Construction
Standard Specifications
& Details

STANDARD
SPECIFICATIONS
for
WATER UTILITY DISTRIBUTION SYSTEM

CITY OF CROSSVILLE
&
CATOOSA UTILITY DISTRICT

DW20260519
APPROVED WATER SPECIFICATIONS
THE DOCUMENT BEARING THIS STAMP HAS BEEN RECEIVED AND REVIEWED BY THE
TENNESSEE DEPT. OF ENVIRONMENT & CONSERVATION
DIVISION OF WATER RESOURCES
AND IS HEREBY APPROVED FOR USE IN CONSTRUCTION BY THE COMMISSIONER
06/29/2026
THIS APPROVAL SHALL NOT BE CONSTRUED AS CREATING A PRESUMPTION OF CORRECT OPERATION OR AS WARRANTING BY THE COMMISSIONER THAT THE APPROVED FACILITIES WILL REACH THE DESIGNED GOALS.
APPROVAL EXPIRES FIVE YEARS FROM ABOVE DATE

PWSID# 0000150

April 25, 2026

Prepare by:

City of Crossville
Engineering Department
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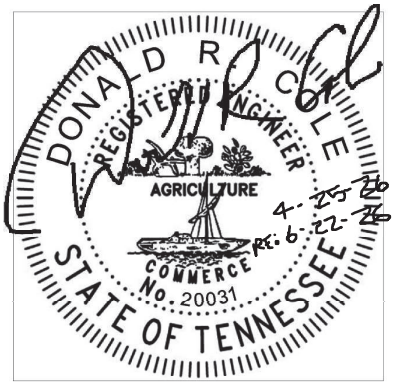
REVISED: 06/22/2026



City of Crossville &
Catoosa Utility District

WATER UTILITY DISTRIBUTION PIPING SPECIFICATIONS

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Technical Specifications:

LIST OF REVISIONS:

06/22/2026

- Section 1.01 – Updated Section 1.01 WORK INCLUDED
- Section 3.03.4 – Updated Section 3.03.4 Separation of Water Mains and Sewers
- Section 5.02 – Updated Section 5.02 PRESSURE AND LEAKAGE TEST, and made DISENFECTION Section 5.03

WATER UTILITY
DISTRIBUTION PIPING

SECTION 1 - GENERAL REQUIREMENTS

1.01 WORK INCLUDED

A. Installation, testing, and disinfection of water lines and appurtenances as shown on the approved plans and details.

1.02 RELATED WORK

Not Applicable

1.03 DEFINITIONS

A. Utility Department – City of Crossville, Utility Maintenance Department, and/ or Catoosa Utility District according to project location
B. Catoosa UD – Catoosa Utility District – area served by Catoosa Utility District
C. City of Crossville Utility District – area served by the City of Crossville, Utility Maintenance Department
D. ENGINEER – City of Crossville, Engineering Department
E. OWNER – City of Crossville

1.04 ADDITIONAL REQUIREMENTS

A. In addition to these specifications, all work shall be performed in accordance with the City of Crossville and/or Catoosa UD Standard Water Line Installation Details.
B. Where there is a discrepancy between these specifications and the City of Crossville and/or Catoosa UD Standard Water Line Installation Details, these specifications shall govern.

1.05 ALTERNATIVES (for Projects Bid out by the City and/or Catoosa UD only)

The Bid Form contains space for pricing any proposed alternatives. If no such alternatives, materials, equipment, or methods are listed, none apply to this Work.

Substitution of materials, equipment, or methods by CONTRACTOR will be accepted by OWNER only if judged to be equal to or better than the specified material, equipment, or method on which the Contract Price is based. The ENGINEER shall be the sole judge as to the acceptance of a proposed substitution.

1.06 PROJECT MEETINGS (**Preconstruction Meeting for all Projects**)

The OWNER, CONTRACTOR, and ENGINEER or their authorized representatives shall meet before construction begins to discuss the Work, including the establishment of schedules, inspections, survey locating for as-builts, testing, and other matters as are appropriate.

1.07 PROJECT MEETINGS (for Projects Bid out by the City and/or Catoosa UD only)

The OWNER, CONTRACTOR, and ENGINEER or their authorized representatives shall meet after the execution of the Agreement and before construction begins to discuss the Work, including the establishment of schedules for Shop Drawings submittals, the Application for Payment form, and other matters as are appropriate.

These meeting and other meetings as required during construction shall be called by the ENGINEER.

1.08 SUBMITTALS

Submittals required for this work shall include shop drawings and/or installation drawings for the following:

a. Water pipe and fittings for all materials specified.
b. Valves, valve boxes, and lids.
c. Fire hydrants.
d. Blow Off/Flushing Hydrants.
e. Underground vaults for hidden blow off/flushing hydrants.
f. Water meter assemblies: Tapping saddles, corporation stops, meter yokes, water meters, and meter boxes.
g. Air releases (if used).
h. Steel casing pipe.
i. Casing spacers and End seals.
k. Marking tape.
l. Locator wire.
m. Certifications and test reports required in MATERIALS section of these Specifications.
n. Proposed method for no-blast rock removal.

Such submittals are to be made for approval by ENGINEER prior to incorporation of any materials into the work. A sufficient number of copies of each submittal are to be furnished so that ENGINEER may retain 4 copies. CONTRACTOR must review manufacturers'/suppliers' data prior to submittal to ENGINEER and shall indicate approval of that material in some acceptable manner.

1.09 MATERIAL AND EQUIPMENT

Materials, products, and equipment shall be properly containerized, packaged, boxed, and protected to prevent damage during transportation and handling. The CONTRACTOR shall provide suitable temporary weather tight storage facilities as may be required for materials or equipment which will be damaged by storage in the open. Protect from damage all materials delivered at the site. Do not use damaged material on the Work. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the respective manufacturers, unless directed otherwise by the provisions of these Specifications.

1.10 MATERIALS TESTING

MATERIALS designates the testing applicable for materials incorporated in the Work. Testing shall be done by the manufacturer in accordance with the applicable ASTM specification. Manufacturer shall furnish the ENGINEER with four (4) copies of the certifications and/or test results as required, certifying that the tests were performed in accordance with, and that the materials supplied meet the requirements of the applicable standards.

The OWNER may, at his option, elect to have an independent testing laboratory test materials to be furnished for incorporation in the Work. Such testing, when done, shall be in accordance with provisions of the Specifications for MATERIALS, and will be at the OWNER's expense, including cost of materials actually tested.

1.11 PROJECT SAFETY

It shall be the CONTRACTOR's responsibility to exercise precautions at all times for the protection of persons and property on the job site and in other related areas such as storage yards and maintenance facilities. CONTRACTOR must strictly adhere to safety and health regulations as described in the latest OSHA and TOSHA standards.

1.12 CONSTRUCTION SCHEDULE (for Projects Bid out by the City and/or Catoosa UD only)

The CONTRACTOR shall submit his proposed construction schedule for the ENGINEER's approval before construction begins. Schedule must identify the main project activities and indicate beginning and ending dates for those activities. Along with construction schedule, CONTRACTOR shall also submit a schedule of the estimated pay request amounts for each month of the project.

The construction schedule shall be updated monthly and submitted with each pay request.

1.13 PROJECT CLOSEOUT (for Projects Bid out by the City and/or Catoosa UD only)

The premises and the job site shall be maintained in a reasonably neat and orderly condition and kept free from an accumulation of waste materials and rubbish during the entire construction period. Remove crates, cartons, and other flammable waste materials or trash from the work areas at the end of each working day.

When the CONTRACTOR requests a final inspection, ENGINEER will inspect the work for completeness in accordance with the Contract Documents. Any deficiencies shall be promptly corrected by CONTRACTOR.

Final acceptance cannot be made until the CONTRACTOR furnishes to the OWNER a notarized certification in a form suitable to the OWNER that all labor and material costs for the work have been paid by the CONTRACTOR and that there are no liens against the Work.

Payment in full of the Final Application for Payment shall constitute acceptance of the work by the OWNER subject to conditions of the Contract Documents.

SECTION 2 - MATERIALS

2.01 GENERAL

All materials to be incorporated in the project shall be first quality, new and undamaged material conforming to all applicable portions of these specifications.

2.02 CONCRETE

Cement - Cement shall be Portland cement of a brand approved by the Engineer and shall conform to "Standard Specifications for Portland Cement", Type 1, ASTM Designation C150, latest revision. Cement shall be furnished in undamaged 94 pound, one cubic foot sacks, and shall show no evidence of lumping.

Concrete Fine Aggregate - Fine aggregate shall be clean, hard uncoated natural sand conforming to ASTM Designation C33, latest revision, "Standard Specifications for Concrete Aggregate".

Concrete Coarse Aggregate - Coarse aggregate shall consist of clean, hard, dense particles of stone or gravel conforming to ASTM Designation C33, latest revision, "Standard Specifications for Concrete Aggregate". Aggregate shall be well graded between 1-1/2" and #4 sieve sizes.

Water - Water used in mixing concrete shall be clean and free from organic matter, pollutants, and other foreign materials.

Ready Mix Concrete - Ready-mix concrete shall be secured only from a source approved by the Engineer, and shall conform to ASTM Designation C94, latest revision, "Specifications for Ready-Mix Concrete". Before any concrete is delivered to the job site, the supplier must furnish a statement of the proportions of cement, fine aggregate, and coarse aggregate to be used for each mix ordered, and must receive the Engineer's approval of such proportions.

Class "A" Concrete - Class A concrete shall have a minimum compressive strength of 4,000 pounds per square inch in 28 days and shall contain not less than 6 sacks of cement per cubic yard.

Class "B" Concrete - Class B concrete shall have a minimum compressive strength of 2,500 pounds per square inch in 28 days and shall contain not less than 4-1/2 sacks of cement per cubic yard.

Metal Reinforcing - Reinforcing bars shall be intermediate grade steel conforming to ASTM Designation A15, latest revision, "Standard Specifications for Billet Steel Bars for Concrete Reinforcement". Bars shall be deformed with a cross sectional area at all points equal to that of plain bars of equal nominal size.

2.03 CRUSHED STONE

Crushed stone for bedding or backfill shall be Tennessee Department of Transportation (TDOT), Bureau of Highways, Standard Size No. 57 and shall meet TDOT Standards.

2.04 BASE STONE

Base stone for backfill or temporary pavement patching shall conform to TDOT 303.02, Type A, Grading D, Limestone 33C, and shall meet TDOT Standards for mineral aggregate base.

2.05 ASPHALT

Asphalt to conform to TDOT 307-CW for asphalt base where required and/or TDOT 411E for asphalt surface mix where required and shall meet TDOT Standards for asphalt.

2.06 DUCTILE IRON PIPE

Ductile iron pipe shall conform to the requirements of ANSI/AWWA C151/A21.51 for ductile iron pipe centrifugally cast in metal or sand-lined molds, and ANSI/AWWA

C150/A21.50. It shall be made and tested in accordance with ASTM A536, Grade 60-42-10

Ductile Iron Pipe to be used for 10 inch or larger water mains in the *City of Crossville Utility District* unless shown otherwise indicated in the plans. The minimum size allowed shall be 6 inches, unless otherwise approved by the Utility Maintenance Department and/or Engineering Department.

The pipe shall be a push-on, single molded ring gasket shall conform with ANSI /AWWA C111/A21.11.

The design thickness and dimensions shall conform to ANSI1/AWWA C151/A21.51. All ductile iron pipe to be Class 350 unless shown otherwise on plans. The thickness shall be adequate for the rated water working pressure plus a surge allowance of 100 psi.

Pipe shall be furnished in lengths of 18' to 20'.

Pipe shall be furnished with standard thickness cement lining on the inside with an asphaltic coating on the outside. Cement lining shall conform to ANSI/AWWA C104/A21.4 and the asphaltic outside coating to conform to ANSI/AWWA C151/A21.51.

The exterior of the pipe shall be clearly marked to indicate the manufacturer, date of manufacture, the pipe class and weight. Exterior markings shall also positively identify the pipe as being Ductile Iron.

2.07 POLYVINYL CHLORIDE PIPE (PVC) –

a) Pipe requirements for each District

City of Crossville Utility District

All PVC pipe shall be pressure rated for 250 psi and shall be used only where the maximum pressure shall not exceed two-thirds of the pressure rating or 165 psi unless otherwise noted on the approved plans.

Maximum standard dimension ratio (SDR) of 17 for PVC pipe.

Alternatively, PVC water line may be DR 14 ANSI/AWWA Standard C-900 pressure pipe, and shall be installed in accordance with ANSI/AWWA C-605. Prior approval required for this alternative.

Catoosa Utility District

All PVC pipe shall be pressure rated for 200 psi and shall be used only where the maximum

pressure shall not exceed two-thirds of the pressure rating or 133 psi unless otherwise noted on the approved plans.

Maximum standard dimension ratio (SDR) of 21 for PVC pipe.

b) Pipe Material

Polyvinyl Chloride pipe for water distribution shall be made from Type I, Grade 1 or 2, Polyvinyl Chloride plastic as defined in the latest revision of ASTM D1784, "Specifications for Rigid Poly (Vinyl Chloride) Compounds" and comply with ASTM D1784 for PVC 1120 cell classification 12454.

c) Physical Properties

The pipe shall conform to and/or exceed the latest revision of Commercial Standard CS-256-63 or ASTM D2241 "Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)" as it applies to Type I, Grade 1 or 2 Polyvinyl Chloride plastic pipe.

d) Joints

The joints for pipe 1 ½-inch size and larger shall be push-on joints designed so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The push-on joint shall be single rubber gasket joint designed to be assembled by the positioning of a continuous, molded, rubber ring gasket in an annular recess in the pipe or fitting socket and the forcing of the plain end of the entering pipe into the socket, thereby compressing the gasket radially to the pipe to form a positive seal. The gasket and the annular recess shall be so designed and shaped that the gasket is locked in place against displacement as the joint is assembled. Details of the joint design and assembly shall be in accordance with the joint manufacturer's standard practice. The joints shall be designed so as to provide for the thermal expansion or contraction experienced with a total temperature change of at least 75°F in each joint per length of pipe. Joints to conform to ASTM D3139.

e) Lubricant

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 color, taste or odor to water. The lubricant containers shall be labeled with

the manufacturer's name.

f) Gaskets

Gaskets shall meet all applicable requirements of ANSI Standard A21.11.

Gasket dimensions shall be in accordance with the manufacturer's standard design dimensions and tolerances. The gasket shall be of such size and shape as to provide an adequate compressive force against the spigot and socket after assembly to affect a positive seal under all combinations of joint and gasket tolerances. The trade name or trademark, size, mold number, gasket manufacturer's mark, and year of manufacturer shall be molded in the rubber on the back of the gaskets.

Gaskets shall be vulcanized natural or vulcanized synthetic rubber. No reclaimed rubber shall be used. When two harnesses of rubber are included in a gasket, the soft and hard portions shall be integrally molded and joined in a strong vulcanized bond. They shall be free of porous areas, foreign material, and visible defects.

Gaskets to conform to ASTM F477.

g) Pipe Lengths

The pipe shall be furnished in nominal lengths of 20 or 38 feet. If 38 foot lengths are used, the pipe shall be supported at least every 10 feet of its length during all handling and special care shall be taken to avoid placing undue stress on the pipe during handling and any actions that may damage the bell or spigot ends of the pipe shall be avoided.

h) Approval for Potable Water

The pipe and fittings shall conform to the Specifications of the National Sanitation Foundation Testing Laboratories, Ann Arbor, Michigan, and the pipe and manufacturer shall be approved by the Division of Water Pollution Control, Tennessee Department of Environment and Conservation.

i) Marking of Pipe

As a minimum the pipe shall have the following data applied to each piece:

(a) Nominal Size
(b) Type of Material
(c) SDR or Class (color coded)
(d) Manufacturer

(e) NSF (National Sanitation Foundation) seal of approval
(f) Quality Control Code

j) Deflection and/or Bending of Pipe

The deflection shall not exceed that allowed by the manufacturer in the printed instructions. Bending of pipe will NOT be permitted.

2.08 HIGH DENSITY POLYETHYLENE (HDPE)

All HDPE pipe shall confirm to the requirements of ASTM F714 and shall be manufactured with premium, highly engineered PE4710resin suitable for use in transporting potable water.

All HDPE pipe shall be pressure rated for 250 psi and use only where the maximum pressure shall not exceed two-thirds of the pressure rating or 165 psi.

Maximum standard dimension ratio (DR) of 9 for HDPE pipe.

Type of HDPE pipe shall be Iron Pipe Size (IPS), ASTM 3035 (O.D. Controlled), unless otherwise shown on construction plans.

HDPE pipe for potable water to be colored blue.

All HDPE Pipe Joints to be connected by heat fusion.

All HDPE pipe shall be clearly mark with the manufacturer's name, nominal size and OD base, material code, dimension ratio, pressure class, current AWWA C906 (if applicable), ASTM F714 (if applicable), and production date (day, month, & year).

2.09 FITTINGS

All fittings for ductile iron pipe shall be Class 350 mechanical joint single gasket ductile iron conforming to ANSI/AWWA C153/A21.53 and shall meet the current requirements for the manufacturer's standards. Fittings shown on the Plans are intended to convey the general configuration, but the Contractor shall furnish all fittings required.

Pipe shall be furnished with standard thickness cement lining on the inside with an asphaltic coating on the outside. Cement lining shall conform to ANSI/AWWA C104/A21.4, and the asphaltic outside coating to conform to ANSI/AWWA C151/A21.51 The lining thicknesses shall be equal to or greater than those for comparable size pipe.

All fittings shall be ductile iron, cement lined, bituminous coated, manufactured in accordance with ANSI/AWWA C110/A21.10. Fittings shall be furnished with mechanical joints conforming to ANSI/AWWA C111/A21.11, unless otherwise indicated or directed.

All fittings shall use thrust restraint devices in lieu of the standard glands.

EBAA Iron, Inc., Megalug series 1100 retainer glands and gaskets for Ductile Iron Pipe may be used for field installed mechanical joint restraint or approved equal.

EBAA Iron, Inc., Megalug series 2000PV retainer glands and gaskets for PVC pipe may be used for field installed mechanical joint restraint or approved equal.

Each fitting shall be certified by the manufacturer to have been tested and to have met the requirements of the governing standard specifications.

Mechanical Joint Adapters with a stainless-steel stiffener for HDPE pipe shall be used with Mechanical Joint fittings and with other mechanical connections connecting polyethylene components to themselves or to other pipe materials or components. Mechanical Joint (MJ) Adapters can be provided as a complete kit including the MJ adapter with a stainless-steel stiffener, extended gland bolts and nuts, gland, and gasket. MJ adapter to be connected by butt fusion to the HDPE pipe. All fittings to meet or exceed the pressure rating for the pipe.

2.10 CASING PIPE

Steel Casing Pipe

Material for casing pipe used in highway or railroad crossings shall be steel conforming to ASTM A139, Grade B. Minimum yield strength shall be 35,000 psi unless otherwise noted. Nominal casing diameter shall be as indicated on the Plans. Joints shall be continuously welded. Casing pipe and joints shall be leakproof and capable of withstanding Cooper E-80 loading. Casing pipe shall be coated as specified herein.

The minimum wall thickness of casing pipe shall be as shown in the table below.

Nominal Diameter (Inches)	Minimum Wall Thickness (Inches)	
	With Coating	Without Coating
Under 14	0.188	0.251
14 and 16	0.219	0.282
18	0.250	0.313
20	0.281	0.344
22	0.312	0.375
24	0.344	0.407
26	0.375	0.438
28 and 30	0.406	0.469
32	0.438	0.501
34 and 36	0.469	0.532
38, 40, 42	0.500	0.563
54	0.500	0.563

All steel casing pipe installed below ground shall be coated with a bituminous coating inside and out.

Bitumen Coating

1. Bituminous Coating – Bituminous Coating shall be an asphalt type bitumen conforming to TDOT Standard Specifications.
2. Primer – Primer shall conform to the requirements of AASHTO M116.
3. All surfaces to be coated with bitumen shall be dry and thoroughly cleaned of dust and loose materials. No primer or bitumen shall be applied in wet weather, nor when the temperature is below 50°F.
4. Application of the primer coat shall be with a brush or other approved means and in a manner to thoroughly coat the surface with a continuous film of primer. The purpose of the primer is to provide a suitable bond of the bitumen coating to the steel. The primer shall completely dry through before the bituminous coating is applied.
5. Bitumen shall be applied uniformly at a temperature of not less than 300°F, not more than 350°F and shall be applied either by mopping, brushing, or spraying. The bituminous coating shall be applied to a minimum thickness of 60 mils.
6. If splices are required, no coating shall be applied for 12” on either side of the splice location. After splicing has been completed, the uncoated area shall be coated with bituminous material in accordance with the requirements of this

specification.

7. Bitumen coated casings shall be stored, protected from sunlight and heat. Coatings shall not be exposed to damage during storage, hauling, or handling. The use of steel cables wrapped around the coated part of the pile will not be permitted. The Contractor shall take appropriate measures to preserve and maintain the bituminous coating. At the time of installation, the bituminous coating shall have the minimum thickness of 60 mils.

Casing spacers shall be utilized on PVC and ductile iron carrier pipe. Casing spacers to be centered restrained and shall be BWM Company Model BWM-SS-8 (Stainless Steel) for up to 24 inch diameters and Model BWM-SS-12 (Stainless Steel) for larger sizes or approved equal. Casing End Seals on all carrier pipes shall be BWM Company Model BWM-PO or BWM-WR with stainless steel bands or approved equal. See Standard Water Line Installation Details.

HDPE Casing Pipe

All HDPE pipe shall confirm to the requirements of ASTM F714 and shall be manufactured with premium, highly engineered PE4710 resin suitable for use in transporting potable water.

All HDPE pipe shall be pressure rated for 250 psi and use only where the maximum pressure shall not exceed two-thirds of the pressure rating or 165 psi.

Maximum standard dimension ratio (DR) of 9 for HDPE pipe.

Type of HDPE pipe can either be Iron Pipe Size (IPS) or Ductile Iron Pipe Size (DIPS). See Construction Plans for type.

All HDPE Pipe Joints to be connected by heat fusion.

All HDPE pipe shall be clearly mark with the manufacturer's name, nominal size and OD base, material code, dimension ratio, pressure class, current AWWA C906 (if applicable), ASTM F714 (if applicable), and production date (day, month, & year).

Casing End Seals shall be utilized unless noted on plans. Casing End Seals shall be BWM Company Model BWM-PO or BWM-WR with stainless steel bands or approved equal. See Standard Water Line Installation Details.

PVC Casing for Water Service Lines (New Construction)

PVC casing for water service lines under roadways for new construction and subdivisions shall be a Class 200 (SDR 21) or a greater pressure class. See Standard Water Line Installation Details for Service Connections.

2.11 GATE VALVES

Gate valves through size 12" shall be resilient wedge design, manufactured to meet or exceed the requirements of AWWA C515, latest revision. Design working pressure shall be minimums 250 psi for all sizes. Gate valves shall be Mueller, M & H, American Flow Control, or equal.

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 suitable for connection to the pipe furnished.

Valves shall have an unobstructed waterway equal to or greater than the full nominal diameter of the valve.

The stem sealing shall be by an O-ring.

The valve body, bonnet, and bonnet cover shall be ductile iron ASTM A536.

All valves are to be tested in strict accordance with AWWA C515, latest revision.

Buried valves shall be equipped with a 2" square operating nut and shall be complete with a valve box as specified herein. Valves shall open to the left.

The inside and outside of the gate valve shall be coated with an epoxy coating. Coating materials, application and testing shall comply with AWWA C550, latest revision.

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

For ease of location outside of paved areas an 18 inch square by 4-inch thick concrete pad shall be installed around the valve box and cover as shown on the Standard Water

Line Installation Details or a precast concrete valve box collar with a 24 inch outside diameter unless noted otherwise on the plans.

2.12 BUTTERFLY VALVES - Rubber Seated Butterfly Valves (14" through 48")

All valves to be furnished under these specifications must be manufactured by Henry Pratt Company, Mueller Company or approved equal.

All butterfly valves shall be furnished for installation in a horizontal line with the operating nut in a vertical position. Each shall be furnished for buried service with a valve box as specified and as detailed on the Drawings.

Buried valves shall be equipped with a 2" square operating nut and shall be complete with a valve box as specified herein. Valves shall open to the left.

All butterfly valves shall be of the tight closing, rubber seated type. Valves shall be bubble tight at rated pressures and shall be satisfactory for applications involving throttling service and/or frequent operations and for applications involving valve operation after long periods of inactivity. Valve discs shall rotate 90 degrees form the full open position to the tight shut position. Valves shall conform to Class 250-B of AWWA Specifications C-504, latest revision. The manufacturer shall have manufactured tight closing rubber seated butterfly valves for a period of at least five years. All valves shall be designed for the most severe operating conditions such as free discharge of "line break" conditions.

Valve bodies shall be constructed of ductile iron ASTM A536 with Mechanical Joint Ends. Body thickness shall meet or exceed the requirements given in AWWA Specification C-504 of latest revision, for Class 250-B Valves.

Valve discs shall be constructed of ductile iron conforming to ASTM A-536,

Shafts shall be constructed of stainless-steel ASTM A-564 Type 630 Condition H-1150. Shaft seals shall be standard self-adjusting split "V" type packing. Shaft seals shall be of a design allowing replacement without removing the valve shaft.

Valve seats shall be or either new natural rubber or of synthetic rubber, Buna-N compound or EPDM rubber. Rubber seats shall be applied to the valve body.

Valves Bearing shall be stainless steel backed Teflon material.

Both valve ends shall be mechanical-joint as per AWWA Specification C111.

All surfaces of the valves shall be clean, dry and free from grease before painting. The valve interior surfaces, except seating surfaces, and the exterior surface shall be evenly coated with two coats of epoxy paint in accordance with TT-C-494A and AWWA C504 latest edition.

Valve actuators shall be designed to hold the valve in any intermediate position between full open or fully closed without creeping fluttering. Valve actuators shall be manual and shall be of the traveling nut type. Units shall be designed for buried service and shall be fully gasketed and grease packed. Adjustable mechanical stops shall be provided to stop valve in the fully opened and fully closed positions.

For ease of location outside of paved areas an 18 inch square by 4-inch thick concrete pad shall be installed around the valve box and cover as shown on the Standard Water Line Installation Details or a precast concrete valve box collar with a 24 inch outside diameter unless noted otherwise on the plans.

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2.13 TAPPING SLEEVES AND VALVES

Tapping sleeves requiring a mechanical joint tapping sleeve shall be Mueller H-615, or approved equal, and a valve with mechanical joint outlet. The valve shall conform to all applicable specifications for gate valves

All other Tapping sleeves shall be stainless steel, Mueller H-304, or approved equal, and a valve with mechanical joint outlet, Mueller T-2361, or approved equal. The valve shall conform to all applicable specifications for gate valves in Section 2.11.

2.14 FIRE HYDRANTS

Fire hydrants shall be iron bodied fully bronze mounted hydrants manufactured to equal or exceed AWWA Specifications C502. Hydrants shall be suitable for 250 psi. Inlet connection shall be 6" mechanical joint unless noted otherwise on project Drawings. Main hydrant valve shall be compression type, closing with the pressure, with 5-1/4" valve opening.

All hydrants shall be equipped with two 2-1/2" hose nozzles, one 4-1/2” steamer nipple (threaded and screwed into the nozzle section and pinned to prevent turning), breakable safety flange and safety stem coupling. Bronze nozzles shall be securely locked to prevent them from blowing off. Hose threads shall be National Standard. Nozzle caps shall be equipped with non-kink chains.

Hydrants shall be of the "dry head" type with an oil reservoir and provision for automatic lubrication of stem threads and bearing surfaces each time the hydrant is operated.

Double O-ring seals shall be provided to keep water out of the hydrant top. **Operating nut shall be hex style, opening to left, and shall be equipped with a weather cap.**

Hydrants shall be provided with automatic multiport drain ports arranged to momentarily flush under pressure each time hydrant is operated. A positive stop shall be provided on the operating stem to prevent over-travel when operating valve.

Fire hydrant shall be supplied with a bituminous coating for buried portion of the hydrant and a red enamel finish for above ground portions of the hydrant. Hydrants shall be Mueller "Super Centurion 250" model A-421 for 6 inch water mains and model A-423 for water mains 8 inches and larger, or M&H Style 129 with a main valve size of 5 1/4 inches on mainlines 8 inches and larger and with a main valve size of 4 1/2 inches on 6 inch mainlines.

See Standard Water Line Installation Details.

2.15 BLOW OFF HYDRANTS

The blow-off shall be an 2" Flushing Hydrant as manufactured by Gil Industries, Inc., Kupferle Foundry Company, MainGuard #77 Post Hydrant or approved equal. The blow-off hydrant shall be equipped with a 2 1/2" brass NSFT discharge with cap and chain, self-draining, and non-freezing type. See Standard Water Line Installation Details.

2.16 HIDDEN BLOW OFF HYDRANTS

The blow-off shall be an 2" Flushing Hidden Hydrant as manufactured by Gil Industries, Inc., Kupferle Foundry Company, MainGuard #78 Blow-Off Hydrant or approved equal. The blow-off hydrant shall be equipped with a 2 1/2" brass NSFT discharge with cap and chain, a freeze-proof peephole, and a lockable, one quarter turn bronze body ball valve. See Standard Water Line Installation Details.

2.17 VALVE BOX FRAMES AND COVERS

Valve Box frames and covers shall be made of heavy cast iron and shall conform to sizes as shown on Standard Water Line Installation Details and shall meet the requirements of ASTM A-48, Class 30.

All casting shall be made accurately to the required dimensions and shall be sound, smooth, clear and free of blemishes or other defects. Defective castings which have been plugged or otherwise treated to remedy defects shall be rejected. Contact surfaces or frames and covers to be machined so that the cover rests securely in the

frames with no rocking. The cover shall be in contact with the frame for the entire perimeter of the contract surface.

Valve boxes shall be cast iron, screw type with drop cover identifying the valve as “Water”. They shall be set vertically and properly adjusted so that the cover shall be in the same plane as the finished surface of the ground or street.

The valve box frames and covers shall be as manufactured by Bouchard No. 8006, Roadway Type, Nashville Standard, SIGMA Corporation VB-2600, VB-2621, and VB-2622 or equal. The cover shall be marked "WATER".

2.18 LOCATOR/TRACER WIRE

A strand of #12 Tracer Wire shall be positively connected to valves. #12 Tracer Wire shall be placed in the bottom of the pipe ditch as a locator device. Tracer Wire to be blue, # 12 gauge, and solid copper wire.

2.19 UNDERGROUND MARKING TAPE

Install underground marking tape in trench with all main water lines. Marking tape shall be installed at a depth of 12 inches minimum above the top of the pipe.

The underground marking tape shall be TERRA-TAPE (detectable) or an approved equal and shall be two inches in width. All underground marking tape shall be blue in color and shall be imprinted to read "CAUTION BURIED WATER LINE BELOW."

2.20 SERVICE INSTALLATIONS

The service assembly shall include a corporation cock, tapping saddle, service pipe, meter yoke and meter box.

Saddle

The saddle shall have an outlet for the service connection that will allow an NPT or AWWA thread to be tapped into it.

City of Crossville

The saddle shall be double strap Ford Model FC202, Smith Blair Model #313, Or Romac Model #202U or approved equal.

Catoosa Utility District

The saddle shall be Ford Brass Saddle Model S70 or approved equal.

Corporation Stop

The corporation stop shall be of solid bronze suitable for a compression flange on the service pipe and for tapping into the water main. This cock shall be Mueller B-2500-8 or Ford FB-1000-X-Q-NL ball valve. The threads on the corporation cock shall be AWWA.

Service Lines

The service lines shall terminate at the meter yoke which is to be installed in a standard meter box.

City of Crossville Utility District

Service pipe shall be a minimum 3/4 inch Type K copper meeting ASTM B88, latest, or of a size as approved by the utility department.

Service pipe over 1 inch diameter to be HDPE.

Catoosa Utility District

Service pipe shall be a minimum 3/4 inch SDR9 Municipex or equal. The water service line shall be copper tube size polyethylene tubing conforming to or exceeding the requirements of ASTM D 2737, latest, or of a size as approved by the utility department.

Meter Boxes

Plastic Meter Boxes for installation in yards, grass areas, landscaped areas, or non-hard surfaces, and for 5/8 inch x 3/4 inch assemblies shall be Carson No. 1520 or approved equal. The lids shall be HDPE, flush lid with cast iron hinged reader lid. The box shall be installed with one course of brick as a base. The cover shall be marked "WATER METER".

City of Crossville Utility District

Concrete Meter Boxes for installation in hard surface areas such as concrete or pavement, and for 5/8 inch x 3/4 inch assemblies shall be precast concrete, Brooks Products No. 36, 16 inch deep cover or Southern Meter Box, 23 inch x 16 inch x 12 inches

deep. The lids shall be concrete with cast iron hinged reader lid. The box shall be installed with one course of brick as a base. The cover shall be marked "WATER METER".

Catoosa Utility District

Traffic Rated HDPE Meter Boxes for installation in hard surface areas such as concrete or pavement, and for 5/8 inch x 3/4 inch assemblies shall be SIGMA RMB 111818-SW or approved equal, and shall meet H20 loading standards. Meter Lid shall be made of Ductile Iron as per ASTM A53648, Grade 65-45-12, and shall be a SIGNA LC 1118R-D or approved equal, and shall meet H20 loading standards.

Meter Yokes Setters

Meter yokes setters shall be Ford 70 series VBHH72-7W-41-33-Q-NL with double purpose ends or approved equal. Yokes to be fitted with angle ball valves with provision for locking, ASSE dual check valves, saddle type swivel nuts, hard copper cross tubes, Mueller 110 compression inlet fittings, and double purpose (flare of FIP) outlet fittings. Copper cross tubes are to be of sufficient weight and hardness that they will not be bent during service installation or meter replacement.

Water Meters

All new water meters shall meet the requirements of the latest revision of ANSI/AWWA Standard C700.

Water meters will be housed in plastic synthetic polymer castings with hinged cover and will be of the “Frost-proof” type. The meter register will read in gallons and will be hermetically sealed to prevent condensation and keep out water and foreign material. The water meter will be the standard meter used by the Utility Department.

The water meters will be installed by the Utility Department for new construction and subdivisions. Water meters indicated to be relocated on plans shall be the Contractor’s responsibility unless noted otherwise on the plans.

General

The service line shall have a minimum of 24-inch cover except under roads and sidewalks where it shall have minimum of 28-inch cover and set perpendicular to the property it is serving. After the line is installed and yoke set, turn water on service pipe

between yoke and main, blowing any accumulated trash out of the pipe. A single piece of copper pipe shall be used from the main to the meter unless the meter is over 100 feet from the main.

In general, install at the property line the meter box and yoke. All residential meters shall be installed by the Utility Department. No meter shall be removed, tampered with, relocated, etc. except by an authorized representative of the Utility Department. Set plumb approximately 1 inch above the existing or proposed grade and so that surface drainage will not enter it. Fill from the existing or proposed grade to the top of the meter box at a slope of 1-inch in 12 inches. When the cut or fill slopes on streets extend beyond the street right-of-way, install the meter box at the top or toe of slope, as applicable, or as directed by the Utility Department. Place a minimum of 2 cubic feet of clean 1/2 inch crushed stone under each meter box.

Set the yoke plumb and level.

The meter box is to be installed at a location such that it will not be in a driveway or under shrubs and trees. If during construction of homes, the meter location conflicts with the location of the driveway, then the meter shall be moved at the expense of the builder or developer.

A 2-inch schedule 40 PVC pipe (WITNESS POST) shall be installed at the meter box with a minimum of 2 feet in the ground and 2 feet above ground. The above ground portion of the pipe shall be painted blue.

See Standard Water Line Installation Details for appropriate utility district for Single and Double Water Service Connection (Residential).

2.21 AIR RELEASE VALVE ASSEMBLY

The Air release Valve shall be APCO Model 200A or A.R.I. Model S-050 or an approved equal. The Air Release Valve to be installed in a four foot diameter precast flattop manhole with a traffic rated manhole rim and cover. A one inch valve is required for 8 inch and smaller water mains. A two valve is required on 10 inch and larger water mains. See Standard Water Line Installation Details for complete Air Release Valve Assembly.

SECTION 3 - CONSTRUCTION

3.01 LOCATION OF LINES

The streets, roads, and easements in which lines will be placed shall be indicated on the plans. Final location of the pipe lines within these locations shall be made by the Engineering Department and the Utility Department at the time of construction.

3.02 TRENCHING

Trenching must be done in a neat and workmanlike manner, maintaining proper alignment except where necessary to make deviations to miss obstructions. Trenching for installation of water distribution piping shall be such that the pipe will have a minimum cover of thirty (30) inches over the bell. The bottom of trenches must be shaped by hand and bell holes must be dug so that full length of pipe is resting on trench bottom. Blocking shall not be used. Refer to profile view for areas where extra depth excavation is required.

All shade trees, telephone poles, power poles, etc., along the line of work shall be protected, and sufficient barricades, lanterns, etc., shall be provided for the protection of the public.

3.02.1 Rock Excavation in Trenches

Where rock is encountered in trenches, the excavation shall be carried to a depth of 6" below the barrel of the pipe and the excess excavation shall be backfilled with approved bedding material firmly compacted. Boulders and large stones, rock or shale shall be removed to provide a clearance of at least 6" below all parts of the pipe or fittings and to clear width of at least 6" on each side of all pipe and appurtenances.

Rock excavation in proximity to other pipes or structures shall be conducted with the utmost care to prevent damage to the existing structures and any such damage caused shall be promptly repaired at the Contractor's expense.

The project area is designated as a NO BLAST ZONE. Rock must be removed by other methods, to be chosen by the Contractor.

3.02.2 Obstruction of Streets, Premises, Etc.

All materials excavated shall be placed so as to interfere as little as possible with public vehicular traffic. In general, excavated material shall be kept clear of the sidewalk except where local conditions make other arrangements desirable. In this event, the Contractor will receive appropriate instructions from the Engineer.

At such street crossings and other points as may be directed by the Engineer, the trenches shall be bridged in a proper and secure manner so as to prevent any serious interruption of travel upon the roadway or sidewalk, and also to afford necessary access to particular public premises.

The Contractor will not be permitted under any circumstances to close to vehicular traffic, any roadway, neutral grounds, or street except by special permission of the applicable agencies from the City of Crossville, Cumberland County, and the State of Tennessee, for a specified period. Alternate streets crossing the work must always be kept open. In the event closure is allowed, Contractor shall notify local police, fire officials and E911 dispatch.

3.02.3 Surface Obstructions

All buildings, walls, fences, rock walls, poles, bridges, railroads, trees, and other property or improvements encountered shall be carefully protected from all injury, and in the event that any of the foregoing are damaged or removed during the process of the work, they shall be repaired or replaced in a satisfactory manner.

3.02.4 Subsurface Obstructions

In excavating, backfilling, and laying pipe, care must be taken not to remove, disturb, or injure other pipes, conduits, or structures, without the approval of the Utility Department. If necessary, the Contractor, at his own expense, shall sling, shore up and maintain such structures in operation, and within a reasonable time shall repair any damage done thereto. Repairs to these facilities shall be made to the satisfaction of the Utility Department.

The Contractor shall give sufficient notice to the interested utility of his intention to remove or disturb any other pipe, conduit, etc., and shall abide by their regulations governing such work. In the event subsurface structures are broken or damaged in the prosecution of the work, the Contractor shall immediately notify the proper authorities and shall be responsible for any damage to persons or property caused by such breaks.

When pipes or conduits providing service to adjoining buildings are broken during the progress of the work, the Contractor shall have them repaired at once. Delays, such as would result in buildings being without service overnight or for needlessly long periods during the day, will not be tolerated, and the Utility Department reserves the right to make repairs at the Contractor's expense without prior notification. Should it become necessary to move the position of a pipe, conduit, or structure, it shall be done by the Contractor in strict accordance with instruction given by the Engineer or the utility involved.

The Utility Department or Engineer will not be liable for any claim made by the Contractor based on underground obstructions being different than that indicated on the plans. Where ordered by the Engineer, the Contractor shall uncover subsurface obstructions in advance of construction so that the method of avoiding same may be determined before pipe laying reaches the obstructions.

The Contractor shall be governed by instructions of the Engineer regarding the laying of pipe along State Highways and the latter will determine whether the pipe shall be laid over, under, or along the end of various drainage structures encountered.

3.02.5 Shoring, Sheeting and Bracing of Excavations

It is the sole responsibility of the Contractor(s) to determine sheeting, shoring and bracing of excavations and such work is NOT a separate pay item.

In some cases, a note on the Plans indicates shoring and sheeting is required; where this occurs, the cost of same shall be merged into the cost of the pipeline (no extra payment).

3.02.6 Unauthorized Excavation and Over-Breakage

Whenever the excavation is carried beyond or below the lines and grades given by the Engineer, the Contractor, at his own expense, shall refill such excavated space with such material and in such a manner as will ensure stability of the line involved, including the use of crushed stone.

Over-breakage is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the Engineer, including slides. All over-breakage shall be removed by the Contractor and disposed of as directed. PAYMENT WILL NOT BE MADE FOR REMOVAL AND DISPOSAL OF OVER-BREAKAGE.

3.03 LAYING WATER PIPE

3.03.1 General

In case of any item not covered by this Section, the manufacturer's recommendations shall govern the manner in which water pipe is laid. Jointing of the pipe and fittings shall be done according to manufacturer's published recommendations.

Immediately before being placed in trench, all pipe shall be examined for defects and shall be swabbed clean and free of all dirt or rubbish. While suspended in sling and

before lowering in trench, pipe shall be inspected for defects; and defective, damaged or unsound pipe shall be rejected and Contractor shall remove at once from work area.

Bell holes for bell and spigot and mechanical joint pipe shall be dug in trench to allow entire length of pipe barrel to be bedded and to allow proper jointing of pipe. Alignment of pipe shall be as true as possible in order to avoid air pockets. When work is suspended either for the night or for any other reason, open ends of the pipe shall be securely plugged to prevent the entrance of foreign materials. The interior of the pipe, as the work progresses, shall be clean. Dead ends of the pipe and unused branches of crosses, tees, valves, etc., shall be closed with plugs or caps suitable to the type of pipe in use as required.

Cutting of pipe shall be done in a neat, workmanlike manner without damage to pipe, coatings and linings and so that a smooth end remains at right angles to axis of pipe.

No pipe shall be laid in trench with water in it which, in opinion of Engineer or the Utility Department, prevents successful jointing, laying or backfilling of trench.

All water main pipe shall be supported on a bed of well compacted earth, dirt, sand, fine gravel, or approved crushed stone as shown in the details on of the plans. Bedding material shall be free from rock and be acceptable to the Engineer. In no case shall pipe be supported directly on the rock bottom of trenches, boulders, or loose rock in the trench.

Granular pipe bedding material shall be used to correct irregularities in the earth trench subgrade and shall be furnished at the contractor's expense as specified hereinbefore.

No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment, and grade in the section laid, but such inspection shall not relieve the contractor of further liability in case of defective joints, misalignment caused by backfilling, and other such deficiencies that are noted later

3.03.2 Installation of Tracer Wire

Install a continuous length of tracer wire (12 gauge) for the full length of each run of pipe. Tracer wire to run along the bottom of the trench in such a manner that will not be displaced during construction operations.

3.03.3 Installation of Locator Tape

Install locator marking tape labeled "CAUTION BURIED WATER LINE BELOW" approximately 12 inches above the water pipe in the trench.

3.03.4 Separation of Water Mains and Sewers

When water mains are to be constructed near sewer lines, horizontal and vertical separation shall be maintained in accordance with the following guidelines:

Parallel Installations

1. For parallel installations, line separation is to be at least 10 feet edge to edge. If this cannot be obtained, the bottom of the water line shall be at least 18 inches above the top of the sewer.
2. If this condition is also unobtainable, the sewer line is to be constructed of materials and have a joint design equivalent to water main standards as approved by the Utility Department and shall be pressure tested in accordance with the requirements for water mains, Section 5 of this document, to assure water tightness.

Crossing Installations

1. Where the water line crosses house sewers, storm sewers, or sanitary sewers, a separation of at least 18 inches shall be provided between the bottom of the water line and the top of the sewer. without vertical separation (DRC 6/30/2026)
2. Sewers lines passing over or under water lines shall be shall be constructed of materials, and have a joint design equivalent to water main standards as approved by the Utility Department. Such sewer lines shall be pressure tested in accordance with the requirements for water mains, Section 5 of this document, to assure water tightness.
3. Water mains passing under sewers shall be protected (in addition to the above sewer line construction) by providing:
    a. at least 18 inches between the bottom of the sewer and the top of the water line;
    b. adequate structural support to prevent excessive joint deflection or damage to the water line when crossing a gravity or storm sewer; Install the water line in a steel casing to prevent excessive joint deflection or damage to the water line if crossing a gravity sewer or storm sewer. Center up the steel casing on the crossing and extend in both direction a minimum of five feet or as shown on the approved plans.
    c. adequate structural support to prevent excessive joint deflection or damage to the water line when crossing a force main or low pressure sewer; Install the force main or low pressure sewer line in a PVC casing pipe to prevent excessive joint deflection or damage to the water line if crossing a gravity sewer or storm sewer. Center up the PVC casing on the crossing and extend in both direction a minimum of five feet or as shown

on approved plans. The PVC casing pipe shall be equivalent to water main standards as approved by the Utility Department.

d. centering of the water line section to result in the water line joints being removed from the sewer line to the maximum possible extent.

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

3.03.5 Ductile Iron Pipe

Provisions of AWWA Specifications C600 latest revision, "AWWA Standard for Installation of Gray and Ductile Cast Iron Water Mains" shall apply. Laying condition shall be Type 2 (flat bottom trench without blocks with tamped backfill).

Joints shall be approved slip-on type or mechanical joint. Unless otherwise indicated on Drawings, lines laid below ground shall have approved slip-on joints; lines laid above ground shall have mechanical joints. Flanged joints shall be used only where designated on Drawings.

Mechanical joint and slip-on type water line shall be joined together in trench according to recommendations of pipe manufacturer. Inside of bell and outside of spigot end shall be thoroughly cleaned to remove oil, grit, excess coating and other foreign matter. Circular rubber gasket shall be flexed inward and inserted in gasket recess of bell socket. Thin film of gasket lubricant shall be applied to inside surface of gasket or spigot end of pipe or both. Gasket lubricant shall be as supplied by pipe manufacturer and approved by Engineer. Spigot end of pipe shall be inserted into socket, with care used to keep joint from contacting ground. Joint shall then be completed by forcing plain end to bottom of socket with forked tool, jack-type tool, or other device approved by Engineer. Pipe not furnished with depth mark shall be marked before assembly to assure that spigot end is inserted to full depth of joint. Field cut pipe lengths shall be filed or ground to resemble spigot end of such pipe as manufactured.

Whenever it is desirable to deflect slip-on joint pipe in order to form long-radius curve, amount of deflection shall not exceed manufacture's limits or the maximum limits as follows:

Diameter	Joint Length	Deflection
4" thru 12"	18 ft.	19 in.
14" thru 36"	18 ft.	11 in.

Consult Engineer for cases not covered in above table.

3.04 INSTALLATION OF FITTINGS

3.04.1 General

Fittings in pipe lines shall be firmly secured to prevent the fitting from being blown off the lines when under pressure. When connections are made between the new work and existing mains, the connections shall be made by using special fittings to suit the actual conditions.

All tees, caps, plugs, bends, or other fittings subjected to unbalanced forces tending to pull the joints apart shall be protected with concrete thrust blocks. Thrust blocks shall be provided in accordance with the Standard Water Line Installation Details Drawing of these specifications, and must bear against an undisturbed trench face. Thrust blocks must be used unless written permission is obtained from Engineer to use special locked-joint fittings, anchoring fittings, or pipe clamps with tie rods.

Fittings shall be wrapped in a minimum of 5 mil. plastic where thrust block are installed.

Fittings shall be placed in locations indicated on Drawings or designated by Engineer and the Utility Department.

Before being placed in trench, all fittings shall be subjected to inspection by Engineer and any defective, unsound or damaged fitting shall be rejected and Contractor shall remove at once from work area.

3.04.2 Fittings

Fittings shall be installed in accordance with provisions of these Specifications dealing with laying of ductile iron pipe. Joints shall be as designated under Section 2, Materials.

3.05 INSTALLATION OF VALVES AND VALVE BOXES

Valves shall be placed in the locations indicated on the plans or at locations designated by the Engineer and the Utility Department. All valves shall be set vertically. Before being placed in the trench, all valves shall be carefully examined by the Contractor and Engineer to see that they are in good working order.

Over each valve shall be placed a valve box. All valves which, when properly set, have operating nuts deeper than 30" below the top of the valve box shall have extension stems with operating nuts located within one foot of the valve box cover.

Valve box shall not come in contact with valve at any point. Backfill around boxes shall be tamped to maintain centered and plumbed alignment of box.

Box shall be installed with the top of the casting set flush with finished surface in paved areas and two inches above natural ground level in unpaved areas.
Valve and valve box installations shall conform to the Standard Water Line Installation Details drawing of these Specifications.

3.06 INSTALLATION OF FIRE HYDRANTS

Hydrants shall be located generally as shown on the Drawings subject to review and approval by the City Fire Department. Location shall provide complete accessibility and minimize possibility of damage from vehicles or injury to pedestrians.

Hydrants shall stand plumb (vertically) with pumper nozzle facing street or public right-of-way. Hydrants shall be set so that ground line, as indicated on hydrant barrel, is within 4" of finished grade. Hydrants without ground lines marked on barrel shall be set so that barrel flange is no more than 2" below finished grade. Hydrant barrel extensions shall be used to conform to these requirements, if necessary.

A hydrant drain consisting of at least seven (7) cubic feet of clean, washed gravel or crushed stone shall be placed around base of hydrant. After installation is complete, hydrant will be tested for drainage and Contractor must correct situation if hydrant does not drain satisfactorily.

Concrete thrust block shall be poured at base of hydrant with care taken not to plug hydrant drains. Blocks must be poured unless written permission is obtained from the Utility Department to use locked joint base fittings, anchoring fittings, or pipe clamps and tie rods.

Painting of hydrants after installation shall be required if factory finish is not satisfactory or has been damaged. All hydrants shall be red unless otherwise directed by the Utility Department.

In case of damaged or otherwise unsatisfactory paint, Contractor shall apply two (2) coats of approved enamel.

Hydrant installation shall conform to the Standard Water Line Installation Details drawing of these Specifications.

3.07 INSTALLATION OF SERVICES

Service shall be installed in the best workmanlike manner with 24" minimum cover. Corporation cock at the main shall be installed in top quadrant of main. Service line shall run from main to meter box in as straight a line as possible and at an angle of $90^{o}\pm$ to the main. The service line shall terminate with a meter yoke $2'\pm$ inside the lot to be

served within a meter box. The top of the meter box shall be set such that surface water will drain away from the box.

The water meters with Radio Read Technology will be installed by the Utility Department for new construction and subdivisions. Water meters with Radio Read Technology indicated to be relocated on plans shall be the Contractor's responsibility unless noted otherwise on the plans.

3.08 INSTALLATION OF SPECIAL ITEMS

3.08.1 Connections To Existing Mains

Connections to existing mains for line extensions or fire hydrant installation shall be made in the manner approved by the Utility Department.

Where existing mains must be valved off to make connections, the Contractor shall notify the Utility Department not less than 24 hours prior to the making of the connection and the actual time of the service interruption shall be subject to the approval of the Utility Department.

It shall be the responsibility of the Contractor to measure outside diameters of existing pipes before ordering tapping sleeves or other fittings intended for connection to existing mains.

3.08.2 Concrete Work

Concrete is to be proportioned in two classes according to use as follows:

Class "A" for reinforced concrete structures, non-reinforced portions of manholes, control chambers and interceptor structures, curbs and gutters, driveways, sidewalks, and surface base courses for highway and street paving.

Class "B" for encasement around sewers and water lines for cradle, refill and tunnel backfill, or thrust blocks.

Class "A" concrete is to be proportioned one 94 lb. sack Portland cement, 195 lbs. sand, and 270 lbs. coarse aggregate. These proportions may be varied by the Engineer after the materials supplied have been tested and proportions for the greatest density and workability determined, provided that no more than 7.25, nor less than 5.5 bags of cement per cubic yard of concrete will be required. Class "A" concrete shall have a minimum compressive strength of 4000 lbs. per square inch in 28 days.

Class "B" concrete shall have a minimum compressive strength of 2500 lbs. per square inch and shall contain not less than 4.5 sacks of cement per cubic yard of concrete. The

relative amounts of fine and coarse aggregate shall be comparable to that for Class "A" concrete.

3.08.3 Installation Of Blow-Off Hydrant

A 2" blow-off shall be installed at the dead-end of a water main when there is not a fire hydrant within 15'. See Construction Plans for locations if required.

Blow-off installation shall conform to the Standard Water Line Installation Details drawing of these Specifications.

3.08.4 Installation Of Hidden Blow-Off Hydrant

A 2" blow-off shall be installed at the dead-end of a water main when there is not a fire hydrant within 15'. A concrete thrust block shall be poured against the dead-end plug encasing the 2" piping for the blow-off. See Construction Plans for locations if required.

The blow-off hydrant shall be installed below ground. A standard pre-cast concrete valve box, frame and cover shall be installed on the blow-off with the top of casting grade projecting slightly above finished grade.

Hidden Blow-off Hydrant installation shall conform to the Standard Water Line Installation Details drawing of these Specifications.

3.09 BACKFILLING

3.09.1 General

All backfill material shall be free from cinders, ashes, refuse, vegetable or organic material, boulders, rocks or stones, or other material that in the opinion of the Engineer is unsuitable. From one foot above top of pipe to subgrade of pavement or, in unpaved areas, to within 12 inches of finished grade, backfill may contain stones up to 8 inches in their greatest dimension, unless otherwise specified. Backfill containing rock must contain enough dirt to fill voids between rock.

When backfill material is not specified on project plans or elsewhere in these Specifications, Contractor may backfill with the excavated material provided material consist of loam, clay, sand, gravel or other materials that, in opinion of Engineer, are suitable for backfilling.

Backfilling shall not be started until pipe work has been inspected and approved by the Engineering Department.

Backfilling shall not be done in freezing weather and it shall not be made with frozen material. No fill shall be made where material already in trench is frozen. Backfill shall not be made with material which, in Engineer's opinion, is too wet.

3.09.2 Backfilling Under Pipe

All trenches shall be backfilled by hand from bottom of trench to centerline of pipe. Approved backfill material shall be placed in 6" layers and thoroughly compacted by hand tamping. Backfill material shall be deposited in trench for its full width on each side of pipe, fittings and appurtenances simultaneously. Care must be taken to compact fill along sides of pipe and appurtenances adjacent to pipe wall.

3.09.3 Backfilling Under Pipe In Rock

Where trench is excavated in rock or shale, 6" space below pipe shall be backfilled with approved bedding material firmly compacted to form a cushion for pipe and appurtenances.

3.09.4 Backfilling Over Pipe

From centerline of pipe, fittings and appurtenances to a depth of 1 foot above top of pipe, trench shall be backfilled by hand or by approved mechanical methods in 6" layers and thoroughly compacted by hand tamping or by approved mechanical methods. Contractor shall use special care in placing this portion of backfill in order to avoid injuring or moving pipe.

3.09.5 Backfilling To Grade

From one foot above top of pipe to grade, trench shall be backfilled by hand or by approved mechanical methods (power equipment).

3.09.6 In Areas Subject To Vehicular Traffic

Where excavation is made through pavements, curbs, driveways, sidewalks, road shoulders, or other areas subject to vehicular traffic or supporting permanent structures, or where such areas, items, or structures are undercut by excavation, the entire backfill shall be crushed stone, TDOT# 57 stone.

Where excavation is made through permanent pavements, backfill shall be placed as described above to the subgrade elevation. Remainder of backfill shall be mineral aggregate base (Limestone 33C, TDOT 303.02, Type A, Grading D) placed as directed to pavement subgrade to serve as base for temporary or permanent pavement.

From time that backfilling is complete until time permanent pavement surface is replaced or, in absence of pavement replacement, until job is accepted, Contractor shall, at direction of Engineer, water streets, roads, etc., to settle dust where excessive dust has, in opinion of Engineer, been caused by Contractor's operations. If Contractor refuses or delays unnecessarily to obey direction of Engineer, the Utility Department shall, after 24 hours written notice through Engineer, be permitted to proceed with such work with cost to be billed to Contractor.

3.09.7 In Areas Not Subject To Vehicular Traffic

Where excavation is made in areas not subject to vehicular traffic or supporting permanent structures and where settlement is unimportant, Contractor may backfill trench from 1 foot above top of pipe to top of trench with approved excavated material using hand or approved mechanical methods. Backfill shall be neatly rounded over trench to sufficient height to allow for settlement to grade after consolidation.

3.10 REPLACING ROAD SURFACING, DRIVEWAYS, ETC.

In paved or improved roads, or where sidewalks, curbs, gutters or driveways have been damaged by Contractor, and where replacement of surfaces or damaged items is required, items shall be repaired or replaced without any needless delay and in the best workmanlike manner with same kind of materials as were removed or damaged in construction operation. Underlying foundation courses of roads, etc., finished surface, etc., shall conform to undisturbed portions of damaged items and shall in every respect be equal to quality, materials and workmanship in original, undisturbed item. Decision of Engineer shall be final as to classification of any form of pavement or surfacing not specified on project plans or of any forms of pavement or surfacing where classification is at all doubtful. Should Contractor fail or refuse to repair any damage after receiving directions of the Engineer, the Utility Department may, after 24 hours written notice, employ such force and furnish such materials as may be necessary to do the work with cost to be billed to Contractor.

3.11 CLEAN-UP PROCEDURES AND REQUIREMENTS

The Contractor shall not, without the permission of the Engineer, remove from the line of work any earth excavated there from which may be suitable for backfilling or surfacing until the excavation has been refilled and surfaced.

As soon as the backfilling of any excavation is completed and when in areas of existing development, the Contractor must at once begin the removal of all surplus dirt except that actually necessary to provide for the settlement of the filling unless otherwise provided in the special specifications. He shall also remove all the pipe and other material placed or left on the street by him except material needed for the replacement of paving, and the street shall be opened up and made passable for traffic. Following the above work, the repairing and complete restoration of the street surfaces, bridges, crossings and all places affected by the work shall be done as promptly as possible.

All excavated material shall be cleared from adjacent street surfaces, gutters, sidewalks, parkways, railroads, grass plots, yards, etc., and the whole work shall be left in tidy and acceptable conditions. Contractor will be required to regrass lawns or neutral grounds where trenches are excavated in these locations or where Contractor has damaged lawns or neutral grounds by his operations.

The Engineer shall be sole authority in determining time in which rough and final clean-up shall be performed. Rough clean-up shall consist of removal of rocks larger than 1 foot in any dimension, grading of excess backfill material over pipeline or removal of said material, opening of any drainage device, restoration of any street or roadway to condition so that traffic may safely and conveniently use street or roadway, restoration of pedestrian ways to condition where pedestrians may safely and

conveniently use same. Rough clean-up shall, in general, be performed no later than 1 day after pipe laying and backfilling or no farther behind pipe laying operations than 1000 feet; whichever time limit is shortest shall govern. Final clean-up consisting of pavement replacement, sidewalk replacement, removal of rocks, hand raking with seeding, strawing, etc., of lawns and neutral grounds, adjusting grade of ground over pipeline, property repairs, and other items shall, in general, be prosecuted no later than 2 weeks after pipe has been laid and backfilled.

SECTION 4 - EROSION AND SEDIMENT CONTROL (for Projects Bid out by the City and/or Catoosa UD only)

Note: New construction to be covered by the project TDEC Stormwater Permit and a City Stormwater permit if required.

4.01 GENERAL

The work covered by this Section relates to erosion and sediment control on all cut and fill operations, excavation, backfill site, within any temporary or permanent easements, and within any borrow site used during the period of construction.

The temporary pollution control provisions contained herein shall be coordinated with the permanent erosion and sediment control features to insure economical, effective, and continuous erosion and sediment control throughout the construction and post-construction period.

4.02 METHODS OF EROSION AND SEDIMENT CONTROL

It is the intent of this Section to provide a written plan to insure than PL 100-4 Section 319, TCA 69-3-101, et. Seg., Subsection 69-3-108 and Subsection 69-3-114, and Division of Water Pollution Control General Permit for Utility Line Crossings, Chapter 1200-4-7.09 are met. Since the Contractor is responsible for the construction means and methods which in turn are responsible for insuring the construction does not harm the Waters of Tennessee, the Contractor is solely responsible for insuring that the above-mentioned laws and regulations are met.

4.02.1 Temporary Berms

A temporary berm is constructed of compacted soil, with or without a shallow ditch, at the top of fill slopes or transverse to centerline of fills. These berms are used temporarily at the top of newly constructed slopes to prevent excessive erosion until permanent controls are installed or slopes stabilized.

4.02.2 Temporary Slope Drains

A temporary slope drain is a facility consisting of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, sod, or other material that may be used to carry water down slopes to reduce erosion.

4.02.3 Sediment Structures

Sediment basins, ponds, and traps are prepared storage areas constructed to trap and store sediment from erodible areas in order to protect properties and stream channels below the construction areas from excessive siltation.

4.02.4 Check Dams

Check dams are barriers composed of large stones, sandbags, or other nonerodible materials placed across or partially crossing a natural or constructed drainageway.

4.02.5 Temporary Seeding and Mulching

Temporary seeding and mulching are measures consisting of seeding, mulching, fertilizing, and matting utilized to reduce erosion. All cut and fill slopes, including waste sites and borrow pits, shall be seeded when and where necessary to eliminate erosion.

4.02.6 Temporary Silt Fences

Silt fences are temporary measures utilizing woven wire or other approved material attached to posts with filter cloth composed of burlap, plastic filter fabric, etc., attached to the upstream side of the fence to retain the suspended silt particles in the runoff water.

4.02.7 Rubble Stone Rip-Rap

Where rip-rap backfill is called for on the drawings, coarse stone from the excavation may be conserved and used. Rip-rap for bank stabilization shall be sound, dense, durable, and free from excessive cracks, pyrite intrusions, and other structural defects. At least ninety (90%) percent of the stone shall be not less than eight (8") inches wide

by twelve (12") inches long by twelve (12") inches deep and shall be approximately rectangular in shape.

4.02.8 Geotextile Erosion Control Fabric

The geotextile fabric used in conjunction with the rip-rap for erosion control shall meet Corps of Engineers specifications for erosion control fabric and shall be equivalent to Exxon GTF 400E or Mirafi 700X fabrics.

4.03 CONSTRUCTION

4.03.1 General

The Contractor shall submit to the Engineer for approval a plan and schedule for accomplishment of temporary and permanent erosion and sediment control for the project, including haul roads, borrow pits, and waste areas. No work shall be started until the Plan and Schedule have been accepted by the Engineer.

The Contractor shall submit a spill prevention plan to the Engineer for review. The contents of this spill prevention plan shall depend on what types of chemicals, lubricants, and fuels will be used, and if these will be stored on site. As a minimum, if no fuel, lubricants, or other chemicals are stored on site, either temporarily in vehicular tanks or in skid or trailer mounted tanks, a plan shall be supplied which directs all employees of the Contractor in the proper procedures to be followed should a spill occur. For more complex chemical storage requirements, a more complex plan will be required.

Conduct construction so as to provide the site with maximum protection from erosion and sedimentation at all times.

General guidelines to be followed by the Contractor include, but are not limited to, the following:

A. Grading and construction operations should be timed to minimize soil exposure.

B. Remove only the existing vegetation that is absolutely necessary.

C. Reseed and mulch areas where vegetation is removed.

D. Divert runoff water around areas where vegetation has been removed.

E. Utilize measures to keep runoff velocities as low as possible.

F. Trap sediment on site.

G. Construction debris must not be allowed to enter stream channels.

H. Inspect and maintain control measures as necessary.

I. Under no circumstances will spent oil wastes be discharged anywhere on the site without the expressed written consent of the Tennessee Office of Water Management.

4.03.2 Construction Requirements

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

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

Where erosion is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if the project conditions permit; otherwise erosion control measures may be required between successive construction stages. Under no conditions shall the surface area of erodible earth material exposed at one time by clearing and grubbing exceed 250,000 square feet without approval of the Engineer.

The Engineer will limit the area of excavation, borrow, and embankment operations in progress commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding, and other such permanent pollution control measures current in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

The Engineer may increase or decrease the amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, and borrow and fill operations as determined by his analysis of project conditions.

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

4.03.3 Pipeline Construction near Streams and Across Streams

In areas where the pipeline is parallel to a stream bank, excavated material shall be stored on the upslope side of the trench rather than between the trench and stream. Staked and entrenched straw bales and/or silt fences shall be placed where necessary to prevent runoff from the construction site from entering the stream channel.

At stream crossings, Contractor shall utilize construction methods and erosion control methods which will minimize the entrance of sediment into the stream channel. Hay bales or silt fences shall be placed where required.

Water pumped from cofferdams or excavations must be held in settling or dewatering basins until it is at least as clean as the stream water on the upstream side of the crossing. Once the stream crossing has been completed, Contractor shall place rubble stone rip-rap to protect bank areas disturbed by construction.

Prior to the placement of rip-rap material, the sloping ground surface shall be thoroughly compacted by the use of hand or mechanical tamps. Geotextile erosion control fabric shall then be placed in strict accordance with manufacturer's recommendations. At the bottom of the slope, rip-rap shall be placed at least two (2') feet below the natural ground surface. Across the face of the slope, rip-rap shall be placed a minimum of five (5') beyond the firm ditch line, unless shown otherwise on the Drawings.

The standard depth of rubble stone rip-rap shall be twelve (12") inches. Rip-rap material shall be carefully placed in a single layer so that the stones shall be as close together as is practicable in order to reduce voids to a minimum. Each stone shall be so placed that the depth will be perpendicular to the surface upon which it is set. The length shall be placed as directed by the Engineer, and each main stone shall be placed so that it will be against the adjoining stones. The stones shall be placed in such a manner as to stagger all joints as far as it is possible and practicable.

The main stones shall be thoroughly "chinked" and filled with the smaller stones by throwing them over the surface in any manner that is practical for the smaller stones to fill the voids. This work shall continue with the progress of the construction. Tamping

of the stones will not be required if the stones have been placed in a reasonable and satisfactory manner.

Knapping of the stones will not be required, except stones protruding more than four (4") inches above what is considered normal surface of the stones, in which case these stones shall be broken down to come within four (4") inches of the normal surface.

4.03.4 Construction of Erosion and Sediment Control Structures -

A. Temporary Berms

A temporary berm shall be constructed of compacted soil, with a minimum width of twenty-four (24") at the top and a minimum height of twelve (12") inches with or without a shallow ditch, constructed at the top of fill slopes or transverse to centerline of fills. Temporary berms shall be graded so as to drain to a compacted outlet at a slope drain. The area adjacent to the temporary berm in the vicinity of the slope drain must be properly graded to enable this inlet to function efficiently and with only minimum ponding in this area. All transverse berms required on the downstream side of a slope drain shall extend across the grade to the highest point at approximately a ten (10) degree angle with a perpendicular to centerline. The top width of these berms may be wider and the side slope flatter on transverse berms to allow equipment to pass over these berms with minimal disruptions. When practical, and until final elevations are approached, embankments should be constructed with a gradual slope to one side of the embankment to permit the placement of temporary berms and slope drains on only one side of the embankment.

B. Temporary Slope Drains

Temporary slope drains shall consist of stone gutters, fiber mats, plastic sheets, concrete or asphalt gutters, half round pipe, metal pipe, plastic pipe, flexible rubber, or other materials which can be used as temporary measures to carry water accumulating in the cuts and on the fills down the slopes prior to installation of permanent facilities or growth of adequate ground cover on the slopes.

Fiber matting and plastic sheeting shall not be used on slopes steeper than four to one (4:1) except for short distances of twenty (20') feet or less.

All temporary slope drains shall be adequately anchored to the slope to prevent disruption by the force of the water flowing in the drains. The base for temporary slope drains shall be compacted and concavely formed to channel the water or hold the slope drain in place. The inlet end shall be properly constructed to channel water into the temporary slope drain. Energy dissipaters, sediment basins, or other approved devices shall be constructed at the outlet end of the

slope drains to reduce erosion downstream. An ideal dissipator would be dumped rock or a small sediment basin which would slow the water as well as pick up some sediment. All temporary slope drains shall be removed when no longer necessary and the site restored to match the surroundings.

C. Sediment Structures

Sediment structures shall be utilized to control sediment at the foot of embankments where slope drains discharge; at the bottom as well as in the ditchlines atop waste sites; in the ditchlines for borrow pits. Sediment structures may be used in most drainage situations to prevent excessive siltation of pipe structures. All sediment structures shall be at least twice as long as they are wide.

When use of temporary sediment structures is to be discontinued, all sediment accumulation shall be removed, and all excavation backfilled and properly compacted. The existing ground shall be restored to its natural or intended condition.

D. Check Dams

Check dams shall be utilized to retard stream flow or restrict stream flow within the channel. Materials utilized to construct check dams are varied and should be clearly illustrated or explained in the Contractor's erosion control plan.

All check dams shall be keyed into the sides and bottom of the channel. A design is not needed for check dams.

E. Temporary Seeding and Mulching

Temporary Seeding and Mulching shall be performed within 7 days after construction activity ceases on any particular area, and all disturbed ground where there will not be any construction activities for more than 15 days must be seeded. The seeding must be performed with a fast-germinating temporary seed and be protected with mulch. This seeding must be completed within 15 days of the cease of construction activity.

F. Temporary Silt Fences

Temporary silt fences shall be placed on the natural ground, at the bottom of fill slopes, in ditches, or other areas where siltation is a problem. Silt fences are constructed of wire mesh fence with a covering of burlap or some other suitable material on the upper grade side of the fence and anchored into the soil.

The Contractor shall be required to maintain the silt fence in a satisfactory condition for the duration of the project or until its removal is requested by the Engineer. The silt accumulation at the fence may be left in place and seeded, removed, etc., as directed by the Engineer. The silt fence becomes the property of the Contractor whenever the fence is removed.

4.03.5 Maintenance

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

4.03.6 Erosion and Sediment Control Outside Project Areas

Temporary erosion and sediment control shall include construction work outside the project area where such work is necessary as a result of construction such as borrow pit operations, haul roads, and equipment storage sites.

SECTION 5 - TESTING AND DISINFECTION

5.01 GENERAL

Upon completion of the construction work the Contractor shall conduct the necessary pressure and leakage tests, and shall disinfect the completed water mains and appurtenances. The Contractor shall furnish all labor, tools, equipment, and materials for making the tests. In the event that the pressure or leakage test is unsatisfactory, or bacteriological tests indicate that disinfection is incomplete, the Contractor shall take corrective measures and shall repeat the test until satisfactory results are obtained. Test shall be made in the presence of an authorized representative of the Utility Department.

Valves proposed for construction shall be operated by Contractor. Existing Utility Department valves shall be operated by Utility Department personnel only. Contractor shall coordinate opening or closing of the Utility Department valves and the isolation of Utility Department water lines with the appropriate Utility Department, City of Crossville, Utility Maintenance Department, and/or Catoosa UD.

All flushing and bacteriological water sampling shall be done by City of Crossville personnel. the opening of existing valves to fill newly installed water mains shall also be done by City of Crossville personnel only. The contractor shall not use existing meter yokes, service connections, fire hydrants, or flus/blow off hydrants to fill the newly installed water mains. The contractor shall use potable water from a source which is not connected to a water main or water service for pressure testing.

5.02 PRESSURE AND LEAKAGE TESTS

PVC and Ductile Iron Pipe

Each section of the completed water main extensions shall be subjected to a pressure test. The section to be tested shall be valved off by gate valves, after having been filled with water, and a positive displacement test pump shall be used to pump clean water into the section to build up a test pressure of the greater of 1.5 times the working pressure or 200 psi for Class 250 pipe and Ductile Iron Pipe or 175 psi for Class 200 PVC pipe. The test pump shall then be valved off from the system and the pressure shall be observed over a minimum period of two hours. A drop in pressure of 5 psi or more during the two hour test period shall be taken as an indication of leakage. In the event leaks are found and corrected, the Contractor shall repeat the pressure test using the same procedure described above

The Contractor shall provide suitable first quality pressure gauge with 5 lb. or smaller graduations. The City and/or Catoosa UD will use a digital pressure data logger during

the pressure test to document the pressure during the test period. Pressure gauges shall be in good condition and shall be subject to such tests for proof of accuracy as the Engineer or the Utility Department may require.

Pressure test to occur after the water line is flushed after it is disinfected.

Allowable leakage to comply with AWWA standard C600 for Ductile Iron Pipe and AWWA standard C605 for PVC pipe. The allowable leakage is L=(SDvP)/148,000.

HDPE Pipe

Each section of the completed water main extensions shall be subjected to a pressure test. The section to be tested shall be valved off by gate valves, after having been filled with water, and a positive displacement test pump shall be used to pump clean water into the section to build up a test pressure of the greater of 1.5 times the working pressure or 200 psi for Class 250 or 175 psi for Class 200 PVC pipe. The test pump shall then be valved off from the system. An initial expansion test phase holding the pressure at the test pressure for a minimum period of two hours with the pressure stabilizing in the pipe. After the initial expansion test phase reduce the pressure by 10 psi for the test phase. The test phase will last a minimum of two hours and a drop in pressure of 5 psi or more during the two hour test period shall be taken as an indication of leakage. In the event leaks are found and corrected, the Contractor shall repeat the pressure test using the same procedure described above

The Contractor shall provide suitable first quality pressure gauge with 5 lb. or smaller graduations. The City and/or Catoosa UD will use a digital pressure data logger during the pressure test to document the pressure during the test period. Pressure gauges shall be in good condition and shall be subject to such tests for proof of accuracy as the Engineer or the Utility Department may require.

Pressure test to occur after the water line is flushed after it is disinfected.

No allowable leakage for a section of heat-fusion joined polyethylene piping.

HDPE pipe pressure testing to follow procedures as outlined in ASTM F2164, latest edition.

5.03 DISINFECTION

Disinfection procedures shall be in accordance with the AWWA Standard for Disinfecting Water Mains, AWWA C651, latest edition.

Prior to starting the disinfection, furnish an outline of proposed sequence of operation, manner of filling and flushing.

Disinfection work shall be acceptable to the ENGINEER, and to the appropriate Utility Department, City of Crossville Utility Maintenance Department and/or Catoosa UD. All testing must be performed in the presence of the Utilities Inspector or Utility Department personnel. All disinfection and testing to follow the Standard Operation Procedures for the appropriate Utility Department.

All water main extensions and appurtenances shall be disinfected upon completion and after the system has been flushed to remove dirt or foreign objects which may have been accidentally introduced into the line.

Calcium Hypochlorite shall be used for disinfecting PVC and Ductile Iron Pipe water lines in accordance with AWWA Standard for disinfecting water mains (AWWA C651). All additions or replacements to the water system shall be chlorinated before being placed in service. Such chlorination must take place under the supervision of the appropriate Utility Department. HDPE water line pipe shall be disinfected by the Continuous Feed Method or the Slug Method.

The chlorine shall be introduced into the mains as water is being added so that adequate mixing will occur. Chlorine shall be added until a concentration of not less than 50 parts per million of available chlorine is observed at check points throughout the section being disinfected. The first dose of disinfectant will be added within 10 feet of the connection point to the existing water main. The chlorine solution shall be left in the mains for a period of at least 24 hours after which the chlorine residual will be checked, and must be at least 25 ppm after 24 hours. If proper residual is present, water mains will be flushed until all the water in the water mains has been replaced, and has the normal residual chlorine found in tap water. Pressure test can occur after the water line is flushed.

Bacteriological Sampling shall then be taken by the appropriate Utility Department personnel and shall be submitted to the bacteriological laboratory for testing. Initial Bacteriological Sampling will be taken after 48 hours for every 1200 feet interval of water main, and at each beginning and ending point, and at the end of each branch line.

In the event any of the bacteriological samples show the presence of coliform organisms or an excessive total count, the disinfection procedure shall be repeated until samples of satisfactory bacteriological quality can be obtained.

All flushing and bacteriological sampling shall be done by the appropriate Utility Department personnel. The operation of existing valves shall be done by the appropriate Utility Department personnel.

The Contractor shall furnish the chlorine for main disinfection and shall furnish all labor, tools and equipment for the disinfection. The Contractor is responsible for installing any test ports and/or taps for pressure testing, flushing, and/or sampling newly installed mains. The cost for the material and labor for testing and disinfection to be included in the water main installation price.

SECTION 6 - SPECIAL CONDITIONS

6.01 GENERAL

The CONTRACTOR'S attention is called to the special conditions indicated on the Plans and described in this section of the Specifications. Special conditions include construction within highway rights-of-way which lie within the jurisdiction of the Tennessee Department of Transportation, City of Crossville, and Cumberland County, construction in the vicinity of existing utilities, and construction on easements and in yards.

The Plans and Specifications reflect the type of construction that is anticipated in the various locations requiring special attention but it shall be the responsibility of the CONTRACTOR to contact the various agencies affected, and for coordinating construction with their requirements in such a way as to avoid conflicts, damage, or interruption of service.

6.02 WORK ON STATE HIGHWAY RIGHTS-OF-WAY

When required, Utility Department will submit Plans and Specifications for this project to the Tennessee Department of Transportation and will make application for a permit to construct utilities on State highway rights-of-way. In the event that a bond is required, said bond will be provided by the Utility Department at no cost to the CONTRACTOR, but the CONTRACTOR will be required to conform to the conditions of the permit and bond.

When working in or near lanes of traffic, the CONTRACTOR shall provide warning signals and/or flagmen as required by the Manual on Uniform Traffic Control Devices, latest revision, and shall prosecute the work in such a way as to cause a minimum of inconvenience to the traveling public.

It shall be the responsibility of the CONTRACTOR to contact and coordinate his work with the inspectors from the Tennessee Department of Transportation.

6.03 EXCAVATION IN STREETS

When excavation must be performed in paved streets or roads, all excavation, backfill, pavement replacement, and traffic control must conform to the requirements of city or county as applicable. CONTRACTOR shall obtain the required street closure permits and will be responsible for notification of inspection personnel prior to beginning work. When working in or near lanes of traffic, the CONTRACTOR shall provide warning signals and/or flagmen as required by the Manual on Uniform Traffic Control Devices, latest revision, and shall prosecute the work in such a way as to cause a minimum of inconvenience to the traveling public.

CONTRACTOR must contact City and County Road Departments, and in the event that bond(s) are required, CONTRACTOR will be responsible for cost of bonds.

6.04 EXISTING UTILITIES

The CONTRACTOR is required to contact Tennessee One Call (Tennessee 811) a minimum of three days before commencing on any work. Call 811 or 1-800-351-1111.

When construction work is performed in areas of existing utilities, the Utility Department will locate existing water and sewer lines as closely as possible prior to beginning of construction. It shall be the CONTRACTOR's responsibility to contact other municipalities, the telephone company, cable, broadband, gas company, or other utilities to request locations of those lines. Utility companies shall be contacted far enough in advance so as not to delay progress of the construction.

6.05 STORMWATER PERMITS

A TDEC NPDES Stormwater Permit may be required. If so, the CONTRACTOR will be required to sign the NOI and Stormwater Pollution Prevention Plan (SWPPP). **The CONTRACTOR shall be required to adhere to the terms and requirements of the stormwater permit and to the stormwater regulations and stormwater ordinance of The City of Crossville when working within the city limits**

6.06 EXTRA DEPTH EXCAVATION

Where indicated on the Plans, water line must be installed deeper than normal to avoid conflicts with proposed ditches and roadway cuts. See profile view. No extra payment will be made for extra depth excavation on Utility Department Projects.

In addition to the above- mentioned requirements, the Contractor shall be responsible for any additional work as described in the Appendix under Additional Requirements for Easement Acquisition if applicable. If no Appendix attached, no Additional Requirement required.

6.07 SURVEY LOCATE and INSPECTION

All newly installed water mains to be field survey located and inspected before the line is backfilled. Any newly installed water mains not survey located and inspected before backfilling will not be accepted by the Utility Department unless approved prior to backfilling.

SECTION 7 – MEASUREMENT AND PAYMENT
(for Projects Bid out by the City and/or Catoosa UD only)

7.01 MEASUREMENT AND PAYMENT—WATER PIPE

A. Water pipe will be measured by the linear foot of pipe installed, tested, disinfected, and accepted including trenching, bedding, backfill, fittings (unless otherwise specified), thrust blocking, tracer wire and metallic locator tape including all labor and materials.
B. Water pipe as stipulated above will be paid for at the Contract unit price per linear foot for the various sizes and classifications shown on the Bid Form.

7.02 MEASUREMENT AND PAYMENT—VALVES

A. Valves including valves and valve boxes & covers will be measured by the number installed, tested, disinfected, and accepted all labor and materials.
B. Valves as stipulated above, will be paid for at the Contract unit price per each for the various sizes and classifications shown on the Bid Form.

7.03 MEASUREMENT AND PAYMENT—HYDRANT ASSEMBLIES

A. Hydrant assemblies will be measured by the number installed, tested,

disinfected, and accepted including trenching, backfill, valves, fittings, and thrust blocking including all labor and materials.

B. Hydrant assemblies, as stipulated above, will be paid for at the Contract unit price per each for the various sizes and classifications shown on the Bid Form.

7.04 MEASUREMENT AND PAYMENT—WATER SERVICE ASSEMBLIES

A. Water service assemblies will be measured by the number installed, tested, disinfected, and accepted including trenching, backfill, fittings, tapping saddles, Corporation Stops, meter yokes, and meter boxes including all labor and materials.

B. Water service assemblies, as stipulated above, will be paid for at the Contract unit price per each for the various sizes and classifications shown on the Bid Form.

7.05 MEASUREMENT AND PAYMENT— WATER SERVICE LINE

A. Water Service Line will be measured by the linear foot of pipe installed, tested, disinfected, and accepted including trenching, bedding, backfill, and fittings including all labor and materials.

B. Water Service Line as stipulated above will be paid for at the Contract unit price per linear foot for the various sizes and classifications shown on the Bid Form.

7.06 MEASUREMENT AND PAYMENT— FITTINGS (SPECIALLY CALLED FOR ON BID FORM)

A. Waterline fittings will be measured for payment only when specially called for on the Bid Form and will be measured by the fittings installed, tested, and accepted.

B. Fittings, as stipulated above, will be paid for at the Contract unit price per each.

7.07 MEASUREMENT AND PAYMENT— CASING PIPE (BORE & JACK)

A. Casing Pipe by Bore & Jack will be measured by the linear foot of casing pipe installed and accepted including boring, steel casing pipe, casing spacers, casing end seals, boring pits and clean up. The carrier pipe to be paid for under Section 7.01

B. Casing pipe as stipulated above will be paid for at the Contract unit price per linear foot for the various sizes and classifications shown on the Bid Form.

7.08 MEASUREMENT AND PAYMENT— CASING PIPE (OPEN CUT)

A. Casing Pipe by Open Cut will be measured by the linear foot of casing pipe installed and accepted including installation, steel casing pipe, casing spacers, casing end seals, trenching and clean up. The carrier pipe to be paid for under Section 7.01

B. Casing pipe as stipulated above will be paid for at the Contract unit price per linear foot for the various sizes and classifications shown on the Bid Form.

7.09 MEASUREMENT AND PAYMENT—DIRECTIONAL BORING

A. Directional Boring will be measured by the linear foot installed and accepted including boring and clean up. The carrier pipe to be paid for under Section 7.01
B. Directional Boring as stipulated above will be paid for at the Contract unit price per linear foot for the various sizes and classifications shown on the Bid Form.

7.10 MEASUREMENT AND PAYMENT—CASING PIPE (DIRECTIONAL BORING)

A. Casing Pipe by Directional Boring will be measured by the linear foot of casing pipe installed and accepted including boring and clean up. The carrier pipe to be paid for under Section 7.01
B. Casing pipe as stipulated above will be paid for at the Contract unit price per linear foot for the various sizes and classifications shown on the Bid Form.

7.11 MEASUREMENT AND PAYMENT—CONNECTION TO EXISTING WATER MAIN

A. Connection to existing water main includes all labor and material required to perform the connection to the existing line including fittings, restraints and plugs where shown on the drawings.
B. Connection to exiting water main as stipulated above will be paid for at the Contract unit price per each connection for the various connections shown on the Bid Form.

7.12 MEASUREMENT AND PAYMENT—AIR RELEASE ASSEMBLY

A. An Air Release Valve Assembly shall consist of all fittings, piping, tapping saddle, corporation stop, valve, gravel, Air Release Valve, manhole with rim and cover, and accessories including all labor and materials.
B. Air Release Valve Assembly as stipulated above will be paid for at the Contract unit price per each for the various sizes as shown on the Bid Form.

7.13 RECONNECT SERVICE ASSEMBLY

A. This item is to include the labor and material for new tapping saddle, corporation stop to change the location of a tap and connection to the existing meter. Water service line to be to be paid for under Section 7.05

B. Payment for the reconnection of an existing water service assembly as stipulated above will be paid for at the Contract unit price per each for the various sizes as shown on the Bid Form.

7.14 RELOCATE SERVICE ASSEMBLY

A. This item is to include the labor and material for new tapping saddle, corporation stop, meter yoke, meter box, meter with radio head technology to change the location of a tap and relocate meter, and reconnect to the existing private service line. Water service line to be to be paid for under Section 7.05

B. Payment for the relocation of the water service assembly as stipulated above will be paid for at the Contract unit price per each for the various sizes as shown on the Bid Form.

7.15 RESTORE ASPHALT

A. This item to include all labor and materials to restore asphalt drives and/or asphalt roadways include TDOT#57 clean limestone backfill, TDOT 33C Limestone base, and asphalt.
B. Payment for restoring all asphalt as required will be made at the contract unit price of square yard as shown in the PROPOSAL. Overbreakage is not considered for payment under this item.

7.16 RESTORE CONCRETE

A. This item to include all labor and materials to restore concrete drives and/or concrete roadways include TDOT#57 clean limestone backfill, TDOT 33C Limestone base, and concrete.
B. Payment for restoring all concrete as required will be made at the contract unit price of square yard as shown in the PROPOSAL. Overbreakage is not considered for payment under this item.

7.17 RESTORE GRAVEL

A. This item to include all labor and materials to restore gravel drives and/or gravel roadways include TDOT#57 clean limestone backfill and TDOT 33C Limestone base.
B. Payment for restoring all gravel as required will be made at the contract unit price of square yards as shown in the PROPOSAL. Overbreakage is not considered for payment under this item.

END OF SECTION

SECTION 8 – STANDARD DETAILS

See attached detail sheets.

CITY OF CROSSVILLE WATER GENERAL NOTE:

1. PVC PIPE - CLASS 250 PSI PIPE SHALL BE USED UNLESS SPECIFIED OTHERWISE. ALL FITTINGS AND APPURTENANCES (INCLUDING SERVICES) FOR WATER LINE INSTALLATIONS SHALL HAVE A MINIMUM PRESSURE RATING OF 200 PSI. DUCTILE IRON PIPE - CLASS 350 SHALL BE USED FOR PIPES 10" OR GREATER UNLESS SPECIFIED OTHERWISE.

CATOOSA UTILITY DEPARTMENT WATER GENERAL NOTE:

1. PVC PIPE - CLASS 200 PSI PIPE SHALL BE USED UNLESS SPECIFIED OTHERWISE. ALL FITTINGS AND APPURTENANCES (INCLUDING SERVICES) FOR WATER LINE INSTALLATIONS SHALL HAVE A MINIMUM PRESSURE RATING OF 200 PSI. DUCTILE IRON PIPE - CLASS 350 SHALL BE USED FOR PIPES 10" OR GREATER UNLESS SPECIFIED OTHERWISE.

WATER GENERAL NOTES:

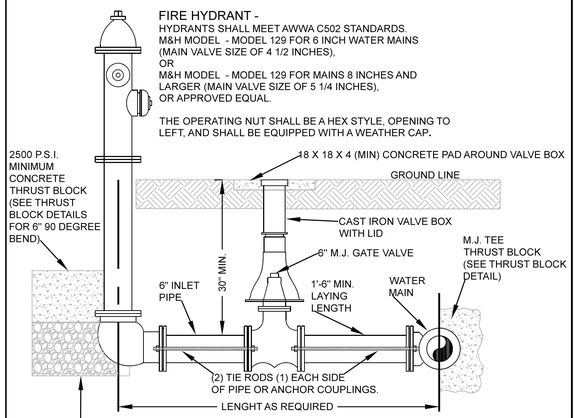
1. WATER MAINS SHALL HAVE A MINIMUM OF 30" OF COVER, EXCEPT ON TDOT RIGHT OF WAYS WHERE A MINIMUM OF 36" OF COVER IS REQUIRED.
2. TRENCH WIDTHS (WHERE ROCK IS ENCOUNTERED DURING EXCAVATION) SHALL BE A MINIMUM OF 2', PLUS THE DIAMETER OF THE WATER MAIN.
3. ALL WATER MAINS (EXCLUDING THOSE IN A CASING) SHALL HAVE A MINIMUM OF 6" OF BEDDING BELOW, ON EACH SIDE IN SOIL (WITH A MINIMUM OF 12" ON EACH SIDE IN ROCK), AND 12" OF BEDDING ABOVE THE WATER MAIN. ALL BEDDING MATERIAL SHALL BE FREE OF ROCK LARGER THAN 2" DIAMETER AND ORGANIC DEBRIS, AND SHALL BE INSTALLED IN 6" WELL COMPACTED LIFTS. NO ROCK LARGER THAN 6" IN DIAMETER SHALL BE USED AS BACKFILL IN THE REMAINDER OF THE TRENCH.
4. NEW WATER MAINS SHALL BE INSTALLED 5' INSIDE ROAD RIGHT OF WAYS (TYPICALLY) OR AS SHOWN ON PLANS.
5. SUBMITTALS FOR "APPROVED EQUALS" MUST BE PRE-APPROVED IN WRITING BY THE CITY OF CROSSVILLE ENGINEERING DEPARTMENT PRIOR TO INSTALLATION.
6. MECHANICAL JOINT RESTRAINTS SHALL BE USED ON ALL FITTINGS (UNLESS SPECIFIED OTHERWISE) AND SHALL BE EBAA IRON, INC., MEGALUG SERIES 2000PV FOR PVC PIPE AND EBAA IRON, INC., MEGALUG SERIES 1100 FOR DUCTILE IRON PIPE OR APPROVED EQUAL.
7. ALL FLUSHING AND BACTERIOLOGICAL WATER SAMPLING SHALL BE DONE BY CITY OF CROSSVILLE OR CATOOSA UTILITY DEPARTMENT PERSONNEL. THE OPENING OF EXISTING VAVLES TO FILL NEWLY INSTALLED WATER MAINS SHALL ALSO BE DONE **BY CITY OF CROSSVILLE OR CATOOSA UTILITY DEARTMENT PERSONNEL ONLY**. THE CONTRACTOR SHALL NOT USE EXISTING METER YOKES, SERVICE CONNECTIONS, FIRE HYRANTS, OR FLUSHING HYDRANTS TO FILL THE NEWLY INSTALLED WATER MAINS. THE CONTRACTOR SHALL USE POTABLE WATER FROM A SOURCE WHICH IS NOT CONNECTED TO A WATER MAIN OR WATER SERVICE FOR PRESSURE TESTING.
8. CURRENT **AWWA STANDARDS** SHALL BE FOLLOWED BY THE CONTRACTOR FOR NEW WATER LINE DISINFECTION AND WATER LINE REPAIRS. THE CONTRACTOR SHALL ADD THE FIRST DOSE OF DISINFECTANT WITHIN 10' OF THE START OF A NEW PROJECT. DISINFECTANT SHALL BE APPLIED AT A MINIMUM OF 25 PPM DURING THE CONSTRUCTION PHASE OF THE PROJECT. BACTERIOLOGICAL WATER SAMPLES SHALL BE TAKEN (BY CITY EMPLOYEES) EVERY 1200', AND ALL SPUR LINES SHALL BE SAMPLED. WATER MAINS AND SPUR LINES MUST HAVE A NEGATIVE BACTERIOLOGICAL SAMPLE BEFORE BEING ACCEPTED INTO THE EXISTING WATER SYSTEM.
9. IF A WATER SERVICE CONNECTION, BLOW-OFF HYDRANT, OR FIRE HYDRANT IS NOT LOCATED WHERE A BACTERIOLOGICAL WATER SAMPLE NEEDS TO BE TAKEN, THE CONTRACTOR SHALL INSTALL AN APPROVED 3/4" TAPPING SADDLE, 3/4" CORPORATION STOP, AND 3/4" SERVICE TUBING AS NEEDED TO OBTAIN THE SAMPLE. AFTER A NEGATIVE BACTERIOLOGICAL SAMPLE IS OBTAINED; THE SERVICE TUBING SHALL BE REMOVED, THE CORPORATION STOP CLOSED AND CAPPED, AND THE AREA BACKFILLED TO EXISTING GRADE. THE COST (INCLUDING LABOR) SHALL BE INCLUDED WITH THE PIPE INSTALLATION PRICE.
10. BEFORE PRESSURE TESTING WATER MAINS: THE WATER MAIN SHALL BE ADEQUATELY CHLORINATED (50 PPM MINIMUM), ALLOWED TO SET A MINIMUM OF 24 HOURS, THEN FLUSHED TO AN ACCEPTABLE CHLORINE LEVEL (25 PPM MINIMUM). WHEN A PASSING PRESSURE TEST HAS BEEN ACCOMPLISHED, THE WATER MAIN SHALL BE FLUSHED AGAIN TO AN ACCEPTABLE CHLORINE LEVEL, SHALL REMAIN SEPARATED FROM THE EXISTING WATER SYSTEM FOR 48 HOURS (MINIMUM), THEN A BACTERIOLOGICAL WATER SAMPLE SHALL BE TAKEN. IF THE BACTERIOLOGICAL WATER SAMPLE PASSES, THE WATER MAIN SHALL BE ADDED TO THE WATER SYSTEM.
11. ALL WATER MAINS AND WATER SERVICE LINES CROSSING STREETS\ROADS SHALL BE ENCASED UNLESS OTHERWISE SPECIFIED BY THE CITY OF CROSSVILLE ENGINEERING DEPARTMENT. TRACER WIRE AND LOCATOR TAPE SHALL BE INSTALLED IN EACH STREET \ ROAD CROSSING WHETHER IT BE A MAIN LINE OR A SERVICE LINE. LOCATOR WIRE SHALL BE PLACED IN THE CASING WITH THE CARRIER PIPE.
12. STEEL CASING SHALL BE USED IN ALL BORE AND JACK CROSSINGS, AND WHEN THE TOP OF THE CASING PIPE IS LESS THAN 24" BELOW ROAD SURFACE OR WHEN THE CASING SHALL BE INSTALLED GREATER THAN 7' DEEP FROM THE ROAD SURFACE. STEEL CASING SHALL HAVE A MINIMUM CLEARANCE OF 2" BETWEEN THE CASING AND THE CARRIER PIPE. SPACERS SHALL BE INSTALLED NO MORE THAN 18" FROM EITHER END OF THE CASING.
13. STEEL CASINGS SHALL MEET ASTM A-252, SHALL BE BITUMINOUS COATED INSIDE AND OUT, AND SHALL HAVE A MIMIMUM YEILD STRENGHT OF 35,000 PSI. THE STEEL CASINGS SHALL ALSO MEET AASHTO H 20 LOADING REQUIREMENTS.
14. TRENCHES SHALL BE OPENED SUFFICIENTLY TO ALLOW INSTALLATION AND REMOVAL OF CARRIER PIPE IN MANUFACTURED LENGTHS FROM EITHER END OF THE CASING PIPE. SPACERS SHALL BE USED IN ALL CASINGS UNLESS OTHERWISE NOTED. WHERE CARRIER PIPE IS 2" OR GREATER, SPACERS SHALL BE A MAXIMUM OF 7' APART (OR AS SPECIFIED BY THE MANUFACTURER) AND WITHIN 2' OF EACH BELL WITH A MINIMUM 2" SPACE BETWEEN THE CASING AND THE CARRIER PIPE. CASING SPACERS SHALL BE BWM COMPANY MODEL BWM SS (STAINLESS STEEL) OR APPROVED EQUAL.
15. CASING END SEALS SHALL BE USED AND SHALL BE BWM COMPANY MODEL BWM-PO OR MODEL BWM-WP WITH STAINLESS STEEL BANDS OR APPROVED EQUAL.
16. THE CONTRACTOR SHALL NOTIFY THE CITY OF CROSSVILLE ENGINEERING DEPARTMENT A MINIMUM OF 24 HOURS IN ADVANCE OF ALL NEW CONSTRUCTION WHICH SHALL REQUIRE INSPECTION, SURVEY LOCATION, BACTERIOLOGICAL TESTING, OR PRESSURE TESTING.

POTABLE WATER PRESSURE TEST:

EACH SECTION OF THE COMPLETED WATER MAIN SHALL BE SUBJECTED TO A PRESSURE TEST. THE SECTION TO BE TESTED SHALL BE VALVED OFF BY GATE VALVES. THEN SHALL BE FILLED WITH WATER, AND A POSITIVE DISPLACEMENT TEST PUMP SHALL BE USED TO PUMP WATER INTO THE SECTION TO BUILD UP A TEST PRESSURE OF THE GREATER OF 1.5 TIMES THE WORKING PRESSURE OR **200** PSI FOR **CLASS 250 PIPE** AND DUCTILE IRON PIPE OR **175** PSI FOR CLASS 200 PVC PIPE. THE TEST PUMP SHALL THEN BE VALVED OFF FROM THE SYSTEM AND THE PRESSURE SHALL BE OBSERVED A **MINIMUM** OF TWO HOURS. A DROP IN PRESSURE OF 5 PSI OR MORE DURING THE TWO HOUR TEST PERIOD SHALL BE TAKEN AS AN INDICATION OF LEAKAGE (FAILURE) IN THE EVENT LEAKS ARE FOUND AND CORRECTED, THE PRESSURE TEST SHALL BE REPEATED USING THE SAME PROCEDURE AS DESCRIBED ABOVE. A LINE FAILING THIS TEST WILL NOT BE PLACED IN SERVICE OR ACCEPTED BY THE CITY OF CROSSVILLE. IF POSSIBLE, A DIGITAL GAUGE SHALL BE USED TO RECORD THE LINE PRESSURE FOR THE DURATION OF THE PRESSURE TEST.

POTABLE WATER LINE ACCEPTANCE:

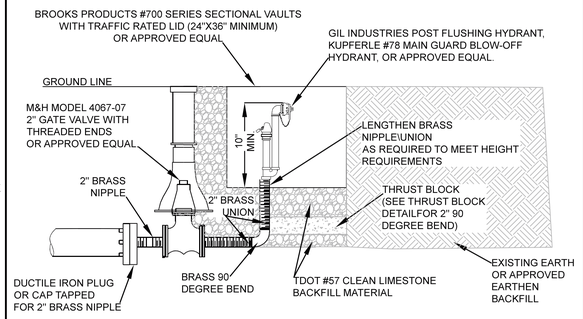
WATER MAINS AND SERVICES SHALL BE ACCEPTED ONLY AFTER ALL CITY OF CROSSVILLE INSTALLATION AND TESTING REQUIREMENTS HAVE BEEN MET. THE CITY OF CROSSVILLE ENGINEERING DEPARTMENT SHALL VERIFY THAT ALL THE CRITERIA HAS BEEN ACCOMPLISHED FOR THE ACCEPTANCE OF THE WATER MAINS AND SERVICES BEFORE BEING PLACED INTO THE EXISTING WATER SYSTEM.



NOTES :
1. A 4.5 INCH BARREL IS TO BE USED ON 6 INCH WATERLINES. A 5.25 INCH BARREL IS TO BE USED ON WATERLINES LARGER THAN 6 INCHES.
2. DO NOT BLOCK THE WEEP HOLE WITH CONCRETE.
3. FIRE HYDRANTS AND VALVES SHALL BE INSTALLED A MINIMUM OF 5' BEHIND THE CENTER LINE OF THE DITCH ON STATE ROUTES.

SEE **VALVE AND VALVE BOX** DETAIL FOR INSTALLATION REQUIREMENTS

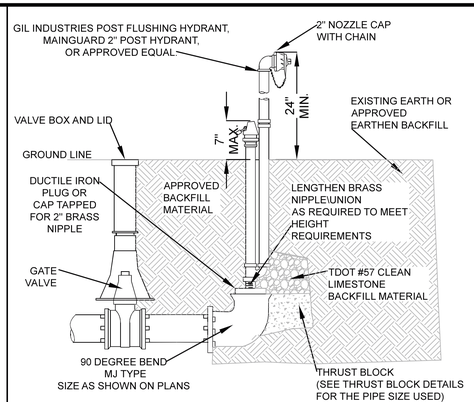
FIRE HYDRANT ASSEMBLY
NOT TO SCALE



NOTES:
1. VAULTS SHALL BE LARGE ENOUGH TO ALLOW ACCESS AND USE OF HYDRANT.
2. ALL PIPE FROM THE CAP OR PLUG TO THE BOTTOM OF THE HYDRANT SHALL BE 2" BRASS WITH A PRESSURE RATING OF NO LESS THAN 250 PSI.
3. SLOPE GROUND WATER AWAY FROM VAULT LID.
4. DO NOT BLOCK WEEP HOLE WITH CONCRETE.

SEE **VALVE AND VALVE BOX** DETAIL FOR INSTALLATION REQUIREMENTS

HIDDEN BLOW-OFF HYDRANT ASSEMBLY
NOT TO SCALE



NOTES:
1. DO NOT BLOCK WEEP HOLE WITH CONCRETE.
2. THE GATE VALVE SHALL MATCH THE WATER LINE IN SIZE. SEE THE DETAIL FOR **VALVE AND VALVE BOXES** FOR INSTALLATION REQUIREMENTS.
3. IF A TWO INCH GATE VALVE IS SPECIFIED, SEE THE **HIDDEN BLOW-OFF HYDRANT DETAIL** USING TWO INCH THREADED BRASS FITTINGS AND A TWO INCH THREADED GATE VALVE.

SEE **VALVE AND VALVE BOX** DETAIL FOR INSTALLATION REQUIREMENTS

BLOW-OFF HYDRANT ASSEMBLY
NOT OT SCALE

NOTE: M.J. = MECHANICAL JOINT.

90 DEGREE BEND							
SIZE	2"	4"	6"	8"	10"	12"	18"
A	16"	16"	26"	33"	40"	50"	70"
B	16"	16"	24"	33"	40"	50"	70"
C	9"	9"	12"	12"	15"	16"	22"
D	8"	8"	12"	16"	20"	25"	24"

45 DEGREE BEND							
SIZE	2"	4"	6"	8"	10"	12"	18"
A	12"	12"	18"	24"	31"	37"	52"
B	12"	12"	18"	24"	31"	37"	52"
C	8"	8"	10"	12"	14"	16"	14"
D	6"	6"	9"	12"	15"	18"	18"

22-1/2 DEGREE BEND							
SIZE	2"	4"	6"	8"	10"	12"	18"
A	9"	9"	13"	18"	23"	26"	40"
B	9"	9"	13"	18"	23"	26"	40"
C	8"	8"	10"	12"	14"	16"	15"
D	4"	4"	6"	9"	11"	13"	16"

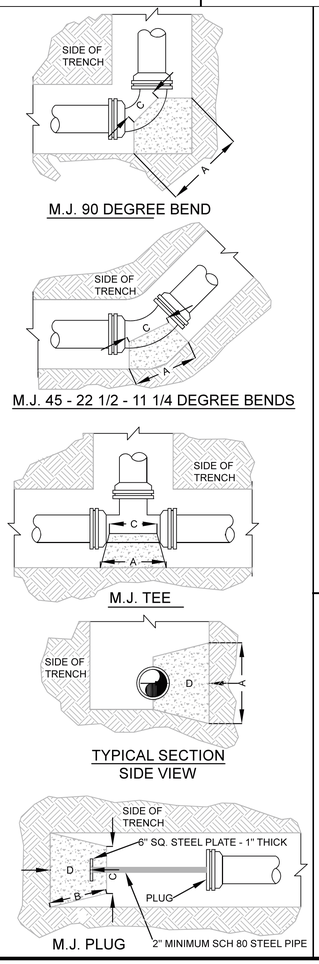
11-1/4 DEGREE BEND							
SIZE	2"	4"	6"	8"	10"	12"	18"
A	9"	9"	11"	13"	16"	18"	30"
B	9"	9"	11"	13"	16"	18"	30"
C	8"	8"	10"	12"	14"	16"	15"
D	4"	4"	5"	6"	8"	9"	16"

TEE							
SIZE							
Main	2"- 6"	8"- 12"	8"- 10"	12"	12"	12"	18"
Branch	2"- 6"	2"- 6"	8"- 10"	2"- 6"	8"- 10"	12"	16"- 18"
A	26"	26"	43"	26"	43"	52"	70"
B	26"	26"	43"	26"	43"	52"	70"
C	12"	12"	12"	12"	12"	12"	30"
D	13"	13"	21"	13"	21"	26"	24"

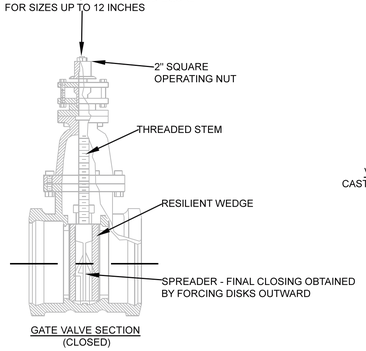
PLUG							
SIZE	2"	4"	6"	8"	10"	12"	18"
A	26"	26"	26"	34"	43"	52"	70"
B	26"	26"	26"	34"	43"	52"	70"
C	12"	12"	12"	12"	12"	12"	30"
D	11"	11"	11"	15"	22"	32"	32"

NOTES:
1. PIPE AND FITTINGS SHALL BE WRAPPED IN 5 MIL. PLASTIC WHERE THRUST BLOCKS ARE INSTALLED.
2. PLASTIC LINING SHALL NOT COVER OR IMPAIR THE FLOW OF WATER FROM THE WEEP HOLE ON A FIRE HYDRANT OR BLOW OFF HYDRANT ASSEMBLY.
3. 2500 PSI (MINIMUM) CONCRETE SHALL BE USED FOR THRUST BLOCKS.
4. THRUST BLOCKS SHALL BE POURED AGAINST UNDISTURBED EARTH OR ROCK.

THRUST BLOCK DETAILS & DIMENSIONS
NOT TO SCALE



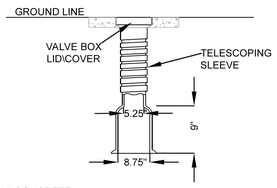
GATE VALVES SHALL BE (AWWA STANDARD C515) MUELLER, AMERICAN SERIES 2500-1, OR APPROVED EQUAL. FOR SIZES UP TO 12 INCHES

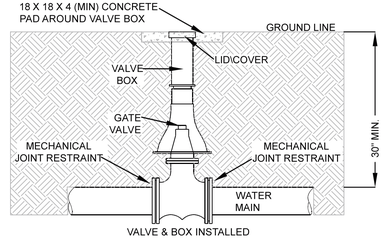


NOTES:
1. GATE VALVES SHALL BE (AWWA STANDARD C515) MUELLER, AMERICAN SERIES 2500-1, OR APPROVED EQUAL. FOR SIZES UP TO 12 INCHES
2. TAPPING SLEEVES SHALL BE MUELLER H-615 OR APPROVED EQUAL.
3. TAPPING VALVES SHALL BE MUELLER T-2360-16, AMERICAN SERIES 2500-1, OR APPROVED EQUAL FOR SIZES UP TO 12 INCHES
4. BUTTERFLY VALVES SHALL BE USED FOR SIZES 14 INCHES OR LARGER, MUELLER H-667 FOR 14 INCH THROUGH 24 INCH OR APPROVED EQUAL.
5. WHENEVER A WATER VALVE IS ADJACENT TO A TEE IN THE WATER LINE THE WATER VALVE SHALL BE ATTACHED TO THE TEE USING RODDING OR ALL THREAD.
7. ALL GATE VALVES SHALL BE RESILIENT WEDGE TYPE.
8. ALL VALVES SHALL HAVE A 18 X 18 X 4 (MIN) CONCRETE PAD AROUND THE VALVE BOX. 2500 PSI CONCRETE (MINIMUM) SHALL BE USED FOR PAD\COLLAR.
9. THE VALVE BOX AND LID SHALL BE INCLUDED IN THE PRICE OF THE VALVE.

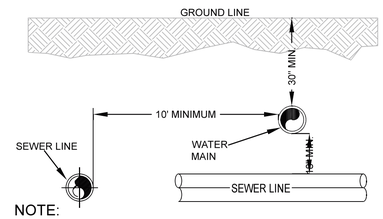
SCREW TYPE VALVE BOX
SIGMA CATALOG NUMBER VB-262:
SIGMA MODEL NUMBERS VB-2600, VB-2621, AND VB-2622 ROADWAY TYPE, OR APPROVED EQUAL.
VALVE BOXES SHALL MEET H20 LOADING STANDARDS.
THE COVER SHALL BE MARKED "WATER".

VALVE BOX LID
CAST IRON, TWO PIECE, SCREW TYPE



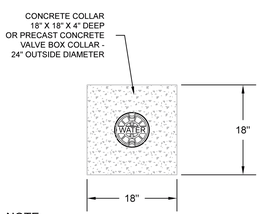


VALVE & VALVE BOX
NOT TO SCALE



NOTE:
1. IF THE SEWER MAIN OR SEWER SERVICE LINE CROSSES ON TOP OF THE WATER MAIN IT SHALL BE ENCASED A MINIMUM OF 5' ON EACH SIDE OF THE WATER MAIN. ALTERNATE CASING PIPE TYPES (STEEL,PVC, HDPE, DIP, ETC) ARE ALLOWED ON CITY STREETS AND COUNTY ROADS, BUT THEY MUST BE PRE-APPROVED IN WRITING BY THE CITY ENGINEERING DEPARTMENT PRIOR TO BEING INSTALLED IN THE TRENCH. THE CASING PIPE SHALL MEET OR EXCEED THE WALL THICKNESS AND PSI RATING OF PVC SDR 21 (CLASS 200) PIPE.

SEPARATION OF PIPED UTILITIES
NOT TO SCALE



NOTE:

PRECAST CONCRETE VALVE BOX COLLAR WITH A 24 INCH OUTSIDE DIAMETER IS APPROVED EQUAL.

CONCRETE COLLARS TO BE INSTALLED AROUND VALVE BOXES LOCATED OUTSIDE OF PAVED AREAS UNLESS NOTED OTHERWISE ON THE PLANS.

CONCRETE VALVE BOX COLLAR
NOT TO SCALE

DONALD R. COLE — REGISTERED ENGINEER — AGRICULTURE — TENNESSEE — No. 20031 — STATE OF TENNESSEE — 4-9-26

CITY OF CROSSVILLE
ENGINEERING DEPARTMENT
392 N MAIN ST
CROSSVILLE, TN 38555
PHONE: (931) 484-5113
FAX: (931) 484-7713

DETAIL SHEET
WATER - CITY OF CROSSVILLE

NO.	DATE	REVISION DESCRIPTION

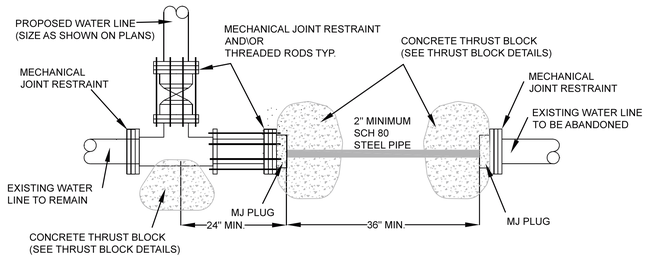
FILE NAME: DETAIL SHEET GRAVITY SEWER
DRAWN BY: DRC
CHECKED BY: TB
DATE: 4/2026
PROJECT NO.:

SHEET NO. **1 OF 5**

SHEET TITLE **DETAIL SHEET**

MJ TYPE FITTINGS SHALL HAVE MECHANICAL JOINT RESTRAINTS AND\OR THREADED RODS TO SECURE THE FITTINGS, APPURTENANCES, AND PIPING TOGETHER.

WHERE TAPPING TEES AND TAPPING VALVES ARE INSTALLED THE CONNECTION AND ABANDON DETAIL NOT ADJACENT TO MJ FITTING SHALL BE USED

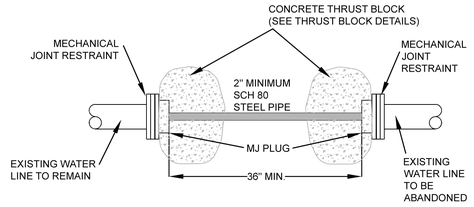


NOTE:
ALL ITEMS SHOWN SHALL BE INCLUDED IN THE PRICE OF CONNECTION TO EXISTING WATER LINE INCLUDING LABOR.

MJ TEE & VALVE CONFIGURATION SHOWN
TYPICAL FOR STANDARD MJ TEE OR MJ FITTING INSTALLATION

CONNECTION TO EXISTING WATER LINE AND ABANDONED
DETAIL ADJACENT TO A MJ FITTING
NOT TO SCALE

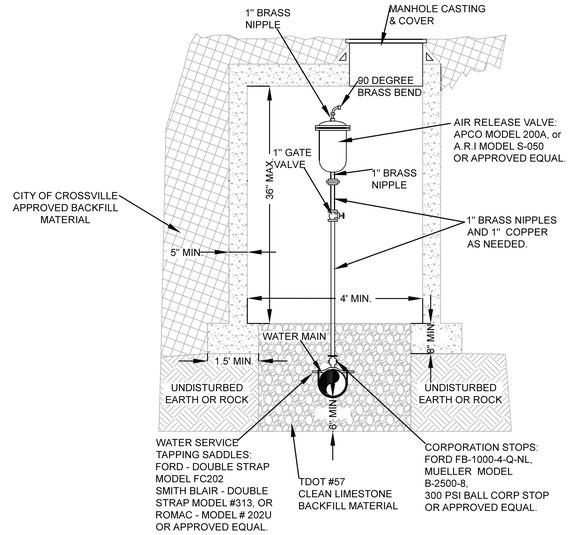
NOTE:
4" SOLID CONCRETE CAP BLOCKS MAY USED INSTEAD OF THE 2" SCHEDULE 80 STEEL PIPE UPON APPROVAL BY THE CITY OF CROSSVILLE ENGINEERING DEPARTMENT.



NOTE:
ALL ITEMS SHOWN SHALL BE INCLUDED IN THE PRICE OF CONNECTION TO EXISTING WATER LINE INCLUDING LABOR.

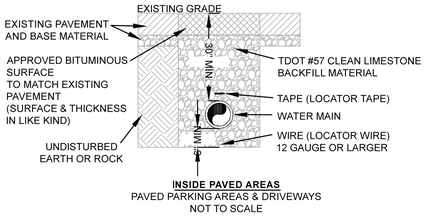
CONNECTION TO EXISTING WATER LINE AND ABANDONED
DETAIL NOT ADJACENT TO A MJ FITTING
NOT TO SCALE

USE PRECAST MANHOLE SECTION W/FLAT TOP OR AN APPROVED BOX.
BOXES MUST BE PRE-APPROVED IN WRITING BY THE CITY ENGINEERING DEPARTMENT PRIOR TO INSTALLATION

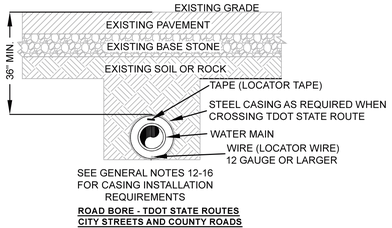


NOTES:
1. A 1" VALVE IS REQUIRED ON 8" AND SMALLER WATER MAINS, & A 2" VALVE IS REQUIRED ON 10" AND LARGER WATER MAINS.
2. SOLID CONCRETE CAP BLOCKS MAY BE USED AT THE BOTTOM OF THE BOX TO ADJUST HEIGHT IF NEEEDED.

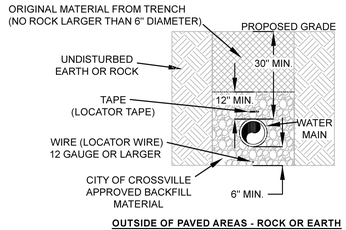
AIR RELEASE VALVE ASSEMBLY
NOT TO SCALE



INSIDE PAVED AREAS
PAVED PARKING AREAS & DRIVEWAYS
NOT TO SCALE

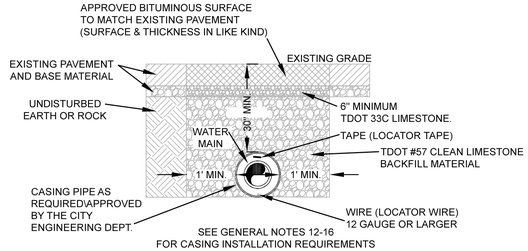


ROAD BORE - TDOT STATE ROUTES
CITY STREETS AND COUNTY ROADS
NOT TO SCALE



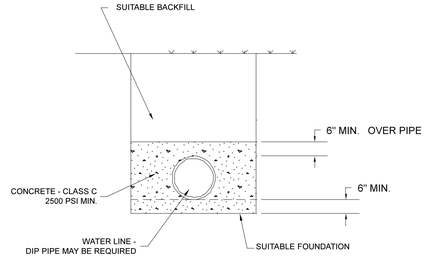
OUTSIDE OF PAVED AREAS - ROCK OR EARTH
NOT TO SCALE

NOTES:
1. 2" (MINIMUM) WIDTH METALIC LOCATOR TAPE LABELED "WATER" SHALL BE PLACED IN THE TRENCH 6" - 8" ABOVE THE WATER MAIN.
2. LOCATOR WIRE: SHALL BE COLORED BLUE, 12 GAUGE OR LARGER SOLID WIRE, AND BE PLACED IN THE BOTTOM OF THE PIPE TRENCH.
3. ALL BACKFILL MATERIAL MUST BE PRE-APPROVED IN WRITING BY THE CITY ENGINEERING DEPARTMENT PRIOR TO BEING PLACED IN THE TRENCH.
4. ALL WATER MAINS (EXCLUDING THOSE IN A CASING) SHALL HAVE A MINIMUM OF 6" OF BEDDING BELOW, ON EACH SIDE IN SOIL (WITH A MINIMUM OF 12" ON EACH SIDE IN ROCK), AND 12" OF BEDDING ABOVE THE WATER MAIN. ALL BEDDING MATERIAL SHALL BE FREE OF ROCK LARGER THAN 2" DIAMETER AND ORGANIC DEBRIS, AND SHALL BE INSTALLED IN 6" WELL COMPACTED LIFTS. NO ROCK LARGER THAN 6" IN DIAMETER SHALL BE USED AS BACKFILL IN THE REMAINDER OF THE TRENCH.
5. TRENCH WIDTHS (WHERE ROCK IS ENCOUNTERED DURING EXCAVATION) SHALL BE A MINIMUM WIDTH OF 2' PLUS THE DIAMETER OF THE WATER MAIN.
6. BITUMINOUS COATED STEEL CASINGS ARE REQUIRED WHEN CROSSING STATE ROUTES, (36" MINIMUM DEPTH).
7. ALTERNATE CASING PIPE TYPES (PVC, HDPE, DIP, ETC) ARE ALLOWED ON CITY STREETS AND COUNTY ROADS, BUT THEY MUST BE PRE-APPROVED IN WRITING BY THE CITY ENGINEERING DEPARTMENT PRIOR TO BEING INSTALLED IN A TRENCH OR BORE.



BITUMINOUS SURFACE OPEN-CUT
CITY STREET OR COUNTY ROAD
NOT TO SCALE

TENCH AND BACKFILL DETAIL
NOT TO SCALE



CONCRETE ENCASEMENT
STREAM OR DITCH CROSSINGS
NTS

NOTE: VALVE ON BOTH SIDES OF STREAM OR DITCH CROSSING MAY BE REQUIRED.

CITY OF CROSSVILLE
ENGINEERING DEPARTMENT
392 N MAIN ST
CROSSVILLE, TN 38555
PHONE: (931) 484-5113
FAX: (931) 484-7713

DETAIL SHEET
WATER - CITY OF CROSSVILLE

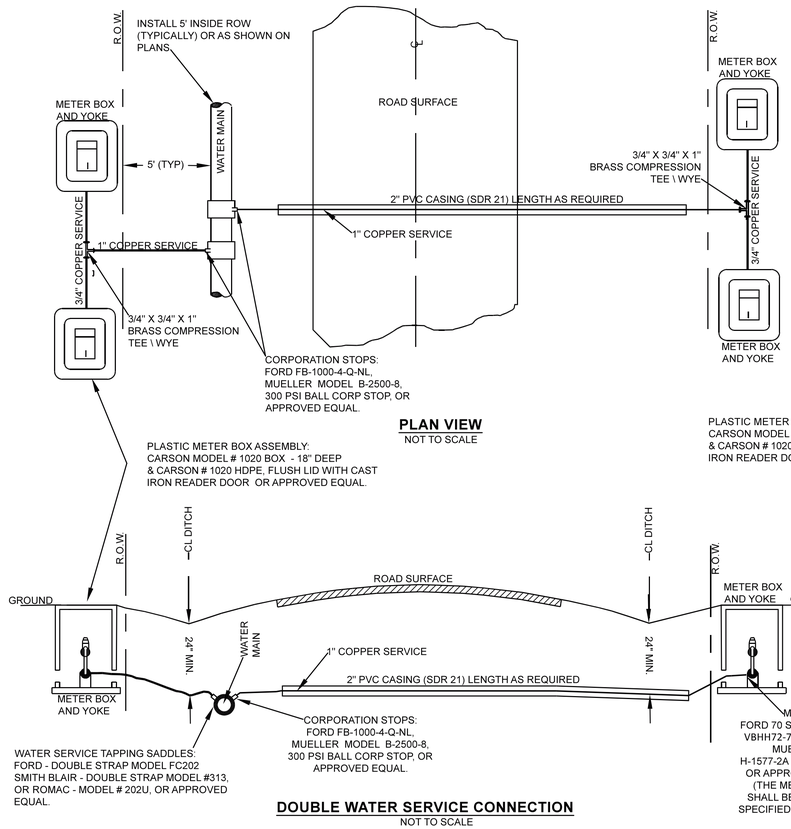
NO	DATE	REVISION DESCRIPTION

FILE NAME:
DETAIL SHEET
GRAVITY SEWER
DRAWN BY: DRC
CHECKED BY: TB
DATE: 4/2026
PROJECT NO.:

SHEET NO.
2 OF 5

SHEET TITLE
DETAIL SHEET

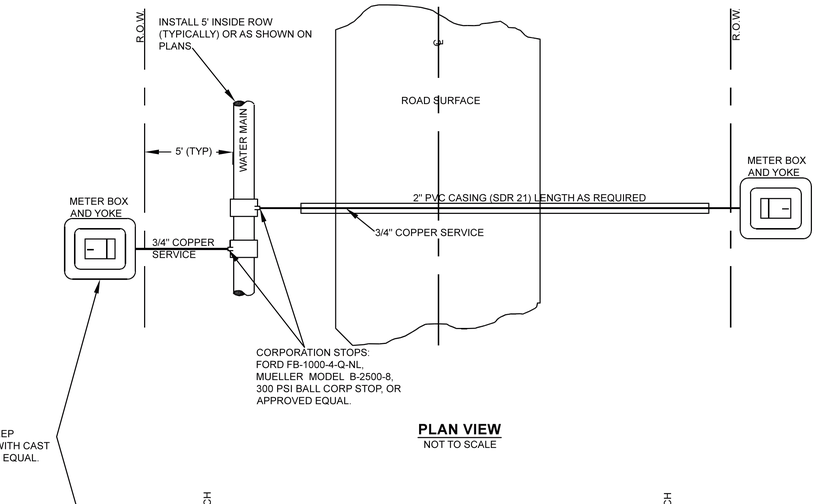
DONALD R. GALE
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
No. 20031
STATE OF TENNESSEE
5-9-26



PLAN VIEW
NOT TO SCALE

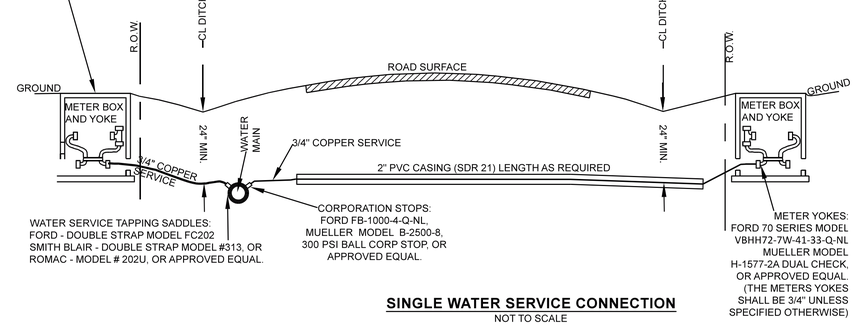
PLASTIC METER BOX ASSEMBLY:
CARSON MODEL # 1020 BOX - 18" DEEP
& CARSON # 1020 HDPE, FLUSH LID WITH CAST
IRON READER DOOR OR APPROVED EQUAL.

DOUBLE WATER SERVICE CONNECTION
NOT TO SCALE



PLAN VIEW
NOT TO SCALE

PLASTIC METER BOX ASSEMBLY:
CARSON MODEL # 1020 BOX - 18" DEEP
& CARSON # 1020 HDPE, FLUSH LID WITH CAST
IRON READER DOOR OR APPROVED EQUAL.



SINGLE WATER SERVICE CONNECTION
NOT TO SCALE

NOTES:

1. WATER SERVICE LINE CASINGS SHALL EXEND A MINIMUM OF 5' PAST THE CENTER LINE OF THE DITCH OR THE TOE OF THE SLOPE. WHERE THE WATER MAIN IS CLOSER THAN 5' TO THE DITCH OR TOE OF SLOPE THE CASING SHALL BE WITHIN 2' OF THE WATER MAIN.
2. ON CURB AND GUTTER STREETS THE CASING SHALL EXTEND A MINIMUM OF 3' BEHIND THE BACK OF THE CURBS OR THE RIGHT OF WAY SIDE OF THE SIDEWALKS.
3. ALL WATER SERVICES EXTENDING UNDER ROADWAYS SHALL BE IN CASINGS AS SHOWN.
4. ALL CASINGS SHALL BE A MINIMUM OF 36" DEEP FROM TOP OF THE CASING PIPE TO CENTER LINE OF THE DITCH ON STATE ROUTES.
5. ALL COPPER SERVICE TUBING SHALL BE TYPE K.
6. THE CASING PIPE SHALL MEET OR EXCEED THE WALL THICKNESS AND PSI RATING OF PVC SDR 21 (CLASS 200) PIPE.
7. ANY WATER SERVICE LINE GREATER THAN 1 INCH TO BE HDPE (IPS - OD CONTROLLED).

CITY OF CROSSVILLE UTILITY AREA ONLY

SERVICE CONNECTION DETAIL

NOT TO SCALE

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DETAIL SHEET
WATER - CITY OF CROSSVILLE

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DETAIL SHEET
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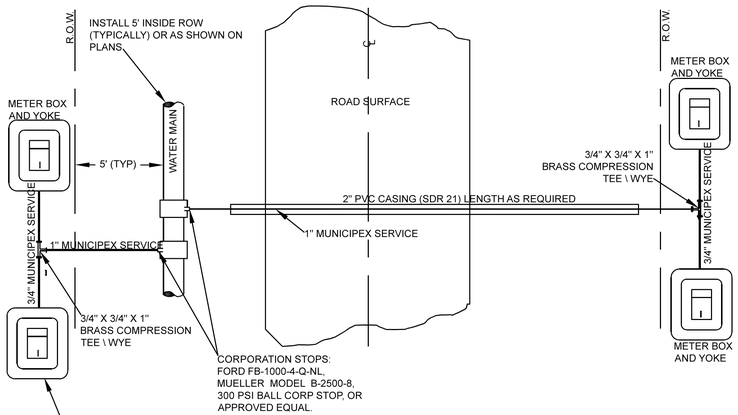
SHEET NO.
3 OF 5

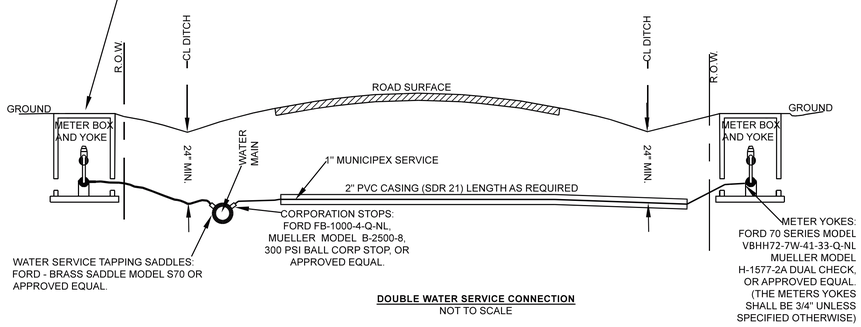
SHEET TITLE
DETAIL SHEET

DONALD R. CLINE
REGISTERED ENGINEER
AGRICULTURE
COMMERCE
No. 20031
STATE OF TENNESSEE
6-9-26

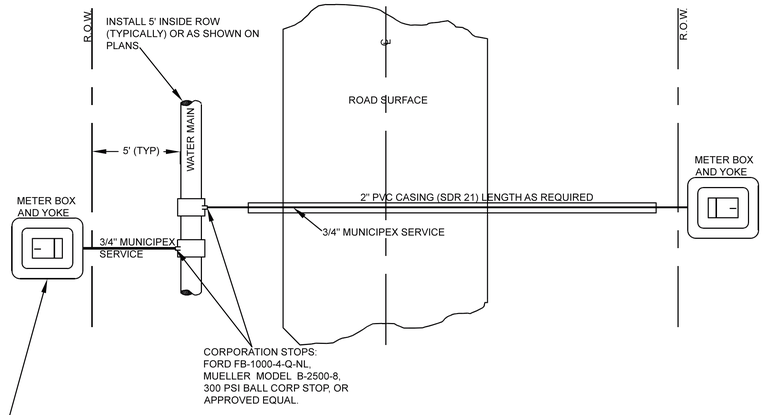


PLAN VIEW
NOT TO SCALE

PLASTIC METER BOX ASSEMBLY: CARSON MODEL # 1020 BOX - 18" DEEP & CARSON # 1020 HDPE, FLUSH LID WITH CAST IRON READER DOOR OR APPROVED EQUAL.

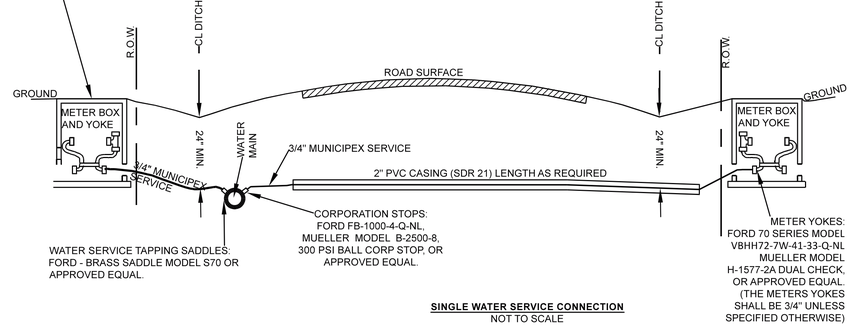


DOUBLE WATER SERVICE CONNECTION
NOT TO SCALE



PLAN VIEW
NOT TO SCALE

PLASTIC METER BOX ASSEMBLY: CARSON MODEL # 1020 BOX - 18" DEEP & CARSON # 1020 HDPE, FLUSH LID WITH CAST IRON READER DOOR OR APPROVED EQUAL.



SINGLE WATER SERVICE CONNECTION
NOT TO SCALE

WATER SERVICE NOTES:

1. WATER SERVICE LINE CASINGS SHALL EXEND A MINIMUM OF 5' PAST THE CENTER LINE OF THE DITCH OR THE TOE OF THE SLOPE. WHERE THE WATER MAIN IS CLOSER THAN 5' TO THE DITCH OR TOE OF SLOPE THE CASING SHALL BE WITHIN 2' OF THE WATER MAIN.
2. ON CURB AND GUTTER STREETS THE CASING SHALL EXTEND A MINIMUM OF 3' BEHIND THE BACK OF THE CURBS.
3. ALL WATER SERVICES EXTENDING UNDER ROADWAYS SHALL BE ENCASED AS REQUIRED.
4. ALL CASINGS SHALL BE A MINIMUM OF 36" DEEP FROM TOP OF THE CASING PIPE TO CENTER LINE OF THE DITCH ON STATE ROUTES.
5. TRACER WIRE AND LOCATOR TAPE SHALL BE INSTALLED FOR ALL WATER SERVICE STREET\ROAD\HIGHWAY CROSSINGS WHICH ARE INSTALLED BY THE OPEN CUT METHOD.
6. THE CASING PIPE SHALL MEET OR EXCEED THE WALL THICKNESS AND PSI RATING OF PVC SDR 21 (CLASS 200) PIPE.
7. ALL SERVICE TUBING SHALL BE MUNICIPEX CLASS 200
8. WHEN UNDERGROUND ELECTRIC SERVICE OR MAIN LINES ARE INSTALLED AT THE PROPERTY LINE, WATER SERVICES SHALL BE INSTALLED IN THE CENTER OF THE LOT.

CATOOSA UTILITY DISTRICT ONLY UTILITY AREA ONLY

SERVICE CONNECTION DETAIL

NOT TO SCALE

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DETAIL SHEET
WATER - CITY OF CROSSVILLE

NO	DATE	REVISION DESCRIPTION

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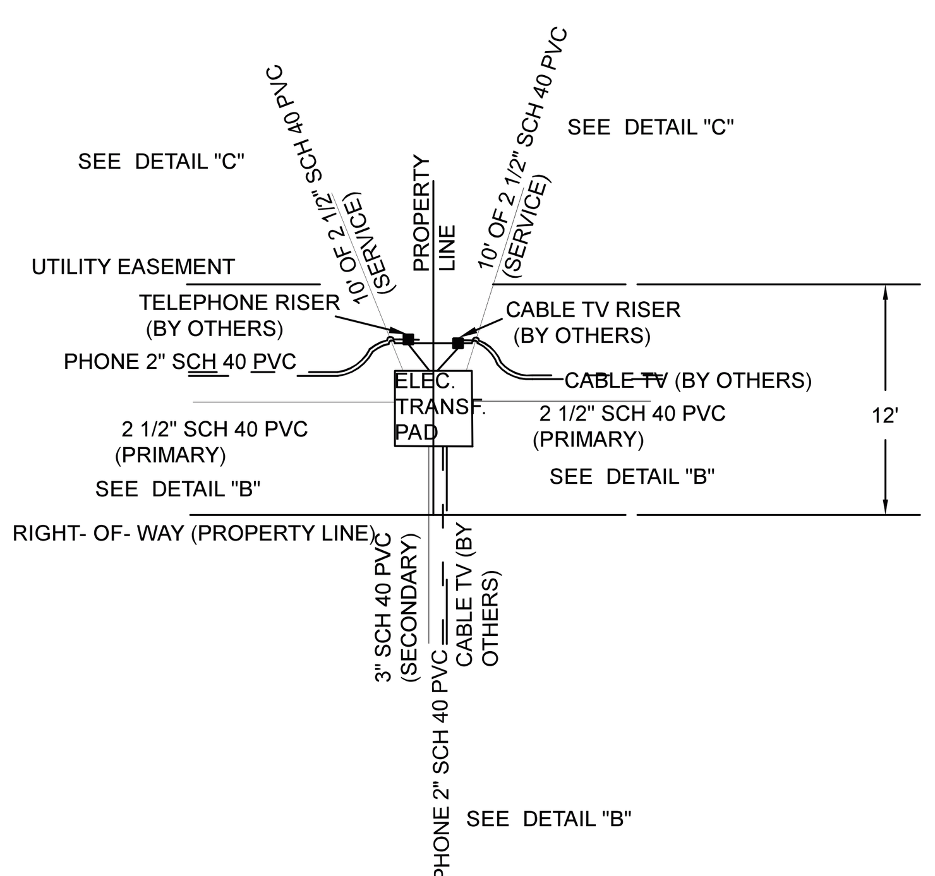
SHEET NO.
4 OF 5

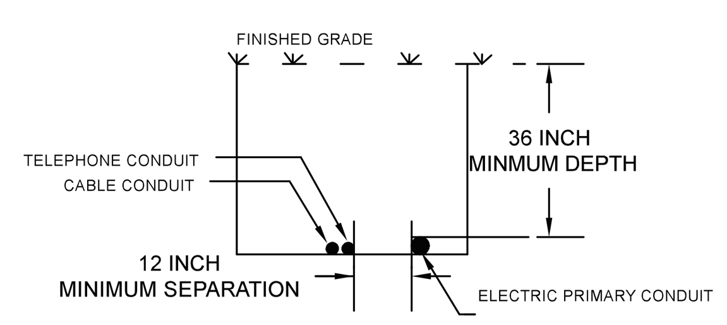
SHEET TITLE
DETAIL SHEET

5-9-26

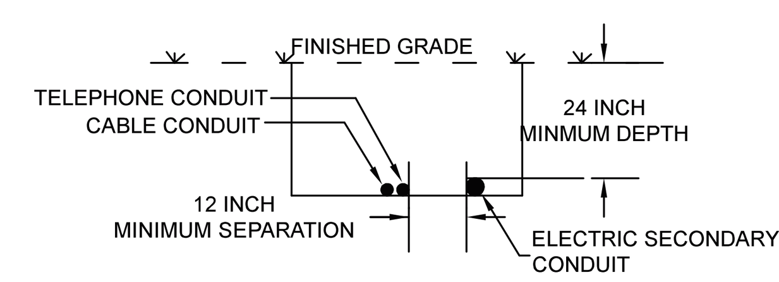
NOTES:
ELECTRICAL PRIMARY SHALL BE INSTALLED OFF THE R.O.W. IN THE UTILITY EASEMENT AND THE WATER DISTRIBUTION LINE SHALL BE INSTALLED ON THE SAME SIDE OF THE ROAD IN THE R.O.W. WITH A TEN FOOT SEPARATION FROM THE ELECTRICAL PRIMARY. ALL WATER TAPS ON THIS SIDE OF THE ROAD SHALL BE INSTALLED IN THE CENTER OF EACH LOT AS SHOWN. ON THE OPPOSITE SIDE OF THE ROAD THE LOW PRESSURE SEWER SHALL BE INSTALLED IN THE R.O.W. WITH THE TAPS LOCATED IN THE CENTER OF THE LOTS.



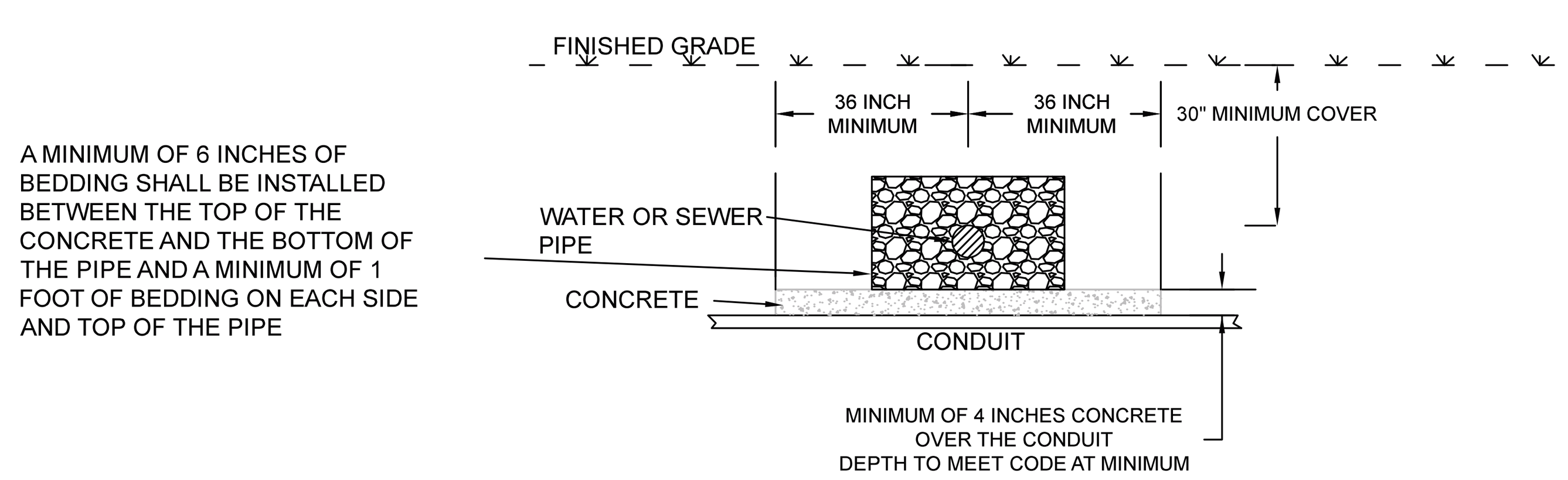
TYPICIAL TRANSFORMER
INSTALLATION DETAIL
DETAIL "A"



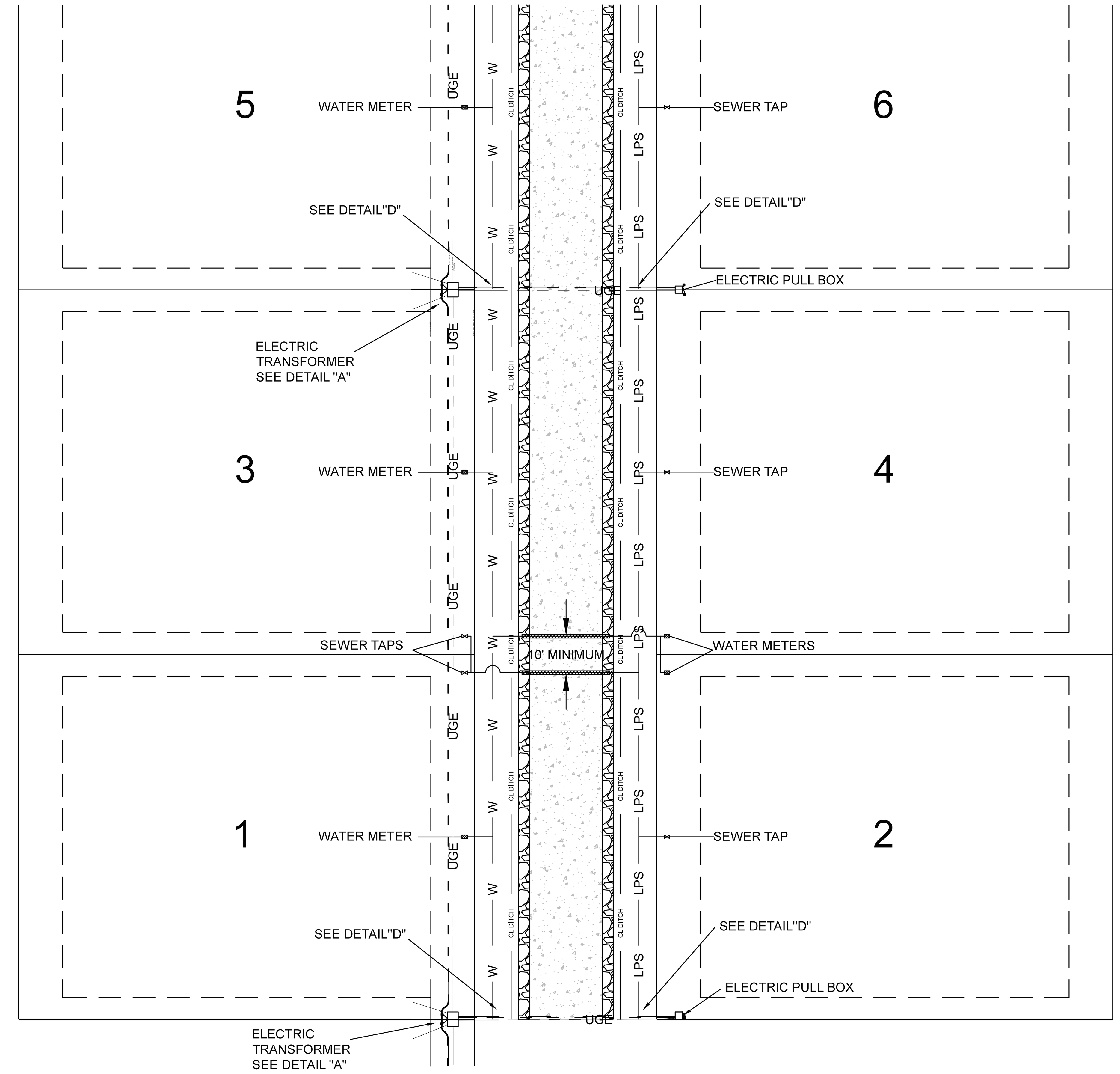
TYPICAL DITCH CROSS SECTION
ELECTRICAL PRIMARY
DETAIL "B"



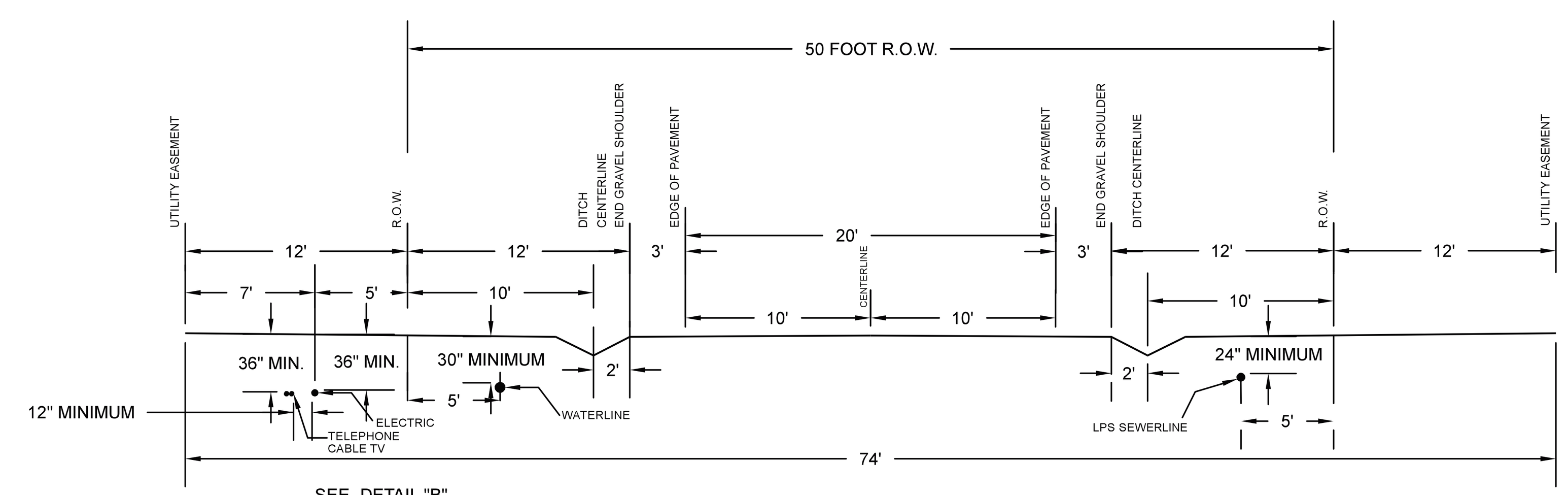
TYPICAL DITCH CROSS SECTION
ELECTRICAL SECONDARY
DETAIL "C"



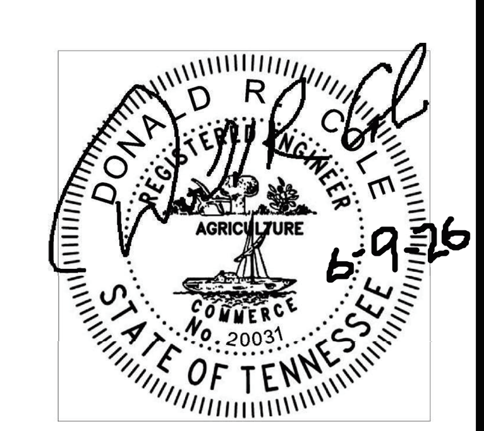
TYPICAL TRENCH CROSS SECTION
CONDUIT AND UTILITY LINE CROSSING
DETAIL"D"



TYPICAL LOT & UTILITY LAYOUT WITH UNDERGROUND ELECTRIC SERVICE



TYPICAL ROAD CROSS SECTION



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SHEET NO. 5 OF 5

SHEET TITLE: DETAIL SHEET