manufactured by either U.S. Pipe, American or McWane is allowed. This centrifugally cast ductile iron pipe, with push-on joints complete with necessary gaskets and lubricant must be in accordance with ANSI/AWWA C150/A21.50-21, ANSI/AWWA C151/A21.51-17, and ANSI/AWWA C111/A21.11-17 specifications. Pipe will be furnished cement lined per ANSI/AWWA C104/A21.4-16, seal coated inside and bituminous coated outside.

No PVC water mains are allowed for new construction projects.

The following sizes and classes of pipe are allowable:

- 6-inch Pressure Class 350 or minimum Thickness Class 50
- 8-inch Pressure Class 350 or minimum Thickness Class 50
- 12-inch Pressure Class 350 or minimum Thickness Class 50
- 16-inch Pressure Class 250 or minimum Thickness Class 50
- 24-inch Pressure Class 250 or minimum Thickness Class 50

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k. Tapping Sleeves and Tapping Valves

The acceptable tapping sleeves for connection to an SVUD water main are a Mueller H-615 for sizes 10-inches and larger; a Mueller H 304 or Smith-Blair Style 665 for 8-inches and smaller. Alternatives must be approved by SVUD, but the tapping valve shall be from Mueller or a McWane company. Tap to be made by SVUD or an approved Contractor.

The Contractor shall field verify the type of existing pipe to be tapped.

l. Valve Boxes

Valve boxes shall be cast iron, 3-piece, screw type with drop cover marked "Water". They shall be set vertically and properly adjusted so that the cover shall be in the same plane as the finished surface of the ground or street and valve nut centered. Valve box shall be supported on concrete blocks or brick and not on the valve.

m. Valves

Gate valves shall conform to AWWA Standard C 509-15 as modified herein. GATE VALVES MEETING AWWA STANDARD C 515-20 SHALL NOT BE ACCEPTABLE. All gate valves shall be of the resilient seated type, iron body, non-rising stem, suitable for water working pressure of 150 psi. Valves shall be of a standard manufacture and of the highest quality both as to materials and workmanship. An affidavit of compliance is required. Bolting materials shall be cadmium plated. The stem sealing shall be by an O-ring.

All gate valves shall be furnished with mechanical joint end-connections unless exceptions submitted to and approved by SVUD.

All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve. They shall be epoxy coated and touched up in the field as required.

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All gate valves shall be provided with a 2-inch square operating nut and shall open by turning to the left (counter-clockwise). Resilient seats shall apply to both sides of the gate. Gate valves shall be Mueller Company or a McWane company.

4. LINES AND GRADES

Unless otherwise directed by SVUD, lines and grades shall be set to conform to those shown on the approved Plans, where required to ensure that air release valves have sufficient depth and function properly. Plans and profile information shall be provided for all water mains 10-inches and larger.

When the water main is in the vicinity of a sewer, the following guidelines apply.

a. **Parallel Installation**

- Normal conditions: Water mains shall be laid at least 10-feet horizontally from any sanitary sewer, storm sewer or sewer manhole, whenever possible; the distance shall be measured edge-to-edge.
- Unusual Conditions: When local conditions prevent a horizontal separation of 10-feet, a water main may be laid closer to a storm or sanitary sewer provided that:
 - The bottom of the water main is at least 18-inches above the top of the sewer
 - Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water-tightness prior to backfilling.

b. **Crossings**

- Normal Conditions: Water mains crossing house sewers, storm sewers or sanitary sewers shall be laid to provide a separation of at least 18-inches between the bottom of the water main and the top of the sewer, whenever possible.
- Unusual Conditions: Water mains passing under sewers, shall, in addition, be protected by providing:
 - A vertical separation of at least 18-inches between the bottom of the sewer and the top of the water main;

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- Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking the water mains;
- That the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer; and
- Both the sewer and the water main shall be constructed of water pipe.

c. Sewer Manholes

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

d. Natural Gas

The Contractor shall lay water lines to maintain a minimum vertical separation of 12-inches between water lines and existing gas lines where they cross and a minimum horizontal separation of 5-feet between water lines and existing gas lines where they parallel.

When a water main is to cross a body of water (creek, stream, lake, etc.) locking gaskets are to be used throughout the crossing. Valves shall be provided at both ends of the crossing so that the section can be isolated for testing or repair; the valves shall be easily accessible and not subject to flooding. A casing shall be used if dictated by the governing agency.

5. INSPECTION OF LINES – DURING CONSTRUCTION

The Contractor shall notify SVUD when pipe will be received on the job to provide SVUD staff the opportunity to inspect the pipe and review the pipe manufacturer's production reports.

BEFORE THE CONTRACTOR BACKFILLS ANY LINES, SVUD SHALL OBSERVE THE INSTALLATION; AND THE CONTRACTOR SHALL BACKFILL TRENCH ONLY WITH SVUD PERMISSION.

If any joints, pipes or other workmanship or materials are found to be defective, they shall be removed and replaced by the Contractor without any extra compensation.

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6. EXCAVATION FOR WATER MAINS**a. General**

The excavation shall be carried to the depths indicated on the approved Plans and/or directed by SVUD to permit proper bedding of the pipe. Trenches shall be opened to a depth so that the top of the pipe shall not be less than 30-inches below the surface of the ground when laid in areas outside the pavement or traveled surface of highways and roadways. Unless otherwise dictated by the governing agency, the minimum depth of cover shall not be less than 36-inches for pipe lines laid in the shoulder or traveled surface of any existing or proposed highway and/or roadway. All depths of cover are measured to the top of pipe once installed.

Trenches shall be of sufficient width to provide free working space on each side of the pipe and permit proper backfilling around the pipe, but unless specifically authorized by SVUD, trenches shall in no case be excavated or permitted to become wider than 18-inches plus the nominal diameter of the pipe.

When rock is encountered, the trench shall be excavated to a depth at least 6-inches below the invert of the pipe and refilled with compacted No. 67 crushed stone to a sufficient depth to provide a firm bed for the bottom quadrant of the pipe. Crushed stone shall be utilized to a depth of 12-inches above the top of the pipe as shown in the Diagrams at the end of these specifications. No rock larger than 2-inches shall be permitted within 12-inches of the pipe.

Unless specifically directed otherwise by SVUD or where required to uncover or determine the presence of underground obstructions, not more than 300-feet of trench shall be opened ahead of the pipe laying, and not more than 200-feet of open ditch shall be left behind the pipe laying. Before laying the pipe, the Contractor shall open the trench far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.

All barricades, lanterns, watchmen, and other such signs and signals as may be necessary to warn the public of the dangers in connection with open trenches, excavations, and other obstructions shall be provided by the Contractor.

The trench shall be straight and uniform to permit laying pipe to the proper lines and grades.

Where excavation is within the traveled roadways, all native earth and rock shall be removed, hauled away, and disposed of in accordance with the criteria of the local jurisdiction by the Contractor. Any street cut shall be handled in accordance with the governing agency, including its criteria for saw-cutting and removal of existing asphalt, installation of granular backfill material, and repaving. All backfilled ditches shall be maintained in such a manner that they offer minimal hazard to the passage of traffic. The convenience of the traveling public and the property owners abutting the improvements shall be taken into consideration.

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In all areas in local or state ROW's, the Contractor shall adhere to the requirements of the governing agency in terms of ditches being left open overnight.

All permits, fees, and deposits required shall be the sole responsibility of the Contractor. Proposed crossings shall have been previously approved by the governing agency prior to the start of construction.

All public or private drives shall be promptly backfilled or bridged.

In excavating for masonry and concrete structures, the required width shall be such as to permit forms to be constructed in the proper manner and to permit proper backfilling upon completion of the structures. Depth of excavation for footings shall be as shown on the approved Plans and/or directed by SVUD to obtain sufficient bearing.

All excavated material not needed or unsuitable for backfilling purposes shall be disposed of in a manner satisfactory to the local regulatory authority.

All excavation shall be accomplished in accordance with applicable safety laws and regulations; SVUD does not assume responsibility of any degree or sort for acts of the Contractor.

b. Unstable Trench Bottom Material or Undercutting

If wet, mucky and/or unstable or unsuitable material is encountered in a trench bottom and undercutting of the trench is required, the quantity of same will be determined by observation by a representative of SVUD to ensure a firm foundation for the pipe. The quantity of undercutting of trench will be determined by the area of unsuitable native material encountered.

The Contractor will be required to remove all unsuitable material and fill the ditch with compacted No. 67 crushed stone to 6-inches below the invert elevation of the pipe. If native materials obtained from prior trench excavation are determined by a representative of SVUD to be suitable for replacing the materials excavated by undercutting, no imported materials will be required.

c. Excavation on Easements

Excavation of pipeline trenches on easements shall be performed in such a manner that the private property owner's facilities and grounds shall be restored to as near their original condition as possible considering the work performed. The grass cover of the ditches or excavations shall be the same type as the original undisturbed cover.

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Before any excavation is begun or before drilling and blasting, a minimum of 9-inches of the topsoil or original cover shall be removed and stockpiled in a manner so as not to contaminate the topsoil with other fill or excavated material. Stockpiling outside the easement shall be done only with the Owner's written permission and agreement on remedial restoration measures, which shall be on file with the General Manager of SVUD.

d. Responsibility

It will be the responsibility of the Contractor to contact and coordinate the location of all existing utilities through the Tennessee One-Call system. Those utilities not a member of Tennessee One-Call will need to be contacted directly.

NO WORK SHALL BEGIN UNTIL ALL EXISTING UNDERGROUND UTILITIES HAVE BEEN LOCATED AND MARKED.

7. PIPE LAYING AND BEDDING FOR WATER LINES**a. General**

The bed of each pipe shall be carefully prepared so that each individual piece of pipe shall have a uniform bearing. Pipes shall be laid in a straight line and grade without kinks or sags and shall be laid in a workmanlike manner. Bell holes shall be large enough so that the bell will clear the ground and leave ample room for making joints and inspection of joints.

Before each piece of pipe is lowered into the trench, it shall be thoroughly swabbed out to ensure its being clean. Each piece of pipe shall be lowered separately.

Care shall be taken to prevent injury to the pipe coating both inside and out. No piece of pipe or fitting which is known to be defective shall be used. However, if any defective pipe or fitting shall be discovered after the pipeline is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge.

In case a length of pipe is cut to fit, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe as per ANSI/AWWA Standard C 600-17.

All angles or bends in the pipelines, either vertical or horizontal, shall be satisfactorily braced or anchored against the tendency of movement with

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joint harness, concrete or equal anchors to the satisfaction of SVUD and as shown on the Diagrams at the end of these specifications.

Concrete used for anchors, kickers, and encasement shall be Class "C" concrete as shown on the Diagrams at the end of these specifications.

Open ends of unfinished pipelines shall be securely plugged or closed at the end of each day's work or when the line is left temporarily at any other time. The maximum horizontal or vertical deflection for laying pipe shall be according to the manufacturer's specifications.

b. Unstable Trench Bottom Material or Undercutting

If wet, mucky and/or unstable or unsuitable material is encountered in the trench bottom, it shall be excavated and backfilled as specified in Section 6.b., above.

A SVUD representative shall determine when it is necessary to remove such material and the Contractor shall be responsible for calling such unstable trench bottom conditions to the attention of SVUD prior to pipeline installation.

c. Ductile Iron Pipe

Ductile iron pipe shall be installed in accordance with ANSI/AWWA Standard C 600-17 unless modified herein. These Standard Design Specifications are intended to paraphrase and summarize said Standard.

Ductile iron pipe shall be laid in trenches mentioned in Section 6.a., above.

Regardless of location, bell holes shall be provided to ensure that the pipe is uniformly supported over its entire length. Any unyielding material such as rock within the pipe foundation shall be removed and the foundation shall be brought up to grade as specified in Section 6.a., above.

8. HIGHWAY CROSSINGS**a. General**

The Contractor shall familiarize himself with the requirements of the governing agency. THE CONTRACTOR SHALL SECURE ANY REQUIRED PERMITS AND ERECT AND MAINTAIN ANY REQUIRED SIGNAGE TO WORK WITHIN THOSE RIGHTS-OF-WAY, AND PROVIDE FLAGMEN WHERE REQUIRED BY THE GOVERNING AGENCY. A copy

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of the approved permit from the transportation agency involved shall be furnished to SVUD prior to commencing work.

All work within the rights-of-way shall be in accordance with the requirements of the agency having jurisdiction over the rights-of-way within which the Contractor is working. In the absence of formal requirements, the Contractor shall follow the recommendations in the most current edition of the Manual of Uniform Control Devices when working in or near public roadways.

b. Bored Crossings with Casing Pipe

Where shown on the approved Plans, all bored main line and service line crossings shall be made according to the governing agency's requirements. The pipe shall be jacked through a bored hole. Where boring is required, the holes shall be bored under the roadway at a depth determined by the governing agency but at least 4-feet below the surface with no disturbance to the surface. Casing spacers must be used as mentioned in Section 3.c., above.

c. Crossings with Horizontal Directional Drilling without Casing Pipe

Where shown on the approved Plans, main line and service crossings not requiring a casing pipe (as approved by the governing agency) shall be installed using horizontal directional drilling procedures. Horizontal directional drilling procedures for installing water lines under roadways shall include boring a small horizontal hole (pilot hole) under the roadway with a continuous string of steel rod; then, when the bore head emerges on the opposite side of the crossing, pulling a special cutter through the pilot hole to bore out said hole; then forcing a "drilling mud", such as fluid bentonite clay, through the hole for stabilization and removing the cutting materials; then pulling the ENTIRE water line length in ONE SEGMENT through the "drilling mud" along the reamed hole pathway. Dispose of "drilling mud" and other construction debris in an approved manner in accordance with the governing agency.

The Contractor shall be fully equipped and experienced in the installation of horizontal directional drilling pipeline procedures. The Contractor shall be held responsible for any roadway settlement which may occur as a result of said work.

The pipe utilized in roadway crossings installed using horizontal directional drilling procedures shall be ductile iron pipe as specified in Section 3.j., above.

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d. Open Cut Crossings

Whenever possible and approved by the governing agency, main water line and service line crossings under roadways will be open cut. This operation must be coordinated with the governing agency and done to their specifications. The Contractor shall be fully responsible for the successful operation without interruption of traffic and shall be held responsible for any settlement which occurs as a result of his work.

9. CASING PIPE FOR HIGHWAY CROSSINGS**a. General**

Where required, highway crossings shall be bored or tunneled so as to prevent interruption to traffic and to prevent later settlement of the roadway or railroad bed.

The Contractor must be fully equipped and experienced in the installation of large diameter structures by boring methods. The Contractor shall be fully responsible for the successful operation without interruption of traffic and shall be held responsible for any settlement which occurs as a result of his work.

A diagram is provided at the end of these specifications.

b. Casing Spacers

All ductile water mains inside casing pipes shall use BWM SS-8 casing spacers and 304 stainless steel bolts to uniformly support the ductile pipe and prevent movement inside the casing.

c. Steel Casing Pipe

Black steel casing pipe shall be manufactured and tested in accordance with ASTM Specification A 139-04 or A 53-05, Grade B, 35,000 psi yield strength. Steel casing pipe where shown shall be as follows:

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Diameter Carrier in inches	Diameter Casing in inches	Minimum Wall Thickness of Casing in inches
3/4	2	0.25
1	2	0.25
4	12	0.25
6	14	0.25
8	16	0.281
10	20	0.344
12	24	0.407

c. Schedule 80 PVC Casing Pipe

Schedule 80 PVC casing pipe for service lines 3/4-inches through 2-inches shall be manufactured and tested in accordance with ASTM Specifications D 1784-20 and D 1785-21a.

PVC CASINGS MUST BE APPROVED BY SVUD.

10. STREAM OR RIVER CROSSINGS

Stream or river crossings must be done in accordance with TDEC ARAP criteria and the plans, details, and specifications shown on the approved construction plans. The casing pipe used is what is called for in their specifications.

11. UNAUTHORIZED EXCAVATION AND OVER-BREAKAGE

Whenever the excavation is carried beyond or below the lines and grades shown on the approved Plans, the Contractor shall refill such excavated space with such material and in such a manner as will ensure stability of the line involved, including the use of crushed stone or Class "C" concrete, all at Contractor's expense.

Over-breakage is that portion of any material displaced or loosened beyond the finished work as planned, including slides. All over-breakage shall be removed by the Contractor and disposed of as directed, all at Contractor's expense.

12. BACKFILLING PIPELINE TRENCHES

a. General

In the backfilling of the trench outside of traveled roadways, material reasonably free from rock and acceptable to SVUD shall be used. Walking or working on the complete pipeline, except as may be necessary in

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tamping or backfilling, shall not be permitted until the trench has been backfilled to a height of at least 1-foot above the top of the pipe. The filling of the trench shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipeline will not be disturbed and injurious side pressures do not occur.

In filling the remainder of the trench, the backfill material may be placed in the trench without compacting, and heaped over whenever, in the opinion of SVUD, this method of backfilling may be used without inconvenience to the public. Where street paving or shoulders are to be replaced, the Contractor will be required to tamp or puddle all backfill as described hereinafter.

Backfilling in traveled roadways shall be in compliance with the governing agency's standards.

Mechanical tamping will be required on lines where street pavement is to be replaced immediately. Backfill requirements of the governing agency shall apply.

Whenever, in the opinion of SVUD it is necessary, the Contractor will be required to use a combination of any or all of the above outlined methods for proper compaction of the backfill in the trenches.

Before final acceptance, the Contractor will be required to level off all trenches where backfill material has been piled up, or to bring the trench up to the level of the surrounding street, roadway or terrain. The Contractor will be required to remove from the streets, roadways, and private property all excess earth or other materials.

b. Backfilling Operations Conducted on Easements

Backfilling of trenches or excavations on easements shall be performed in such a manner that the private property owner's facilities and grounds shall be restored to as near as possible their original condition or better immediately after pipe laying.

The top portion of the trench or excavation shall be filled using the stockpiled topsoil as mentioned in Section 6.c., above. The ditch shall be left high to allow for settling unless in the opinion of SVUD, this method of backfilling will cause inconvenience to the private property owner. Seeding or sodding shall proceed immediately following backfill.

If the backfilling operation is performed during extremely dry weather the Contractor should leave some stockpiled topsoil to use later as additional fill after settlement has occurred.

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The Contractor will be held responsible for the condition of grass cover and the condition of the ground surface at the time of final observation unless the private owner has plowed or excavated the ground.

c. Disposal of Excess Material

The Contractor shall be responsible for the satisfactory off-site disposal of any and all excess or unsuitable material excavated in the construction of the project. He shall be responsible for obtaining any and all permits, license fees, remediation measures, etc., associated with the disposal of excess material.

13. TESTING OF MAINS

Testing of lines shall comply with the provisions listed below, or similar approved procedures which will ensure equal or better results.

Ductile iron water mains shall only be water-pressure tested. The test pressure shall not be less than 1.25 times the state working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times the stated working pressure at the lowest elevation of the test section. The test pressure shall not exceed the thrust restraint design pressures or 1.5 times the pressure rating of the pipe or joint, whichever is less (as specified by the manufacturer). The mains shall not show leakage exceeding the following values as prescribed by the latest revision of AWWA Standard C 600-17.

Allowable Leakage/1,000 feet (gallons/hour)				
Pipe Size	125 psi	150 psi	175 psi	200 psi
6-inch	0.45	0.50	0.54	0.57
8-inch	0.60	0.66	0.72	0.76
12-inch	0.91	0.99	1.07	1.15
16-inch	1.21	1.32	1.43	1.53
24-inch	1.81	1.99	2.15	2.29

The following formula shall be used to calculate leakage:

$$L = \frac{SD\sqrt{P}}{148,000}$$

L = testing allowance (make-up water), in gallons per hour

S = length of pipe tested, in feet

D = nominal diameter of the pipe, in inches

P = average test pressure during hydrostatic test in psi (gauge)

STANDARD DESIGN SPECIFICATIONS

The Contractor shall furnish all gauges, meters, pumps, and other equipment required and shall maintain said equipment in condition for accurate testing as determined by SVUD. Where practicable, pipelines shall be tested in lengths between line valves or plugs of no more than 3,000 feet. Where leaks are visible at exposed joints and/or evident on the surface when joints are covered, the pipe shall be rejoined and leakage minimized regardless of total leakage as shown by test.

Duration of test shall be at least 2 hours. Lines which fail to meet the leakage requirements shall be repaired and retested until test requirements are met. All pipe, fittings, and other materials found to be defective under test shall be removed and replaced.

PIPELINES SHALL BE HELD UNDER NORMAL OPERATING PRESSURES FOR AT LEAST THREE (3) DAYS BEFORE TESTING.

14. DISINFECTION OF LINES

After all water distribution pipeline installation and service and hydrant connections are completed, and simultaneously with the hydrostatic test, but prior to opening any corporation stops or line valves connecting to the existing water distribution system; the water distribution pipeline shall be disinfected in accordance with the requirements of the latest revision of ANSI/AWWA Standard C651-05 using the Tablet Method.

During installation of the water distribution pipelines, the Contractor shall place calcium hypochlorite granules or five (5) gram tablets meeting the requirements of the latest revision of ANSI/AWWA Standard C 651-05 in the water distribution pipelines at the intervals listed in the following tables.

GRANULES	
Pipe Size	Ounces of Granules Placed at 500 Feet Intervals
6-inch	3.8
8-inch	6.7
10-inch	10.5
12-inch	15.1

STANDARD DESIGN SPECIFICATIONS

TABLETS	
Pipe Size	No. of Tablets Placed at Each 20 Feet Length of Pipe
6-inch	1
8-inch	2
10-inch	3
12-inch	4

For pipelines larger than 12-inches, the Contractor shall contact SVUD.

When tablets are used, one tablet shall also be placed at each fire hydrant. Tablets shall be attached to the top inside of the pipe using Permatex Form-A-Gasket No. 2 or Permatex Clear RTV Silicone Adhesive Sealant.

Disinfection will occur concurrently with the hydrostatic test. Following the hydrostatic testing, the chlorinated water shall remain in the water pipeline for a total 24-hour period, including the time required for the hydrostatic testing.

After the chlorinated water has remained in the pipeline for 24 hours, the pipeline will be flushed and refilled and a bacteriological sample will be taken by SVUD. SAMPLES SHALL BE COLLECTED FROM MANUAL AIR RELEASE VALVES INSTALLED BY THE CONTRACTOR AT INTERVALS NOT EXCEEDING 2,500 FEET IF WATER METER CONNECTIONS ARE NOT AVAILABLE. SAMPLES SHALL NOT BE COLLECTED FROM FIRE HYDRANTS. If all samples collected yield negative results, the pipeline may be placed in service. If a positive sample is obtained, the disinfection procedure must be repeated until a negative sample is obtained. The cost of the bacteriological test will be borne by the Contractor. The Contractor will pay for the water required for the filling of the pipelines.

15. REPLACING STREETS AND ROADWAYS

The Contractor shall replace all streets, alleys, and roadways which may be removed, disturbed or damaged in connection with his operation. Both the temporary and permanent replacement shall be done according to the governing agency's specifications. The Contractor shall reconstruct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition as that which existed prior to his operations.

Where the existing surface is untreated crushed stone, the Contractor shall replace the surfacing that is disturbed or removed with crushed stone to at least the thickness of the existing surface.

STANDARD DESIGN SPECIFICATIONS

16. RIP-RAP

Where shown on the approved Plans or directed by SVUD, rip-rap shall be of the rubble-stone type (plain) and placed to a depth of not less than 12-inches. Materials and construction methods for rubble stone rip-rap (plain) shall conform to the requirements of Section 709 of the TDOT's Standard Specifications.

17. SEEDING, SODDING, AND LANDSCAPING

The areas disturbed by construction which are not a part of pavements shall be seeded in accordance with the requirements below. Roadway shoulders which were crushed stone or receive crushed stone are considered as pavements. Special attention shall be directed to the work performed on private easements.

All disturbed areas (which shall be reseeded in approximately their pre-construction condition) shall be left smooth and thickly sown with a mixture of Blue Grass, Italian Rye Grass, Kentucky Fescue #31, and/or such other grasses as are required by SVUD (in pastures, etc., the property owner's preference of grasses shall be used). When the final grading has been completed, the entire area to be seeded shall be hand raked and fertilized with ammonium nitrate at the rate of 5 pounds per 1,000 square feet and an approved commercial fertilizer at the rate of 10 pounds per 1,000 square feet. The analysis of the commercial fertilizer shall be determined by soil tests.

After the fertilizer has been distributed, the Contractor shall rake or harrow the ground to thoroughly work the fertilizer into the soil. The seed shall then be sowed in two operations broadcast either by hand or by approved sowing equipment. The application shall be 30 pounds per acre for each operation. If SVUD determines "hulled" or "unhulled" Bermuda is to be used, the application rate shall be 7 pounds per acre. After the seed has been distributed, the Contractor shall then lightly cover the seed by use of a drag or other approved device. All seed shall be certified not more than 3 percent weed. The seeded area shall then be covered with straw at the rate of 1-1/2 ton per acre.

Any necessary reseeding or repairing shall be accomplished by the Contractor prior to final acceptance. If the construction work is brought to completion when, in the opinion of SVUD, the season is not favorable for the seeding of the grounds, then the Contractor shall delay this item of work until the proper season for such seeding as directed by SVUD.

All planting and seeding shall be watered thoroughly as soon as completed and shall be watered twice daily or more often, if necessary, until all growth is thoroughly established.

STANDARD DESIGN SPECIFICATIONS

18. TEMPORARY PROJECT WATER POLLUTION CONTROL (SOIL EROSION)**a. General**

Temporary pollution control provisions shall be taken to avoid damage to embankments and cut slopes and to avoid transport of sediment to adjacent property owners and/or streams.

The erosion control shall consist of temporary measures as shown on the approved Plans or required to control erosion and water pollution through the use of temporary silt fences or other erosion control methods approved in the Contractor's Storm Water Pollution Prevention Plan (SWPPP).

THE CONTRACTOR SHALL BE SOLELY AND STRICTLY LIABLE FOR ANY VIOLATIONS OF LOCAL, STATE OR FEDERAL WATER POLLUTION LAWS, REGULATIONS OR STANDARDS CAUSED DURING CONSTRUCTION BY THE CONTRACTOR'S FORCES OR SUBCONTRACTORS AND ANY PENALTIES LEVIED BY ANY PARTY DUE TO SAID VIOLATIONS.

b. Construction Requirements

The surface area of erodible earth material exposed by clearing and grubbing shall be kept to a minimum. The Contractor shall provide immediate permanent or temporary pollution control measures to prevent contamination of adjacent streams or other watercourses, lakes, ponds or other water impoundment. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded and mulched as the excavation proceeds.

The Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time. Temporary pollution control measures shall be used to correct conditions that develop during construction; that are needed prior to installations of permanent pollution control features; or that are needed temporarily to control erosion that develops during normal construction practices but are not associated with permanent control features on the project.

Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise, erosion control measures may be required between successive construction stages.

STANDARD DESIGN SPECIFICATIONS

In the event of conflict between these requirements and pollution control laws, rules or regulations, or other Federal, State or Local agencies, the more restrictive laws, rules or regulations shall apply.

c. Pollution and Erosion Control Methods

Temporary erosion control methods shall be dictated by the governing agency and/or as shown on the approved Plans or outlined in the Contractor's SWPPP.

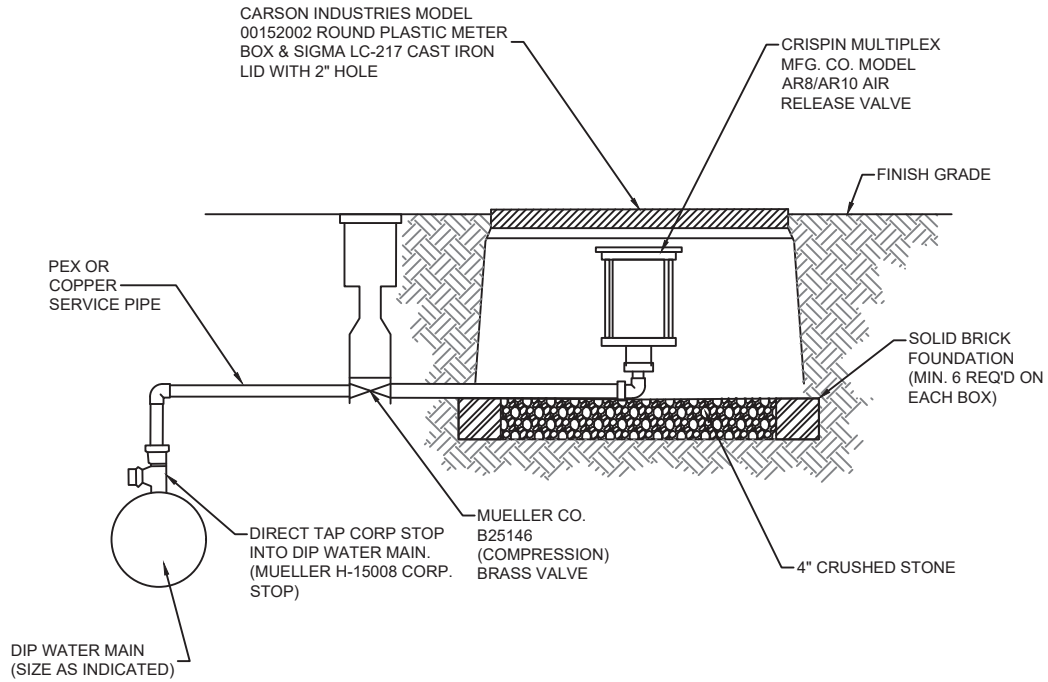
The Contractor shall be required to maintain the erosion control measures in a satisfactory condition for the duration of the project or until the disturbed area has sufficient grass cover or native vegetation to prevent siltation from entering area streams.

Check dams shall be temporary measures to retard stream flow and catch small sediment loads. All check dams shall be keyed into the sides and bottom of the channel to a minimum depth of 2-feet. Check dams shall be used where siltation, erosion or stream degradation is considered a problem. The Contractor shall remove the check dam immediately upon completing construction across the stream.

The temporary erosion control features installed by the Contractor shall be acceptably maintained by the Contractor until no longer needed or permanent erosion control methods are installed. Any materials removed shall become the property of the Contractor.

DIAGRAMS

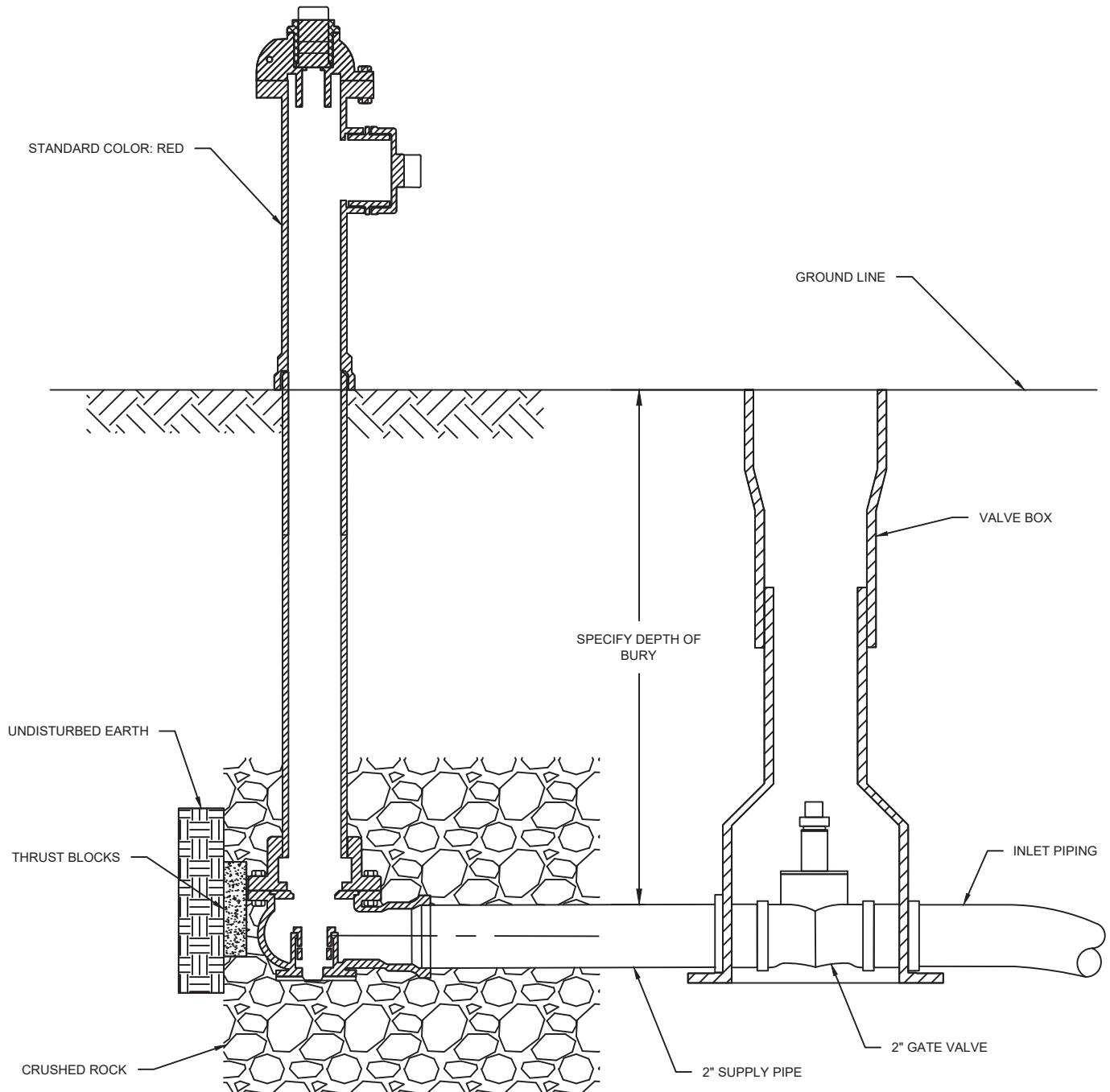
STANDARD DESIGN SPECIFICATIONS



3/4" / 1" AIR RELEASE VALVE & BOX

NTS

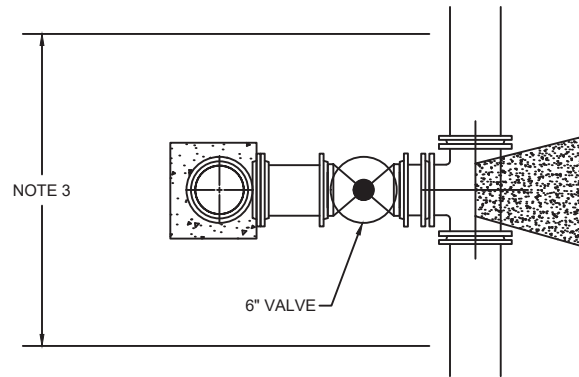
STANDARD DESIGN SPECIFICATIONS

**NOTES:**

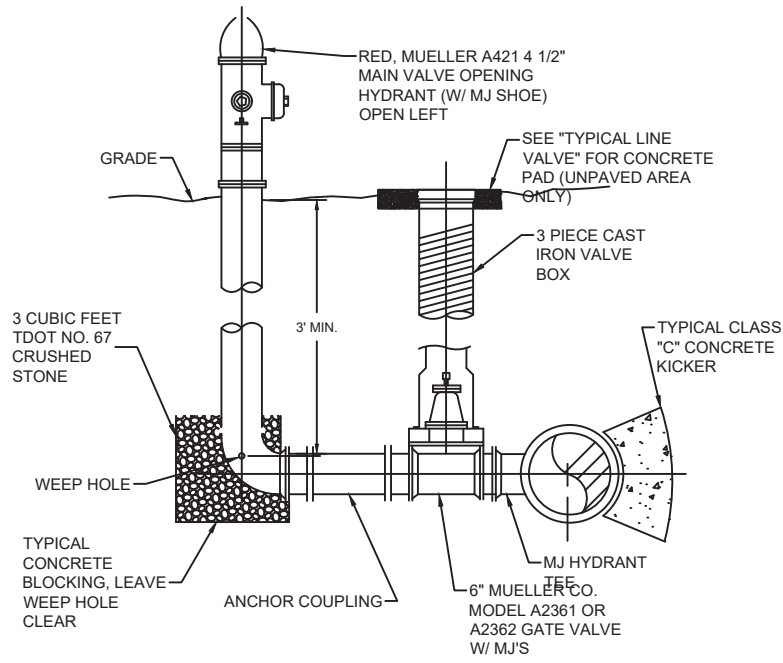
1. Hydrants shall be self-draining, non-freezing, compression type with 2-1/8" main opening. Inlet shall be (2", 2-1/2" + 3" FNPT, or 2", 3" or 4" MJ).
2. Outlet shall be (3 4" GHT or 1", 1-1/4", 1-1/2", 2" or 1-1/2", 2" or 2-1/2" NST).
3. Hydrants shall have a (ductile iron (STD), galvanized steel, stainless steel, or brass) exterior casing pipe, a (galvanized (STD), stainless steel or brass) interior non-turning operating rod with a heavy wall (cast iron (STD), or aluminum) top stock.
4. Principal interior operating parts shall be brass, bronze and aluminum and be removable for servicing without excavating the hydrant.
5. Hydrants shall be set in 4 cubic feet of crushed stone to allow for proper drainage of the hydrant. Recommendations of the AWWA should be followed when installing the hydrant.
6. Hydrants shall be #2 Eclipse Post Hydrant as manufactured by John C. Kupferie Company, St. Louis, MO or approved equal.

ECLIPSE #2 POST HYDRANT

STANDARD DESIGN SPECIFICATIONS



PLAN VIEW



PROFILE VIEW

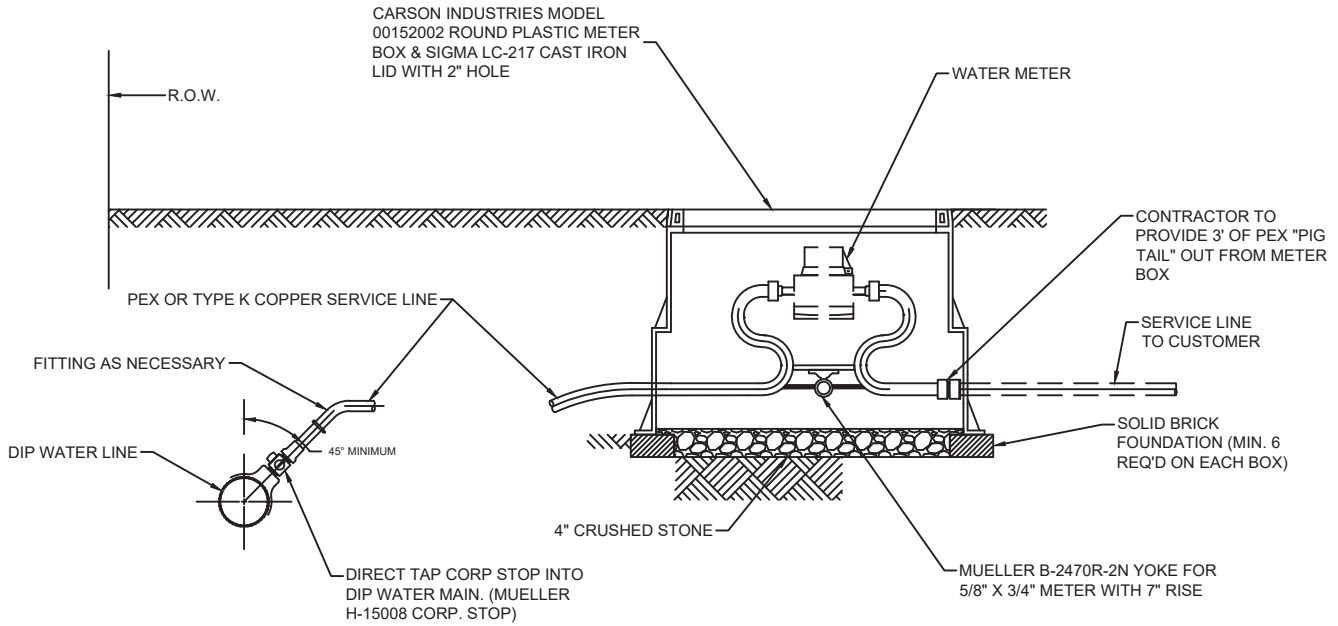
NOTE:

1. USE TAPPING SLEEVE AS SPECIFIED FOR FIRE HYDRANT INSTALLATION ON EXISTING WATER LINES.
2. DIP WITH RETAINER GLANDS MAY BE USED WHEN THE DISTANCE BETWEEN THE VALVE AND HYDRANT EXCEEDS 3-FEET.
3. LIMITS OF LUMP SUM FIRE HYDRANT ASSEMBLY INCLUDES 6" VALVE, MJ TEE WITH ROTATING GLAND, ANCHOR COUPLING, FIRE HYDRANT, ANCHORAGE, STONE WITHIN THE LIMITS SHOWN.

FIRE HYDRANT ASSEMBLY

NTS

STANDARD DESIGN SPECIFICATIONS



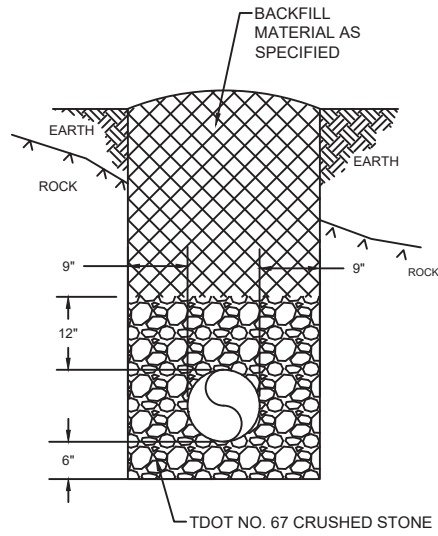
NOTES:

1. PROVIDE 2" SCHEDULE 80 PVC, 0.24" MIN. WALL THICKNESS STEEL OR SDR 11 HDPE CASING PIPE FOR SERVICE LINES UNDER ROADWAY.
2. THE CASING PIPE SHALL BE BURIED AT LEAST 48" BENEATH THE ROADWAY.

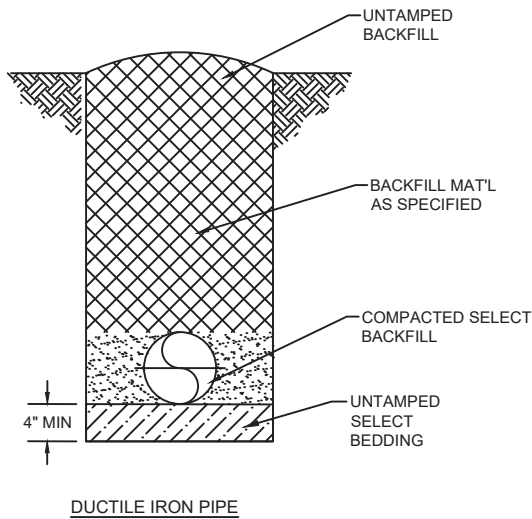
METER SETTING FOR 3/4" SERVICES

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STANDARD DESIGN SPECIFICATIONS



ALL PIPE
IN ROCK



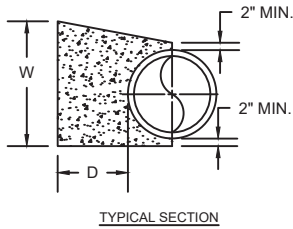
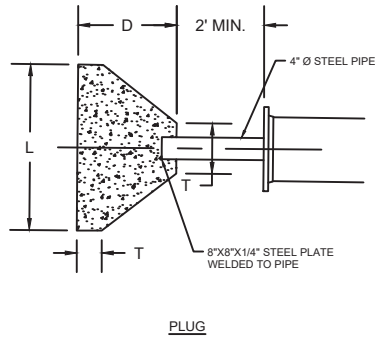
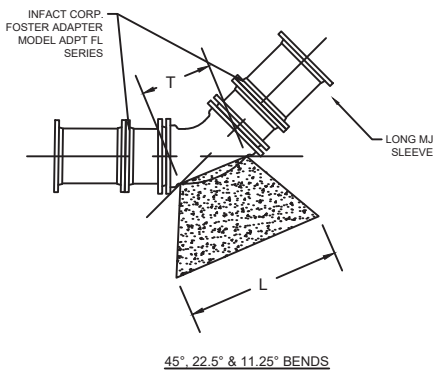
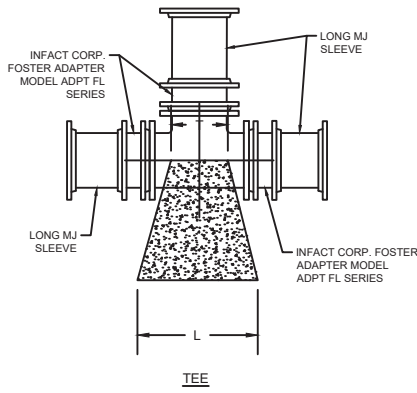
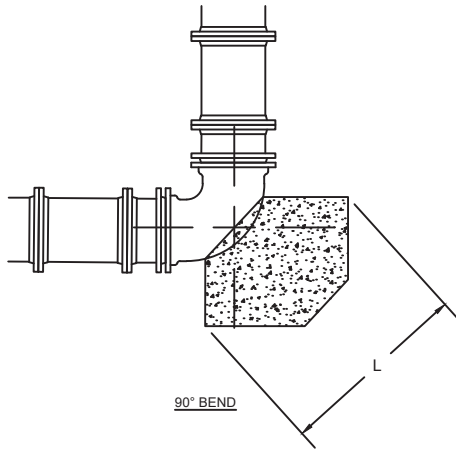
DUCTILE IRON PIPE

NOTE:
ALL COUNTY & STATE ROADWAY REQUIREMENTS SUPERSEDE SVUD SPECIFICATIONS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ADHERE TO THEM.

STANDARD WATER LINE BEDDING

NTS

STANDARD DESIGN SPECIFICATIONS



PRESSURE = 250 PSI
 SOIL CONDITIONS: EARTH - 2,500 PSF
 ROCK - 10,000 PSF

90° BEND											
SIZE	4"	6"	8"	10"	12"	4"	6"	8"	10"	12"	
D	14	16	18	20	24	8	10	12	14	16	
L	38	48	66	78	88	12	14	16	20	24	
W	24	30	36	42	48	12	14	16	20	24	
T	16	18	20	22	26	10	12	14	16	18	
45° & 22.5° BENDS											
SIZE	4"	6"	8"	10"	12"	4"	6"	8"	10"	12"	
D	14	16	16	18	22	14	14	16	20	24	
L	32	42	48	56	66	14	18	24	30	36	
W	24	30	30	36	42	14	16	18	22	28	
T	16	18	18	20	24	14	16	20	24	28	
11.25° BENDS											
SIZE	4"	6"	8"	10"	12"	4"	6"	8"	10"	12"	
D	12	16	16	18	22	8	10	12	14	16	
L	14	20	24	28	36	12	14	16	20	24	
W	14	16	18	20	22	12	14	16	20	24	
T	12	16	16	18	20	10	12	14	16	18	
TEE											
SIZE	4"	6"	8"	10"	12"	4"	6"	8"	10"	12"	
D	14	18	18	20	24	14	16	16	20	24	
L	28	42	48	56	64	22	26	30	42	60	
W	24	36	36	48	48	18	20	24	36	48	
T	18	20	24	24	24	14	14	16	20	24	
PLUG											
SIZE	4"	6"	8"	10"	12"	4"	6"	8"	10"	12"	
D	14	18	18	20	24	14	16	16	20	24	
L	28	42	48	56	64	18	20	24	42	60	
W	22	30	36	42	48	16	18	20	36	48	
T	18	20	24	24	24	12	14	16	20	24	

DIMENSIONS ARE IN INCHES

NOTES

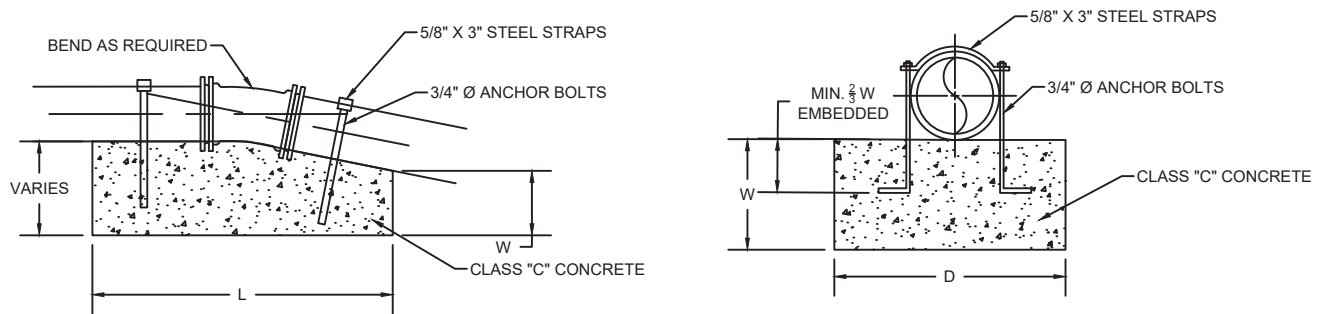
1. FOR TEE WITH BRANCH UNEQUAL TO RUN USE TEE TYPE KICKER WITH D, L, & W DIMENSIONS THE SAME AS THOSE FOR PLUG WITH SAME DIMENSION AS BRANCH OF TEE. SELECT "T" DIMENSION FROM TEE TABLE UNDER COLUMN HEADED BY THE SIZE OF THE BRANCH.
2. IF EXACT SIZE OF PIPE BLOCKING IS NOT SHOWN, USE NEXT LARGER SIZE.
3. DIMENSION "D" MAY BE GREATER THAN SPECIFIED TO ALLOW WORKING SPACE. CONCRETE BLOCKING MUST BE POURED AGAINST UNDISTURBED EARTH.

CONCRETE BLOCKING FOR PIPE

NTS

STANDARD DESIGN SPECIFICATIONS

45° BEND						
SIZE	4"	6"	8"	10"	12"	REMARKS
D	66	72	96	120	144	3/4" Ø ANCHOR BOLTS
L	42	48	48	48	48	
W	42	48	48	48	48	
22.5° BEND						
SIZE	4"	6"	8"	10"	12"	REMARKS
D	48	48	84	96	120	3/4" Ø ANCHOR BOLTS
L	36	42	42	48	48	
W	36	42	42	48	48	
11.25° BEND						
SIZE	4"	6"	8"	10"	12"	REMARKS
D	42	48	60	72	96	3/4" Ø ANCHOR BOLTS
L	36	42	42	48	48	
W	36	42	42	48	48	

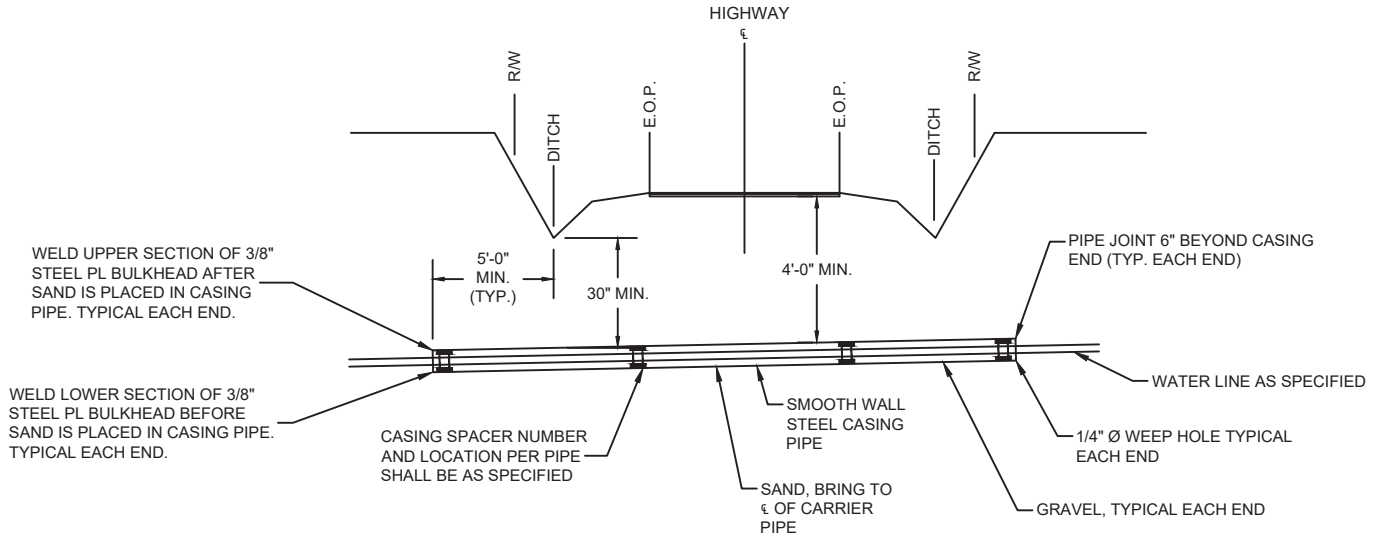


NOTE: FITTINGS ARE TO BE WRAPPED IN PLASTIC BEFORE ENCAPSULATING IN CONCRETE

VERTICAL ANCHORING DETAIL

FOR VERTICAL BENDS 5° OR MORE

STANDARD DESIGN SPECIFICATIONS

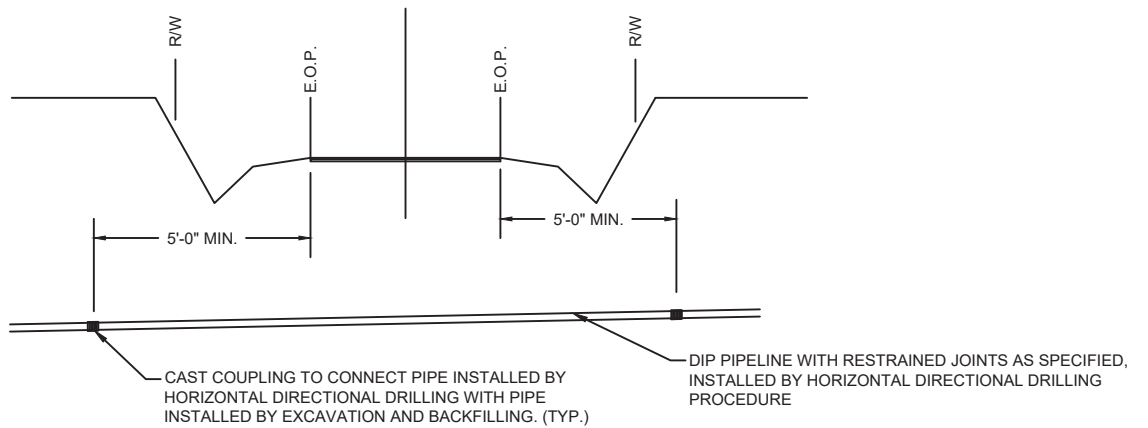


NOTES:

1. THE NUMBER OF STAINLESS STEEL SPACERS & SIZE REQUIRED TO PREVENT FLOATATION SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

BORED HIGHWAY CROSSING

NTS



NOTES:

1. DIAMETER OF BORED HOLE FOR WATER TRANSMISSION PIPELINE SHALL NOT EXCEED OUTSIDE DIAMETER OF WATER TRANSMISSION PIPELINE BY MORE THAN 1"

WATER TRANSMISSION PIPELINE INSTALLED UNDER ROADWAY BY HORIZONTAL DIRECTIONAL DRILLING PROCEDURE

NTS