

TECHNICAL SPECIFICATIONS

FOR

MILCROFTON UTILITY DISTRICT



January 2021

Prepared By:



Table of Contents

1 – GENERAL	1
1.01 – Scope of Work	1
1.02 – Definitions and Abbreviations	1
1.03 – Development Process	2
2 – PRE-CONSTRUCTION	2
2.01 – Location of Utilities and Proposed Water Lines	2
2.02 – Water Line Easements	3
2.03 – Warranty	4
2.04 – Inspection	4
2.05 – Safety	4
3 – CONSTRUCTION	5
3.01 – Construction Methods	5
3.02 – Site Grading and Fill Around Structures and Access Roads	6
3.03 – Clearing and Grubbing	6
3.04 – Excavation for Pipeline Trenches	7
3.05 – Blasting	8
3.06 – Seeding, Sodding, and Landscaping	9
3.07 – Obstructions	9
3.08 – Traffic Control and Utilities	10
3.09 – Pipe Storage and Handling	10
3.10 – Laying Pipe	10
3.11 – Backfilling of Trenches	12
3.12 – Removing and Replacing Sidewalks, Steps, Fences, Etc	14
3.13 – Replacing Streets and Roadways	15
3.14 – Creek and Ditch Crossings	15
3.15 – Highway, Railroad, and Secondary Road Crossings	16
3.16 – General Construction Procedures	17
3.17 – Pressure Testing of Water Lines	19
3.18 – Flushing and Disinfection of Lines	20
3.19 – Final Clean Up	20
4 – PRODUCTS AND MATERIALS	20
4.01 – Concrete and Related Materials	20
4.02 – Gate Valves	22

4.03 – Air Valves.....	23
4.04 – Blow Off Assemblies.....	24
4.05 – Fire Hydrants.....	24
4.06 – Private Fire Hydrants and Sprinkler Systems	25
4.07 – Pipe and Fittings for Water Mains	26
4.08 – Thrust Blocking and Restraint	28
4.09 – Joint Deflection	29
4.10 – Service Line Piping.....	29
4.12 – Water Meters.....	29
4.13 – Meter Boxes	30
4.14 – Meter Fittings.....	31
4.15 – Backflow Preventers	32
4.16 – Water Booster Stations & Water Storage Tanks.....	32
4.17 – Telemetry	33

STANDARD DETAIL DRAWINGS

No.

1. Line Laying Conditions In Rock or Earth
2. Line Valve Setting Detail
3. Anchor Detail for Vertical Bends 10° or greater (up or down)
4. Concrete Blocking Details (Tees and Plugs)
5. Concrete Blocking Details (Bends)
6. Thrust Collar Details
7. Creek Crossing Detail
8. Water Line Casing Detail
9. Combination Air Valve
10. Fire Hydrant Assembly Detail
11. Blow Off Assembly Detail
12. Water Service Line Detail (Typ.)
13. Standard Meter Setting Detail
14. 2" Meter Setting
15. 3"- 4" Meter Setting
16. 6"- 10" Compound Meter Setting
17. Backflow Preventer – Outdoor Installation
18. Backflow Preventer Requirements for Irrigation Systems

1 – GENERAL

1.01 – Scope of Work

The following specifications are to be used for installing public water infrastructure within the Milcrofton Utility District boundaries. The work to be accomplished under these Specifications consists of the furnishing of all labor, materials, and equipment necessary for the construction of the water lines and appurtenances in strict accordance with the Specifications and the applicable Plans. All items to be furnished shall be approved by the Engineer for the District before construction and all items installed shall be approved by the Inspector for the District before acceptance.

1.02 – Definitions and Abbreviations

- A. The term "District" shall mean the Milcrofton Utility District.
- B. The term "Inspector" shall mean the official inspector of the Milcrofton Utility District.
- C. The term "Engineer" shall mean the consulting engineer employed by Milcrofton Utility District.
- D. The term "Developer" shall mean the entity, which has signed a contract with the District for construction of the water system, which will be transferred to the District upon completion and acceptance by the District.
- E. The term "Contractor" shall mean the Contractor performing the construction of the water system for the Developer.
- F. The term "Site" shall mean lands or areas upon which work is performed included Rights-of-Way and easements and other such lands designated for use by Contractor.
- G. The term "Work" shall mean the entire construction project or the various identifiable parts thereof required to be provided under the contract with the Milcrofton Utility District.
- H. ASTM - American Society for Testing and Materials
- I. AWWA – American Water Works Association
- J. County – Williamson County, Tennessee
- K. NSF - National Sanitation Foundation
- L. TDEC - Tennessee Department of Environment and Conservation
- M. TDOT - Tennessee Department of Transportation

1.03 – Development Process

- A. The following technical specifications are applicable to all public water infrastructure projects in the District.
- B. The District’s Engineer will prepare plans for all District improvements.
- C. The first step in Development process requires the Developer to submit an application, application fee, and relevant project information to the District for review.
- D. The District Engineer will determine if the existing distribution system can serve the proposed development and if off-site improvements are required. The Engineer will send the Developer a Water Availability Letter within thirty (30) days of the Developer’s application submittal. The Water Availability Letters are considered valid for sixty (60) days. A fire hydrant flow test will be required.
- E. The Engineer will review the plan and drawings, determine applicable fees, and issue a Fee Letter summarizing the administrative and capacity fees. The Fee Letter is valid for sixty (60) days.
- F. After the administrative fee has been paid, the Engineer will request the most updated CAD files. The Engineer will then prepare detailed drawings of public water infrastructure and submit to TDEC Division of Water Supply for approval. An approved copy of the plans will be provided to the Developer.
- G. Once the capacity fees have been paid and the developer executes a water agreement with the District, public water system, construction may commence. A preconstruction meeting will be conducted with the Contractor and District personnel to review the project and procedures.
- H. The final plat will be submitted by the Developer for review and approval by the District.

2 – PRE-CONSTRUCTION

2.01 – Location of Utilities and Proposed Water Lines

- A. The Contractor is responsible contacting the Owner of all underground utilities before starting construction. The Tennessee 811 call center should be utilized where possible but may not include all buried utilities in all service areas.
- B. The approximate location of the water lines in relation to the limits of rights-of-way, pavement, etc., is shown on the Plans, but is not guaranteed. The location shown attempts to minimize the overall project with rock excavation, pavement replacement, crushed stone for traffic bound roadway, customer water services, etc., considered.

- C. The final location (as constructed) may be varied by the Contractor upon approval by the Engineer and/or Inspector, provided the proposed location is approved by TDOT, the County Highway Department, or other agency or legal entity having jurisdiction. This approval shall be at the expense of the Contractor.
- D. The final location, in any event, may be varied by necessity due to construction conditions at the direction of the Engineer and/or Inspector, or due to the requirements of TDOT, the County Highway Department, or other agency having legal jurisdiction. The construction of pipelines in the highway, road, or street right-of-way shall not be allowed unless there is no other place to construct the line, and only then upon the written approval of the Engineer and/or District.
- E. Before the water line construction can begin, the Developer's engineer/surveyor shall submit, in writing, a letter certifying that the entire width of all water line easements has been graded to the final grade and that all roads have been constructed to sub grade. The letter shall be submitted to the District Manager or his representative before scheduling preconstruction meeting. If the grade letter is for a portion of the total project, the letter must use the State Approved water line plans station numbers.
- F. The Preconstruction meeting must be held no more than two (2) weeks before work is to begin. The Contractor's foreman must attend the preconstruction Meeting. If the District determines a water line must be adjusted to maintain the minimum and maximum cover as stated in these specifications because water line easements had not been graded to the final grade and/or roads had not been constructed to sub grade before the water line was installed, such adjustment shall be made at the Developer's expense and shall be done before the water lines and appurtenances are accepted by the District for the development or project.

2.02 – Water Line Easements

- A. The District requires a twenty (20) foot wide "Exclusive Water Utility Easement" for all proposed water line installations not within subdivisions and a fifteen (15) foot-wide "Exclusive Water Utility Easement" for all proposed water line installations within subdivisions. No other utility will be allowed within the District's Exclusive easement except for the utility service crossings. **All electrical, gas, telephone, and cable TV lines and conduits shall be installed under the water line within the easement.** Secondary electrical boxes within the easements shall be a minimum of five (5) feet off the water line.
- B. In subdivisions, the maximum slope across the easement shall be 5:1 (H:V). In areas outside of subdivisions, the maximum slope across the easement shall be 5:1.
- C. All water lines shall be installed outside of any roadways, parking areas, or under any sidewalks. Crossing of any roads, driveways, sidewalks, or other paved obstructions, with the water line, will be permitted at perpendicular crossings only.
- D. Retaining walls, headwalls, or monument signs are not allowed within the easement.

2.03 – Warranty

For a period of at least one year after the final acceptance of the water system by the District in writing, the Developer and the Contractor shall warrant the fitness and soundness of all work done and materials and equipment put in place under the Contract. Neither the final acceptance nor any provision in the Plans or Specifications nor partial or entire occupancy of the premises by the District, shall constitute an acceptance of work not done in accordance with the Specifications or relieve the Developer of liability in respect to workmanship. The Developer shall remedy any defects in the work and pay for the damage to other work resulting there from which shall appear for a minimum of one year after construction and/or the establishment of a maintenance bond with the District, whichever is greater. The District will give notice of observed defects with reasonable promptness.

2.04 – Inspection

- A. Before the Contractor backfills any of the lines, or earlier, if deemed advisable, they first shall be inspected by the Inspector of the District. Said Inspector shall give the Contractor permission to proceed with the backfilling. If any joints, pipe, fittings, materials, or workmanship are found to be defective, they shall be removed and replaced by the Contractor without any additional expense.
- B. The Inspector will locate the water line, valves, and fittings with a GPS unit before any backfilling is done.
- C. As lines or sections of line are completed, they shall be thoroughly cleaned, disinfected, pressure tested, and inspected for leaks. The Contractor shall complete the testing and disinfection as specified below with inspection by said Inspector and completes all clean-up work before requesting a final inspection.

2.05 – Safety

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work or compliance with applicable safety Laws and Regulations.
- B. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement during construction.

- C. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- D. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations.

3 – CONSTRUCTION

3.01 – Construction Methods

- A. Excavation shall be accomplished at such places as are indicated on the Plans to the lines, grades, and elevations shown, or as directed by Inspector, and shall be made in such a manner that the requirements for the pipelines, structures and/or the formation of embankments as shown on the Plans may be followed. No excavation shall be started until the Inspector has approved the exact location of the proposed work. All material encountered (of whatever nature) within the limits designated shall be removed and disposed of as directed. During the process of excavation, the grade and/or pitch shall be maintained in such condition that it will be well drained always. When directed, temporary drains and/or drainage ditches shall be installed at the Contractor's own expense to intercept or divert surface water which may affect the prosecution or condition of the work. If at any time, it is not possible to place excavated material in the proper area of the permanent construction, it shall be stockpiled in approved areas for later use.
- B. Where rock, shale, hard-pan, or other unsatisfactory subgrade or foundation material is encountered, it shall be excavated to a depth of at least 12 inches below sub-grade, or to such greater depth below sub-grade as the Inspector may direct. The portion so excavated shall be refilled with crushed stone.
- C. Structural foundations shall be excavated to permit the placing of the full width and length of footings shown on the Plans with full horizontal beds. Rounded or undercut corners at edges of footings will not be permitted. All rock and other hard foundation material shall be freed from all loose material, cleaned, and cut to a firm surface leveled, stepped, or serrated as directed by the Inspector. All seams shall be cleaned out and filled with concrete, mortar, or grout. When masonry is to rest on an excavated surface other than rock, special care shall be taken not to disturb the bottom of the excavation, and the final removal of the foundation material to grade shall not be made until just before the masonry is placed. If the condition of the excavation for foundations and/or footings is such that concrete cannot be placed without becoming mixed with mud, special operations shall be performed to remedy the situation. The Contractor shall place sufficient sand, coarse aggregate, or a combination of such aggregates to stabilize properly the sub-grade, and then place a layer of waterproof sub-grade paper or other similar material to prevent the infiltration of mud or the entire mass of mud shall be removed entirely and replaced with suitable stable material.

3.02 – Site Grading and Fill Around Structures and Access Roads

- A. All material used for backfill around and under structures or in access roads shall be of a quality acceptable to the Inspector and shall be free from large or frozen lumps, wood, leaves, grass, roots, and other organic or extraneous material. All spaces excavated and not occupied by footings, foundations, walls or other permanent work shall be refilled with earth up to the surface of the surrounding ground, unless otherwise specified, with sufficient allowance for settlement. In making the fills and terraces around and under structures, the fill shall be placed in layers not exceeding six inches in depth and shall be kept smooth as the work progresses. Each layer of the fill shall be rolled with an approved type roller and/or be compacted to 95% of the Standard Proctor Density as determined by the Method of Test for Moisture Density Relations of Soils ASTM Designation D-698 and to the satisfaction of the Inspector. When, in the opinion of the Inspector, it is not practicable to roll sections of the fill immediately adjacent to the buildings or structures, then such sections shall be thoroughly compacted by means of tamping, puddling, or both, as may be required by the Inspector. All fills shall be placed to load structures symmetrically.
- B. As set out herein before, rough grading shall be held below finished grade and then the topsoil, which has been stockpiled, shall be spread evenly over the surface. The grading shall be brought to the levels shown on the Drawings or to the elevation established by the Inspectors. Final dressing shall be accomplished by handwork or machine work, or a combination of these methods, as may be necessary to produce a uniform and smooth finish to all parts of the re-grade. The surface shall be free from clods greater than two inches in diameter. Rock and/or shale excavation, which has been removed, may be placed in the fills, but it shall be thoroughly covered. Rock placed in fills shall not be closer than twelve inches from finished grade.
- C. Grading height shall be determined based upon the top of curb or sidewalk. If curb and/or sidewalks have not been placed, grading height shall be based upon finished road grade.

3.03 – Clearing and Grubbing

- A. The Contractor shall accomplish all clearing and/or clearing and grubbing within the limits designated on the Plans or as directed by the Inspector, or as required for the construction of the work involved and shall satisfactorily dispose of all materials so removed. The width of the area to be cleared will be the width of the District easement.
- B. The work under this Paragraph shall consist of the cutting and removal of all trees, stumps, brush, logs, trash, weeds, removal of fences, or other loose or projecting materials within the designated area. Unless otherwise specified, it also shall include the grubbing of stumps, roots, and other natural obstructions which, in the opinion of the Inspector, must be removed to allow the proper staking out and construction work and operate properly the facility upon completion of construction. Disposal shall be by approved burning or other methods satisfactory to the Inspector. Trees, which are designated to remain, shall be properly protected. When clearing is performed on private property, the Contractor will be required, at his own expense, to dispose of the material cleared by hauling away or other methods acceptable to the Inspector. Before the Contractor enters private property, the Developer

must have obtained a signed easement approved by the District and the Contractor must inform the property owner of the schedule.

- C. Unless grubbing is specifically not required, all bushes, hedge fences, trees, and stumps within the designated areas, except those occurring under embankments of more than 24 inches in depth, shall be grubbed up so that no root more than three inches in diameter shall be within 18 inches of the finished grade, or within six inches of the surface of any slope. All holes remaining in embankment areas after the grubbing operation, and in excavated areas less than two feet in depth, shall have the sides broken down or leveled if necessary to flatten the slopes, and refilled with acceptable material properly compacted.
- D. Before excavation and grading is commenced for buildings, structures, or other work described hereinafter (except pipe line and manholes), the topsoil shall be removed from the areas affected and stockpiled. When final grading is complete, the topsoil shall be spread evenly over the excavated areas. Rough grading shall have been carried approximately six inches below finished grade (except in solid rock, where it shall be carried 12 inches below finished grade) and brought back up to grade with topsoil as set out herein.

3.04 – Excavation for Pipeline Trenches

- A. The width of the trench shall be only sufficient to permit the pipe to be laid and jointing properly done and the backfill to be placed and compacted as specified. This shall include cutting through pavement and sidewalks. In no case, shall the width of the trench at the top of the pipe be greater than the pipe bell diameter plus 18 inches (in dirt) without prior approval of the District or Engineer. Rock excavation shall have a minimum excavation width of the bell diameter of the pipe plus 36 inches (18 inches each side of the bell diameter). Trenching machines may only be used where the water line is laid in dirt or will be encased through rock.
- B. If the foundation is good firm earth, the earth shall be paired or shaped to give full support to the lower third of each pipe, and, if necessary, a layer of $\frac{3}{4}$ " limestone, or other suitable material shall be placed for the foundation. The same means of securing a firm foundation shall be adopted in case the excavation has been made deeper than necessary.
- C. If the foundation is rock, an equalizing bed of sand, fine gravel, crushed stone, or other well compacted, suitable material shall be placed upon the rock. The thickness of these beds shall not be less than six inches and the pipe shall be laid in these beds so that at least the lower third of each pipe is supported throughout its length. If crushed stone is used, it shall be size 33C as described in the TDOT Standard Specification for Road and Bridge Construction.
- D. All pipe shall have a minimum cover of 36 inches and a maximum of 48 inches, unless otherwise shown on Contract Drawings. Any variation from this requirement shall be made only at the order of the District.

- E. Where trench is cut through paving which does not crumble on edges, trench edge shall be sawcut at least 2 inches deep with straight and neat edges, before excavation is started and care taken to preserve edge to facilitate neat paving.
- F. Trenches shall be excavated so that the pipe can be laid to the alignment and depth required and shall be excavated only so far in advance of pipe laying as to reveal obstructions, unless specifically directed by the inspector, no more than 400 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. The contractor shall open the trench far enough ahead to reveal obstructions that necessitate changing the line or grade of the water line.
- G. The trench shall be supported and drained that work can be performed safely and efficiently. Water shall not be allowed to run or stand in the trench while the pipe laying is in progress or before the joints are completely set or before the trench has been backfilled. The Contractor shall not open at any time more trench than his available pumping facilities can dewater.
- H. When unstable material is encountered or where the depth of excavation exceeds four feet, the sides of the trench or excavation shall be supported to provide a safe condition according to OSHA requirements.
- I. No trench shall be left open or work stopped on trench for a considerable length of time. If such is necessary, trench shall be refilled per backfill operations.
- J. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear or other satisfactory provisions made so that street drainage and natural water courses will not be obstructed. Care shall be taken to prevent, as far as practical, water carriage of excavated materials over street surfaces. All surface material, including sod, which in the opinion of the Inspector is suitable for reuse in restoring the surface, shall be kept separate from the general excavation material as directed by the Inspector.
- K. Whenever the excavation is carried beyond or below the lines and grade given by the Engineer, the Contractor shall refill such excavated space with such material and in such a manner as will insure stability of the structure involved.

3.05 – Blasting

- A. Blasting for excavation will be permitted only after securing the approval of the Inspector and only when proper precautions are taken for the protection of persons and property. The Inspector will establish the hours of blasting.
- B. All blasting operations shall be conducted in accordance with the municipal ordinances and State laws including Tennessee Blasting Standards Act of 1975 or Health, Safety and Environmental Protection Title 68, Chapter 105. All explosives shall be stored in conformity with all said ordinances and laws. No blasting shall be done within twenty (20) feet of any

water mains. Any damage done by blasting is the responsibility of the Contractor and shall be promptly and satisfactorily repaired by Contractor.

3.06 – Seeding, Sodding, and Landscaping

- A. Unless otherwise specified or shown on the Drawings, all graded areas shall be left smooth and thickly sown with a non-invasive grass mixture suitable for the area and season. Refer to the Chapter 7 of the Tennessee Erosion and Sediment Control Handbook for seeding specifications.
- B. When the final grading has been completed, the entire area to be seeded shall be fertilized based on soil tests. When soil tests are not possible, apply a 10-10-10 grade fertilizer at 700-1,000 pounds per acre. After fertilizer has been distributed, the Contractor shall disc or harrow the ground to work the fertilizer thoroughly into the soil. The seed then shall be broadcast, either by hand or by approved sowing equipment, at the rate specified. After the seed has been distributed, the Contractor then shall lightly cover the seed by use of a drag to another approved device. All seed must be certified. The seeded area then shall be covered with straw to a depth of approximately 1-1/2 inches.
- C. 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 the Inspector, the season is not favorable for the seeding of the grounds, then the Contractor shall delay this item of the work until the proper season for such seeding as directed by the Inspector.
- D. Sodding shall not be required unless specifically set out in the Detailed Specifications or shown on the Drawings. When sodding is required, it shall be so laid that no voids occur between strips. Weed roots shall be removed as the sod is laid. Sod shall be tamped or rolled immediately after it is laid, and the finished surface shall true to the grade, even and equally form at all points. Well-screened topsoil shall be lightly sprinkled over the sodded area and shall be raked to insure sealing the sod joints. The sodded areas shall be thoroughly watered.
- E. Landscaping, when specified or shown on the Drawings, shall be accomplished as set out in the Detailed Specifications and shown on the Plans.

3.07 – Obstructions

In cases where water lines, gas lines, sanitary sewer lines, storm sewer lines, or other underground structures are encountered, they shall not be disturbed or interrupted unless necessary, in which case they shall be replaced in as good condition as found as quickly as possible. All such lines or underground structures damaged during construction shall be replaced at the Contractor's expense, unless, in the opinion of the Inspector, such damage was caused through no fault of the Contractor.

3.08 – Traffic Control and Utilities

- A. Before beginning work on any public highway or roadway the Contractor shall plan for maintaining traffic as may be required. The applicable regulations of TDOT and/or City/County in which the project is located must be followed. In addition, the Contractor shall make proper arrangements with the authorities of the Public Transportation Systems whenever the work will interfere with established routing and/or schedules.
- B. Should it become necessary to provide additional buying or support of power, lighting, or telephone facilities, the authorities of these utilities shall be consulted by the Contractor so that suitable arrangements can be made for the protection of same.
- C. All costs for temporary or permanent work necessary for protection of utilities, private or public, shall be included in the contract amount to which the items of work pertain, or may be incidental thereto. In addition, the Contractor shall be responsible for any damage to the existing utilities resulting from the construction operations and shall bear the cost of all repair or replacement necessary for correction.
- D. The Contractor shall furnish proper equipment which shall be available always for maintaining streets and roads upon which work is being performed. All such streets and roads shall be maintained suitable for traffic until complete and final acceptance of work.

3.09 – Pipe Storage and Handling

- A. The Contractor will be required to stockpile all pipe, fittings, valves, valve boxes and other materials in central locations, and haul only the amount to the job site that can be laid in one day. Pipe will not be strung along the pipeline. Care must be exercised in the handling of all piping, valves, and fittings.
- B. Protect pipe, valves, and fittings from moisture and dirt. Elevate above grade.
- C. During storage, pipe ends shall be covered with factory end caps or plastic sheeting to prevent entrance of dirt, debris, or varmints. Pipes shall be stored in compliance with AWWA C600, "Installation of Ductile-Iron Water Mains and Their Appurtenances" requirements.
- D. Any interior and exterior pipe coating damage that was caused by the handling of the Contractor shall be repaired or replaced by the Contractor.

3.10 – Laying Pipe

- A. The trench shall be excavated to the required depth and width, bell holes and/or jointing holes shall be dug in advance of pipe laying. The beds of each piece of pipe shall be prepared carefully so that each individual piece of pipe shall have a uniform bearing. Pipe shall be laid in a straight line and grade without kinks or sags and shall be laid in a workmanlike manner. Bell holes and/or jointing holes shall be large enough so that the bell or hub will clear the ground and leave ample room for making the joint and inspection of joints.

- B. All pipes shall have a minimum of 36 inches and a maximum of 48 inches of cover including ditch crossings unless concrete encasement is used as per the Standard Drawings.
- C. Before each piece of pipe is lowered into the trench it shall be swabbed out thoroughly to insure it is being clean. Each piece of pipe shall be lowered separately unless the Inspector gives special permission otherwise.
- D. Care shall be taken to prevent injury to the pipe coating, both inside and outside. No piece of pipe or fitting which is known to be defective shall be laid or placed in the line. 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 in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.
- E. All angles or bends in the pipelines, either vertical or horizontal, shall be satisfactorily braced or anchored against the tendency of movement with joint harness, concrete or equal anchors to the satisfaction of the Inspector.
- F. All pipes must be tested for uniform diameter, straightness, and defects by the Inspector before being lowered into the trench. Rejected pipe shall be marked so as not to impair its value and separated from accepted pipe and removed from the project.
- G. When laying of pipe is stopped or when the line is left for any reason, the exposed end of such pipe shall be closed with plug fitted into the pipe bell to exclude earth and other material. Precautions shall be taken to prevent flotation of pipe by runoff into trench.
- H. Where bottom of the trench at sub grade is found to be unstable or to include ashes, cinders, any type of refuse, vegetable or other organic material, or large pieces of inorganic material, which in the judgment of the Inspector should be removed, the Contractor shall excavate and remove such unsuitable material to the width and depth ordered by the Inspector. Before the pipe is laid, the sub grade shall be made by backfilling with crushed stone or gravel. The layers shall then be compacted to provide uniform and continuous bearing and support for the pipe at every point between bell recesses.
- I. In rock, the trench shall be excavated to a depth at least 12 inches below the bottom of the pipe and refilled with $\frac{3}{4}$ " limestone to a sufficient depth to provide a firm bed for the bottom quadrant of the pipe. This 12 inch clearance must also hold under pipe bells.
- J. Joints for ductile iron pipe shall be made with mechanical or slip-on joints per the manufacturer's Specifications with the tools recommended. A copy of the manufacturer's instructions shall be available on-site always when pipe is being laid.
- K. All pipes must be forced and held together, or "homed" at the joints before tightening of joint bolts.
- L. Special molded adapters with stainless steel bands as furnished by pipe manufacturer shall be used for connecting dissimilar pipe to ductile iron pipe.

- M. No walking upon the completed pipelines will be permitted until trench has been backfilled to a depth of at least 6 inches over the top of the pipe. Exception may be made at the discretion of the Inspector where it is necessary to tamp the backfill around the pipe.
- 1) No backfilling over pipe, except for securing pipe in place will be allowed until the Inspector has had an opportunity to inspect the joints and alignment in the section laid, but such inspection shall not relieve the Contractor of further liability in case of defective joints. The contractor will not proceed with the backfilling until the Inspector gives permission.
- N. Separation of Water Mains and Sewers
- 1) Where the water line crosses over a storm or sanitary sewer, a full joint of pipe shall be centered over the sewer using Ductile Iron Pipe. Where the water line is parallel to a sanitary or storm sewer or near a manhole, the water line shall be a minimum of 10 feet from the sewer or manhole and be in a separate trench. Where this separation is not practical, the bottom of the water main shall be at least 18 inches above the top of the sewer. Where the water line is perpendicular to a sanitary or storm sewer, the water line shall have a minimum of 18-inch vertical separation.
 - 2) When routing a water line around the end of a storm sewer, water line shall clear end wall or wing wall by at least 5 feet.
- O. Location of Water Main in relation to other Utilities
- 1) All other utility lines (gas, electric, phone, cable, fiber, etc.) crossing an existing water main shall be installed underneath or below the existing water mains to the extent possible.

3.11 – Backfilling of Trenches

- A. Backfilling must be started as soon as practical after the pipe has been laid and jointed, alignment has been approved, and the pipeline and fittings have been surveyed by GPS. Backfilling shall be conducted always in a manner to prevent damage to the pipe and the exterior protection of the pipe. Placing of the backfill about the pipe shall be done only in the presence of the Inspector after his final inspection and acceptance of the pipe in place. Should there be a deficiency of excavated materials for backfilling due to the rejection of part thereof; the Contractor shall "borrow" earth of acceptable quality as directed by the Inspector. The Contractor shall dispose of excess excavated material off site. It shall be the responsibility of the Contractor to obtain locations or permits for its disposal.
- B. All backfilled ditches shall be maintained in such a manner than they will offer no hazard to the passage of traffic. The convenience of the traveling public and the property owners abutting the improvements shall be taken into consideration. All public or private drives shall be promptly backfilled or bridged at the direction of the Inspector. Excavated materials shall

be disposed of to cause the least interference and in every case the disposition of excavated materials shall be satisfactory to the Inspector.

- C. Suitable backfill shall consist of excavated material, if such material consists of loam, clay, sand, gravel, or other materials, which in the opinion of the Inspector is suitable for backfilling. All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, rocks or stones, or other material, which in the opinion of the Inspector, is unsuitable. All public roadways shall be backfilled with $\frac{3}{4}$ " limestone compacted in 6 to 8-inch lifts. Flowable fill may be required for backfill in State highways.
 - 1. Crushed limestone used for backfill or bedding shall be $\frac{3}{4}$ -inch limestone from a quarry approved by the Inspector. It shall contain no loam or clay, and all material must be capable of being passed through a $\frac{3}{4}$ -inch sieve.
 - 2. Gravel used for backfill or bedding shall consist of natural bank or river gravel consisting of durable particles graded from fine to coarse in a reasonably uniform combination with no boulders or stones larger than $\frac{3}{4}$ inches in size. It shall be free from slag, cinders, ashes, refuse, and other deleterious or objectionable materials. It shall not contain excessive amounts of loam and clay and shall not be lumpy or frozen. No more than 15% shall be finer than No. 200 sieve.
- D. The backfill material shall be carefully and solidly tamped around the pipe up to the point where the pipe is thoroughly covered with at least 12 inches of material. This material may be $\frac{3}{4}$ " limestone, in rock. The filling of the trench shall be carried on simultaneously on both sides of the pipe in such a manner that the complete pipeline will not be disturbed and injurious side pressures do not occur. Walking or working on the completed pipeline (except and may be necessary in tamping or backfilling) shall not be permitted until the trench has been backfilled to a height of at least one foot above the pipe.
- E. In filling the remainder of the trench, the requirements of TDOT and the County Highway Department shall be met for road crossings, but in general the backfill material free of rock may be placed into the trench without compacting and mounded, then compacted by rolling with the wheel of a grader or high lift whenever this method of backfilling may be used without inconvenience to the public, unless otherwise specified or required because of street or ramp repaving, or otherwise. Where street crossings are made, and street paving is to be replaced, the Contractor will be required to tamp all backfill as is described hereinafter.
- F. Where tamping is required, the backfilling shall be done in layers not to exceed six inches, and firmly tamped into place by use of tampers or reamers.
- G. Backfill material must be uniformly mounded over trench, and excess hauled away, with no rock over 2 inches in diameter. Mounded backfill shall be confined to the width of the trench and not allowed to overlap onto firm original earth, and its height shall not be more than needs for replacement of settlement of backfill. All rock over 2 inches in diameter shall be removed from streets, yards, and fields. Streets and walks shall be broomed to remove all earth and loose rock immediately following backfilling.

- H. At the completion of the job, should any backfill have settled below the surrounding ground, it shall be refilled and compacted to meet the surrounding surface levels.
- I. Backfilling shall not be done in freezing weather, except by permission of the Inspector, and it shall not be made where the material in the trench is already frozen.
- J. In case of damage to any existing structures, repair and restoration shall be made at once and backfill shall not be replaced until this is done. In all cases, restoration and repair shall be such that the damaged structure will be in as good condition and serve its purpose as completely as before uncovering.
- K. The Contractor shall repair or pay damage to any paving or structures injured by bumping into, undermining, crumbling edges, scraping off surfaces, or other careless handling of equipment. Where necessary to drive track equipment up over edge of curb, walk, or paving, edge shall be protected from chipping by proper timbering.
- L. Upon completion, all surplus water line materials furnished by the Contractor and the Contractor shall remove all tools and temporary structures from the site. All dirt, rubbish, and excess earth from the excavation shall be hauled to a dump provided by the Contractor and the construction site left clean to the satisfaction of the Inspector.
- M. The backfilled trench shall be finished so that its appearance is as good as or better than before construction. Across lawns, this may include sod replacement or seeding. Across fields, this may include seeding. In steep areas, sodding may be required. When seeding is necessary, the Contractor shall perform such work during the best season even if he must return to the job several months after completion.
- N. Preliminary clean-ups shall be made during the progress of the job to protect the traveling public and to satisfy the private property owners and the Inspector.
- O. Before final acceptance, the Contractor will be required to remove from the street, roadway, and private property all excess earth or other materials and obtain a release from the agency responsible for the road or street.

3.12 – Removing and Replacing Sidewalks, Steps, Fences, Etc.

- A. Wherever sidewalks are removed or disturbed about the construction work, they shall be replaced to the original lines and grades in as good or better condition that which existed prior to the Contractor's operations.
- B. After the sub-base has been brought to satisfactory grade, a 3-inch layer of $\frac{3}{4}$ " limestone shall be spread over it and thoroughly tamped. Immediately prior to pouring the concrete, the stone shall be wetted thoroughly, or the concrete poured on layer of heavy building paper.
- C. The paving shall consist of 4- $\frac{1}{2}$ inches of Class "A" concrete, leveled by accurately placed screeds and worked with a wooden float until the mortar appears at the top. After the surface has been floated thoroughly, it shall be brushed to leave markings of a uniform type like the

existing walk. All joints and edges shall be finished with an edging tool. The allowance variation shall be 1/8 inch in ten feet, transversely and longitudinally.

- D. Other types of sidewalks such as brick, stone, etc., shall be replaced with materials removed during the progress of the work in equally as good condition as that found before the work started.
- E. Where it becomes necessary in excavating for pipe work to cut fences, remove mailboxes, signs, or culverts, these items shall be replaced after completion of the backfill. Fences shall be restored to their original condition using the same type of materials that were used in the original construction. Mailboxes, signs, etc., shall be replaced in their original condition and location.
- F. Shrubby, lawns, flowers, whether on public or private property, will be removed ahead of construction as directed by the Inspector, or as shown on the Plans stored, and reset in such a manner as to damage the plants as little as possible.

3.13 – Replacing Streets and Roadways

- A. The Contractor shall replace all streets, alleys, driveways, and roadways which may be removed, disturbed, or damaged about his operations under this contract. The Contractor shall reconstruct it to the satisfaction of TDOT, the County Highway Department, or other legal entity having jurisdiction. The Contractor shall be responsible for adjusting all affected valve boxes so that the valve box tops match the grade of the finished asphalt surface. The re-use of materials removed in making excavations will be permitted, provided said materials are in good condition and acceptable to the Inspectors for the State, County, or other legal entity and the District.
- B. Care shall be exercised to minimize damage to graveled shoulders and paved surfaces.
- C. Gravel, crushed limestone, bituminous materials, or other materials used in the resurfacing of streets shall meet the current requirements of TDOT Standard Specifications for Road and Bridge Construction.
- D. The Contractor shall be held responsible for all damages occurring to the roadway pavement, curb and gutter and/or driveways due to his operations outside the actual limits of his work and shall replace any such damage to as good (or better) condition than that which existed prior to the Contractor's operations and at no additional expense to the District.

3.14 – Creek and Ditch Crossings

- A. All creek crossings shall be made with mechanical joint ductile iron pipe with thrust restraint and concrete cap according to the standard detail drawing.
- B. Where the water line crosses ditches or culverts, the line shall go under the invert of same at such a depth as to provide adequate cover. If the line is within 36 inches of the bottom of a

ditch or within a culvert, it shall be installed per the standard creek crossing detail. (See Standard drawings). The line shall begin to slope on either side of the ditch or culvert at a sufficient distance to hold a uniform gradient in the line without sags or short breaks.

3.15 – Highway, Railroad, and Secondary Road Crossings

- A. The Contractor shall furnish and install at locations shown on the Drawings or where required by Owners or agencies, metal pipe casing for crossing all highways, county and city roadways or railways. Steel pipe casing shall be steel pipe, or pipe as required by the respective Owner or agency having jurisdiction. Crossing shall have a minimum depth of cover of four feet as measured from the top of the casing pipe. The Contractor is responsible for obtaining construction permits and for notifying Owners or Agencies of construction schedules so that they may have a representative at the site to inspect the construction. Specifications published by the owners or agencies when granting permits for this work are to be considered a part of these Specifications. The Contractor shall also be responsible for any bond required by the Owners or agencies, the minimum size of casing pipe for the various sizes of mechanical joint ductile iron carrier pipe shall be as follows:

Ductile Iron Carrier Pipe Diameter	Smooth Wall Steel Casing Pipe Diameter / Wall Thickness
4 inch	10 inches / 0.188 inch
6 inch	12 inches / 0.250 inch
8 inch	18 inches / 0.250 inch
10 inch	18 inches / 0.250 inch
12 inch	20 inches / 0.312 inch
14 inch	24 inches / 0.312 inch
16 inch	26 inches / 0.375 inch
18 inch	30 inches / 0.375 inch
20 inch	30 inches / 0.375 inch
24 inch	36 inches / 0.500 inch
30 inch	42 inches / 0.500 inch

- B. Pipe under highway or railroad proper shall be installed by the jacking, tunneling, or drilling method, subject to the approval of the Owner or agency involved, the excavated base being made to grade at bottom and no more than one inch larger than the casing at top. Pipe extending beyond the minimum jacking limits may be placed by the open trench method. Jacking methods and procedure shall be as recommended by pipe manufacturer. Adjacent sections shall be completely jointed together, and the joint shall be inspected before jacking is resumed.
- C. Casing pipe shall meet ASTM A252, Grade 2. Casing pipe shall have a minimum yield strength of 35,000 pounds per square inch (psi). Jointing of steel pipe shall be by welding at joints.
- D. Construction must not interrupt or interfere with highway or railroad traffic. Roadways shall be kept clear at all times.

- E. Casing Spacers: Casing pipe shall be centered and supported in the casing pipe with a minimum of three (3) spacers per joint with stainless steel band casing spacers Model SSI as manufactured by Advance Product and Systems, Inc., PSI or Cascade Waterworks Mfg. The number of spacers required to be per the manufacturer's recommendation.
- F. End Seals: The ends of the casing pipe to be sealed using Link-Seal with stainless steel bolts or approved equal.
- G. The typical water line casing installation is shown in the Standard Detail Drawings.

3.16 – General Construction Procedures

A. Shutting Down Water Mains

Where it is necessary to shut off water mains and/or pipes to make connections or for capping mains, the work shall be done as quickly as possible, to cause the least inconvenience possible to the water customers, but not exceeding 4 hours. All shutdowns shall be scheduled in writing by the Contractor and must be approved in advance by the District. If deemed necessary, critical shutdowns shall be scheduled for night and/or weekends. The Contractor shall not operate any valves on existing water mains and/or water mains placed in service under this Contract without prior approval and only under the supervision of the District. The Contractor shall provide all water customers at least 48 hours-notice of an intended shutdown or interruption of water service (medical facilities may require a longer notice due to operational issues).

B. Maintain Water Service

The water service to customers, whose connections are to existing mains where the proposed mains under the Contract are to be constructed, must be maintained by the Contractor so that they will not be without water service while proposed mains are being constructed.

C. Abandon Existing Water Mains

1. It shall be the responsibility of the Contractor to remove all existing valve boxes over valves on abandoned mains. All valves on the abandoned main shall be closed only when directed by the Inspector or Engineer. The valve box shall be removed and safely stored to prevent loss or damage until picked up by the District. The hole shall be filled with gravel and the ground surface restored.
2. When water lines are abandoned in place, all open ends shall be capped with a mechanical joint cap or plug.

D. Construction Procedures

The installation of all mains should generally proceed as follows:

1. The Contractor may, at his option, begin the installation of the water main at the connection to the existing system by two means in conformance with the following:
 - a) The Contractor may begin construction without making any connection to the existing system. In this event, the new water line shall be temporarily capped near the proposed connection to the existing system. When the new water line is ready to be filled with water for testing and sampling, it shall be filled through a sufficiently sized copper /PEX jumper pipe tapped from the existing to the new water main using a backflow prevention device. Upon completion of all required pressure and sterilization tests, the Contractor shall make the required connection to the existing water main and sleeve the new main into the new connection. All new pieces and fittings to make final connection shall be sprayed or swabbed with chlorine solution.
 - b) The Contractor may begin construction by making the required connection to the existing system. In this event, the existing system shall be separated from the new construction by 2 consecutive valves. These 2 valves must remain closed at all times, and only be operated under the close supervision of the District to fill and/or flush the new pipeline. This connection to the existing system may be made at one connection point only. Any proposed connection points should remain free to allow the new pipeline to be flushed through a fire hydrant or other means. After the new pipeline is filled and flushed, water for the pressure test and samples should be obtained by placing a sufficiently sized copper/PEX jumper line around the new valves at the connection point. The new pipeline may be filled through the new valves and eliminate the copper jumper only with the prior approval of the District due to hazardous connection point locations, etc. The disinfection test must be conducted by the Contractor first. No pressure test will be allowed to be conducted on the new pipeline until the required samples have been taken and satisfactory results obtained. The required pressure test should then be conducted by the Contractor. The Contractor shall be responsible that the valves shall pass the required pressure tests. If the valve should leak, it shall be the Contractor's responsibility to cut and cap the line for testing purposes.
 - c) The Contractor shall install all new mains, fittings, valves, and hydrants. Existing mains are to be in service at all times.
 - d) The Contractor shall pressure test, disinfect, and flush the new mains, then place them in service, continuing to maintain service in the existing mains.
 - e) The Contractor shall reconnect and/or tie-over existing service lines from existing mains to new mains and install new service lines.
 - f) After all services are removed from the existing water main, the existing main shall be abandoned by cutting and capping as required. All tie-ins of the new water main shall then be completed.

- g) The Contractor shall remove from the ground all existing valve boxes over valves on abandoned mains and restore the surface as specified.

2. Pursuit of Work:

- a) The Contractor shall plan and pursue the work in such a manner as to maintain a work area confined to the immediate area of installation and be completed to the extent possible as the job progresses. This means that all valves, fire hydrants, air release valves, blow offs, valve boxes, and other appurtenances shall be installed at the time the water main is installed. As soon as the installation is complete and prior to testing, the excavations shall be backfilled, as specified, and the excess material is to be removed. Any damage claims to private property shall be investigated promptly and followed by such corrective action as may be necessary. The work area shall also be cleaned immediately following the installation.
- b) The purpose of the above requirements is to keep the inconvenience to the public at a minimum. If service lines must be installed later, the same procedure as outlined above shall be followed upon installation of the service line.

E. Construction Materials

- 1. Where the District furnishes materials, these shall not include any concrete, gravel, or pug mix, threaded rods for thrust restraint (or coatings required), traffic control devices, or other miscellaneous items not routinely furnished along with water mains, services and fittings for a complete installation.
- 2. Materials to be supplied to the Contractor shall conform to District's current approved standard material specifications. Any materials not specifically approved in these specifications shall be approved in writing by the Engineer or the District prior to order and not after receipt at the site. Failure to obtain prior approval shall be sufficient cause for the District's representative to reject any materials so delivered to the Contractor.

3.17 – Pressure Testing of Water Lines

- A. All pipes must be tested under a pressure of 200 psi. This may be done from valve-to-valve or by plugging the open end of the pipe. The tests must be made in the presence of the Inspector. Each joint shall be thoroughly inspected with all joints made watertight before backfilling around the joint. Tests shall be conducted in accordance with AWWA C600-10.
- B. The Contractor shall furnish all equipment and material for testing. Filling of lines shall include backflow prevention devices.
- C. The duration of each pressure test shall be a minimum of two hours.
- D. No more than 2,000 feet of line may be pressure tested at one time.

3.18 – Flushing and Disinfection of Lines

- A. The new water lines shall not be placed in service either temporarily or permanently until they have been disinfected thoroughly, in accordance with the following requirements and to the satisfaction of the Inspector. After pressure testing procedures have been completed, the Contractor shall fill the lines and flush them thoroughly, removing any foreign material, dirt, etc. No more than 6,000 feet of line may be disinfected at one time.
- B. After the lines have been flushed, a solution of hypochlorite using HTH or equal sufficient to ensure a chlorine dosage of at least 50 ppm in the lines shall be introduced into the lines for 24 hours and a residual of at least 25 ppm should be present in the pipe at the end of the 24-hour period. The lines shall be flushed until 2 ppm chlorine residuals remain, then a bacteriological sample taken. If a negative sample is obtained, the lines may be put into service. If a positive sample is obtained however, the disinfection procedure shall be repeated until a negative sample is obtained.
- C. Disinfection, pressure testing, other required testing and flushing are not pay items. The Contractor shall pay for all water used for testing, disinfection, and flushing.
- D. The Contractor shall install a temporary by-pass with a meter around a valve at the point of connection to the District's existing water system. This meter will be for measuring water used by the Contractor for flushing, testing, and disinfecting the new water lines. The meter shall be large enough to pass the required flows and shall be tested for accuracy before being installed.

3.19 – Final Clean Up

- A. In addition to the preliminary clean-ups during the progress of construction, the Contractor shall make a final clean up to ensure that the construction site is returned as nearly as possible to its original state.
- B. The Contractor is to assure the District that all property owners are completely satisfied with the cleanup. The District may require that the Contractor obtain releases from property owners.

4 – PRODUCTS AND MATERIALS

4.01 – Concrete and Related Materials

- A. Cement
 - 1. Cement shall be Portland Cement conforming to the "Standard Specifications for Portland Cement", Type 1, ASTM Serial Designation C150, and latest revision. Bulk cement, cement salvaged from discarded or used sacks, or lumped or caked cement will not be accepted.

2. Cement shall have less than 4% magnesium oxide and less than 1% loss by ignition. All cement shall be in sacks bearing the brand name of the manufacturer. The same brand of cement shall be used throughout the job, unless specifically approved otherwise in writing by the Engineer.

B. Concrete Aggregate

1. Aggregates for all concrete shall conform to the "Standard Specifications of Concrete Aggregates", ASTM Designation C33, and latest revision.
2. Fine aggregate shall meet the requirements of TDOT Standard Specifications for Road and Bridge Construction.
3. Coarse aggregate shall meet the requirements of TDOT Standard Specifications for Road and Bridge Construction.

C. Class "A" Concrete

1. Concrete curbs, gutters, driveways, sidewalks, highways, piers, and collars shall be Ready-Mixed, ASTM Designation C94 with a 28-day compressive strength of 3,000 psi, slump 3 to 4 inches.
2. Concrete for anchors, kickers, cradles, and/or encasement of water lines shall be placed where and as shown on the Plans, or as directed by the Inspector. Concrete for anchors, cradle, and/or encasement shall be Class "C" Concrete with a 28-day compressive strength of 3,000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe, or to insure the joints.

D. Metal Reinforcement:

Metal Reinforcement shall comply with the following:

1. The requirements of the "Standard Specifications for Intermediate Grade Deformed Billet Steel Concrete Reinforcement Bars" (latest ASTM Serial Designation).
2. Welded wire fabric or cold-drawn wire for concrete reinforcement shall conform to the requirements of the "Standard Specifications for Cold Drawn Steel Wire for Concrete Reinforcement" (latest ASTM Serial Designation).
3. All bar reinforcement shall be new intermediate grade deformed billet steel.
4. All bars shall be deformed bars conforming to ASTM Specifications A-305. Bars with deformations not meeting this Specification will not be acceptable.
5. All bending of bars, hooks, splicing of bars, etc., shall be in accordance with the requirements of the "Building Code Requirements for Reinforced Concrete" (latest ACI

Code) as published by the American Concrete Institute, and the "Manual of Standard Practice for Detailing Reinforced Concrete Structures", and the "CRSI Design Handbook" except where shown or called for differently on the Drawings.

4.02 – Gate Valves

A. All gate valves (2-inch to 30-inch) shall be of the resilient seat, iron body, non-rising stem, fully bronze mounted, and suitable for working water pressures of 350 psi. Valves shall be of standard manufacture and of the highest quality both as to materials and workmanship. Meet or exceed AWWA C515 Standard and ANSI/NSF 61 & 372.

B. Approved manufacturers for valves 4-30 inch:

Manufacturer	Model
American Flow Control	Series 2500
Mueller	2361
US Pipe	USP1

C. Valves shall meet all applicable requirements of AWWA C509/C515. Valves shall provide bubble tight closure up to 200 psi when closed and an unobstructed waterway when open. Valves shall be non-rising stems with clockwise operation to open. Stem seals shall be O-ring capable of replacement under pressure when valve is fully open. If the resilient seat is rubber material, the method used for bonding or vulcanizing shall be proved by ASTM D429. The valves shall be hydrostatically tested with twice the specified rated pressure applied to one side of the gate and zero pressure on the other side. The test shall be made in each direction across the gate. Valves shall be epoxy-coated on the inside including the interior of the gate in accordance with AWWA C550. Outside of the valve including bolt holes shall be coated with epoxy. The gate shall be provided with a drain in the bottom to flush the internal cavity of foreign material each time the valve is opened. All valves 24-inch and greater shall be horizontal in orientation.

D. All gate valves shall be furnished with mechanical joint end connections, unless otherwise shown on the Plans or specified herein. The end connections furnished shall be Wedge Restraints.

E. 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 pressure cast on the body of the valve.

F. All gate valves shall be provided with a 2-inch square operating nut and shall open by turning to the left (counter clockwise). At least one (1) adjustable operating wrench shall be furnished to the District Inspector per project at the start of construction by the Contractor.

G. Valve Boxes - All water valve boxes 16 inches and larger shall be constructed of pre-cast sections in accordance with the details as shown on the Contract Drawings. Valve boxes for

12 inches and smaller shall be as manufactured by Concrete Products of Nashville with cover number 8006 by John Bouchard & Sons Company, Russco, Vulcan or equal. Boxes shall be accurately set to finished grade and shall have backfill well tamped around them to hold them securely in place. All lid covers to valve boxes shall be marked "Water". Concrete valve boxes made in increments of 6 inch, 12 inch or 18 inch shall support lids.

- H. Valve boxes where possible must be located out of the pavement area. Where they must be in streets, the boxes must be raised upon final paving. No valves are to be installed in ditches.
- I. Check valves shall be iron body, bronze mounted, and rate for 200 pounds working pressure, suitable for operation in horizontal or vertical lines. Hinge pins and seat rings shall be bronze. A removable cover shall be provided for the removal of internal parts without the necessity of removing the valve from the line. Check valves shall be as manufactured by American or Mueller.
- J. Valves shall be furnished with the type of joints to meet requirements of pipe in which they are to be installed.

4.03 – Air Valves

- A. Air valves shall be installed on water lines at the high points in the line or other potential locations for air accumulation or water column separation as shown on the Plans or as directed by MUD. The valve type used shall be a combination air valve manufactured to meet AWWA C-512 and shall be a dual body configuration. The air release valve component of the combination air valve shall have a 1-inch diameter inlet and shall be fitted a discharge orifice sized per the table below, or as directed by MUD. The combination air valve shall be equipped with an isolation valve between the air/vacuum component and the air release component. The air/vacuum component of the combination air valve shall be sized to evacuate air during filling of the line based on a maximum fill rate that corresponds to 1 foot per second of pipeline velocity. The valve shall be adequately sized to prevent water column separation that creates vacuum conditions in the line.

For lines 12 inch diameter and larger, the combination air valves shall be APCO Series 1800, Crispin AL/PL Series, Cla-Val Series MTP36-CAV, Val-Matic Series VMC-104S/38 or an approved equal.

For lines less than 12 inch diameter, the combination air valves shall be APCO Series 1800, Crispin AL/M Series, Cla-Val Series MTP36, Val-Matic VMC-101S/38 or an approved equal.

The combination air valve must be mounted at the crown of the water line and in a below grade, precast concrete enclosure with at least 6 inches of head space above the tallest portion of the valve. The enclosure shall be designed with adequate drainage to prevent water infiltration into the valve at high groundwater elevations.

Orifice Sizing Guide (for use when pipeline pressure is 50 psi or greater at high point)

Pipeline Diameter (inches)	Air Release Orifice Size (inches)
6	1/16
8	3/32
10	1/8
12	1/8
16	3/16
18	3/16
20	1/4
24	1/4
30	5/16
36"	3/8

The box shall be a 2-inch Metro Style Meter Box less slab as manufactured by Cloud Concrete, Jarrett Concrete, Mid State Plastics, Inc. (MSBCF-1730-18) may be used but must have air release installed with 6-inch clearance under solid metal lid, or Hula Concrete. The lid shall be a large plate frame and cover as manufactured by John Bouchard and Sons, Russco, Vulcan, or equal approved. The cone section of a precast 48-inch ID concrete manhole may also be used or as directed by the District Inspector or Contract Drawings.

4.04 – Blow Off Assemblies

- A. Blow-off assemblies shall be installed at the location as shown on the Plans or as directed by the Inspector.
- B. Blow-Off assemblies shall be made with 2-inch brass piping. A gate valve shall be installed prior to the installation of the cap. A reverse kicker shall be installed prior to the gate valve and the gate valve rodded to the kicker. End of water line shall be capped with a MJ plug with wedge restraint, tapped for 2-inch threaded brass pipe. The blow-off assembly shall consist of 2-inch brass pipe, 2-inch threaded gate valve with 2-inch nut, valve box with frame and cover, and 2-inch bronze ball valve as shown on the Standard Detail drawing.

4.05 – Fire Hydrants

- A. Fire hydrants shall be constructed of the highest-grade materials and shall conform, in all respects, to the latest American Water Works Association's Standard Specifications (AWWA 502) and the National Board of Fire Underwriters. Fire hydrants shall be cast iron bodied, fully bronze mounted, suitable for a working pressure of 150 psi or a hydrostatic pressure of 300 psi. Fire hydrants shall be as manufactured by Mueller Co. (Model A423HS) or American Darling (Model B84B with 2100 check valve). All hydrants shall have Wedge Restraint Glands.

- B. All 6-inch fire hydrants shall have 6-inch bell-end connection to 6-inch and larger mains, which shall conform to Table 11.1 of the American Standard Specifications A21.11 for mechanical joint cast iron pressure pipe and fittings. The hydrants shall be a 3-way hydrant with one (1) 4 ½" pump nozzle or two (2) 2 ½" hose nozzles and NST threads together with cap fastened securely to each hydrant. The hydrants shall be provided with a pentagonal 1-1/2-inch operating nut. The bottom valve of the hydrant shall be not less than 5-1/4 inch in diameter with a 36-inch buried depth. The riser barrel shall have an inside diameter of 7 inches. All connection threads shall conform to the Standard Specification of the National Board of Fire Underwriters.
- C. The main valve of the hydrant shall be of the compression type closing with pressure. The valve shall be faced with heavy impregnated waterproof balata or other approved material. The hydrant shall be of the "dry head" type. Hydrants shall have a safety "Breakable Flange" section located above the ground line. Hydrants shall be set so that the distance from the ground line of the hydrants to the top of the hydrants lead shall not be less than 36-inches and turned to be unobstructed by poles or other objects. The hydrants shall be set plumb and shall be set with no less than 3 cubic feet of ¾" limestone about the waste opening to permit proper drainage. All hydrants shall be backed up with a minimum of one cubic foot of 3,000-pound mix concrete, dug back to hard ground to provide adequate bearing for the kicker. The waterways of hydrants shall be as free as possible of obstruction, sharp turns, corners, or other causes for resistance. The base of the hydrant shall be constructed in such a manner as to admit a proper mechanical joint connection with mechanical joint pipe.
- D. All fire hydrants and their appurtenances shall be installed within District easements on private property, whenever possible, and not within any public right-of-way, unless otherwise shown on the approved construction drawings.
- E. No fire hydrant will be installed until all system improvements necessary to provide adequate pressure and flow have been made or are in the process of being made.
- F. The service line from the District's system to any fire protection device, whether a fire hydrant, sprinkler system or other, shall be used only for fire protection. Such service line shall not be tapped for any other purpose, unless specifically permitted in writing by the District.
- G. After installation, exposed surfaces of hydrants shall be painted with one coat of red and two coats of Sonneborn's Hydrant Enamel. The color shall be red in accordance with the District's Standards.
- H. The Contractor shall provide the District with two (2) collision breakage repair part kits and one (1) valve wrench for the hydrants. These items shall be furnished to the District Inspector per project at the start of construction by the Contractor.

4.06 – Private Fire Hydrants and Sprinkler Systems

- A. Indicator posts and valves shall be required for all privately-owned fire hydrants and/or sprinkler systems on lines from which there is no domestic service, yard hydrant, or other water use.
- B. All automatic sprinkler systems and other fire-fighting devices must be metered, and each such installation must have suitable backflow prevention device. The meter and backflow preventer shall be as specified by the District.
- C. Private Fire Hydrants shall be painted silver per NFPA 291.

4.07 – Pipe and Fittings for Water Mains

A. General

All water line pipes shall be Ductile Iron as specified herein, unless otherwise specified and as approved by the Inspector.

B. Ductile Iron Water Line and Fittings

- 1) Ductile cast iron pipe shall be centrifugally cast in sand-lined or metal-lined molds and shall conform to all requirements of ANSI, A21.51 Standards, and AWWA Specification C151. The pipe is to be slip-type, single gasket joints, and plain end ductile iron pipe with wall thickness class 52. All ductile iron pipe shall be cement lined, in accordance with ANSI A21.4 (AWWA C-104), or latest revision. The pipe shall have an asphaltic coating on the outside approximately 1 mil thick in accordance with ANSI A21.5/AWWA C151. The same ductile iron pipe manufacturer shall be used throughout the construction of each subdivision phase or section or construction project. U.S. Pipe & Foundry, American Cast Iron Pipe Co., and McWane Pipe shall manufacture ductile iron pipe.
- 2) Certificate of Inspection, List of Pipe Weights, etc.: The pipe manufacturer shall furnish the District a certificate of inspection, sworn to by the factory inspector in the presence of a Notary Public, stating that the pieces of pipe making up the shipment were made and tested in accordance with ANSI Specifications A21.51 and that they were subjected to and withstood a hydrostatic pressure of 500 psi. Each statement shall include the number of pieces of pipe in the shipment and the length of each piece of pipe making up the shipment.
- 3) The joints shall be of the slip-on type such as "Fastite," "Tyton," or approved equal which employ a single elongated groove gasket to affect the joint seal. The pipe shall be furnished lengths not to exceed 20' or less than 12', and they shall be cement-lined inside and tar-coated outside, complete with accessories and Lubricant. Fittings shall be mechanical joint type, cast or ductile iron ANSI/AWWA-C110/A21.10, complete with all accessories.
- 4) All ductile iron pipe installed in a casing pipe shall be mechanical joint with restrained joint locking gaskets. Gaskets shall be American Fast Grip or U.S. Pipe Field Lok for sizes

24-inch or less. Gaskets shall be American Flex Ring or U.S. Pipe TR Flex for sizes 24-inch and larger.

- 5) When delivered to the job site, all pipes shall be received, unloaded, and carefully inspected by the Contractor for damaged or defective pieces. All damaged or defective pieces shall be rejected. If it is necessary to redistribute or haul any pipe to a new location, such handling of the pipe shall be at the Contractor's cost. The Contractor shall properly protect the pipe after it has been unloaded.
- 6) Fittings shall be in accordance with standard ductile iron mechanical joint fittings as manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Tyler/Union (McWane), Sigma, or Star. All fittings shall have Wedge Restraint Glands. The restraints shall be as manufactured by EBAA or approved equal.

C. Polyvinyl Chloride (PVC) Plastic Pipe

1) PVC pipe is only to be used for repairs on existing PVC lines.

- 2) All plastic pipes shall be made from Type 1, Grade 1, Polyvinyl Chloride Plastic as defined in ASTM Specification D1784, "Specification for Rigid Poly (vinyl chloride) Compounds." The required Class will be a minimum of 200 and if greater will be as shown on the Drawings. All Class 200, 250, or 315 pipes shall have NSF approval and be manufactured in accordance with Commercial Standard CS-256-64 except for the following tests which shall be run at least once each hour, per machine on each size and type of pipe being produced. The pipe shall also meet the requirements of ASTM D2241.

D. Joints:

1. The pipe and fittings shall have a push-on joint consisting of a rubber gasket designed to be assembled by the positioning of a continuous molded rubber ring gasket in a recess in the pipe and fitting sockets, thereby compressing the gasket radially to the pipe to form a positive seal. The gasket and angular recess shall be so designed and shaped that the gasket is locked in place against displacement as the joint is assembled. Gasket dimensions shall be in accordance with manufacturer's standard design dimensions and tolerances and shall be of such size and shape to provide an adequate assembly to affect a positive seal under all combinations of joint and gasket tolerance. Gasket shall be vulcanized natural or vulcanized synthetic rubber. No reclaimed rubber shall be used.
2. All joints shall meet the requirements of ASTM D3139.
3. All spigot (plain) ends shall be beveled to accommodate easy insertion into the gasket joint. The spigot (plain) end shall also be stripped to indicate the distance it should be extended into the socket. The joint shall be designed so that the spigot (plain) end may move in the socket as the pipe expands or contracts. The joints shall be designed to provide for the thermal expansions or contractions experienced with a temperature change of at least 75°F.

4. Lubricant furnished for lubricating joints shall be non-toxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material, and shall not impart taste or odor to water. The lubricant containers shall be labeled with the manufacturer's name.
 5. Joints shall be either integral bell or ring type with rubber compression gasket or twin gasket couplings. All gaskets shall be molded in the pipe bell during manufacturing. Pipe and bell must, however, be manufactured by the same manufacturer. Pipe to be as manufactured by Diamond Plastic, National, NAPCO, JM Eagle, or Sanderson.
- E. Pipe Lengths: The pipe shall be furnished in manufacturer's standard 20 ft lengths. However, the Contractor is advised that the Inspector must approve methods of storage and handling and that the pipe shall be supported within 5 ft of each end and every 15 ft thereafter. At no time, will the pipe be dragged or dropped. The pipe shall be stored away from heat or direct sunlight and "stringing" of the pipe along the project will not be allowed.
- F. Fittings: Fittings shall be in accordance with standard ductile iron mechanical joint fittings as manufactured by the U.S. Pipe and Foundry Company, American Cast Iron Pipe Company, Tyler/Union (McWane), Sigma, or Star.
- G. Marking of Pipe: As a minimum, the pipe and fittings shall be the following data applied to each piece:
1. Nominal Size
 2. Type of Material
 3. SDR or Class
 4. Manufacturer
 5. N.S.F. (National Sanitation Foundation's Seal of approval)
- H. Magnetic Tape and Locating Wire: All water lines shall have Copperhead 1230B-SF in color blue which is a solid 12-gauge copper wire with a steel coating covered in blue plastic locating wire installed along the side of the pipe. A 3-inch magnetic tape shall be located 18-inches below finished grade. The Contractor shall install metallic faced or backed detection tape when backfilling the water main trench. Tape ends or breaks in tape shall be securely spliced back together.

4.08 – Thrust Blocking and Restraint

- A. Ends of pipe, bends, and other joints or anchors as shown on the plans shall be backed up with concrete. The Contractor shall provide and place concrete in accordance with the Standard Drawings at every bend and fitting.
- B. This concrete shall be Class "C" Concrete with a 28-day compressive strength of 3,500 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. This concrete work shall be in accordance with the best practices and shall meet the approval of the Inspector. No additional compensation will be allowed for this concrete.

- C. The Contractor shall insure that all bolts, nuts and retainer glands except on dead-end stubs, are left clear of concrete thrust blocking for future access. Plywood or other suitable means of confining the concrete and keeping the bolts and nuts clear shall be used, and any excess concrete shall be removed at the Contractor's expense.

4.09 – Joint Deflection

- A. Pipe intended and/or shown to be laid in a straight line shall be laid straight with no deflection at the joints. No deflection will be allowed unless necessary due to grade, curves or to avoid obstructions.
- B. Should it be necessary to deflect the pipe from a straight line, the maximum amount of allowable deflection allowed shall be determined by the Inspector.

4.10 – Service Line Piping

- A. Service Connection Piping

Service connection piping shall be ¾-inch, 1 inch, or 2 inch, Rehau Municipex Pipe meeting AWWA C904 standards, and certified CSA B137.5, ASTM F876 & F877, NSF Standard 14 and 61. The length necessary to run a direct line, without splices from the main to the meter at the property line. Samples shall be submitted to the Inspector for approval prior to installation. Special care should be taken to protect the service piping from any sharp and/or hard objects by installing earth around the pipe. CTS Insert Stiffeners, as manufactured by Mars Company (SKU#F2090970WH for ¾" and SKU#F2090972WH for 1") shall be used for all push fit/pack joint/compression connections; no other products will be accepted without prior written approval by the District. Cover shall be a minimum of 18 inches at all points above the pipe.

- B. Service Pipe Bored Under Highway, Railroad, or Street

1. Where it is necessary to cross existing or proposed streets, highways, or railroads, the Contractor shall bore service pipe under said highway, railroad, or street and install a 3" diameter PVC, SCH 40 or SDR21, CL 200 encasement pipe so the service line can be installed through the encasement pipe. PVC pipe shall be white or blue.
2. The encasement pipe shall extend one (1) foot from the main to within one (1) foot of the meter box. Foam pipe insulation (approx. 1 ft) shall be installed at each end of the encasement pipe to center the service line in the encasement pipe and prevent vibration. Such service line shall be bored at least four feet under the surface.
3. Open cutting of highways, streets, or roadways will be allowed only when it is impossible to bore and when approved by the Inspector.

4.12 – Water Meters

- A. All new water meters (4-inch and smaller) shall be a hermetically closed static water meter, intended for the measurement of cold-water consumption and certified to NSF 61. The meter register shall read in gallons and shall be sealed hermetically to prevent condensation and to keep out water and other foreign materials. The meter shall be powered by an internal lithium battery.
- B. Meter fees for ¾ inch and 1-inch shall be paid to the District by the Developer and District will purchase and install them as needed. The meters in a subdivision shall have consecutive serial numbers. For other size meters, consult with the District.
- C. The capacities in the following table shall be used for meter sizing for ¾ through 8-inch. The District reserves the right to make meter sizing adjustments on a case-by-case basis. Meters 6 inch and larger will require a low flow bypass meter.

Size (inches)	Make / Model	Max Capacity (gpm)	Max Pressure (psi)
¾ x ¾	Kamstrup flowIQ 2200	32	250
1	Kamstrup flowIQ 2200	55	300
2	Kamstrup flow IQ 3200	160	300
3	Kamstrup flow iQ 3200	350	300
4	Kamstrup flow iQ 3200	700	300
6	Elster evoQ4	1,400	230
8	Elster evoQ4	3,500	230

- D. Kamstrup meters shall include the MUD logo and the following configuration code:
 DDD-JJ-LLL-MMMM-N-P-S-U-RR-CCC-V-T-YYYYZ
- E. Honeywell / Elster evoQ4 meters shall be programmed in shifted 8 - Sensus protocol.

Meter Type and Size (inches)	Honeywell Part No.
Domestic 6	5005Q0004XXDWAX or 5005Q0004XXXXXX + 2512Q9033
Domestic 8	5005Q0005XXDWAX or 5005Q0005XXXXXX + 2512Q9033
Fire Service 6 (U&FM)	BQA6825XXDWAX or BQA6825XXXXXX + 2512Q9033
Fire Service 8 (UL & FM)	BQA6826XXDWAX or BQA6826XXXXXX + 2512Q9033

- F. Meters 10 inch and larger will be evaluated on a case-by-case basis.

4.13 – Meter Boxes

- A. All meter boxes for meters 1-inch and smaller shall be the molded HDPE type and shall be constructed to a size adequate for the meter to be installed. The meter boxes shall be fully equipped with a removable cover and lid for adequate and proper reading of the meter. The meter box lid shall be a HDPE poly lid with a ductile iron reader door and designed to accommodate the AMI meter reading system. Shop Drawings of the meter boxes shall be subject to the approval of the District and/or Inspector prior to installation. Boxes shall be a

minimum of 24 inches deep. See Standard Detail Drawing. The meter box shall be as manufactured by Sigma and the lid shall be manufactured by Raven. Part Numbers are as follows:

Size (inches)	Box	Lid
¾	Sigma RMB132418-SW-W Sigma RMB1324-EXT6-W	Raven RMB1324-L-R
1	Sigma RMB173018-SW-W Sigma RMB173012-SW-W	Raven RMB1730-L-R

- B. Meters 2 inch and larger shall be installed in a precast concrete vault. Reference the applicable standard detail drawings for additional detail.

4.14 – Meter Fittings

The Contractor shall furnish and install the following for each service:

- A. Bronze Service Saddle (on PVC Water Lines) - All saddles to be bronze and they shall have a thick tapping boss with full length tapered threads and the "O"-ring gasket cemented in place and confined in a retaining groove. Saddles shall be Mueller H-13000 or A.Y. McDonald 3891 (Hinged Saddle).
- B. Corporation Stops - Stops shall be of bronze construction with one end having tapered threads (AWWA (cc) Thread) for connection to service saddle and the other end with copper service thread connection. Corporation Stop shall be Mueller B-25008 or A.Y. McDonald 74701BQ (AY Ball Corp. cc x Q compression).
- C. Meter Yoke and Curb Stop - Contractor shall install a copper setter meter yoke. The meter yoke shall be the double check valve type. The inlet and outlet ends shall be multi-purpose type joint. A curb stop shall be installed on the inlet of the meter yoke. Refer to the following table for ordering information:

Part	Manufacturer	Size (in)	Part No.
Yoke	Mueller	¾	B-2404-R6A
Yoke	A.Y. McDonald	¾	720-207WDMD33
Yoke	Mueller	1	B-2404-R6A
Yoke	A.Y. McDonald	1	720-410WDMD44
Curb Stop	Mueller	¾	B-25170R
Curb Stop	A.Y. McDonald	¾	7610WQ
Curb Stop	Mueller	1	B25107R
Curb Stop	A.Y. McDonald	1	76102WQ

- D. Fittings - All fittings to be compatible with Municipex Rehau pipe only.

- E. For duplexes, the Contractor shall install a 1" service line to a wye with a 3/4" water line to separate meters. Each side of the duplex to have its own meter. Duplex configuration may only be installed for domestic and irrigation combinations.

4.15 – Backflow Preventers

- A. Backflow requirements will comply with the most current TDEC Cross-Connection Control Manual.
- B. A reduced pressure backflow preventer must be installed at commercial water services at the discretion of the District. The unit shall be mounted outside, above grade in a heated, flood-proof area in accordance with Standard Detail Drawings and must meet all requirements of the State Department of Public Health, and any other Federal, State, and Local code requirements.
- C. The backflow preventer device shall contain a minimum of two independently operating check valves with an automatically operated pressure differential relief valve located between the two shut off valves, the device shall be equipped with the necessary appurtenances for testing. During normal flow and at the cessation of normal flow, the pressure between the two check valves shall be less than the supply pressure. In case of leakage of either check valve, the differential relief valve shall operate to maintain this reduced pressure by discharge to the atmosphere. When the inlet pressure is two psi or less, the relief valve shall open to the atmosphere, thereby producing an air gap in the device.
- D. The backflow preventer must be tested by the District at least once every twelve months by or under the direction of a certified distribution system operator who has special training in testing and maintenance of these devices. The date and other pertinent information concerning the testing and/or repairing of the unit shall be recorded on an operation report attached permanently to the unit. Representatives from the District and from the Tennessee Department of Public Health shall have access for inspection of the backflow preventer at any time.
- E. If sprinklers are installed on a dedicated private line connected directly to a public line with no domestic, fire hydrant, or yard hydrant service a double detector check is required.
- F. Only approved assemblies by the State of Tennessee will be accepted by the District. The State of Tennessee utilizes the most current USC Foundation for Cross Connection Control.
Approved Manufacturers:
 - 1. Ames Fire & Waterworks
 - 2. Apollo/Conbraco Industries, Inc.
 - 3. FEBCO
 - 4. Watts
 - 5. Wilkins Regulator Company (Zurn)

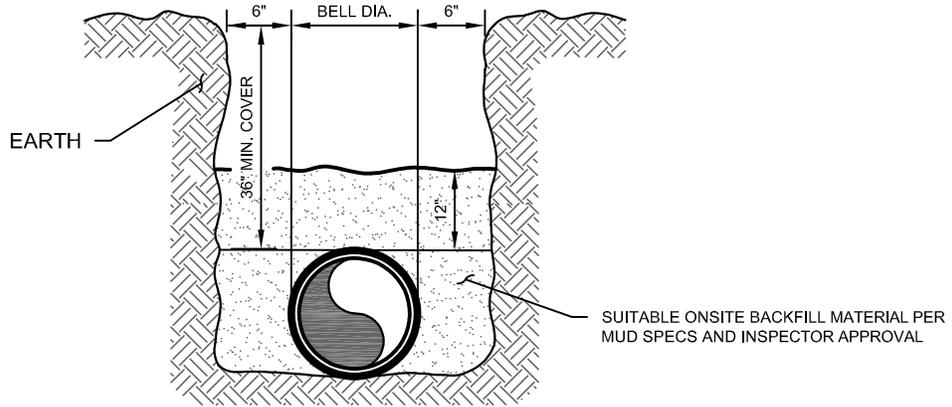
4.16 – Water Booster Stations & Water Storage Tanks

- A. Water Booster Stations shall be designed and constructed to meet Tennessee Public Water System design criteria. Materials of construction, pump configuration, and required appurtenances shall be as approved by District and Engineer. The Contractor shall be responsible for the installation of all required equipment for a complete and working system. The water booster station access road and parking area shall be constructed with asphalt pavement and the area secured with fencing per details on Construction Drawings
- B. Water Storage Tanks shall be designed and constructed to meet designed to meet Tennessee Public Water System and applicable AWWA tank design criteria. Materials of construction, piping configuration, and required appurtenances shall be as approved by District and Engineer. The water tank site shall be fenced and the access road shall be paved per details on Construction Drawings.
- C. All new water tanks shall have a submersible mixer system installed. The mixing system shall be Medora Grid Bee or approved equal. No system requiring solar power will be accepted unless otherwise approved by the District.

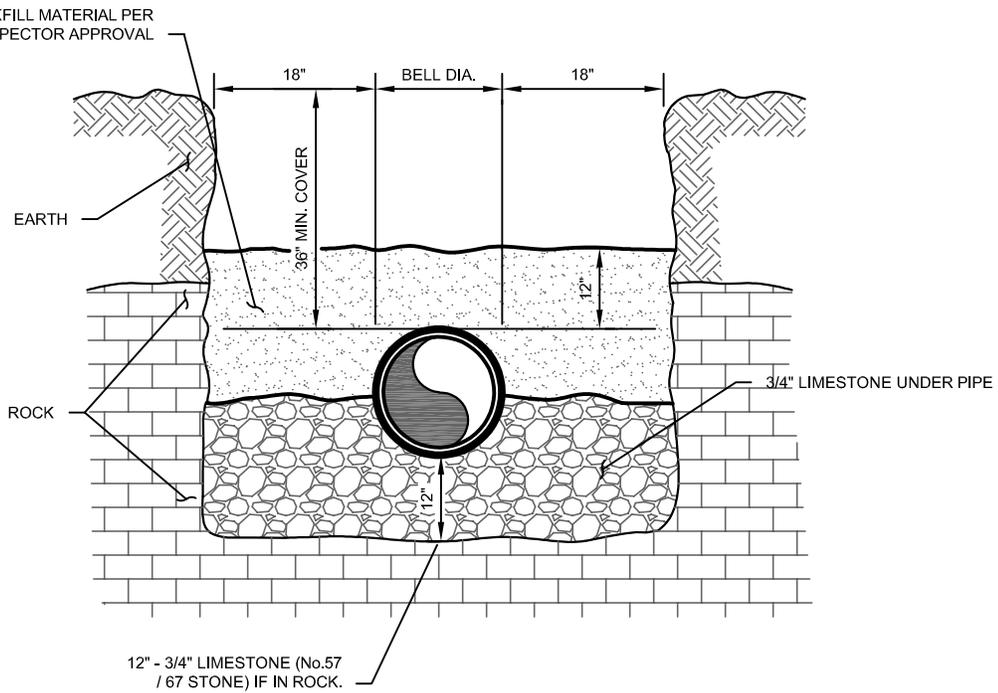
4.17 – Telemetry

- A. All water booster stations and water storage tanks shall be equipped with telemetry to monitor water tank levels and to turn on and off the water booster pumps. A flow meter and a chlorine analyzer as approved by the District must also be supplied. The telemetry system shall be supplied by Dorsett Technologies, Inc. (855-387-2232). No substitutes will be allowed, unless otherwise approved by the District.

IN
EARTH



IN
ROCK



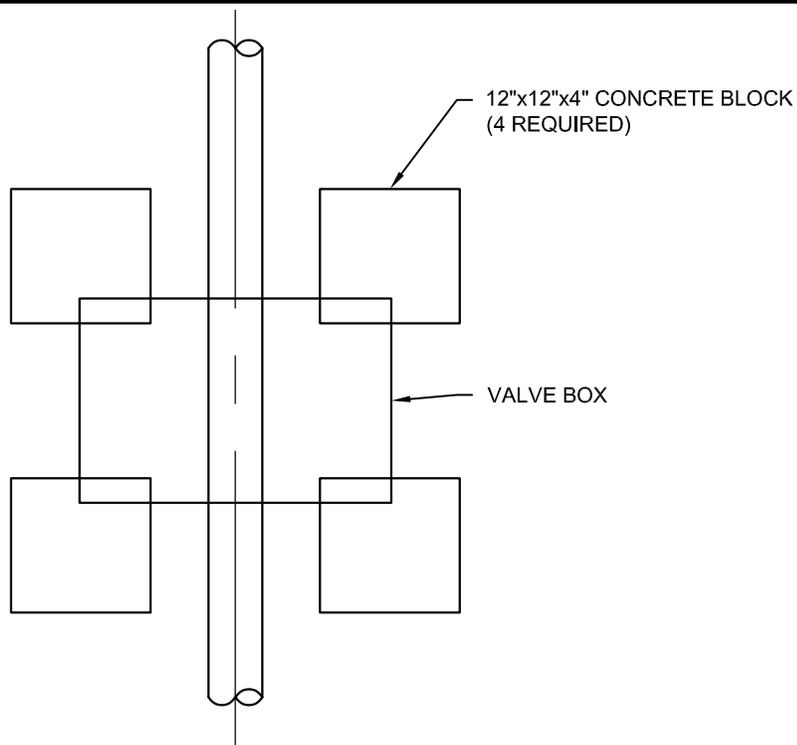
LINE LAYING CONDITIONS IN ROCK OR EARTH

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 1**

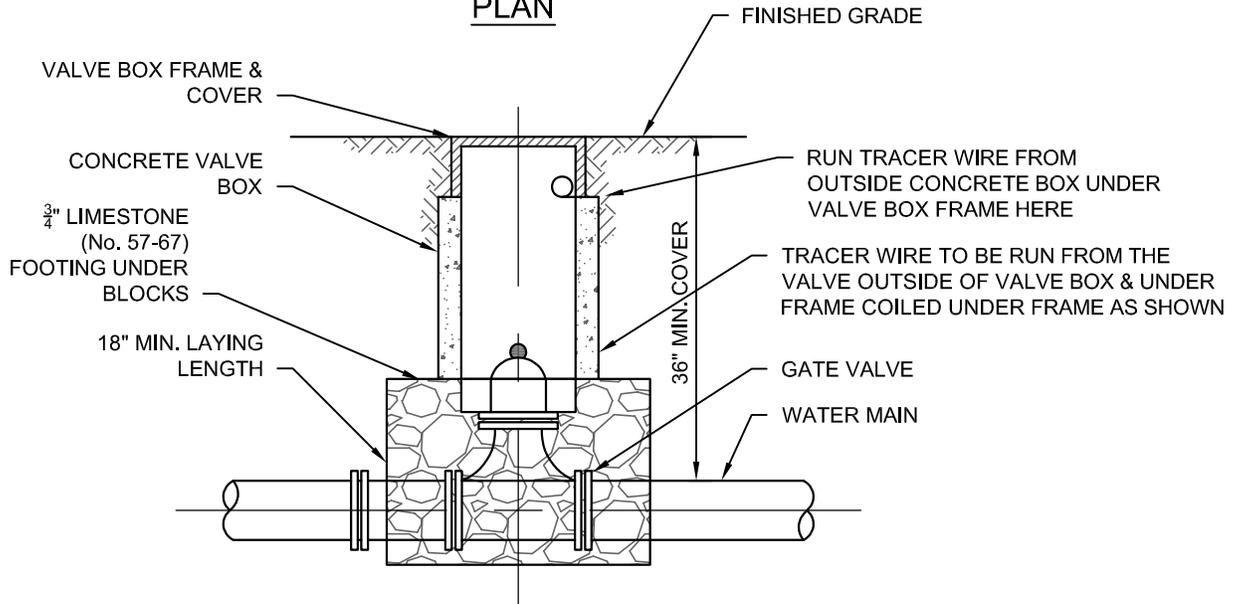
ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE





PLAN



SECTION

NOTES

1. VALVE BOX SHALL BE INSTALLED SO THAT THE WORD "WATER" ON THE VALVE BOX LID IS PERPENDICULAR WITH THE FLOW LINE OF THE WATER LINE.
2. ALL VALVE BOXES SHALL BE SET TO BE FLUSH WITH FINAL GRADES AND SHALL NOT BE COVERED WITH ANY PAVING, DIRT, SOD, GRASSING, AND/OR LANDSCAPING.
3. THIS DETAIL IS VALID FOR 16" AND SMALLER VALVE SIZES. FOR LARGER SIZES, SEE CONTRACT SPECS. OR CONFIRM WITH DISTRICT.

LINE VALVE SETTING DETAIL

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 2**



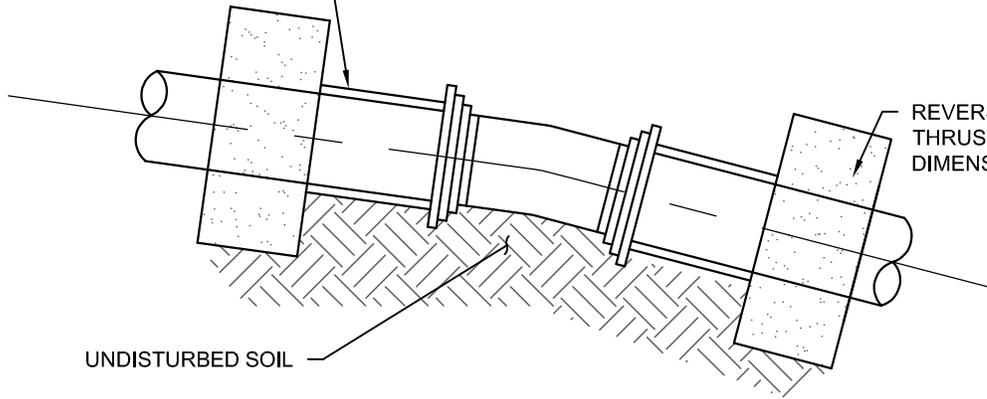
ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE

NOTE:

1. THRUST COLLARS/REVERSE KICKERS NOT DRAWN TO SCALE. SEE DETAIL 6.

STAINLESS STEEL RODS (SEE TABLE BELOW FOR SIZE & NUMBER REQUIRED)



REVERSE KICKER (EACH SIDE) - SEE THRUST COLLAR DETAIL 6 FOR DIMENSIONS

UNDISTURBED SOIL

NOTES

1. PIPE TO BE INSTALLED IN TRENCH AS PER DETAIL No. 1
2. THREE (3) LOK-TIGHT GASKETS SHALL BE INSTALLED BEFORE VERTICAL FITTING, AND THREE (3) LOK-TIGHT GASKETS SHALL BE INSTALLED AFTER EACH VERTICAL FITTING.
3. SEE THRUST COLLAR DETAILS ON STANDARD DETAIL 6 FOR REVERSE KICKER DIMENSIONS.
4. ALL BOLTS AND FITTINGS MUST BE WRAPPED IN MINIMUM SIX (6) MIL. PLASTIC.
5. LEAVE APPROXIMATELY 12" CLEARANCE BETWEEN CONCRETE AND FITTING BELLS
6. THRUST BLOCK DIMENSIONS BASED ON 150 PSI OPERATING PRESSURE AND 50% ADDITIONAL SURGE PRESSURE.
7. SOIL BEARING PRESSURE USED FOR THRUST BLOCK DIMENSIONS SHOWN IS 4000 PSF. IF SOIL SURROUNDING THRUST BLOCK DOES NOT HAVE THIS CAPACITY, ADDITIONAL THRUST BLOCK VOLUME MAY BE REQUIRED.
8. CONCRETE TO BE USED FOR THRUST BLOCKS TO BE 3,500PSI CONCRETE.
9. ELEVATION OF GROUNDWATER IS ASSUMED TO BE BELOW BOTTOM OF THRUST BLOCK.
10. THRUST COLLAR RING MUST BE FACTORY WELDED ON BOTH SIDES ALONG BOTH EDGES OF COLLAR AROUND CIRCUMFERENCE.
11. REINFORCING BARS SHALL BE DEFORMED AND TIED TOGETHER.

RESTRAINT TABLE	
SIZE	No. OF 3/4" DIAMETER RODS REQ'D.
6"	2
8"	2
10"	4
12"	6
16"	8
24"	16
30"	20

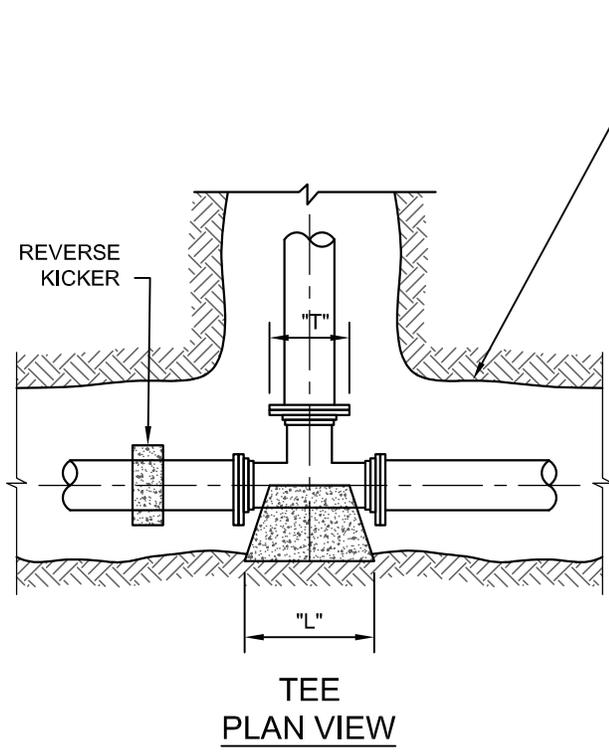
**ANCHOR DETAIL FOR VERTICAL BENDS
10° OR GREATER (UP OR DOWN)**

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 3**

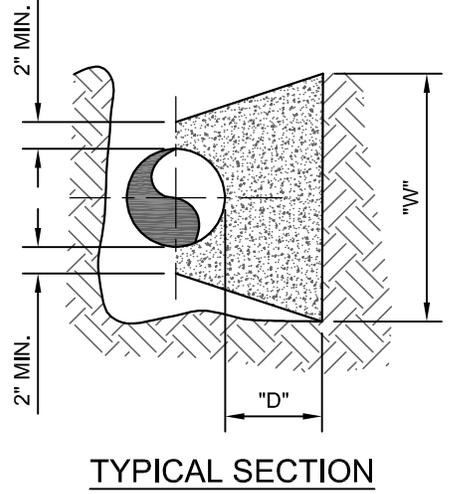
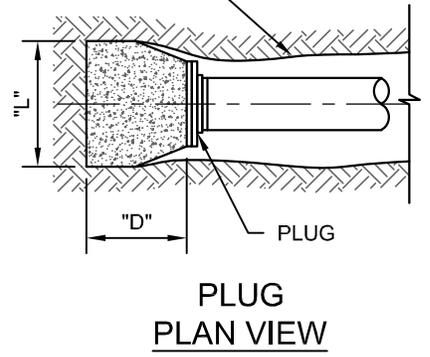


ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE



SIDE OF TRENCH



TEE							
SIZE	6"	8"	10"	12"	16"	24"	30"
"D"	18"	18"	18"	24"	24"	30"	36"
"L"	19"	25"	31"	38"	50"	75"	93"
"W"	19"	25"	31"	38"	50"	75"	93"
"T"	16"	16"	18"	18"	24"	36"	36"

PLUG							
SIZE	6"	8"	10"	12"	16"	24"	30"
"D"	18"	18"	18"	24"	24"	30"	36"
"L"	19"	25"	31"	38"	50"	75"	93"
"W"	19"	25"	31"	38"	50"	75"	93"
"T"	12"	12"	12"	12"	18"	30"	36"

NOTES

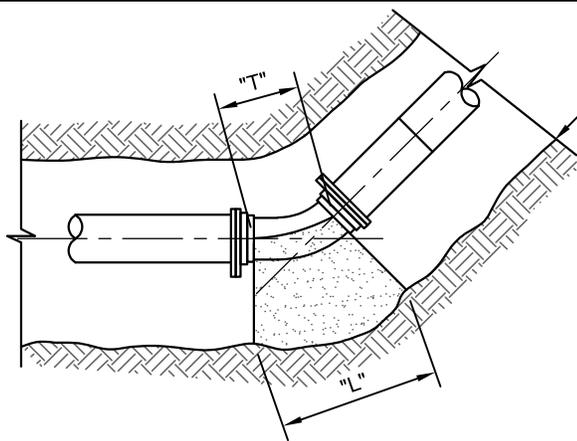
1. DEPTH "D" MAY BE GREATER THAN SPECIFIED TO ALLOW WORKING SPACE AGAINST UNDISTURBED EARTH.
2. ALL BOLTS AND FITTINGS MUST BE WRAPPED IN MINIMUM SIX (6) MIL. PLASTIC.
3. LEAVE APPROXIMATELY 12" CLEARANCE BETWEEN CONCRETE AND FITTING BELLS
4. THRUST BLOCK DIMENSIONS BASED ON 150 PSI OPERATING PRESSURE AND 50% ADDITIONAL SURGE PRESSURE.
5. SOIL BEARING PRESSURE USED FOR THRUST BLOCK DIMENSIONS SHOWN IS 4,000 PSF. IF SOIL SURROUNDING THRUST BLOCK DOES NOT HAVE THIS CAPACITY, ADDITIONAL THRUST BLOCK VOLUME MAY BE REQUIRED.
6. CONCRETE TO BE USED FOR THRUST BLOCKS TO BE 3,500PSI CONCRETE.
7. LENGTH (L) AND WIDTH (W) DIMENSIONS CAN BE MODIFIED SLIGHTLY AS LONG AS TOTAL AREA DOES NOT CHANGE, BY WRITTEN DIRECTION OF MUD ONLY TO MEET SITE SPECIFIC CONCERNS.
8. ELEVATION OF GROUNDWATER IS ASSUMED TO BE BELOW BOTTOM OF THRUST BLOCK.

**CONCRETE BLOCKING DETAILS
(TEES AND PLUGS)**

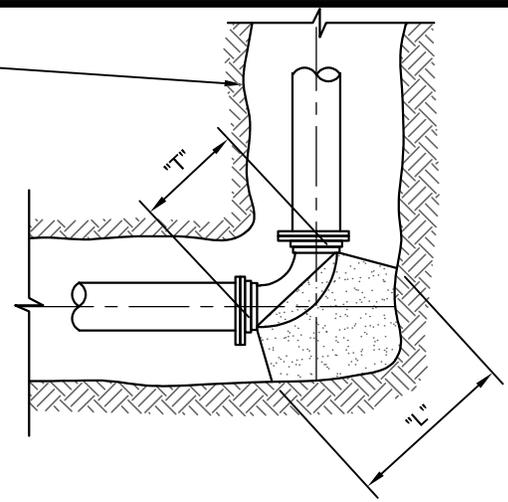
**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 4**

ISSUE DATE : DECEMBER 2020	DRAWN BY :	RCG
SCALE : NOT TO SCALE	CHECKED BY :	JEE





45° BEND (1/8th)
 22-1/2° BEND (1/16th)
 11-1/4° BEND (1/32nd)
PLAN VIEW



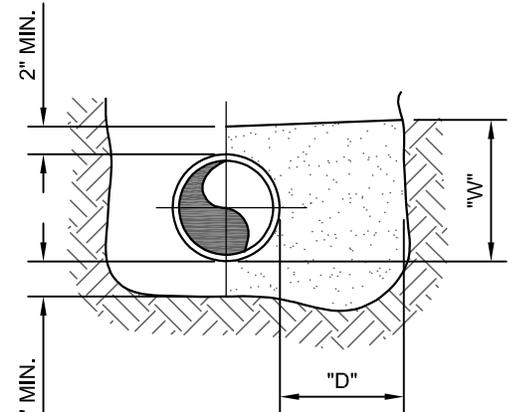
90° BEND (1/4th)
PLAN VIEW

90° BEND (1/4th)							
SIZE	6"	8"	10"	12"	16"	24"	30"
"D"	18"	18"	18"	24"	24"	30"	36"
"L"	32"	42"	52"	63"	84"	125"	156"
"W"	16"	21"	26"	32"	42"	63"	78"
"T"	16"	16"	18"	18"	24"	36"	36"

45° BEND (1/8th)							
SIZE	6"	8"	10"	12"	16"	24"	30"
"D"	18"	18"	18"	18"	24"	30"	36"
"L"	24"	31"	39"	46"	62"	92"	115"
"W"	12"	16"	20"	23"	31"	46"	58"
"T"	16"	16"	18"	18"	18"	24"	24"

22.5° BEND (1/16th)							
SIZE	6"	8"	10"	12"	16"	24"	30"
"D"	12"	12"	18"	18"	24"	24"	24"
"L"	17"	23"	28"	33"	44"	66"	82"
"W"	9"	12"	14"	17"	22"	33"	41"
"T"	16"	16"	18"	18"	18"	24"	24"

11.25° BEND (1/32nd)							
SIZE	6"	8"	10"	12"	16"	24"	30"
"D"	12"	12"	18"	18"	24"	24"	24"
"L"	12"	16"	20"	24"	32"	47"	59"
"W"	6"	8"	10"	12"	16"	24"	30"
"T"	16"	16"	18"	18"	18"	24"	24"



TYPICAL SECTION

NOTES

1. DEPTH "D" MAY BE GREATER THAN SPECIFIED TO ALLOW WORKING SPACE AGAINST UNDISTURBED EARTH.
2. ALL BOLTS AND FITTINGS MUST BE WRAPPED IN MINIMUM SIX (6) MIL. PLASTIC.
3. LEAVE APPROXIMATELY 12" CLEARANCE BETWEEN CONCRETE AND FITTING BELLS
4. THRUST BLOCK DIMENSIONS BASED ON 150 PSI OPERATING PRESSURE AND 50% ADDITIONAL SURGE PRESSURE.
5. SOIL BEARING PRESSURE USED FOR THRUST BLOCK DIMENSIONS SHOWN IS 4000 PSF. IF SOIL SURROUNDING THRUST BLOCK DOES NOT HAVE THIS CAPACITY, ADDITIONAL THRUST BLOCK VOLUME MAY BE REQUIRED.
6. CONCRETE TO BE USED FOR THRUST BLOCKS TO BE 3,500PSI CONCRETE.
7. LENGTH (L) AND WIDTH (W) DIMENSIONS CAN BE MODIFIED SLIGHTLY AS LONG AS TOTAL AREA DOES NOT CHANGE, BY WRITTEN DIRECTION OF MUD ONLY TO MEET SITE SPECIFIC CONCERNS.
8. ELEVATION OF GROUNDWATER IS ASSUMED TO BE BELOW BOTTOM OF THRUST BLOCK.

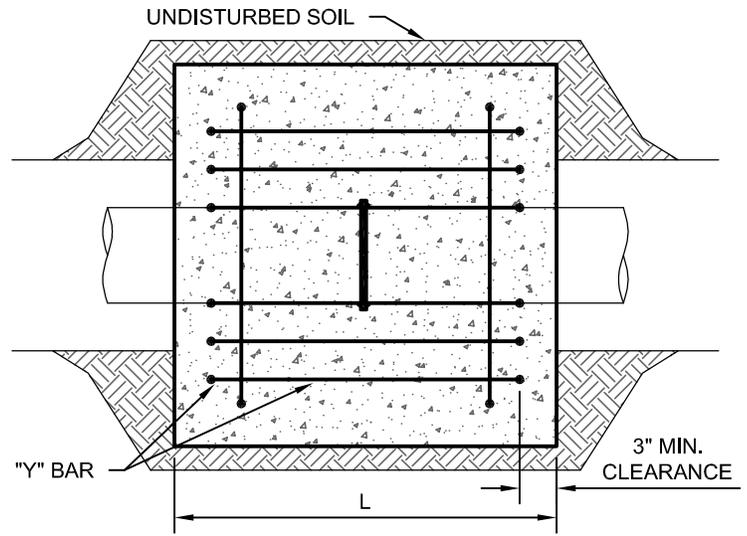
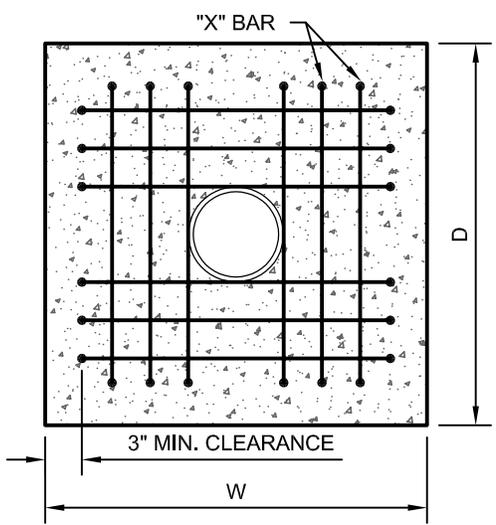
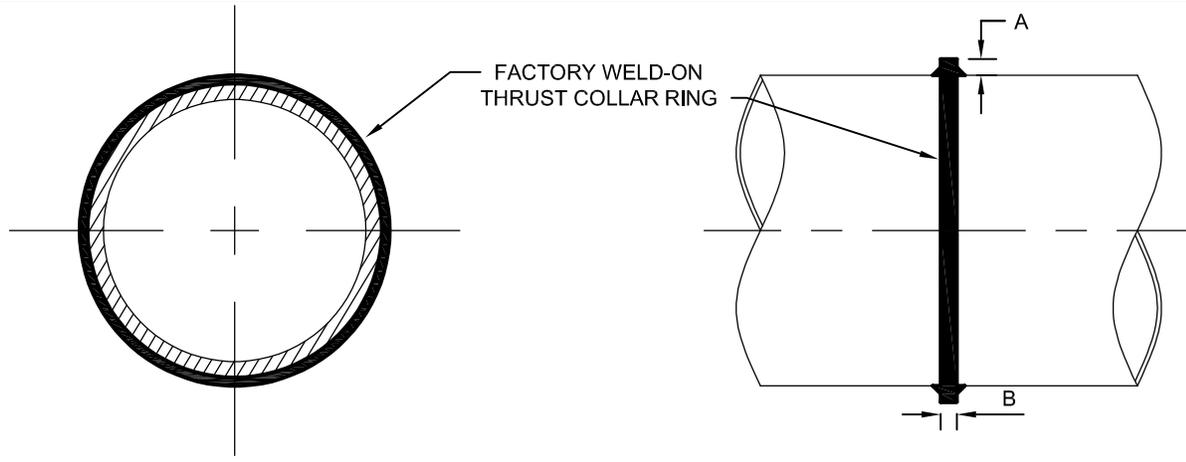
**CONCRETE BLOCKING DETAILS
 (BENDS)**

**MILCROFTON UTILITY DISTRICT
 STANDARD DETAIL NO. 5**

ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE





NOTES

1. DEPTH "D" MAY BE GREATER THAN SPECIFIED TO ALLOW WORKING SPACE AGAINST UNDISTURBED EARTH.
2. ALL BOLTS AND FITTINGS MUST BE WRAPPED IN MINIMUM SIX (6) MIL. PLASTIC.
3. LEAVE APPROXIMATELY 12" CLEARANCE BETWEEN CONCRETE AND FITTING BELLS
4. THRUST BLOCK DIMENSIONS BASED ON 150 PSI OPERATING PRESSURE AND 50% ADDITIONAL SURGE PRESSURE.
5. SOIL BEARING PRESSURE USED FOR THRUST BLOCK DIMENSIONS SHOWN IS 4,000 PSF. IF SOIL SURROUNDING THRUST BLOCK DOES NOT HAVE THIS CAPACITY, ADDITIONAL THRUST BLOCK VOLUME MAY BE REQUIRED.
6. CONCRETE TO BE USED FOR THRUST BLOCKS TO BE 3,500 PSI CONCRETE.
7. LENGTH (L) AND WIDTH (W) DIMENSIONS CAN BE MODIFIED SLIGHTLY AS LONG AS TOTAL AREA DOES NOT CHANGE, BY WRITTEN DIRECTION OF MUD ONLY TO MEET SITE SPECIFIC CONCERNS.
8. ELEVATION OF GROUNDWATER IS ASSUMED TO BE BELOW BOTTOM OF THRUST BLOCK.
9. THRUST COLLAR RING MUST BE FACTORY WELDED ON BOTH SIDES ALONG BOTH EDGES OF COLLAR AROUND CIRCUMFERENCE.
10. REINFORCING BARS SHALL BE DEFORMED AND TIED TOGETHER.

THRUST COLLAR SIZING							
SIZE	6"	8"	10"	12"	16"	24"	30"
"L"	18"	18"	18"	24"	24"	30"	36"
"D"	19"	25"	31"	38"	50"	75"	93"
"W"	19"	25"	31"	38"	50"	75"	93"
"T"	16"	16"	18"	18"	24"	36"	36"
"A"	2"	2"	2"	2"	2"	3"	4"
"B"	3/8"	3/8"	3/8"	3/8"	3/8"	1/2"	5/8"

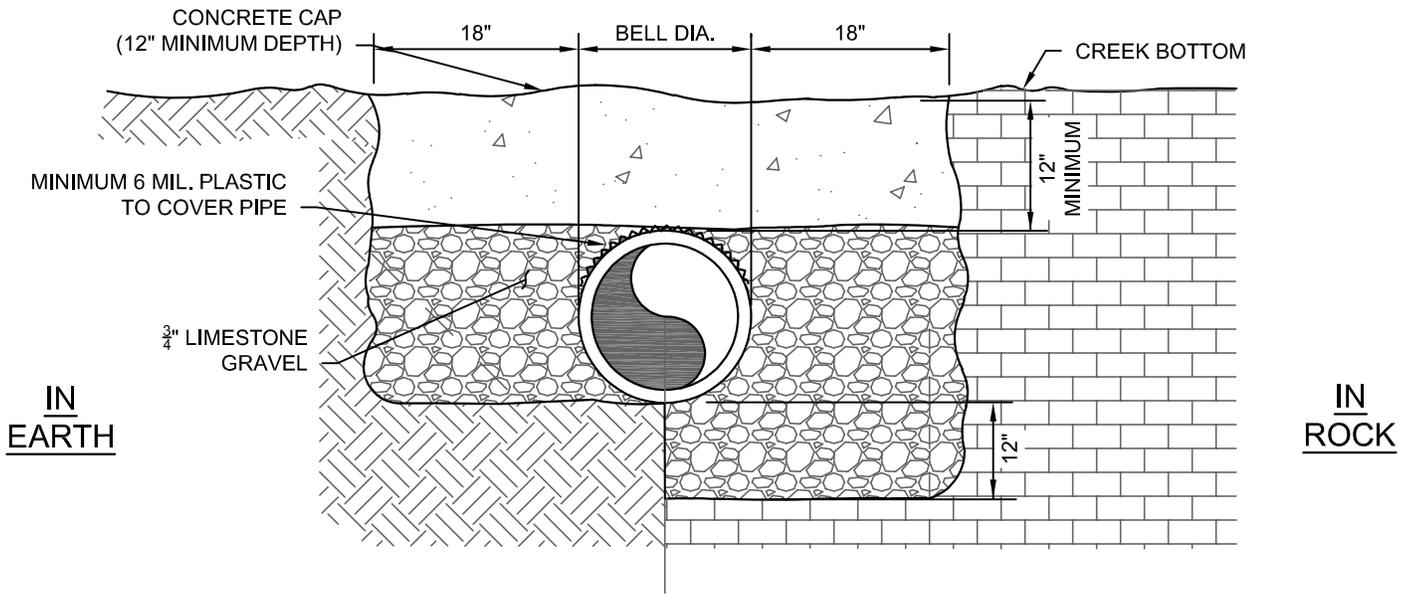
REINFORCING REQUIREMENTS						
I.D. PIPE	REBAR SIZE	"X" BAR LENGTH	"X" BAR WEIGHT	"Y" BAR LENGTH	"Y" BAR WEIGHT	NO. REQ'D.
6" - 36"	#5	2'-2" + O.D. PIPE	1.043 LBS/FT	1'-1"	1.1 LBS EACH	X-24, Y-12
48"+	#6	3'-0" + O.D. PIPE	1.502 LBS/FT	1'-3"	1.9 LBS EACH	X-24, Y-12

THRUST COLLAR DETAILS

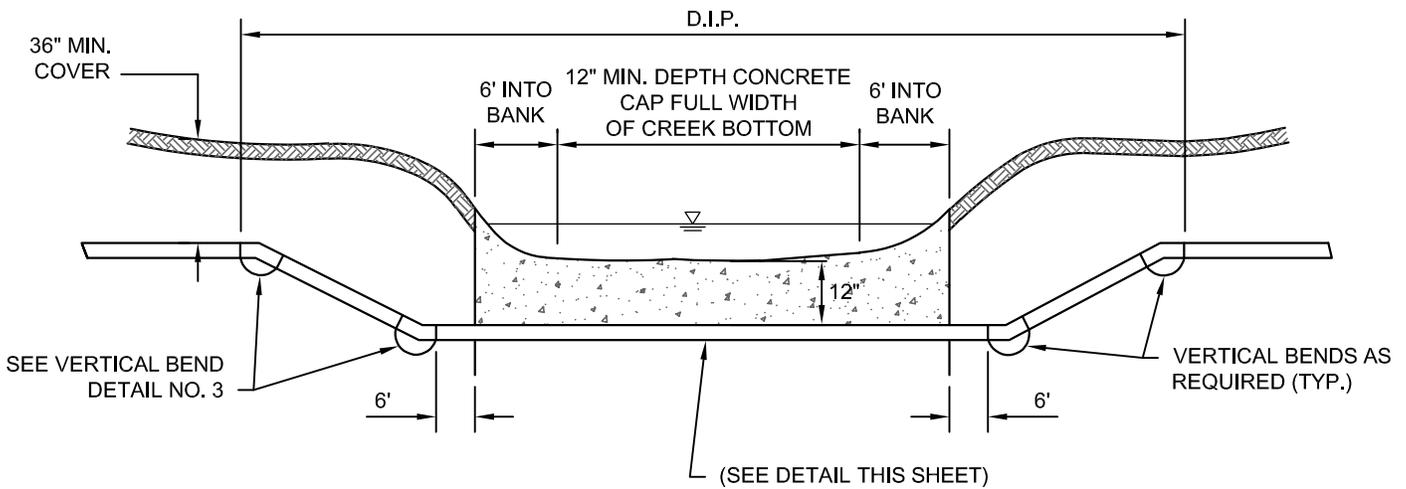
**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 6**

ISSUE DATE : DECEMBER 2020	DRAWN BY :	RCG
SCALE : NOT TO SCALE	CHECKED BY :	JEE





TYPICAL SECTION



PROFILE

NOTES

1. CONTRACTOR TO FOLLOW PERMIT CONDITIONS FOR ARAP PERMIT AS ISSUED BY TDEC AND NWP PERMIT AS ISSUED BY USACE.
2. DEVELOPER AND/OR CONTRACTOR IS RESPONSIBLE FOR ENSURING ALL PERMITS HAVE BEEN OBTAINED AND PERMIT REQUIREMENTS ARE FOLLOWED FOR CROSSING OF WATERCOURSES.

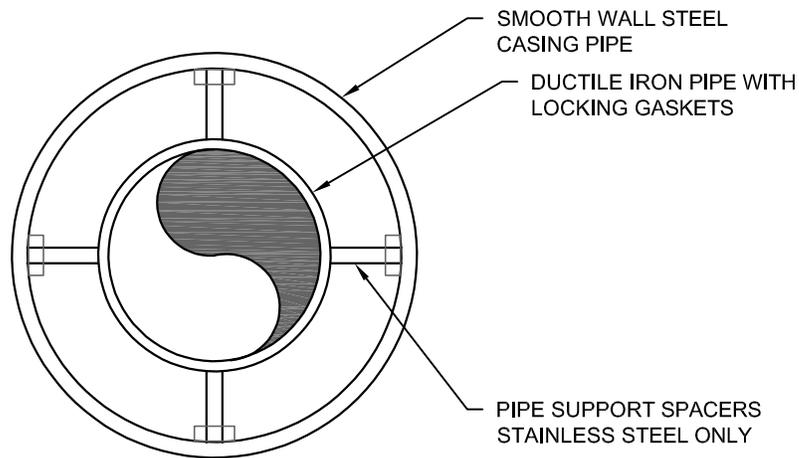
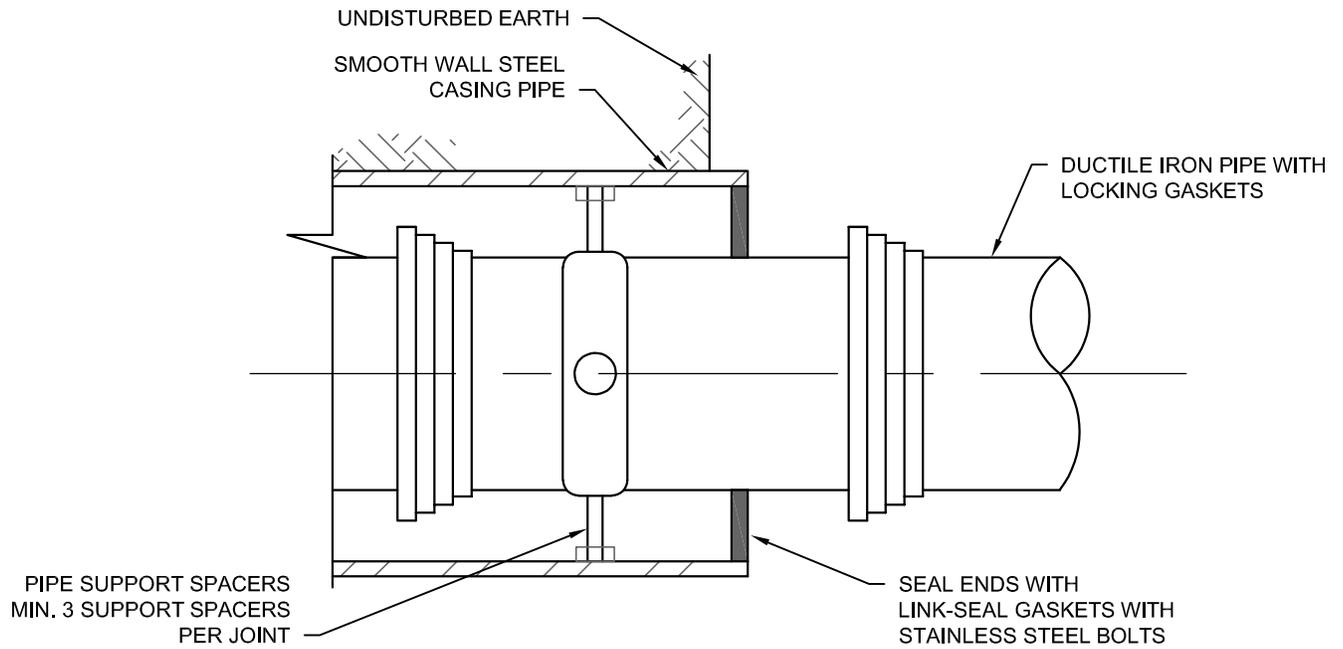
CREEK CROSSING DETAIL

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 7**

ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE





NOTE

1. CASING PIPE MATERIAL MUST MEET ALL DISTRICT, COUNTY, CITY OF BRENTWOOD/FRANKLIN, RAILROAD, AND/OR TDOT SPECIFICATIONS.

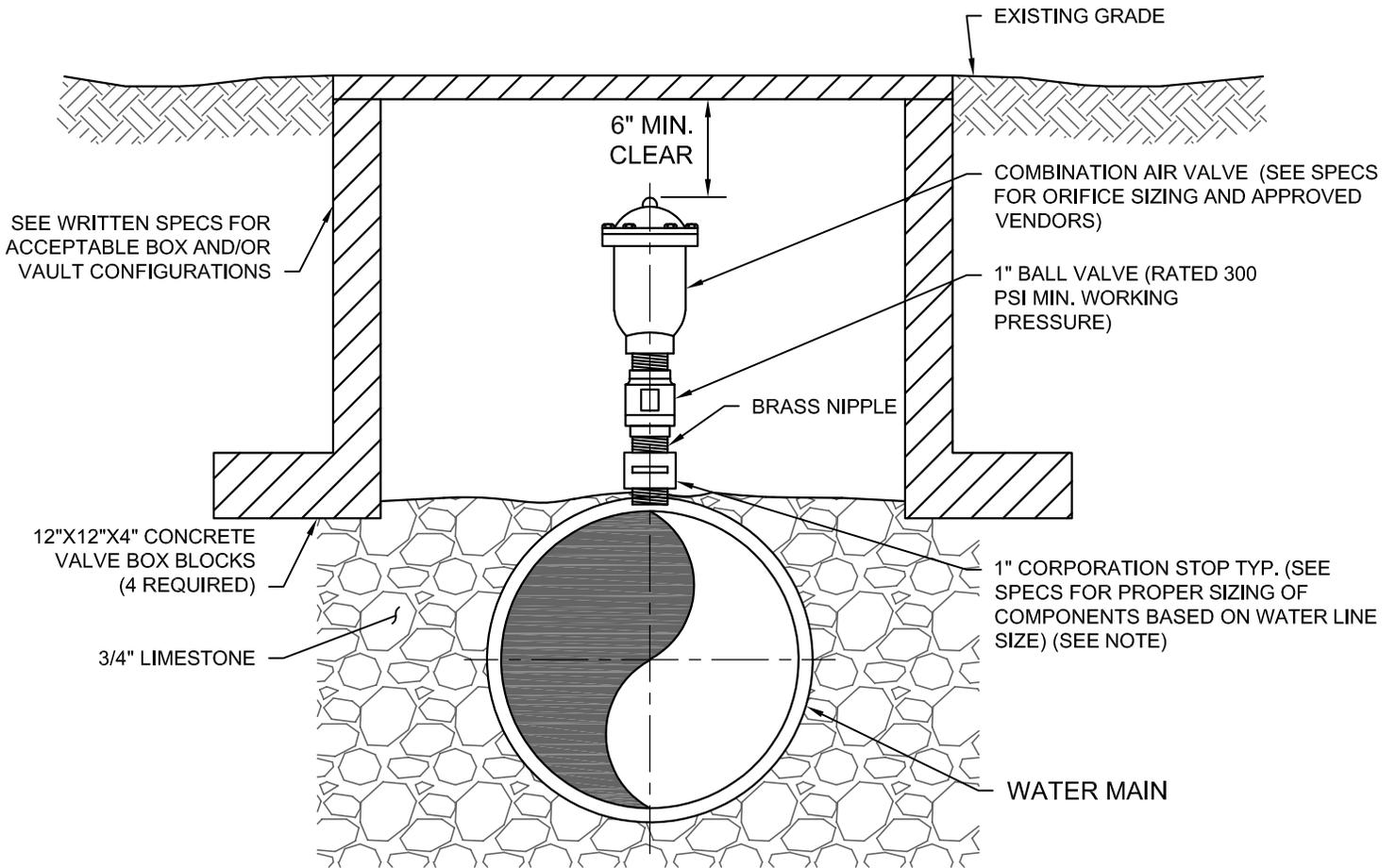
WATER LINE CASING DETAIL

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 8**

ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE





NOTE: WATER MAINS LARGER THAN 16" WILL REQUIRE A MJ TEE WITH 4" FL BRANCH AT HIGH POINT. 4" BRANCH WILL HAVE BLIND FLANGE TAPPED TO PROPER SIZE FOR ARV INLET.

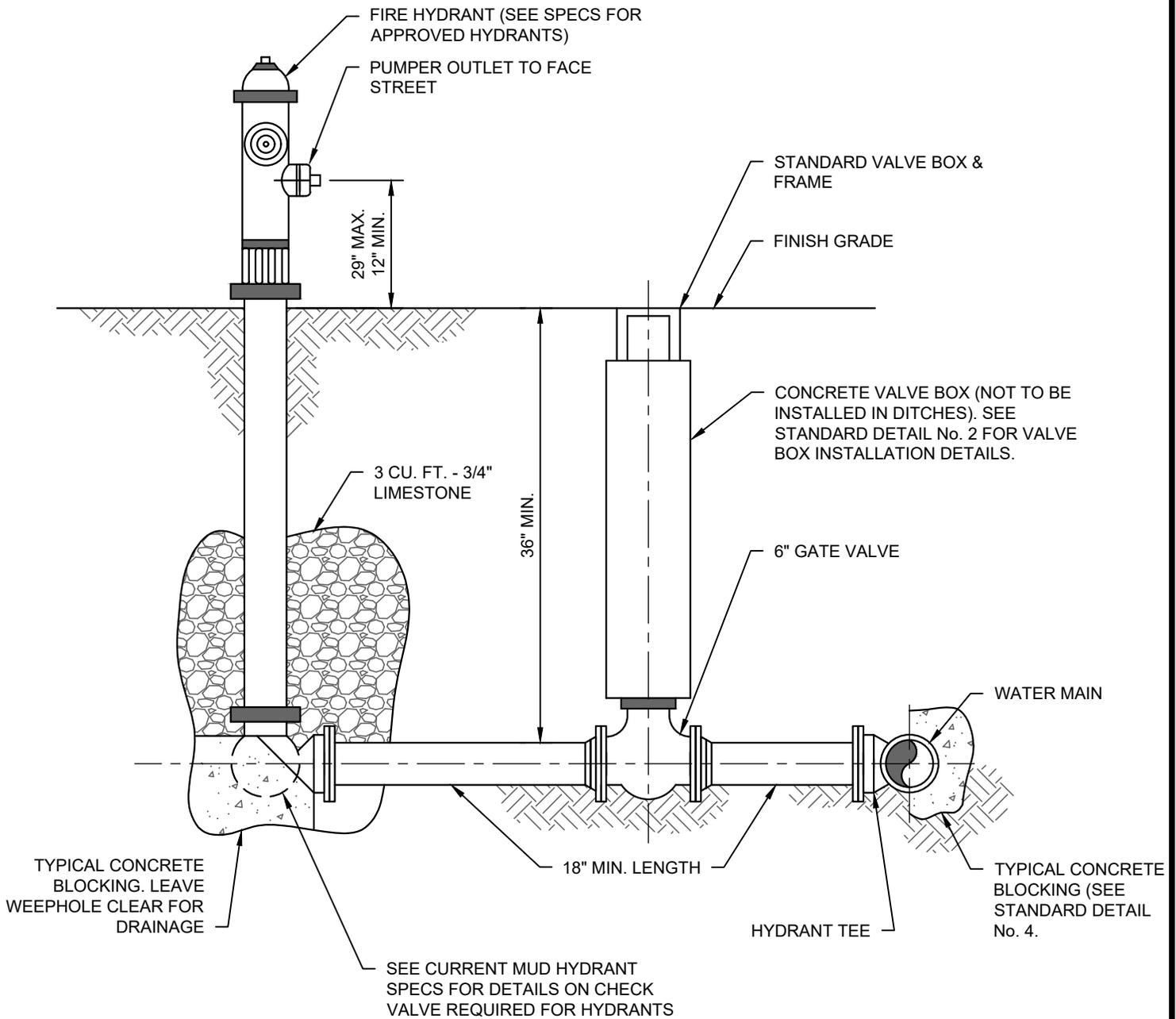
COMBINATION AIR VALVE

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 9**

ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE





NOTES

1. FIRE HYDRANT SHALL BE INSTALLED SO THE PUMPER NOZZLE IS POINTED TOWARD THE STREET.
2. ALL M.J. FITTINGS TO INCLUDE WEDGE STYLE THRUST RESTRAINT.

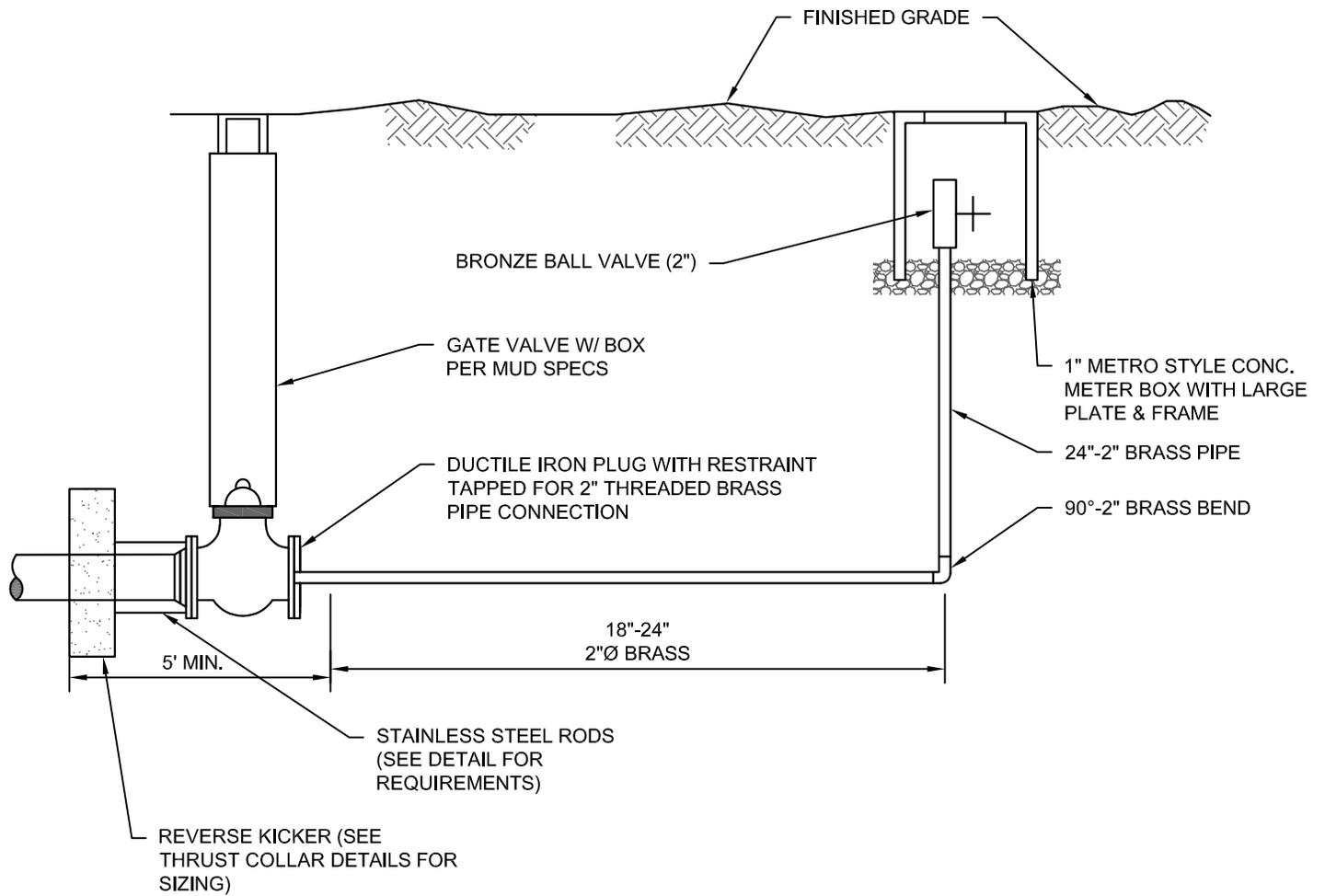
FIRE HYDRANT ASSEMBLY DETAIL

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 10**



ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE



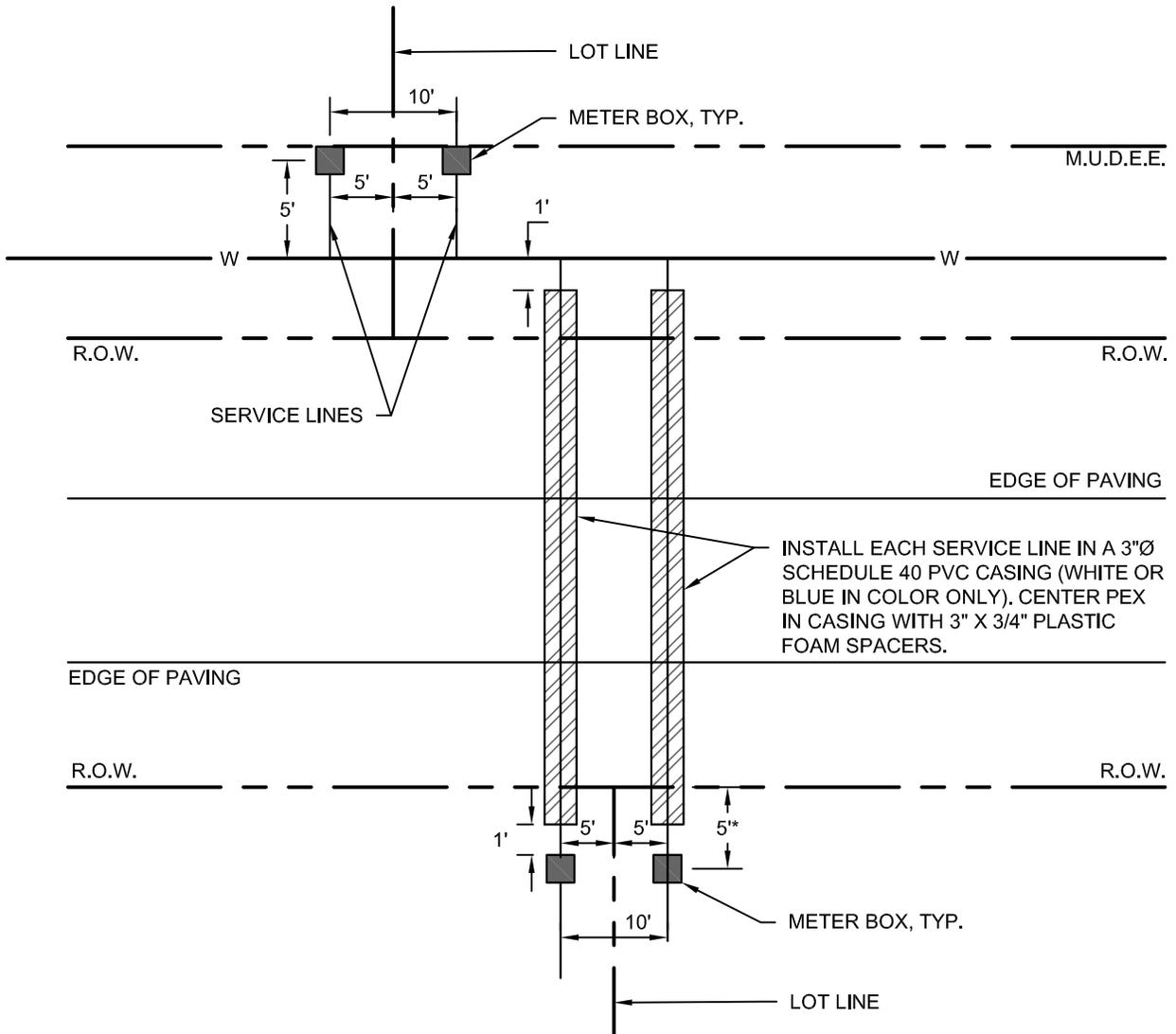
BLOW OFF ASSEMBLY DETAIL

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 11**

ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE





NOTES

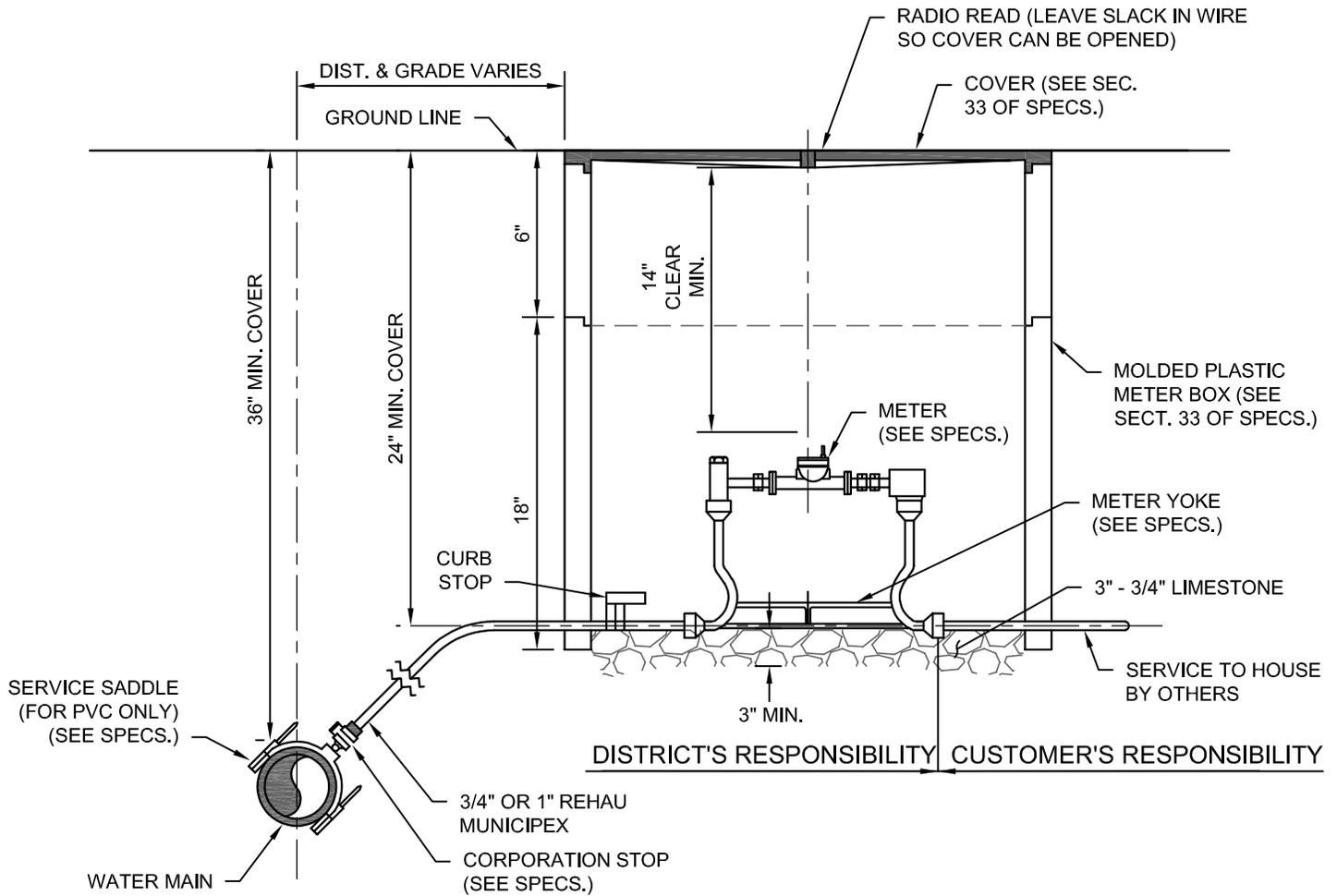
1. SEE APPROVED CONSTRUCTION PLANS FOR FINAL LOCATIONS OF WATER SERVICE LINES AS THEY MAY VARY FROM TYPICAL DETAIL DUE TO LOT/BUILDER REQUIREMENTS.
2. *METER BOX LOCATION MAY VARY DEPENDING ON ACTUAL SITE AND EASEMENT CONDITIONS. CONTRACTOR TO REFER TO APPROVED CONSTRUCTION DRAWINGS AND CONFIRM WITH INSPECTOR PRIOR TO INSTALLATION.

WATER SERVICE LINE DETAIL (TYP.)

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 12**



ISSUE DATE : DECEMBER 2020	DRAWN BY :	RCG
SCALE : NOT TO SCALE	CHECKED BY :	JEE



NOTES

1. SERVICES UNDER ROADWAY ARE TO BE INSTALLED INSIDE 3" DIA. SCH 40 (WHITE OR BLUE COLOR ONLY) PVC CARRIER PIPE, FROM A POINT 1' BEYOND CORPORATION STOP TO WITHIN 1' OF METER BOX, OR AS DIRECTED/APPROVED BY INSPECTOR.
2. TAP TO BE MADE ON SIDE OF WATER MAIN WITH MUELLER CORPORATION STOP OR APPROVED EQUAL.
3. FOR 3/4" & 1" MUNICIPEX CONNECTIONS, ONLY PLASTICS INSERTS ARE PERMITTED.
4. FOR 2" CONNECTIONS, ONLY STAINLESS STEEL INSERTS ARE PERMITTED.
5. STACKED BOXES TO BE SECURED WITH SIX (6) 3" WOOD SCREWS FASTENED AT THE OVERLAPPING CONNECTION SEAM. EACH LONG AND SHORT SIDE OF THE BOX SHALL BE FASTENED WITH TWO (2) AND ONE (1) WOOD SCREW(S) RESPECTIVELY, SECURED FROM THE INSIDE IN AN OUTWARD FACING DIRECTION SO NO SHARP EDGES ARE PROTRUDING INSIDE THE METER BOX.
6. MOUSE HOLES SHALL BE PROVIDED IN LOWER BOX ONLY. THE STACKED UPPER BOX SHALL NOT HAVE MOUSE HOLES.

STANDARD METER SETTING DETAIL

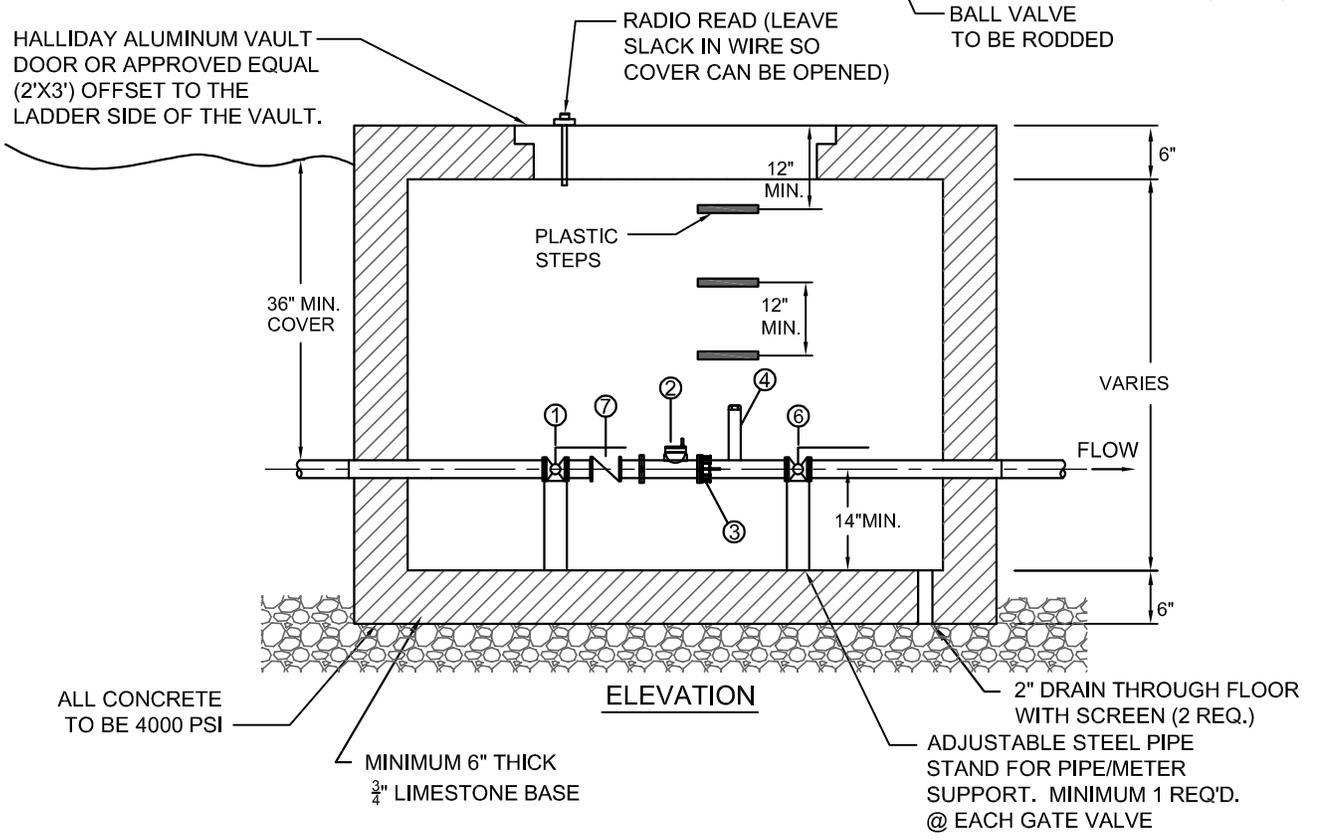
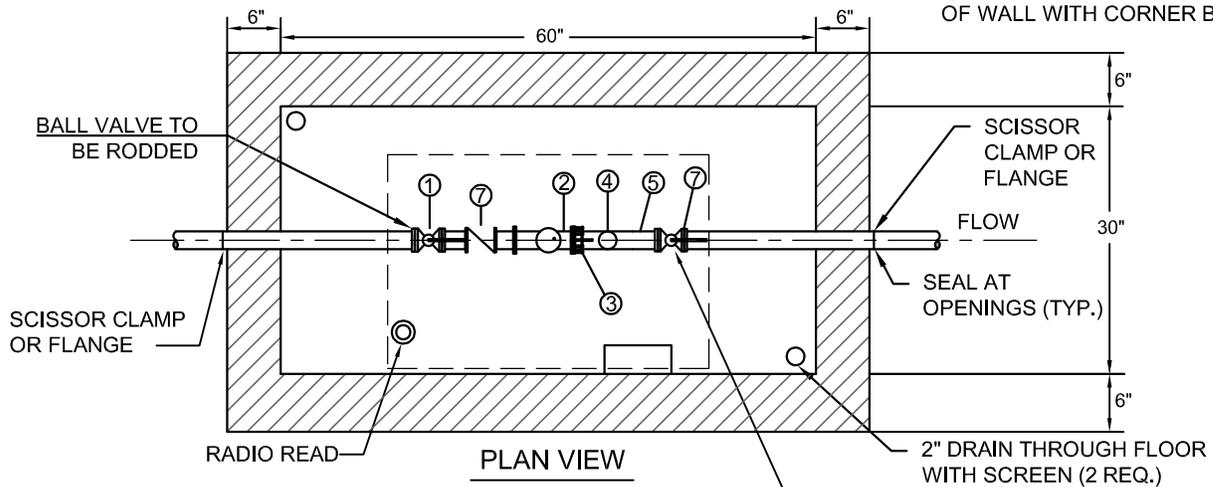
**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 13**

ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE



CONCRETE : 4,000 PSI @ 28 DAYS
 REINFORCING : 4" BAR (GRADE 60)
 @ 12" O/C EACH WAY @ CENTERLINE
 OF WALL WITH CORNER BARS



KEY NOTES

- * ① BALL VALVE
- ② KAMSTRUP MODEL FLOWIQ 3200.
- ③ FLANGE COUPLING ADAPTOR W/ SET SCREWS
- ④ 2" TEST PORT ASSEMBLY (BRASS) W/2" RISER, 2" BALL VALVE & 2" PLUG
- ⑤ SPOOL BY PLAIN PIECE. MIN. 10"
- * ⑥ BALL VALVE
- ⑦ CHECK VALVE (SEE NOTE No. 1)

NOTES:

1. IF CHECK VALVE IS NOT SUPPLIED WITH METER, THEN ONE IS REQUIRED.

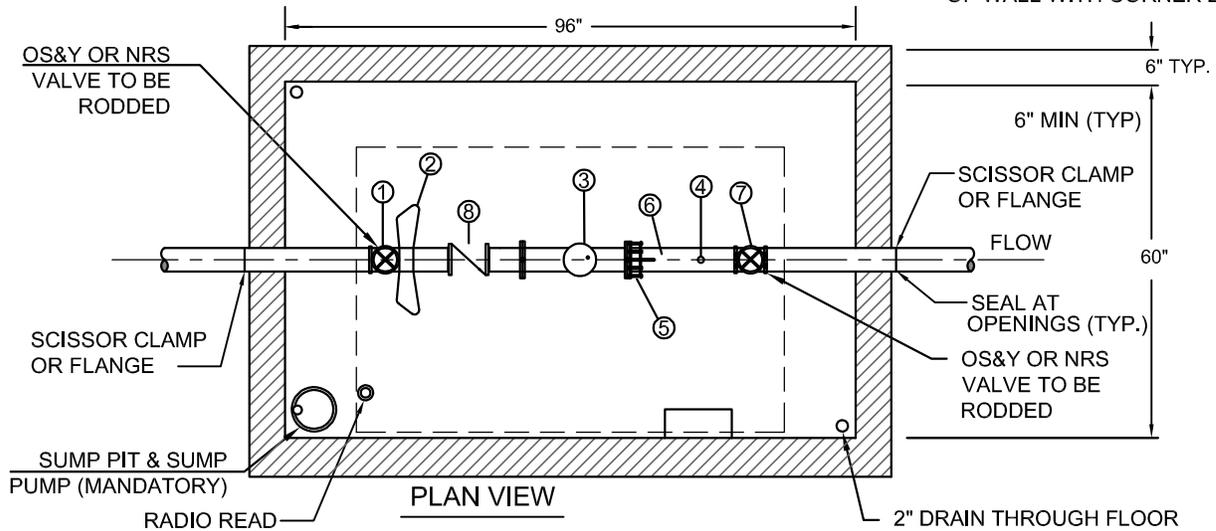
2" METER SETTING

**MILCROFTON UTILITY DISTRICT
 STANDARD DETAIL NO. 14**

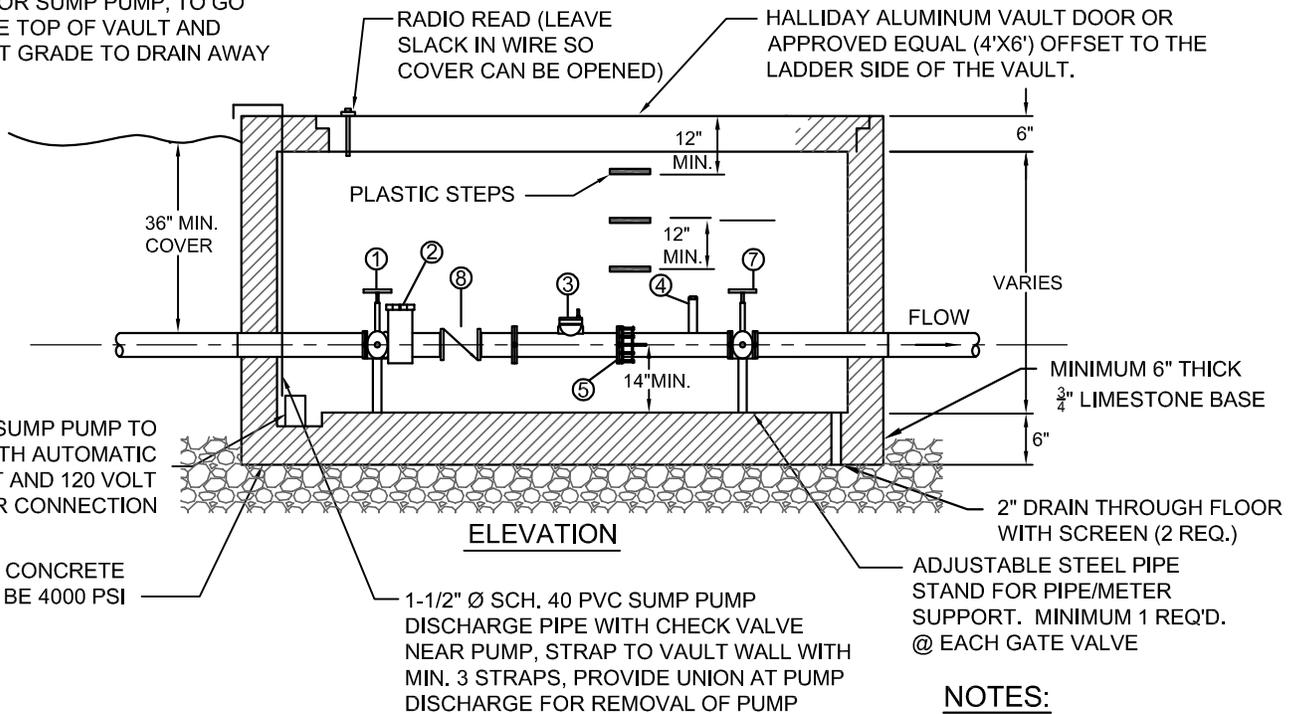
ISSUE DATE : DECEMBER 2020	DRAWN BY :	RCG
SCALE : NOT TO SCALE	CHECKED BY :	JEE



CONCRETE : 4,000 PSI @ 28 DAYS
 REINFORCING : 4" BAR (GRADE 60)
 @ 12" O/C EACH WAY @ CENTERLINE
 OF WALL WITH CORNER BARS



● DISCHARGE FOR SUMP PUMP, TO GO THROUGH THE TOP OF VAULT AND DISCHARGE AT GRADE TO DRAIN AWAY FROM VAULT



KEY NOTES

- | | | |
|---|---|---|
| ① OS&Y VALVE OR NRS VALVE W/ HAND WHEEL FOR 3" METERS & LARGER. | ④ 2" TEST PORT ASSEMBLY (BRASS) W/2" RISER, 2" BALL VALVE & 2" PLUG | ⑤ FLANGE COUPLING ADAPTOR W/ SET SCREWS |
| ② COMPACT STRAINER | | ⑥ SPOOL BY PLAIN PIECE. MIN. 10" |
| ③ KAMSTRUP MODEL FLOWIQ 3200. | | ⑦ OS&Y VALVE OR NRS VALVE W/ HAND WHEEL FOR 3" METERS & LARGER. |
| | | ⑧ CHECK VALVE (SEE NOTE No. 1) |

NOTES:

- IF CHECK VALVE IS NOT SUPPLIED WITH METER, THEN ONE IS REQUIRED.
- SUMP PUMP TO BE MINIMUM 1/3 H.P. MYERS MC1033 (OR APPROVED EQUAL) AS MANUFACTURED BY PENTAIR W/ FLOAT SWITCH. CONTRACTOR TO ENSURE SUMP DIAMETER IS LARGE ENOUGH TO ACCOMODATE PUMP.

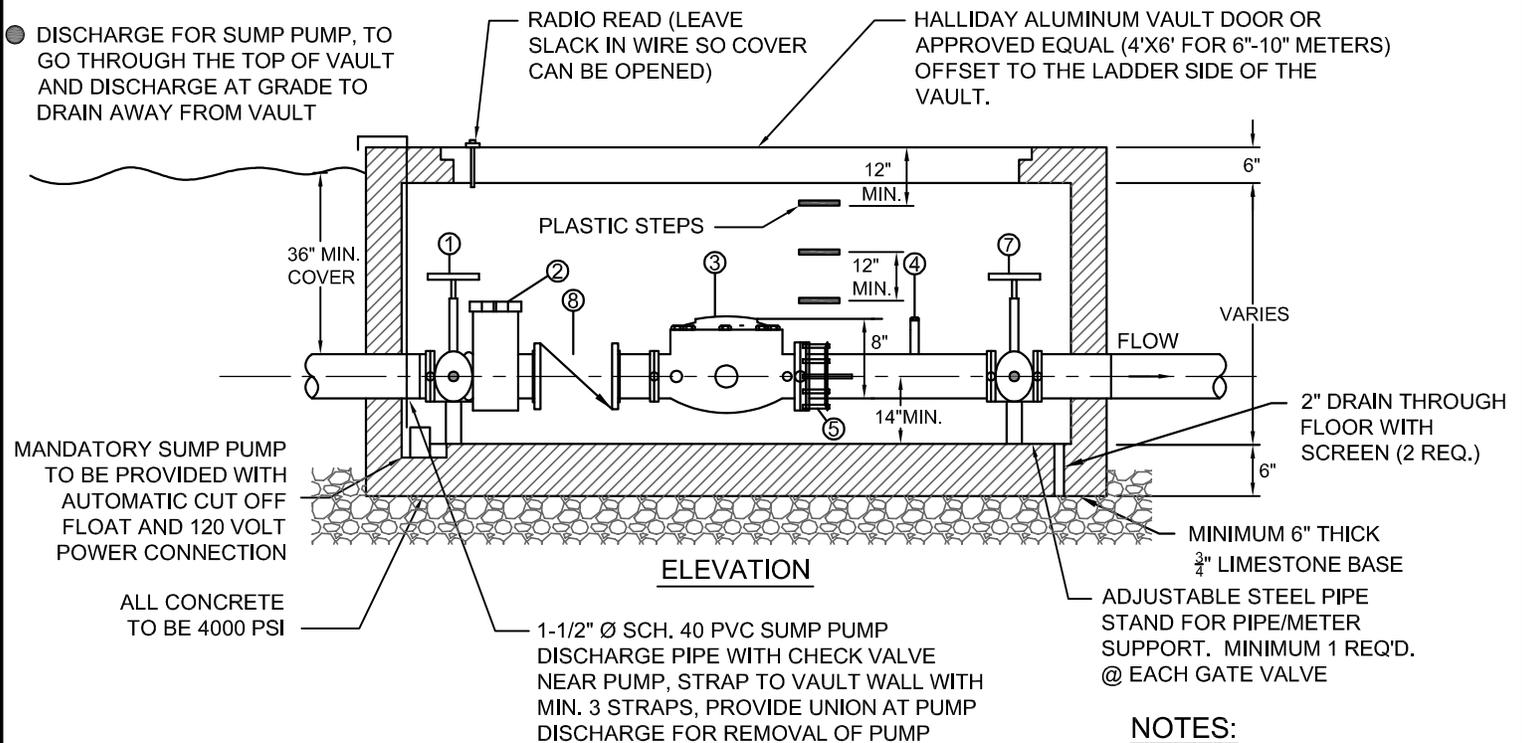
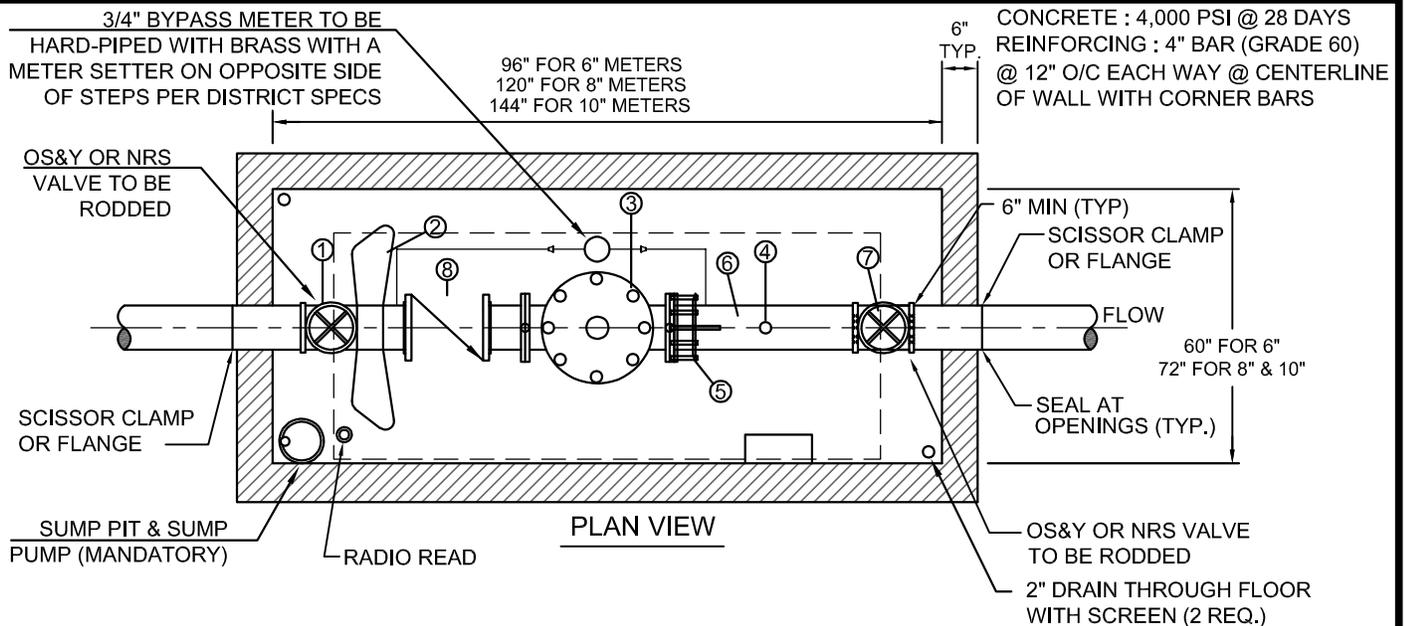
3" & 4" METER SETTING

**MILCROFTON UTILITY DISTRICT
 STANDARD DETAIL NO. 15**

ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE





KEY NOTES

- | | | |
|--|---|--|
| ① OS&Y VALVE OR NRS VALVE W/ HAND WHEEL. | ② 2" TEST PORT ASSEMBLY (BRASS) W/2" RISER, 2" BALL VALVE & 2" PLUG | ⑤ FLANGE COUPLING ADAPTOR W/ SET SCREWS |
| ② COMPACT STRAINER | ④ 2" TEST PORT ASSEMBLY (BRASS) W/2" RISER, 2" BALL VALVE & 2" PLUG | ⑥ SPOOL BY PLAIN PIECE. MIN. 10" |
| ③ ELSTER EVO-Q4 METER | | ⑦ OS&Y VALVE OR NRS VALVE W/ HAND WHEEL. |
| | | ⑧ CHECK VALVE (SEE NOTE No. 1) |

NOTES:

- IF CHECK VALVE IS NOT SUPPLIED WITH METER, THEN ONE IS REQUIRED.
- SUMP PUMP TO BE MINIMUM 1/3 H.P. MYERS MC1033 (OR APPROVED EQUAL) AS MANUFACTURED BY PENTAIR W/ FLOAT SWITCH. CONTRACTOR TO ENSURE SUMP DIAMETER IS LARGE ENOUGH TO ACCOMMODATE PUMP.

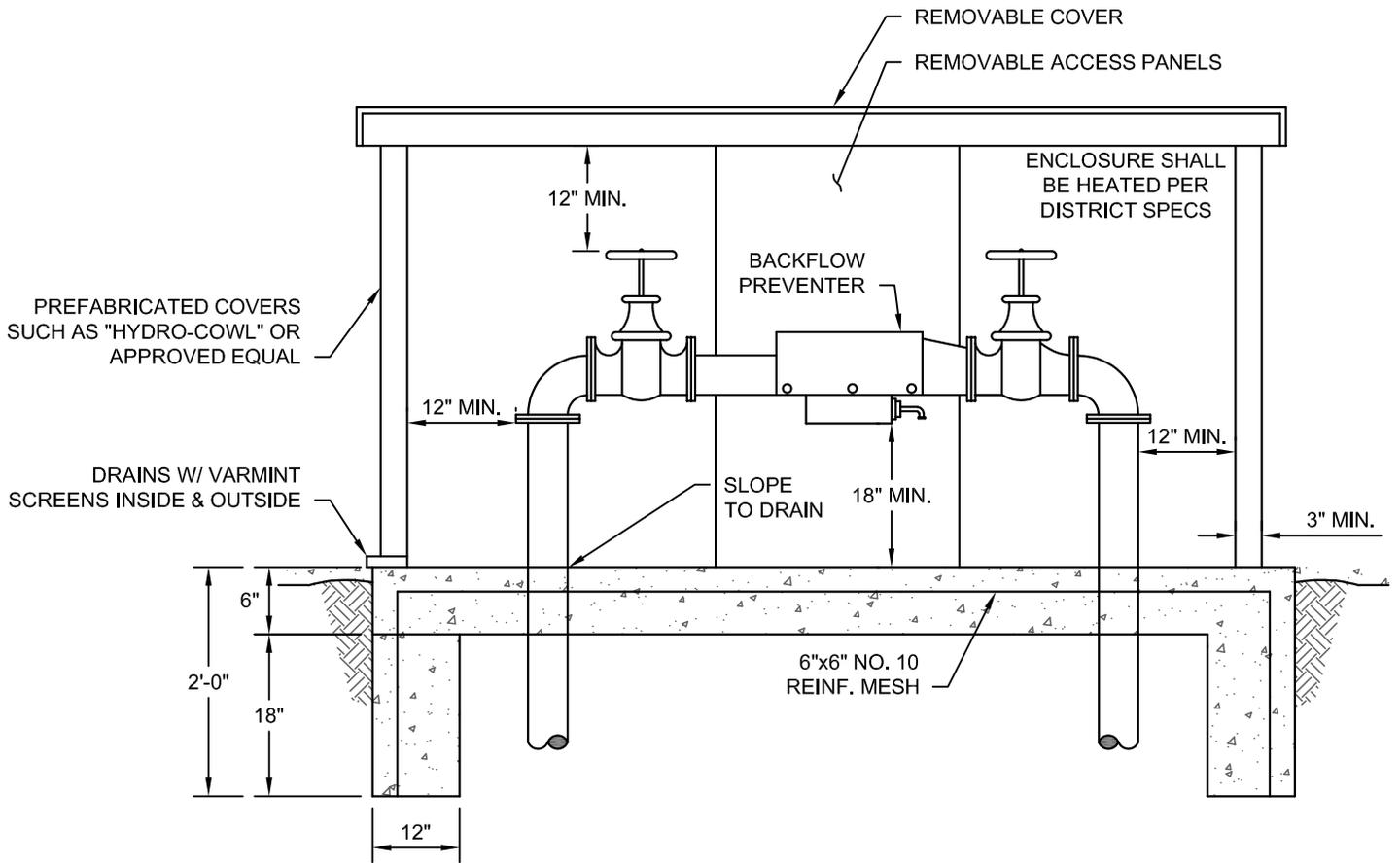
6"-10" COMPOUND METER SETTING

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 16**

ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE





NOTE

1. COVERS SHALL HAVE A GALVANIZED STEEL LINING WITH HIGH PERFORMANCE CLOSED CELL INSULATION WHICH WILL NOT READILY ABSORB WATER.
2. THIS DRAWING INDICATES MINIMUM INSIDE DIMENSIONS FOR CLEARANCE AND ACCESS ONLY. THE TYPE OF OUTSIDE FINISH IS OPTIONAL WITH OWNER.
3. 3/4" RADIO READ BYPASS METER REQUIRED. LOCATION OF METER TO BE APPROVED BY DISTRICT.

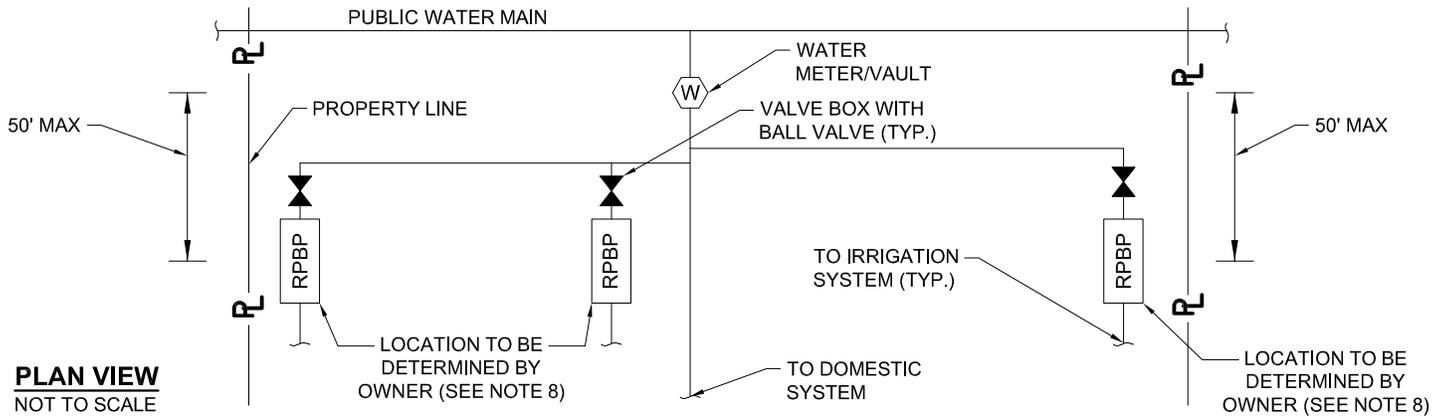
**BACKFLOW PREVENTER - OUTDOOR INSTALLATION
STANDARD DETAIL
(DOUBLE DETECTOR CHECK BACKFLOW PREVENTER)**

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 17**

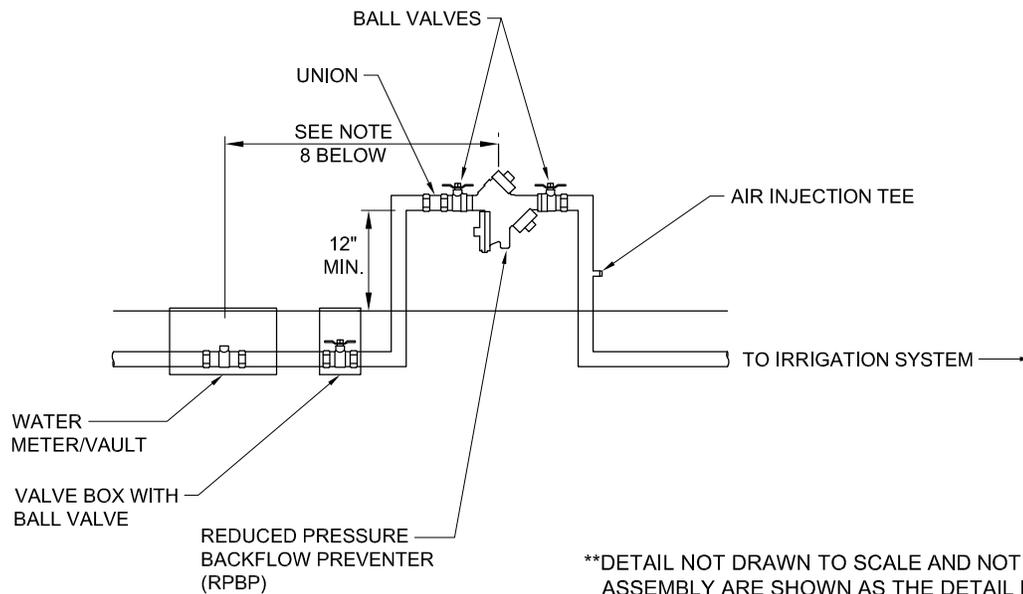
ISSUE DATE : DECEMBER 2020 DRAWN BY : RCG

SCALE : NOT TO SCALE CHECKED BY : JEE





PLAN VIEW
NOT TO SCALE



SECTION VIEW
NOT TO SCALE

**DETAIL NOT DRAWN TO SCALE AND NOT ALL DETAILS OF ASSEMBLY ARE SHOWN AS THE DETAIL IS FOR GRAPHICAL PURPOSES ONLY TO SHOW INTENT OF INSTALLATION.

NOTES

1. BACKFLOW PREVENTION ASSEMBLY SHALL BE A REDUCED PRESSURE ASSEMBLY TYPE WITH THE MODEL BEING APPROVED BY THE TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION DIVISION OF WATER SUPPLY.
2. BACKFLOW PREVENTION ASSEMBLIES SHALL HAVE APPROVED SHUTOFF VALVES.
3. BACKFLOW PREVENTION ASSEMBLIES SHALL BE INSTALLED IN A MANNER SO TESTING AND REPAIRS CAN BE PERFORMED. CLEARANCES OF A MINIMUM OF 12" ON ALL NON-TESTING SIDES, 36" ON TESTING SIDE FROM OBJECTS INCLUDING BUT NOT LIMITED TO SHRUBBERY, ELECTRIC TRANSFORMERS, AND PHONE AND CABLE PEDESTALS. ASSEMBLIES SHALL NOT BE INSTALLED BEHIND A HOUSE OR BEHIND A FENCE. ASSEMBLIES SHALL BE INSTALLED AT A HEIGHT OF 12" MINIMUM FROM GROUND ELEVATION.
4. BACKFLOW PREVENTION ASSEMBLIES SHALL NOT HAVE ANY TYPE OF ELECTRIC CONTROL VALVE INSTALLED BETWEEN THE MAIN WATER SUPPLY LINE AND THE BACKFLOW PREVENTION ASSEMBLY.
5. BACKFLOW PREVENTION ASSEMBLIES SHALL BE INSTALLED IN A HORIZONTAL POSITION, UNLESS WRITTEN APPROVAL IS OBTAINED FROM THE DISTRICT FOR VERTICAL INSTALLATION.
6. THERE SHALL NOT BE ANY BYPASS IN PLUMBING SYSTEM INSTALLED AROUND BACKFLOW PREVENTION ASSEMBLIES.
7. BACKFLOW PREVENTION ASSEMBLIES SHALL BE INSTALLED WITH TEST COCKS AND 1/4 INCH FLARE FITTINGS FOR TESTING.
8. BACKFLOW PREVENTION ASSEMBLIES FOR IRRIGATION SYSTEMS SHALL BE INSTALLED AT A DISTANCE NO GREATER THAN 50' FROM MUD WATER METER PERPENDICULAR TO RIGHT OF WAY OR ANYWHERE HORIZONTALLY ALONG SUCH LINE BETWEEN THE PROPERTY LINES AS SHOWN IN DETAIL.
9. WHEN INSTALLING AN IRRIGATION SYSTEM ON A POTABLE WATER LINE CONNECTION, A TEE MUST BE INSTALLED AFTER THE METER WITH AN ISOLATION VALVE PRIOR TO THE BACKFLOW PREVENTION ASSEMBLY TO SEPARATE THE IRRIGATION SYSTEM FROM THE DOMESTIC SUPPLY TO THE HOUSE.

BACKFLOW PREVENTER REQUIREMENTS FOR IRRIGATION SYSTEMS

**MILCROFTON UTILITY DISTRICT
STANDARD DETAIL NO. 18**



ISSUE DATE : SEPTEMBER 2021	DRAWN BY :	RCG
SCALE : NOT TO SCALE	CHECKED BY :	JEE