



2241 Fews Chapel Road

Greer, SC 29651

**STANDARD SPECIFICATIONS
&
STANDARD CONSTRUCTION DETAILS**

WATER DISTRIBUTION SYSTEM

JANUARY 2014

Revised: January 19, 2017

Revised: March 17, 2017



SPECIFICATIONS
WATER DISTRIBUTION SYSTEM

All standards cited in the text refer to the latest revision of that standard under the same specification number or to superseding specifications under a new number.

MATERIALS

MATERIALS STANDARDS - Pipe, fittings, packing, jointing, valves and hydrants or any other material/products that contact potable water shall conform to and be third party certified as meeting the latest revisions of Section C of the American Water Works Association (AWWA) Standards and ANSI/NSF Standard 61, Drinking Water System Components - Health Effects. All products or materials that come into contact with potable water must be certified as "lead free" ($\leq 0.25\%$ lead content by weight) in strict accordance with NSF/ANSI 372, NSF/ANSI 61-G. The pressure rating of the pipe shall be at least 1.5 times the normal working pressure. Previously used mains may not be reused. ALL MATERIALS SHALL BE MADE AND/OR ASSEMBLED IN AMERICA.

PIPE SHALL BE:

For 4" - Rigid Polyvinyl Chloride,

For 6" and Larger - Ductile Iron; unless otherwise indicated on/in the Contract Documents.

RIGID POLYVINYL CHLORIDE PIPE - Pipe shall be installed in strict accordance with manufacture's recommendations. Solvent-weld pipe and fittings shall not be used. Pipe shall be of the integral-bell type.

Size 4"

Pipe shall meet the latest requirements of AWWA Spec. C900-DR14.

Sizes 3" and smaller diameter for repairs and maintenance

Pipe shall meet the latest requirements of ASTM Specs. D2241 and D3139, shall bear the NSF seal, and shall be SDR21, Class 200.

DUCTILE IRON PIPE (sizes equal to and greater than 4 inches in diameter or as indicated on the drawings) shall have mechanical or push-on joints, ANSI/AWWA C150/A21.50 and C151/A21.51, with ANSI/AWWA C104/A21.4 cement lining, Pressure Class 350 or as indicated on drawings..

POLYETHYLENE PIPE (tubing) shall be 3/4" IPS or 1" IPS, 200 PSI, SDR 9 bearing the NSF seal of approval, and conforming to ASTM Spec. D2239.

THERMOPLASTIC PIPE shall not be used.

FITTINGS FOR PIPE 3" AND LARGER in diameter shall be cast and/or ductile iron unless other wise specified.

CAST IRON FITTINGS shall be short body, all outlets mechanical joint, conforming to the requirements of ANSI/AWWA C111/A21.11 and C104/A21.4.

DUCTILE IRON FITTINGS shall be short body, all outlets mechanical joint, conforming to the requirements of ANSI/AWWA C-153 and/or C111/A21.11, C110-77 and C104/A21.4.

FITTINGS FOR PIPE 2½" AND SMALLER IN DIAMETER shall be Brass conforming to ASTM B61 or B62 NSF/ANSI Standard 372, and/or Stainless Steel (304), and/or HARCO Class 350 ductile iron (O.A.E.), manufactured to the requirements of AWWA C-153, and/or AWWA C111. Plans to indicate type of fitting to be used.

VALVES 2" THROUGH 12" shall be iron body, bronze mounted gate valves, with "O"-ring seals, 250 psi minimum working pressure non-rising stem opening to the left, with 2" x 2" operating nut, and conforming to latest AWWA Specifications C-500 LR or C-509 LR. Valves shall be designed for external stem failure when excessive closing torque occurs with no failure of pressure retaining parts. Unless otherwise specified, valves 3" and larger shall have mechanical joint ends and valves 2½" and smaller shall have screwed ends. Resilient wedge valves to be completely made in America – cast, machined, assembled and tested. Valves shall be as follows (or approved equal):

2" – 2-1/2" Mueller#A-2360

VALVES LARGER THAN 12" shall be Butterfly valves meeting latest requirements of ANSI/AWWA C504 LR, Standard Class 150B, NSF 61 certified, 200 psi test, Mueller #3211, or approved equal.

VALVE BOXES shall be cast iron, 5-1/4" shaft, two or more telescoping pieces, screw-type, with bottom flange to rest on blocking which in turn rests on firm earth. Cover shall be round, "Stay-put" type, with "WATER" cast thereon. A concrete "Doughnut" shall be placed around cover to grade.

FIRE HYDRANTS shall have 6" size inlet connection to match pipe used, two strapping lugs, compression-type 4-1/2" main valve, safety stem coupling, safety flange, safety sleeves, pertinent hose nozzles with National Standard Hose Coupling Threads, "O"-ring seals, sealed lubricated oil reservoir, which automatically circulates lubricant to all stem threads and bearing surfaces during each hydrant operating event. Hydrant must have an operating nut National Standard 1-1/2" pentagon from point to base of flat opposite at base of nut, and opening to left (counterclockwise). Design shall be for working pressure of 200 PSI and a test pressure of 400 PSI. Hydrants shall meet or exceed the requirements of ANSI/AWWA Spec. C-502-LR. Hydrants shall have two factory coats of paint and a finish coat of type and color selected by the Owner. Hydrants shall be set plumb and as otherwise detailed on the drawings. Barrel extensions shall be used where required to match existing grade unless permission is granted in writing by the Engineer for other arrangements. Hydrants shall be as follows (or approved equal):

Single Nozzle-Mueller A-411 x 3" MJ
 Twin Nozzle-Mueller A-420
 Three Way-Mueller A-421

1" SERVICE CONNECTIONS shall be as specified below (or approved equal):

1. Mueller H-13000 Service Saddle (line size x 1")
- 2a. Mueller Ball Corporation Valve: B-25005-10 w/T-Head (1")
- 2b. Mueller Ball Corporation Valve: B-25005-(1") for direct taps
3. Mueller B25005 Insta-Tite (1")
4. Endot 1" P.E. 4710 Tubing
5. Insta-Tite P.E. 180
6. D/Box 2031814 FSB N0000N
7. ¾" Threaded Cplg. x 2
8. ¾" x 3" Brass Nipple x 2
9. 8501 Hammond Ball Valve x 2
10. Turf Box
11. Highfield Lockseal Assembly. Stud: 93210141 Head: 93210148

For D.I.P. Class 350 only, Contractor may direct tap corporation, if approved by Owner prior to tapping.

MASTER METER INSTALLATION shall be as specified and detailed on the drawings.

2" BLOW-OFF ASSEMBLIES shall be located as indicated, and installed as detailed, on the drawings. The blow-off riser shall be adaptable for bushing down to the correct size discharge opening for the size main to which it is attached. Blow-off piping shall not be directed toward roads. Blow-off piping shall not be directed

toward bodies of water that support aquatic life; rather, over ground. Main size-discharge openings shall be as follows:

| | |
|--------------------------------|---------------------|
| 12" - as indicated on drawings | 4" - 1-1/2" opening |
| 10" & 12" - Fire hydrant | 3" - 1-1.4" opening |
| 8" - 2.5" opening | 2-1/2" - 1" opening |
| 6" - 2" opening | 2" -3/4" opening |

AIR VALVE installations shall be installed as detailed and specified on the drawings and at indicated locations in accordance with sound engineering practice at high points in water mains. Automatic air relief valves shall not be used in situations where flooding of the box or chamber may occur.

CONCRETE MARKERS as detailed on the drawings shall be furnished and installed near appurtenances at locations designated by the Engineer. Markers, with "X" cast thereon, shall be placed at each end of each change-of-side road crossing.

RODDING - Rods shall be 3/4" stainless steel, all thread, with stainless steel bolts.

TYPE "A" CROSSING ASSEMBLIES shall be installed as specified and detailed on the drawings and at locations indicated thereon.

PIPE SHALL BE BORED AND JACKED under pavement, etc. where indicated on the plans. Borings shall be kept as small in diameter as possible in order to minimize voids under roadways. All service lines shall be bored under paved roads and at other locations where indicated by the Engineer.

CARRIER PIPE shall be encased where indicated on the drawings. Encasement pipe (casing) shall be steel or PVC, of diameter, gage and material as indicated. Borings shall be kept as small in diameter as possible and approach trenches as narrow as possible.

CUTTING AND REPLACING PAVEMENT when surface treatment and/or asphaltic concrete pavement is to be cut for the installation of pipe, it will be cut, excavated, backfilled, and repaired in accordance with SCDOT or County Road Department or in accordance with details shown on the drawings.

BRIDGE CROSSINGS shall be installed as detailed on the drawings and at locations indicated thereon.

STREAM CROSSINGS shall be installed as detailed on the drawings and at locations indicated thereon.

MARKING TAPE shall be installed over all PVC and D.I. water mains. The tape shall be non-detectable plastic 2 inches wide, of bright blue color, with printing "Buried Pipeline Below" or "Water Pipeline Below". The tape shall be buried from 8 to 12 inches below the top of trench. Tape sample shall be approved by the Engineer before installation.

LOCATOR WIRE shall be firmly taped to top of all PVC and D.I. pipe at intervals not to exceed 10 feet. The wire shall be continuous between appurtenances; and, a minimum of 36" shall be coiled in each appurtenance enclosure for easy attachment thereto of locator equipment. The wire shall be single conductor copper, #12 AWG, or minimum, with 600v gasoline and oil resistant insulation, Copperhead (O.A.E.). All splicing of wire shall be accomplished utilizing Snake Bite locking connectors (O.A.E.). All laterals (service connections, fire hydrants, air valves, blow-offs, etc.) shall be connected to be one continuous conducting traceable system.

JUMPERS, connections from new to existing mains, shall be installed as indicated on the drawings.

SPECIALTY ITEMS shall be installed as specified and/or detailed on the drawings.

LEAD FREE REQUIREMENTS any pipe, solder, or flux used in the installation or repair of public water systems and plumbing used for drinking water must be “lead free”. “Lead free” is defined as less than 0.25 percent lead by weight in pipes and fittings.

GASKETS AND JOINTS - Gaskets, O-rings, and other products used for jointing pipes, setting meters or valves, or other appurtenances which will expose the material to potable water shall comply with the requirements of Section C - AWWA and ANSI/NSF Standard 61 and shall not be made of natural rubber or any other type of material that would support microbiological growth. The use of vegetable shortening or any other lubricant which could support microbiological growth is prohibited. Gaskets must be protected from exposure to heat, sunlight, ozone, oil and grease.

POLYETHYLENE ENCASEMENT – For any installation requiring polyethylene encasement “Poly-wrap” for corrosion protection of ductile iron pipe, the encasement shall be installed in accordance with ANSI/AWWA C105/A21.5., with an 8 mil minimum thickness. Poly-wrap will be required in locations as directed by Engineer.

INSTALLATION OF SYSTEM

STANDARDS: Construction Specifications shall incorporate the provisions of Section C of the American Water Works Association (AWWA) Standards and/or Manufacturer's recommended procedures. Construction and Installation of Ductile Iron Pipe, as a minimum standard, shall be accomplished in accordance with ANSI/AWWA C605-05, "Installation of Ductile Iron Water Mains and Their Appurtenances" (LE). Construction and Installation, as a minimum standard, of PVC Pipe shall be accomplished in accordance with ANSI/AWWA C605-05, "Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water" (LE).

WORK ON HIGHWAYS: Work shall be in keeping with pertinent State and County regulations, and, in addition, the following requirements must be met:

The Contractor shall have encroachment permits in-hand, on-site, at all times that work is in progress within highway rights-of-way.

The Contractor shall provide necessary flagmen, with appropriate flags, when work is in progress along highway shoulders.

Necessary warning and descriptive signs shall be provided and placed at each end of the working area while work is in progress. These signs shall be well tended and shall be placed at sufficient distances from the site of the work so that ample warning is given to approaching traffic.

Shoulders, drainage structures, sod, etc. that is disturbed, shall be restored to their original condition.

Unless otherwise indicated, along State Highways no excavated material shall be replaced on the pavement, and the least possible amount of ditch be left open over night. All equipment must be removed from the pavement and shoulders when work is not in progress. In addition to signs, etc. herein before mentioned, lights and flashing signals shall be used at night for the protection of the public.

EXCAVATION AND PREPARATION OF TRENCH: Trenches shall be excavated to a depth that will allow 42" minimum cover over the pipe. In certain cases and only as directed by the Engineer, by using steel or ductile iron pipe, less pipe cover will be allowed.

The trench shall have a flat bottom so that the entire barrel of the pipe will rest thereon. Depressions shall be made in the trench bottom for proper assembly of couplings and to keep weight off same. Trench widths, as a minimum, shall be as follows:

- 28 inches for ≤ 4 " nominal pipe size
- 30 inches for 6" nominal pipe size
- 32 inches for 8" nominal pipe size
- 34 inches for 10" nominal pipe size
- 36 inches for 12" nominal pipe size
- 40 inches for 16" nominal pipe size
- 42 inches for 18" nominal pipe size
- 44 inches for 20" nominal pipe size
- 48 inches for 24" nominal pipe size.

If unstable soil is encountered at pipe foundation grade, which in the opinion of the Engineer will not support the pipe, this unstable material will be removed from the trench and replaced with acceptable material well tamped into place. The Contractor shall receive no extra compensation for the removal and replacement of this material.

If rock is encountered at pipe foundation grade, it shall be excavated six inches below pipe grade and backfilled with good material well rammed into place. The Contractor shall receive no extra compensation for the removal of rock and its replacement with acceptable material.

All trenches shall be shored if required to prevent caving of banks and/or damage to adjacent facilities and structures. Adjacent pipelines shall be underpinned if necessary to prevent their displacement. Every effort shall be made to avoid breaking other utility mains and service lines. They shall be tunneled under wherever possible. Broken services and mains shall be promptly repaired in an acceptable manner at the Contractor's expense.

The Contractor shall keep all excavations free from water while work is in progress by pumping, ditching or other approved means.

After the trench bottom has been properly prepared to receive the pipe, and the pipe laid assembled in accordance with the manufacturer's instructions, it shall be carefully backfilled, in accordance with the proper bedding type, in the following manner: firmly tamp fine material under the haunches of the pipe on either side in 4" layers until the backfill is placed and tamped to a minimum of six inches above the top of the pipe. The remainder of the trench may then be filled with continuous/uniform bedding material free from large stones, other than crushed bedding, and well tamped to 95% Standard Proctor to within six inches of finished surface.

See Standard Bedding Types (AWWA), page WDS-13. Type 1 shall be utilized for Ductile Iron Pipe. Type 5 shall be utilized for PVC Pipe.

Excessive, remaining excavated trench dirt, spoil, due to the addition of granular fill material shall be collected, loaded onto a truck, and hauled to a pre-approved disposal site. The scattering or dumping of excessive trench dirt along road shoulders or adjacent properties will be prohibited.

Streets and highway shoulders shall be restored to good condition at once, and excess material removed. Before completion of the work, all settlement below ground surface that may have occurred shall be refilled and the whole line left in a neat and orderly condition satisfactory to the Engineer and the Owner. The "2000-foot rule" shall be strictly adhered to: Construction is to be no further than 2000 LF ahead of completed restoration. **Contractor shall not backfill fittings and connections until inspection and approval by BRRWC.**

SCREENINGS: Contractor shall utilize screenings on all paved roadway surfaces in which excavated spoils will be placed.

COMPACTION TESTS: Contractor shall provide up to seven compaction tests randomly selected by Engineer or Engineer's representative. Five compaction tests will be conducted along road shoulder trench sections and two compaction tests will be conducted under asphalt sections. Compaction tests shall be performed by an approved certified soils testing laboratory.

SETTING OF VALVES AND HYDRANTS: All valves and hydrants shall be installed in accordance with the recommendations of the manufacturer, and shall be specifically checked by the Engineer or his representative before backfilling. All operating equipment shall be checked, adjusted, tightened, lubricated and serviced, and shall be in proper working order before installation. Hydrants shall be set as detailed on the drawings. All operating nuts on valves shall be no greater than 48" below finished grades (top of box). Stem extensions shall be used where necessary to meet the criteria.

THRUST RESTRAINT: Contractor shall provide restraint at all points where excessive hydraulic thrust may develop and as required by Engineer. All mechanical joint, and non-mechanical fittings (if applicable), fittings located at fire hydrants, bends, any changes in direction, related piping, and bores (cased or free) shall require restrained joint system components. The joint restraint shall be installed in accordance with the manufacturer's recommendations. Mechanical joint restraints should be placed at every joint with a 50 foot minimum radius for ductile iron pipe and with a 70 foot minimum radius for PVC pipe from the specific fitting or stress point as required by the Engineer. Contractor shall provide an approved torque wrench for accurate torque verification for all set screws which do not have inherent torque indicators. Restraint system type, material and manufacturer must be approved prior to installation. For Retainer Glands – Romac Grip Rings or Approved Equal. Concrete Thrust blocking shall be utilized only when approved by Engineer.

CONCRETE BLOCKING: If required by Engineer, instead of Restrained Joint System, all fittings, hydrants, valves, etc. that are so located in the system as to have a tendency to "blow-off" shall be properly blocked and/or rodded into position as indicated on the drawings and as directed by the engineer. The blocking shall be 3,000 PSI mass or unreinforced concrete placed against undisturbed trench walls and bottoms. **No in place mixing of concrete aggregates will be allowed.** If unstable soil conditions preclude this type of blocking, a system of clamps, anchors, and/or tie-rods as directed by the Engineer shall be used.

LINES AND LEVELS: The Engineer will establish sufficient alignment and elevation control points on the ground for the proper guidance of the Contractor in laying out the various items of work. The Contractor shall lay out the work from the controls so established and shall be fully responsible for his own measurements, scaling drawings, etc.

HANDLING MATERIAL: All materials shall be delivered and distributed at the sites of work by the Contractor. Pipe, fittings, valves, hydrants and accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Under no circumstances shall such materials be dropped. Materials delivered at sites of work shall be unloaded opposite or near to the place where it is to be laid in the trench. Pipe shall not be placed in gutters or ditches where water or dirt can enter the pipe or its bell or coupling. Materials damaged in handling or otherwise, shall not be used in the work. Any PVC Pipe exposed to sunlight, past the point in time of 90 days past actual date of manufacturing, shall be covered with an opaque material while permitting adequate air circulation above and around the pipe.

INSTALLATION: While suspended over the trench, and before lowering all material and equipment shall be inspected for defects. Before pipe and accessories are assembled, all bells and spigots shall be thoroughly cleaned both inside and out. No pipe fittings shall be assembled under a strain-especially bends, branches, and services from mains. All exposed threads on ferrous pipe, nipples, etc. shall be thoroughly cleaned and painted with asphalt before backfilling. Field-cut pipe shall be beveled before insertion into push-on type fittings with a file or pipe beveler, or a suitable gasket protective device shall be used and free from foreign matter. Pipe shall be plugged at the end of each days work to prevent entrance of dirt or other foreign objects or matter. Water mains shall not be installed within contaminated areas, unless using pipe materials that will protect (i.e. DIP with chemical resistant gaskets). The Engineer shall be notified of any contaminated areas, so that line can be re-routed if possible.

TESTING: Testing shall conform to AWWA Standard C600 LR. Pressure tests shall be conducted on all new work by the Contractor. This may be done either before or after backfilling, except that no additional payment will be made to the Contractor for any reexcavation, rebackfilling or other work that may be required to make repairs. If tests are conducted prior to backfilling, a sufficient quantity of compacted fill shall be placed around the pipe, between joints, to firmly anchor the pipe in place. The Contractor shall provide all necessary equipment and perform all work in connection with the tests. The Engineer and Owner shall be notified in advance of each test so that he or his representative may be present. Each section of main tested shall be slowly filled with water, care being taken to expel all air from the pipe. If necessary, pipe shall be tapped at high points to vent air. As a minimum, test pressure of 150 PSI, or 1.5 times the highest working pressure, whichever is greater, shall be applied and maintained for two hours on all mains and services. Any defective pipe and appurtenances shall be replaced and all visible leaking joints made watertight. Ductile Iron Pipe may be tested at higher pressures if required by Engineer.

For PVC pipe the leakage shall not exceed that allowed by the formula:

$$L = \frac{ND\sqrt{P}}{7400}$$

- L = Allowable leakage (gallons/hour)
- N = Number of joints in tested section (pipe & fittings)
- D = Nominal diameter of the pipe (inches)
- P = Average test pressure (PSI)

For the DIP, the leakage shall not exceed that allowed by the formula $L=SD\sqrt{P}/133200$.

- Where L=allowable leakage (gals./hr.)
- S=length of the pipeline tested
- D=diameter of pipe (inches)
- P=average test pressure (psig)

STERILIZING: Before being placed into service, the entire system, including service lines, shall be flushed out and sterilized with chlorine. All flushing shall be unidirectional only. The flushing and chlorination process shall require contractor attendance at all times, even all night hours if necessary. The Engineer and Owner shall be notified before the procedure is commenced. Chlorine may be applied by using a liquid chlorine gas-water mixture, a direct chlorine gas feed, or by calcium or sodium hypochlorite-water mixtures. The sterilizing solution or mixture shall be introduced at a controlled rate at one end of a main as water is being withdrawn from the other end in such proportion as to give 50 ppm of free chlorine in the main. The solution shall remain in the pipe for 24 hours, at which time it shall have a chlorine residual of at least 25 ppm, or the process shall be repeated. The Contractor shall furnish all chemicals, equipment, labor, etc. required for the sterilizing process. Procedure shall conform to provisions of AWWA C651-LR.

After the sterilizing process has been completed, and prior to sampling, the chlorine residual must be reduced by flushing the main to normal system residual levels or be non-detectable in those systems not chlorinating. All Flush Water shall be de-chlorinated by a preapproved method acceptable to Owner. Two consecutive satisfactory bacteriological samples must be obtained from each leg or segment of the system of mains including all dead end mains and necessary points to represent all water in the newly constructed mains. Maximum distance between sampling points on all new construction shall be 1200 feet. The samples shall be taken 24 hours apart and analyzed by a SCDHEC approved private laboratory. The sample report results shall include total coliform and non-coliform growth and free chlorine residual. Coliform and non-coliform growth shall be absent.

The satisfactory sample reports, along with the Engineer's "Completion Certificate", shall be submitted to the District SCDHEC office for approval. The mains shall not be placed in operation until a "Permit To Operate" is issued by SCDHEC.

UTILITY SEPARATION: Water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer (gravity or force main). The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, SCDHEC may allow deviation on a case-by-case basis, if supported by data from the Engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. Water mains crossing sewers shall be laid to provide a minimum vertical separation of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case whether the water main is either above or below the sewer line. Whenever possible, the water main shall be located above the sewer line. Where a new water main crosses a new sewer line, a full length of pipe shall be used for both the water main and sewer line and the crossing shall be arranged so that the joints of each line will be as far as possible from the point of crossing and each other. Where a new water main crosses an existing sewer line, one full length of water pipe shall be located so both joints will be as far from the sewer line as possible. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer line to prevent damage to the water main. At any point where the horizontal and/or vertical separation as indicated above cannot be met, and upon approval from SCDHEC, both pipes shall be of ductile iron meeting waterline construction requirements. (Schedule 40 galvanized steel pipe may be used for diameters smaller than 3"). The two utilities and the pipe joints of the two utilities shall be kept as far apart as possible with adequate structural support. Adequate distance to make repairs to one of the lines without damaging the other must be maintained. Separation must conform to SCDHEC State Primary Drinking Water Regulation – Section R.61-58.4D(12) as a minimum. Hydrant drains shall not be connected to or located within 10 feet of sewer systems. Chambers, pits or manholes containing valves, blow-offs, meters, air relief valves, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer. Further, no flushing device shall be directly connected to any sewer.

Sewer Manholes - No water pipe shall pass through or come in contact with any part of a sewer manhole.

Water lines may come in contact with storm sewers or catch basins if there is no other practical alternative, provided that ductile iron is used, no joints of the water line are within the storm sewer or catch basin and the joints are located as far as possible from the storm sewer or catch basin.

Drain-fields and Spray-fields - Potable water lines shall not be laid less than twenty-five (25) feet horizontally from any portion of a waste-water tile-field or spray-field.

Any deviation of above mentioned Utility Separations shall be approved by SCDHEC and the Engineer.

ABOVE WATER CROSSING AND ABOVE GROUND CROSSINGS: The pipe shall be adequately supported and anchored, protected from damage and freezing, accessible for repair or replacement.

UNDERWATER CROSSINGS: 3 feet minimum cover shall be maintained over the pipe. Pipe shall be U.S. Pipe USIFLEX or American Flex-Lok Ball Joint in accordance with ANSI/AWWA C151/A21.51, ANSI/AWWA C150/A21.50 and ANSI/AWWA C110/A21.10. Main sizes less than 3" shall not be installed underwater. Isolation valves and feeder-side blow-off assemblies shall be installed at the locations as indicated on the drawings.

CROSS CONNECTION CONTROL: There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contamination materials may be discharged or drawn into the system. No by-passes shall be allowed, unless the bypass is also equipped with an equal, approved back-flow prevention device. High hazard category cross connections shall require any air gap separation or an approved reduced pressure backflow preventer. Reduced pressure principal backflow prevention assemblies shall not be installed in any area location subject to possible flooding. This includes pits or vaults which are not provided with a gravity drain to the ground's surface that is capable of exceeding the discharge rate of the relief valve. If installed in a pit, the drain line shall be a minimum of 2 times the size of the line entering the backflow prevention device. The drain cannot empty into any type of ditch, storm drain, or sewer, which could flood water back in the pit. All piping up to the inlet of the backflow prevention device must be suitable for potable water. The pipe must be AWWA or NSF approved. Black steel pipe cannot be used. Fire line sprinkler systems and dedicated fire lines, except those in the high hazard category shall be protected by an approved double check assembly.

VERIFICATIONS OF ACTUAL CONDITIONS. Locations of other utilities, service lines, etc. as shown on the drawings are from the best data obtainable at the time the plans were prepared. The Engineer does not guarantee and will not be responsible for their accuracy, locations types and/or number.

Before proceeding with any work dependent upon the data involved, the Contractor shall field check and verify all locations, dimensions, inverts, grades, lines, elevations, or other conditions of limitations at the sites of the work to avoid construction errors or damage to existing facilities.

FIELD RECORD PLANS. The Contractor shall, at all times, maintain exact records of alignment, fittings, valves, fire hydrants, and any deviations from the plans. Upon completion of the work, he shall turn such records over to the Engineer so that final record drawings can be made.

STANDARD SPECIFICATIONS. Wherever standard specifications (A.S.T.M. etc.) are referred to, the reference shall be understood to mean the latest revisions of such specifications.

EQUIPMENT AND MATERIALS. Each bidder is required to state in his Bid, in the spaces provided, the names of equipment and sources of supply of materials on which he bids. Failure to do so will result in the Owner selecting the equipment or materials of his choice at the price listed in the bid. All equipment shall meet the specifications therefore and equipment using light-weight members and/or inferior or inefficient mechanical mechanism will not be considered.

CHAIN LINK FENCE SPECIFICATIONS

Quantity: See Drawings

Overall Height: 7' (6' Fabric – 1' Barbed Wire)

Fabric: #9 2" Mesh – Vinyl Coated over Galvanized

Posts: Galvanized Steel Pipe

Line – 2-1/2" O.D./3.65 #/Ft.

End, Corner, & Gate (to 12' width) – 3" O.D./5.79 #/Ft.

Gate (Over 12' width) – 4" O.D./9.10 #/Ft.

Post Foundation: 3000 psi Concrete – 36" x 10" Minimum – Top finished convex 2" above grade.

Barbed Wire: 3 Strands – 3" Barb spacing – Galvanized Slanting Arms.

Gates Frames Galvanized after Fabrication – Fastening, Locking, and Holdback Galvanized Accessories to be provided. Fabric as above.

CLASSIFICATION OF EXCAVATION. All trench and other excavations will be UNCLASSIFIED, with no allowance whatsoever for rock and/or latent soil conditions.

COMMUNICATION. The Contractor shall, at all times, maintain an on-site mobile telephone so as to have direct communication with Owner's representative. The Contractor shall call Engineer's office (859-6900) between 8:00am and 8:30am on all days that construction work will be performed.

VIDEO TAPE REQUIREMENTS. Contractor shall video (CD) entire length of road shoulders where proposed mains are to be installed at a walking rate not to exceed 5 mph and without camera vibration. Special video attention shall be given to specific land features and forecasted "Problem Areas".

ALL REQUIREMENTS OF SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL STATE PRIMARY DRINKING WATER REGULATIONS R.61-58.4 WILL BE STRICTLY ADHERED TO.

PAYMENT

The various items of the water distribution system and related work will be paid for at the prices stated in the Bid, which shall include all labor, equipment, materials, and incidentals of every and whatever nature required to complete them as specified. It is understood that all compensation to the Contractor for the complete, operable, and acceptable system and related work shall be solely under the pay items enumerated in the Bid. The Engineer's decision shall be final as to the acceptability of all work and the equipment and materials incorporated therein.

PIPE, in place, at the prices bid per lineal foot, for the different types, classes and sizes measured overall along centerlines except where noted, which shall include the cost of excavation, rock and unstable soil removal, handling, hauling, laying, connections to other parts of the system and to other systems, back-filling, dressing-off, replacing sod, ferrous and non-ferrous fittings, tapped couplings, saddles, adapters, connecting pieces, concrete blocking and other anchoring devices for pipe and fittings, detectable marking tape, locator wire, etc. not covered under other bid items.

PIPE BORED AND JACKED UNDER PAVEMENT, ETC., at the prices per lineal foot of the different types and sizes, which prices shall include the cost of all material and the installation complete.

PIPE IN ENCASEMENT UNDER HIGHWAYS, RAILROADS, ETC., at the prices per lineal foot for the different types and sizes, which prices shall include the cost of the casing and the carrier pipe completely installed.

GATE VALVES, at the price each for the various types and sizes, which shall include the valve, the valve box, joint material, concrete blocking and/or other anchoring devices if required for stability, and the setting thereof.

VALVE STEM EXTENSION, at the price each, regardless of length, complete in place.

FIRE HYDRANTS, at the price each, which shall include the hydrant installation complete with blocking, stone, and barrel extensions if required for proper finished elevation, and to include up to 20 LF of leg pipe.

1" SERVICE CONNECTIONS, at the price each, which shall include service saddle, corporation stop, service tubing, service fittings, meter yoke, meter box, meter, all properly installed and set in accordance with specific Owner's individual specifications, which includes final locking utilizing Highfield Lockseal Assembly.

SERVICE RECONNECTIONS, at the price each, which shall include service, saddle, service tubing (bored or open-cut), service fittings and reconnected to existing meter setter, meter box, and meter, all properly installed complete.

LARGE SERVICE METER INSTALLATIONS, at the price each for each size meter, which shall include the complete installation as detailed on the drawings and lying within the limits indicated thereon.

MASTER METER INSTALLATION, at the completely installed price, which shall include the meter if indicated on the drawings, all piping, equipment, materials, fittings, etc. lying within the limits thereof as indicated on the drawings.

ALTITUDE VALVE INSTALLATION, at the completely installed price, which shall include the valve and all other piping, equipment, materials, valves, fittings, etc. lying within the limits thereof as indicated on the drawings.

JUMPERS, at the completely installed price, which shall include all piping, materials, fittings, etc. lying within the limits thereof as indicated on the drawings. All valves are separate pay items.

BLOW-OFF ASSEMBLIES, at the price each, for each size and type indicated on the drawings and completely installed as detailed thereon.

CONCRETE MARKERS, at the price each, which shall include the cost of the marker and the setting thereof.

PROTECTION CONCRETE, at the price per cubic yard, in place as directed.

TYPE 'A' CROSSING ASSEMBLIES, at the completely installed price each for each size, which shall include all the pipe, fittings, materials, etc. lying within the limits thereof as indicated on the drawings.

STREAM CROSSINGS, at the completely installed price, which shall include all the pipe, materials, fittings, etc. lying within the limits thereof as indicated on the drawings.

BRIDGE CROSSINGS, at the completely installed price for each assembly, which shall include all the pipe, fittings, materials, etc. lying within the limits thereof as indicated on the drawings.

RAILWAY CROSSINGS, at the completely installed price for each assembly, which shall include the carrier pipe, casing, fittings, materials, etc. lying within the limits thereof as indicated on the drawings.

AIR VALVE (AIR RELEASE VALVE) installations at the price each for the complete assembly installed in accordance with the details and specifications therefor.

CUTTING AND REPLACING PAVEMENT, at the prices per lineal foot as per the different bid items, which shall include the cost of the base and the pavement placed in accordance with the details on the drawings therefor. Measurement shall be along pipe centerlines.

CONCRETE FOR TANK FOUNDATIONS, at the price per cubic yard, in place and finished, including the setting of anchor bolts, etc. to be furnished by tank contractor.

REINFORCING STEEL FOR TANK FOUNDATIONS, at the price per pound, in place.

TANK SITE WORK & YARD PIPING, at the lump sum price, including all work as specified herein and as indicated on the drawings.

PUMP STATION, at the completely installed and operable lump sum price, which shall include all clearing, grubbing, grading, excavation, building foundations, buildings, pumps & motors, piping, fencing, signs, miscellaneous equipment, and all electrical and control equipment and wiring, both at the station and at any tanks as specified herein and indicated on the drawings.

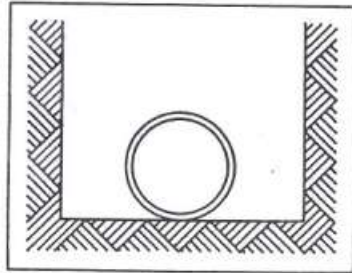
EQUIPMENT MOBILIZATION, a one-time lump sum payment covering all phases of the entire project.

TESTING, STERILIZING & SAMPLING, a one-time lump-sum payment covering all phases of the entire project.

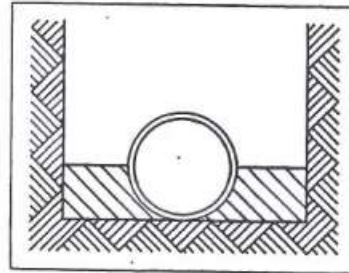
POLYETHYLENE, ENCASMENT (POLY-WRAP), in place, at the price bid per linear foot measured overall along the pipe centerline, installed complete.

PAYMENT FOR WATER: The Contractor shall pay for all water used in flushing, testing and sterilizing the system. He shall also be responsible for any water lost from leaks or from faulty workmanship or materials occurring either during construction or during the one-year guaranty period. The water shall be paid for at cost of same to Owner.

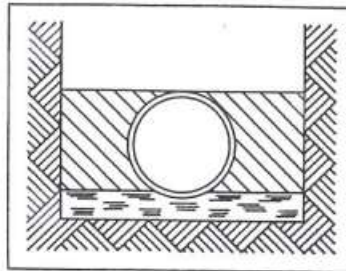
STANDARD BEDDING TYPES



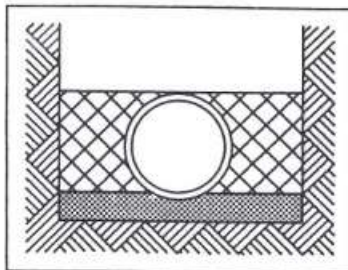
Type 1*
Flat-bottom trench.† Loose backfill.



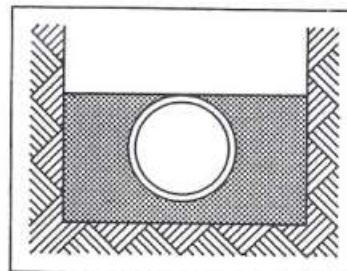
Type 2
Flat-bottom trench.† Backfill lightly consolidated to centerline of pipe.



Type 3
Pipe bedded in 4 in. (100 mm) minimum of loose soil.‡ Backfill lightly consolidated to top of pipe.



Type 4
Pipe bedded in sand, gravel, or crushed stone to depth of $\frac{1}{8}$ pipe diameter, 4 in. (100 mm) minimum. Backfill compacted to top of pipe. (Approximately 80 percent Standard Proctor, AASHTO T-99.)

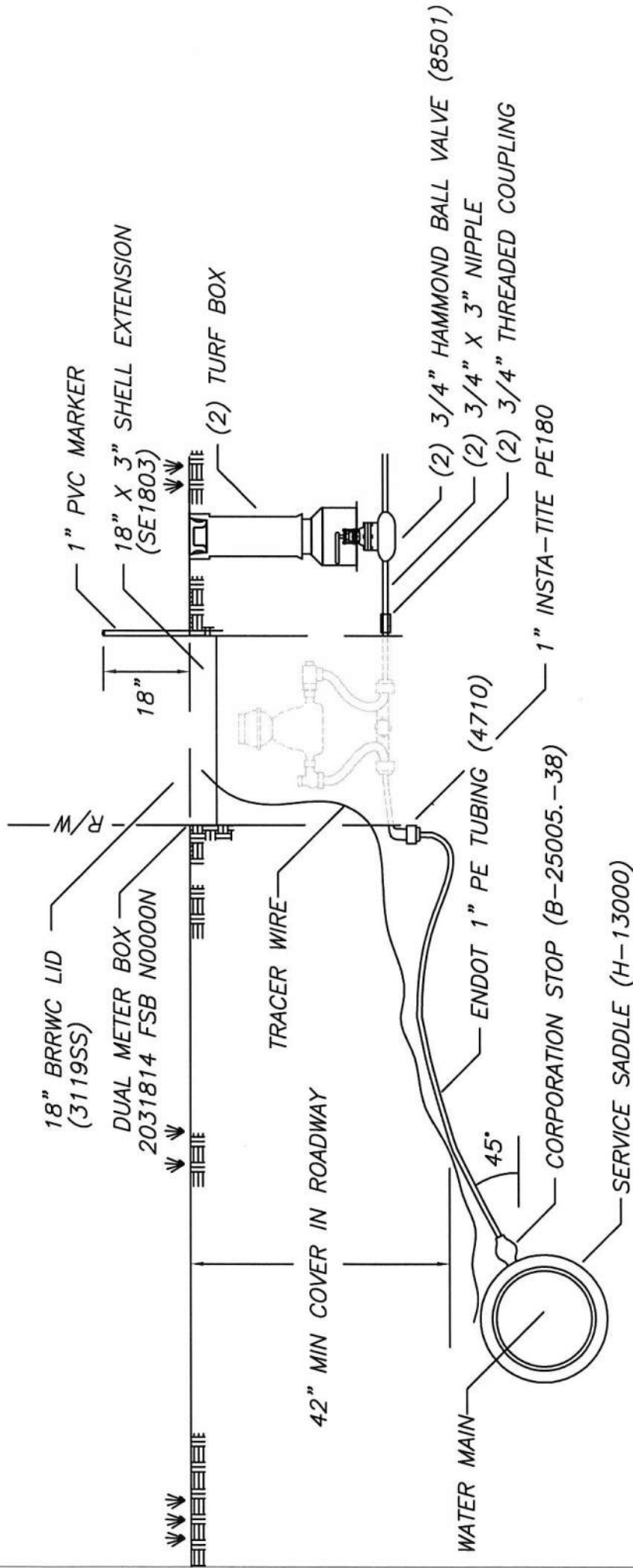


Type 5
Pipe bedded in compacted granular material to centerline of pipe. Compacted granular material‡ to top of pipe. (Approximately 90 percent Standard Proctor, AASHTO T-99.)

*For 14-in. (355-mm) and larger pipe, consideration should be given to the use of laying conditions other than Type 1.
†"Flat-bottom" is defined as undisturbed earth.
‡"Loose soil" or "selected material" is defined as native soil excavated from the trench, free of rocks, foreign materials, and frozen earth.

from American Water Works Association (AWWA)
AWWA Standards

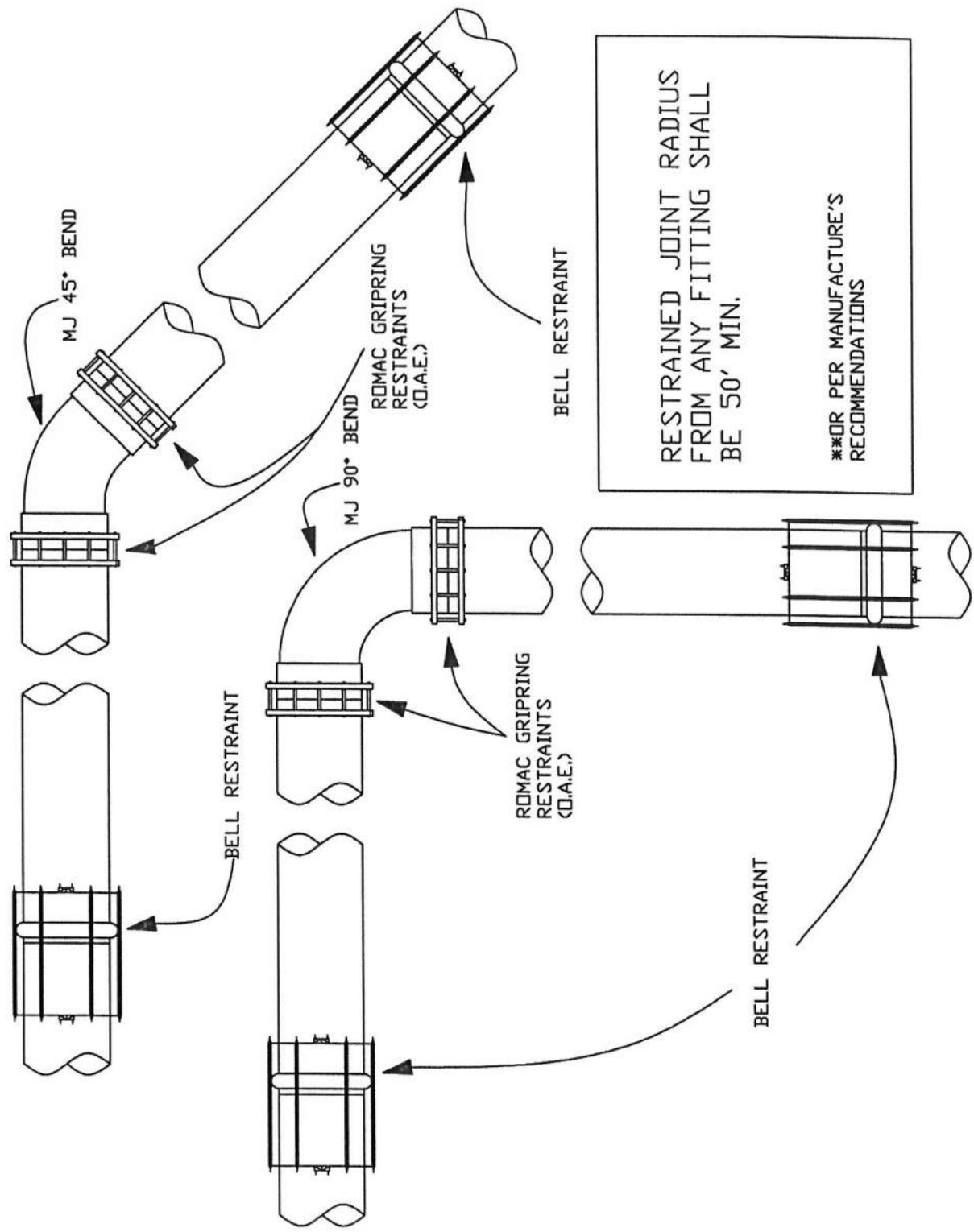
**Blue Ridge Rural Water Company
Standard Construction Drawing Detail**



TYPICAL 1" DUAL SERVICE CONNECTION

N.T.S.

*Blue Ridge Rural Water Company
Standard Construction Drawing Detail*

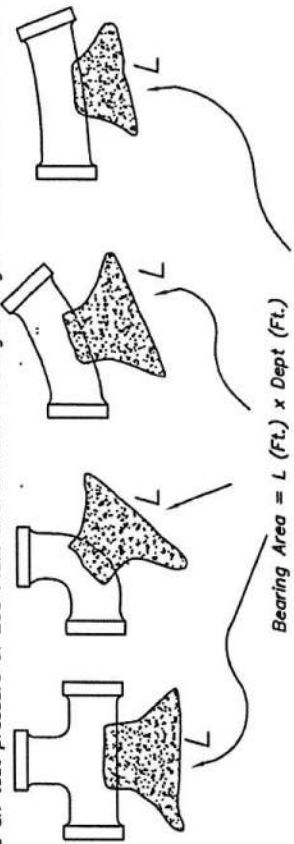


Blue Ridge Rural Water Company Standard Construction Drawing Detail

MINIMUM BEARING AREA IN SQUARE FEET REQUIRED AGAINST UNDISTURBED TRENCH BANK IN FIRM CLAY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO ADJUST BEARING AREAS TO FIT OTHER CONDITIONS.

| PIPE SIZE | JEE/CAP/PLUG F.H. | 1/4 (90°) BEND | 1/8 (45°) BEND | 1/16 (22.5°) BEND |
|-----------|-------------------|----------------|----------------|-------------------|
| 2" | 1 | 1.5 | 1 | 1 |
| 2 1/2" | 1 | 1.5 | 1 | 1 |
| 3" | 1 | 1.5 | 1 | 1 |
| 4" | 1.5 | 2.5 | 1 | 1 |
| 6" | 3 | 4 | 2.5 | 1.5 |
| 8" | 5 | 7 | 4 | 2 |
| 10" | 8 | 11 | 6 | 3 |
| 12" | 12 | 16 | 9 | 5 |
| 14" | 16 | 22 | 12 | 6 |
| 16" | 20 | 28 | 16 | 8 |
| 18" | 25 | 36 | 20 | 10 |
| 20" | 32 | 44 | 24 | 13 |
| 24" | 45 | 64 | 35 | 18 |
| 30" | 71 | 100 | 55 | 28 |
| 36" | 102 | 144 | 78 | 40 |

(Table based on test pressure of 200 P.S.I. and allowable bearing strength of 2000 P.S.I. on trench wall)



Bearing Area = L (Ft.) x Dept (Ft.)

Blocking to be 3,000 P.S.I. Concrete
(No Separate Pay Item for Blocking Included with Fittings, Valves, Pipe, etc.)

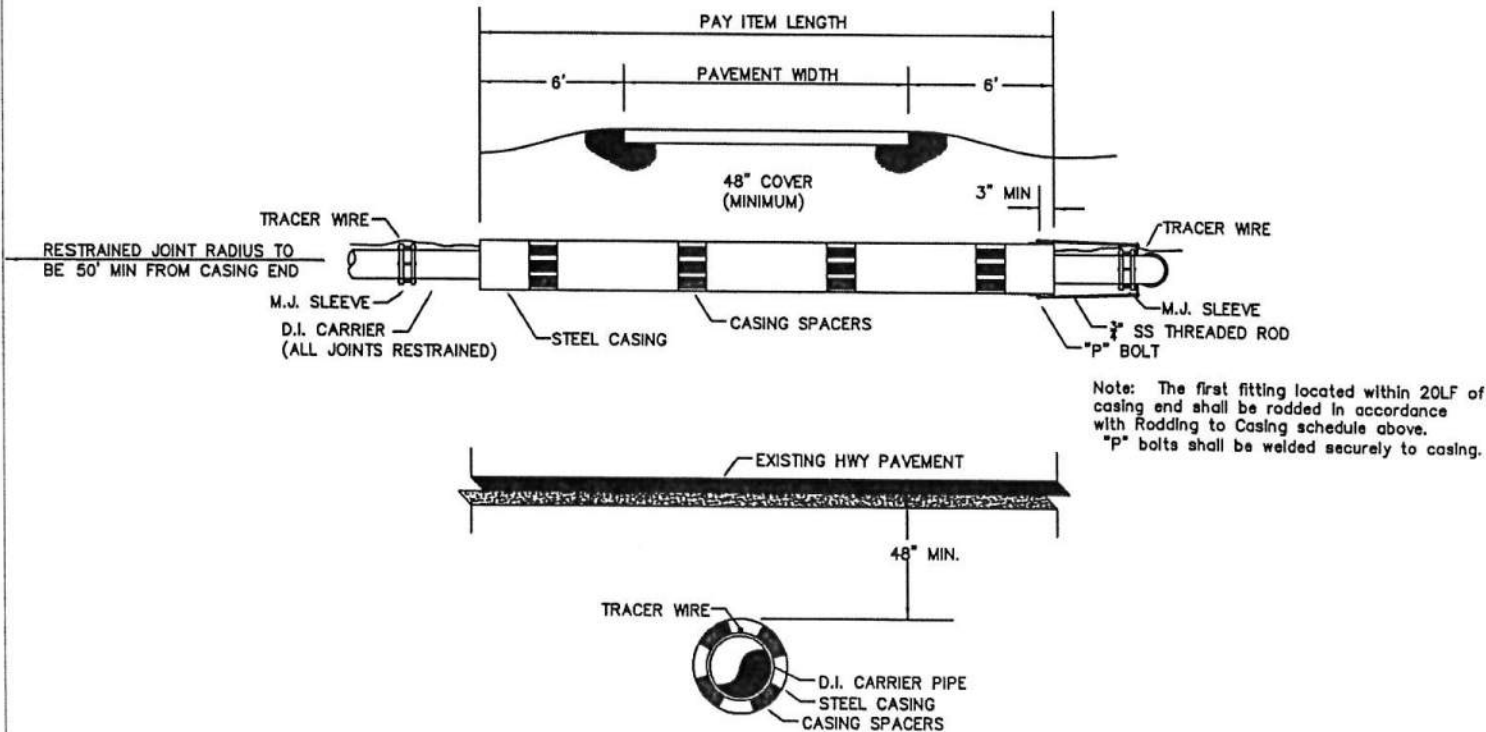
FITTING BLOCKING DETAILS (ALTERNATE METHOD)

Blue Ridge Rural Water Company Standard Construction Drawing Detail

RODDING TO CASING

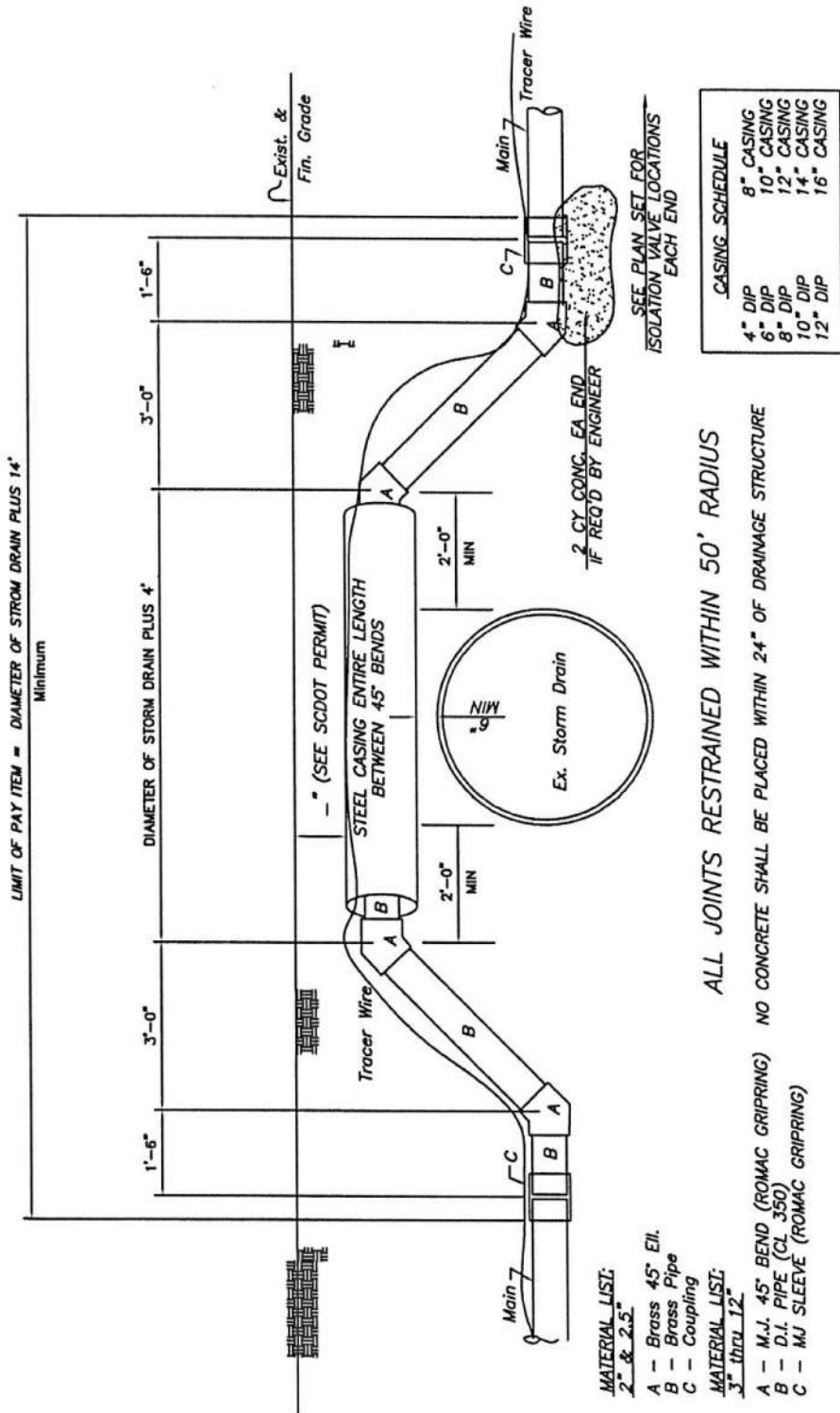
| <u>PIPE SIZE</u> | <u># OF RODS</u> |
|------------------|-------------------------|
| 3" | 2 |
| 4" | 2 |
| 6" | 3 |
| 8" | 4 |
| 10" | 4 |
| 12" | 4 |
| >12" | AS DIRECTED BY ENGINEER |

*RODDING TO CASING DOESN'T ALLEVIATE
NORMAL RESTRAINED JOINT REQUIREMENTS*

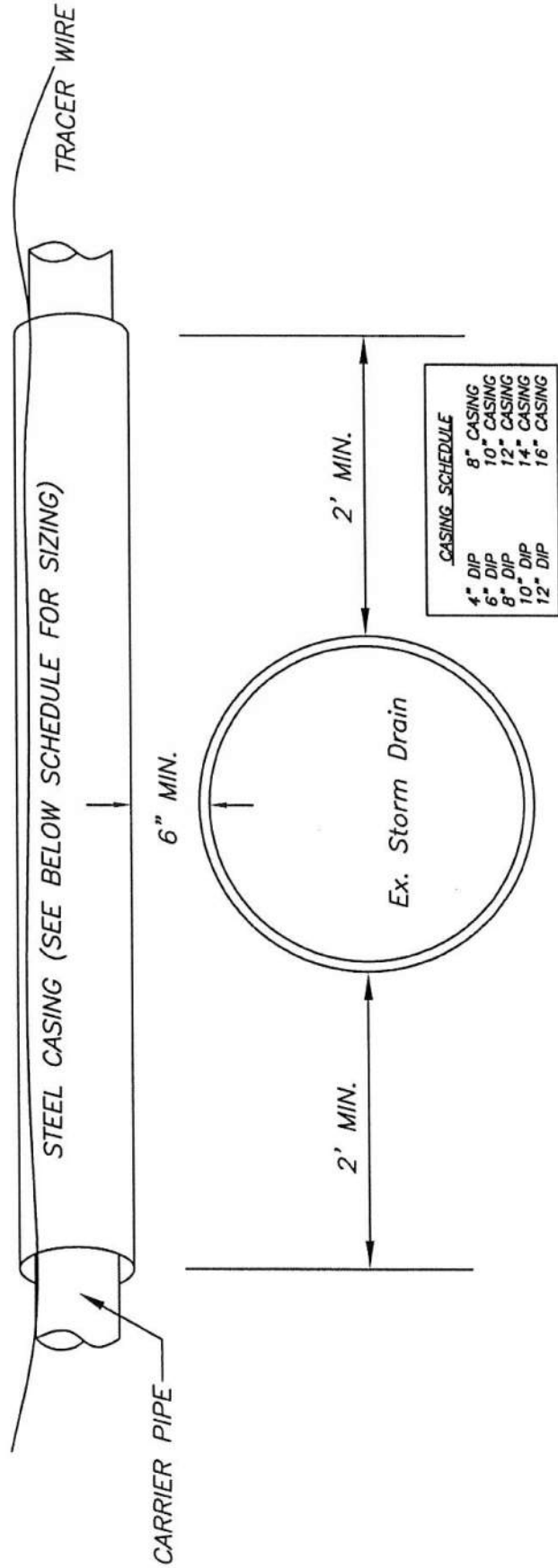


- STEEL CASING - MIN. WALL THICKNESS = 0.250" (CASINGS UP TO 24" DIA.)
= 0.312" (30" CASING)
= 0.375" (36" CASING)
- CASING SPACERS SHALL BE S.S. WITH PLASTIC SLIDES - CASCADE (O.A.E.)
- CASING SPACERS SHALL BE INSTALLED 10' O.C. AND 3' FROM EACH END
- CARRIER PIPE TO BE DUCTILE IRON

Blue Ridge Rural Water Company Standard Construction Drawing Detail



*Blue Ridge Rural Water Company
Standard Construction Drawing Detail*

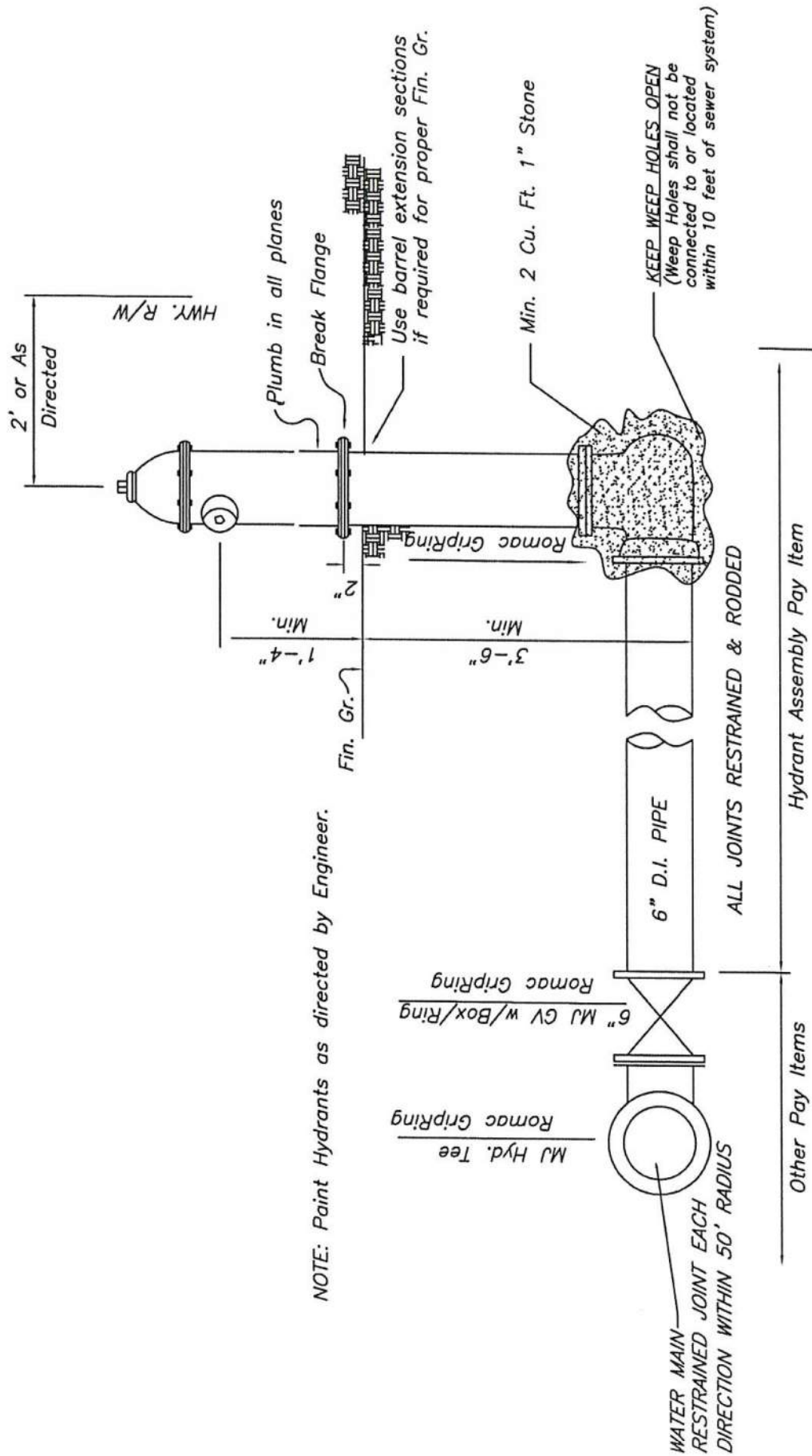


—CASING SPACERS SHALL BE 1' FROM EA. END AND MADE OF S.S. WITH PLASTIC SLIDES — CASCADE (OAE)

CULVERT CROSSING DETAIL FOR LAYING ABOVE CULVERT

---- N.T.S. ----

Blue Ridge Rural Water Company Standard Construction Drawing Detail

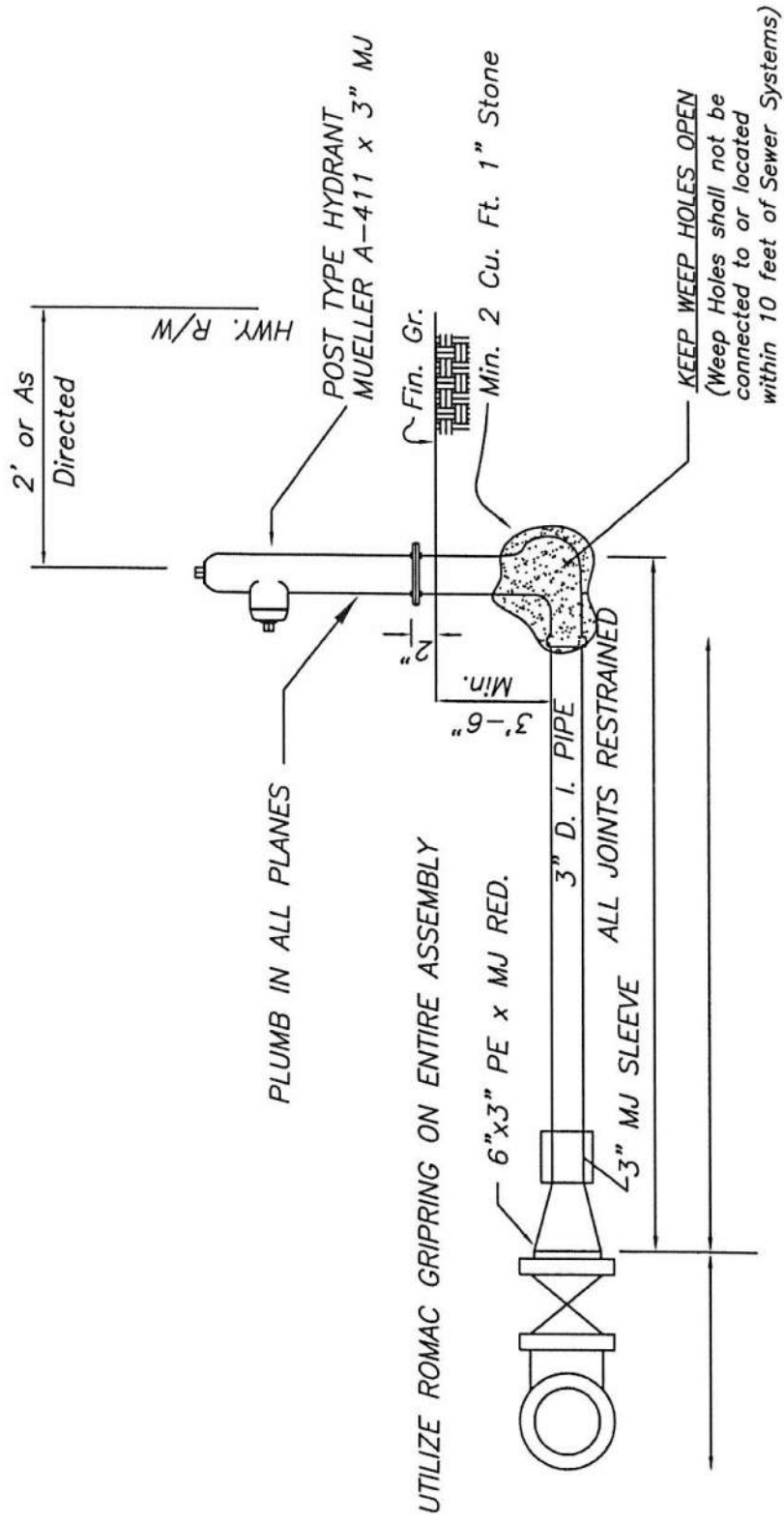


NOTE: Paint Hydrants as directed by Engineer.

FIRE HYDRANT INSTALLATION DETAILS

--- N.T.S. ---

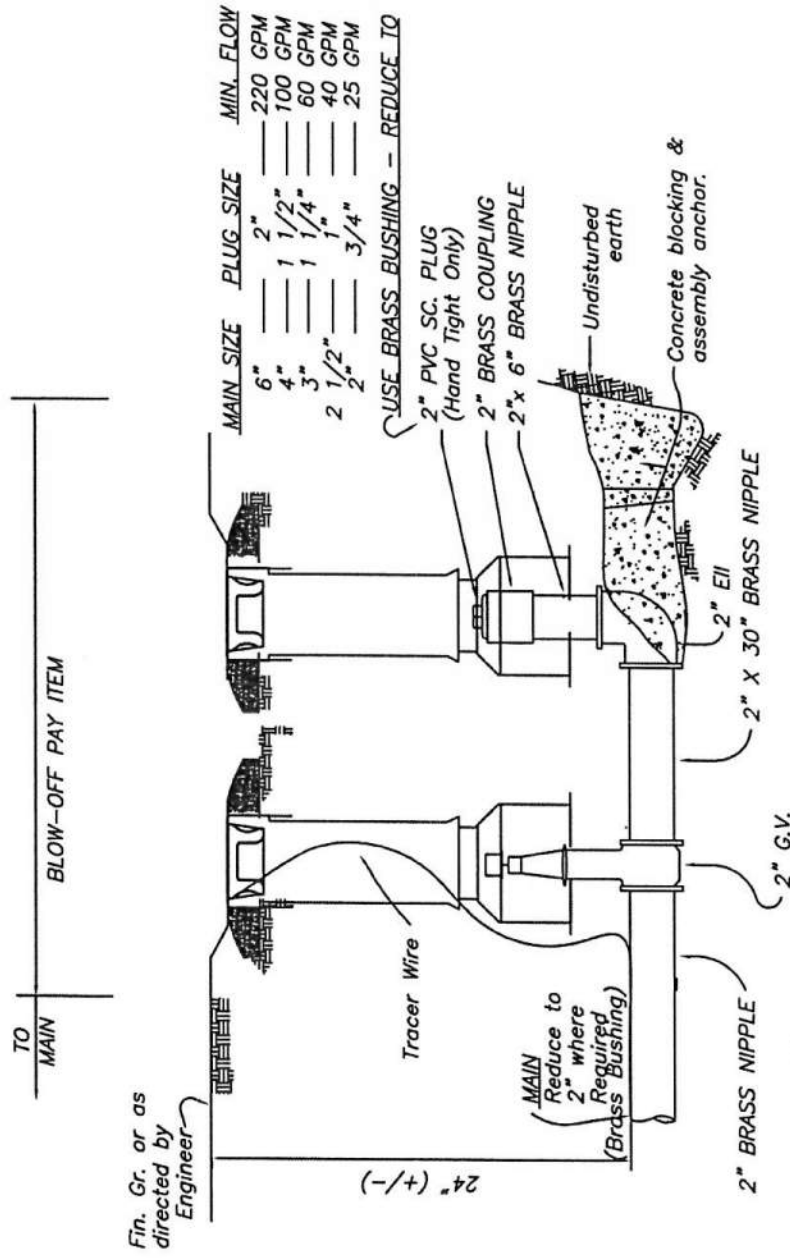
Blue Ridge Rural Water Company
 Standard Construction Drawing Detail



POST TYPE HYDRANT INSTALLATION DETAILS

----- N.T.S. -----

Blue Ridge Rural Water Company Standard Construction Drawing Detail



2" BLOW-OFF ASSEMBLY

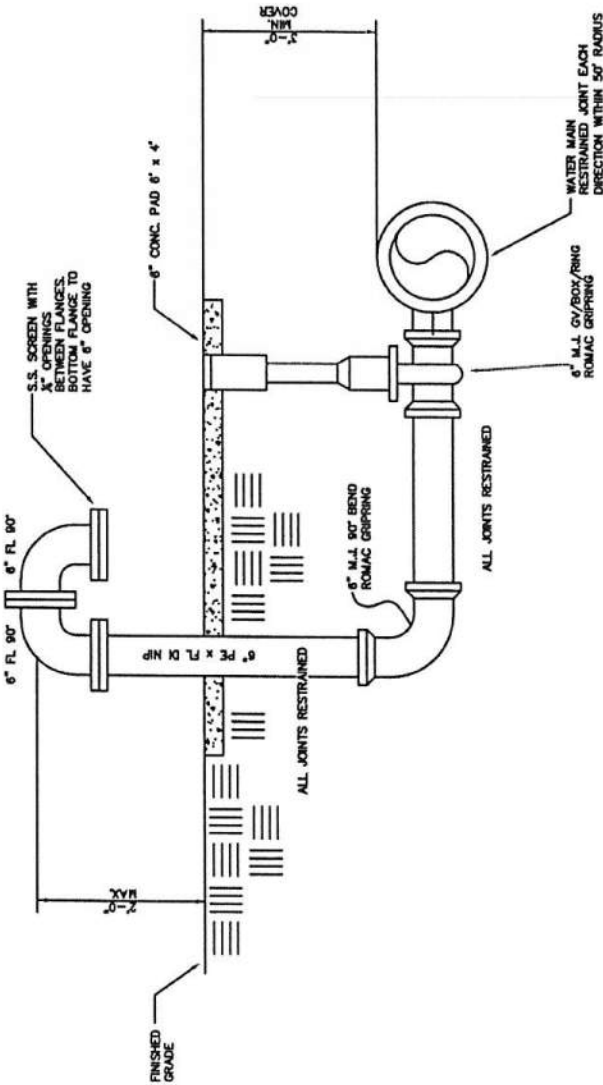
N.T.S.

(Included shall be an appropriately sized stack pipe to direct water away from blow-off box)

NOTE: For flushing main sizes $\geq 8"$, orifice opening shall be sized as follows:

- >12" main - as indicated on drawings
- 12" main - Fire Hydrant (882 gpm min.)
- 10" main - Fire Hydrant (612 gpm min.)
- 8" main - Fire Hydrant (400 gpm min.) (2.5" orifice)

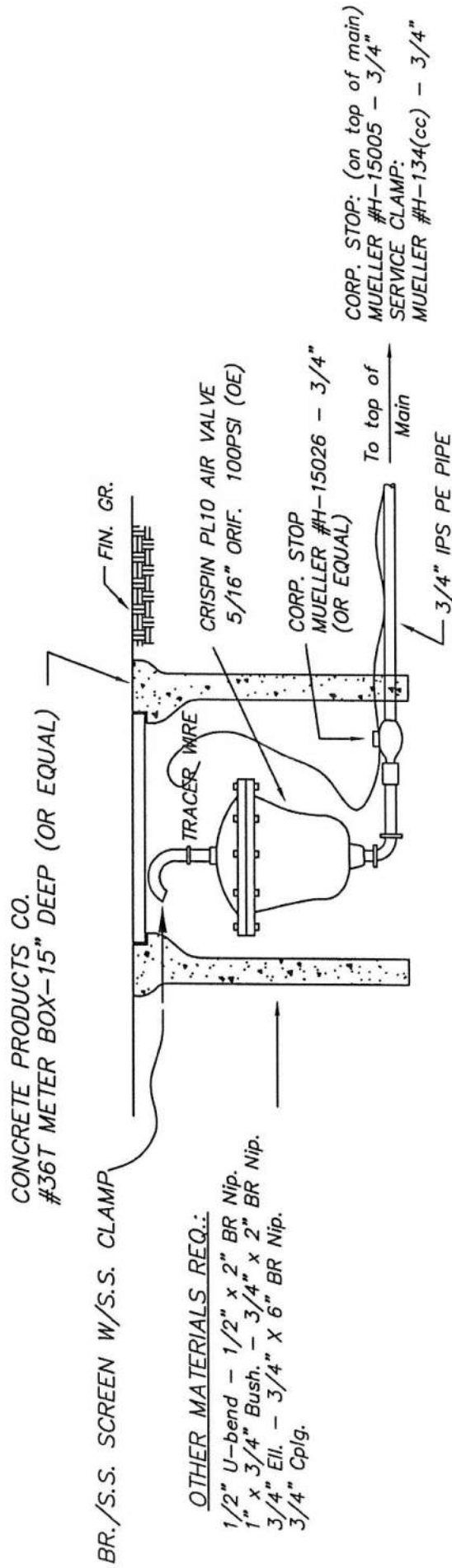
*Blue Ridge Rural Water Company
Standard Construction Drawing Detail*



MAIN SIZE > 12"
TYPICAL BLOW-OFF DETAIL

(N.T.S.)

Blue Ridge Rural Water Company Standard Construction Drawing Detail



OTHER MATERIALS REQ.:

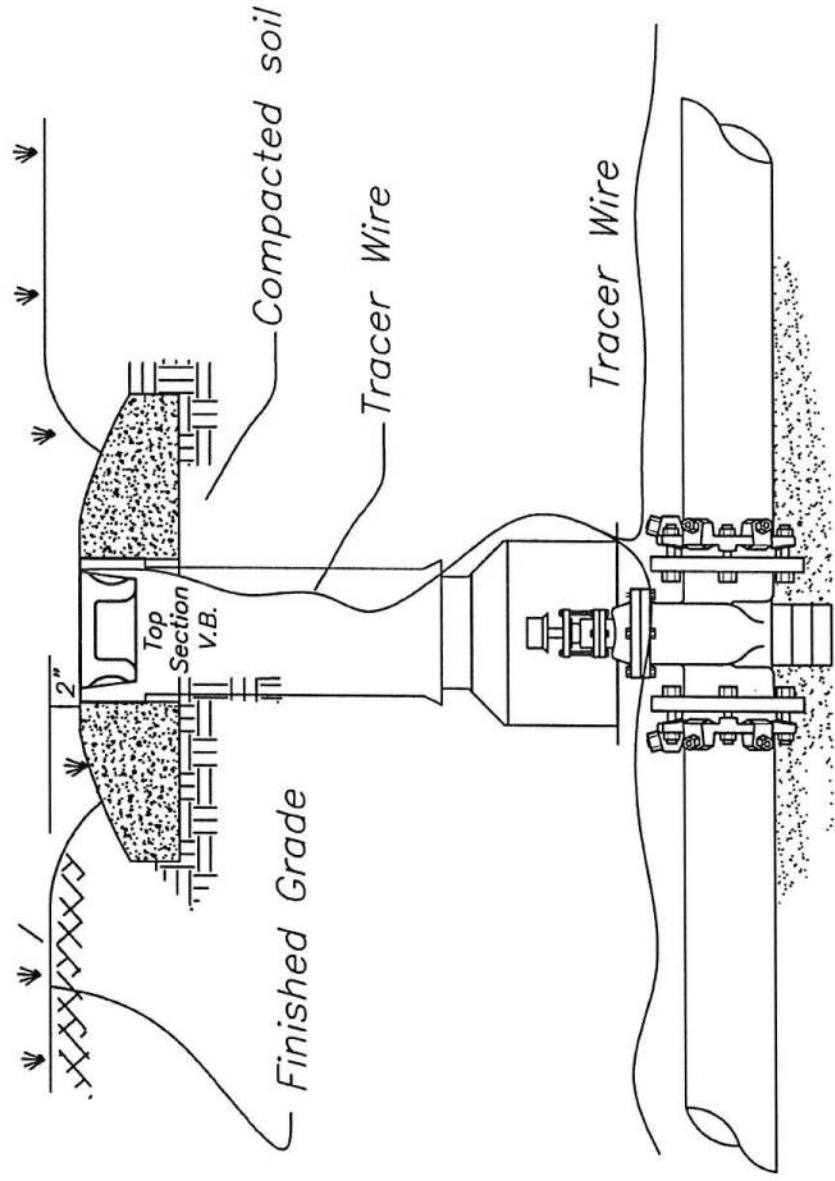
- 1/2" U-bend - 1/2" x 2" BR Nip.
- 1" x 3/4" Bush. - 3/4" x 2" BR Nip.
- 3/4" Ell. - 3/4" x 6" BR Nip.
- 3/4" Cplg.

NOTE: BLOCK AIR VALVE UPRIGHT IN BOX BY USE OF BRICK.

AIR VALVE INSTALLATION

--- N.T.S. ---

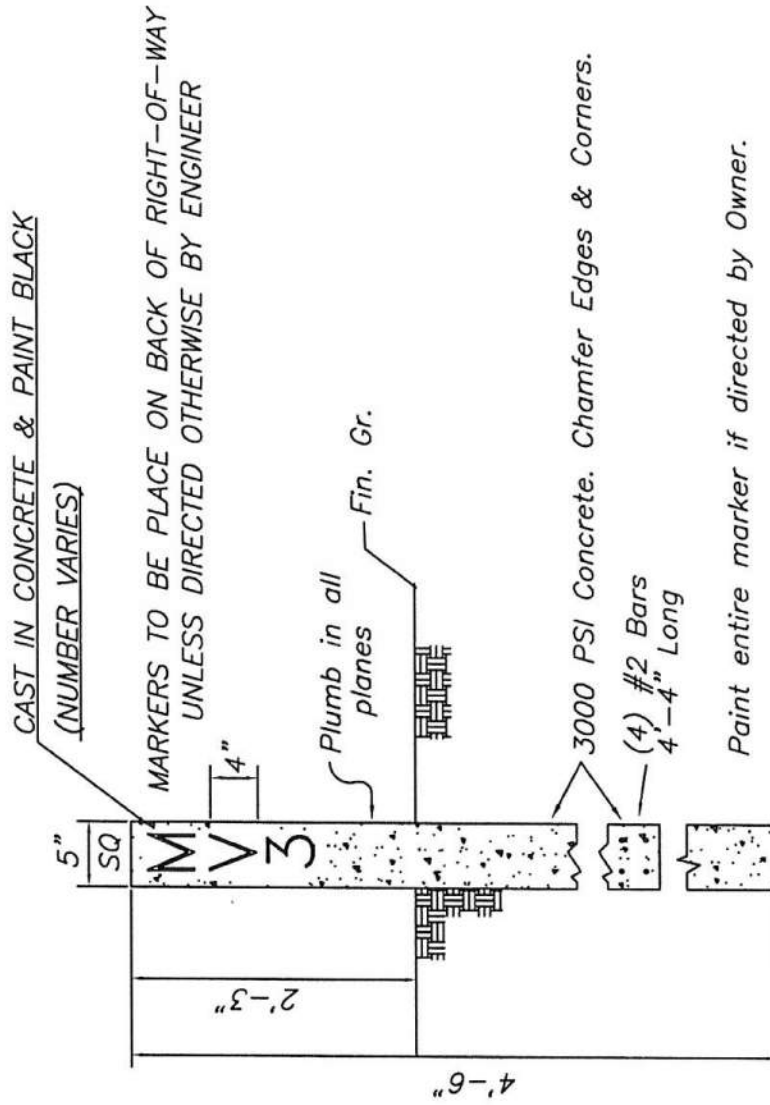
*Blue Ridge Rural Water Company
Standard Construction Drawing Detail*



VALVE BOX "RING" OR "DO-NUT" FINISHED SECTION

- NOT TO SCALE -

**Blue Ridge Rural Water Company
Standard Construction Drawing Detail**

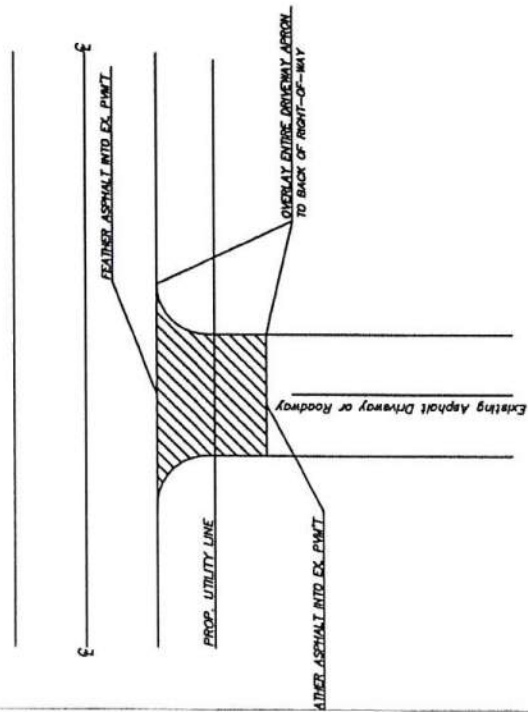


DETAIL OF TYPICAL CONCRETE MARKER

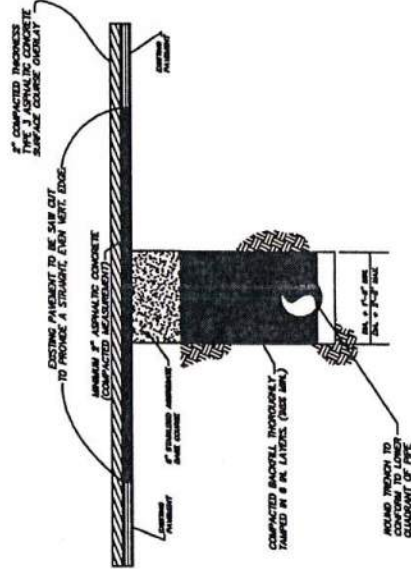
N.T.S.

PAVEMENT RESTORATION DETAILS

PLAN VIEW

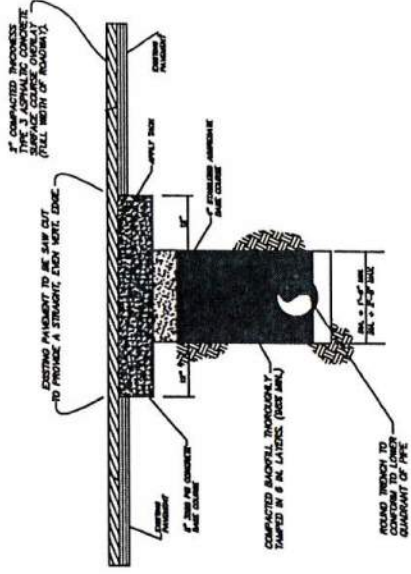


SECTION VIEW (DRIVEWAYS)



- NOTES
1. COMPACTION OF FILL AND BASE MATERIALS SHALL BE ACCOMPLISHED WITH HAND-HELD/ MECHANICAL TAMPER. THE USE OF GRADING AND EXCAVATION EQUIPMENT FOR COMPACTION OPERATIONS WILL NOT BE PERMITTED.
 2. COMPACTIONS ARE AS DETERMINED BY STANDARD PROCTOR TEST.

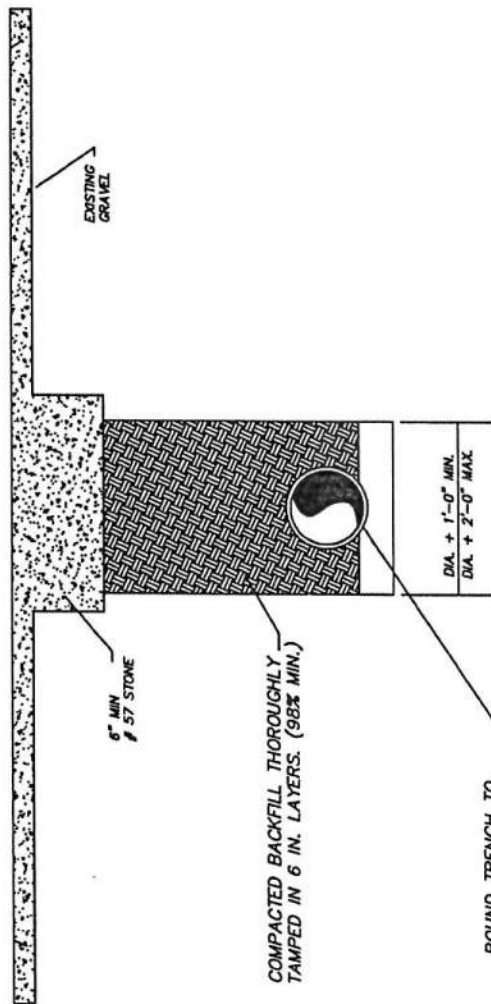
SECTION VIEW (ROADWAYS)



- NOTES
1. COMPACTION OF FILL AND BASE MATERIALS SHALL BE ACCOMPLISHED WITH HAND-HELD/ MECHANICAL TAMPER. THE USE OF GRADING AND EXCAVATION EQUIPMENT FOR COMPACTION OPERATIONS WILL NOT BE PERMITTED.
 2. COMPACTIONS ARE AS DETERMINED BY STANDARD PROCTOR TEST.

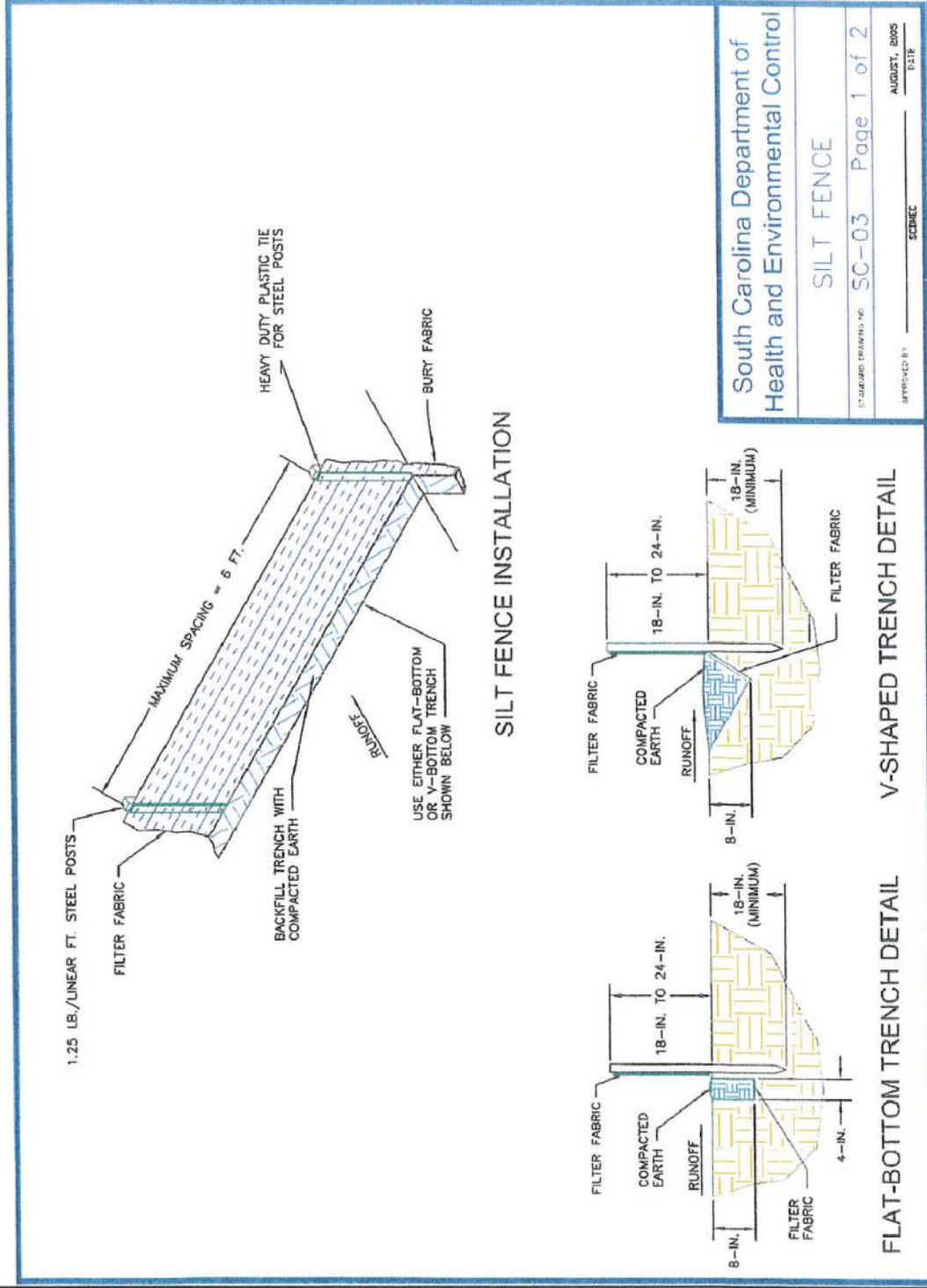
Blue Ridge Rural Water Company
 Standard Construction Drawing Detail

GRAVEL DRIVEWAY CUTS



- NOTES:
1. COMPACTION OF FILL AND BASE MATERIALS SHALL BE ACCOMPLISHED WITH HAND-HELD/ MECHANICAL TAMPERS. THE USE OF GRADING AND EXCAVATION EQUIPMENT FOR COMPACTION OPERATIONS WILL NOT BE PERMITTED.
 2. COMPACTIONS ARE AS DETERMINED BY STANDARD PROCTOR TEST.

Blue Ridge Rural Water Company Standard Construction Drawing Detail



SILT FENCE INSTALLATION

South Carolina Department of
Health and Environmental Control

SILT FENCE

STANDARD DRAWING NO. SC-03 Page 1 of 2

APPROVED BY: _____ DATE: _____

SCHEMATIC

V-SHAPED TRENCH DETAIL

FLAT-BOTTOM TRENCH DETAIL

*Blue Ridge Rural Water Company
Standard Construction Drawing Detail*

SEEDING SPECIFICATIONS

All areas to be seeded shall be pulverized & fine graded as indicated with positively draining slopes. Lime fertilizer shall be thoroughly mixed into seedbed. After seeding, the areas shall be straw-mulched, and asphalt tacked (O.A.E.) or heavy coat hydroseed mulch w/ tackifier to assure an acceptable stand of grass. Material application rate per acre:

Permanent grassing to be the following

| | |
|-------------------------|-------------------------------|
| <i>Rye</i> | <i>3# per 1000 sf.</i> |
| <i>Fescue</i> | <i>5# per 1000 sf.</i> |
| <i>Unhulled Bermuda</i> | <i>3# per 1000 sf.</i> |
| <i>Fertilizer</i> | <i>100# 10-10-10 per acre</i> |
| <i>Lime</i> | <i>1 ½ - 2 tons per acre</i> |

If temporary vegetation is required to assist in siltation control the following is to be used.

| | |
|-------------------------|---|
| <i>Rye</i> | <i>7# per 1000 sf.</i> |
| <i>Fescue</i> | <i>4# per 1000 sf.</i> |
| <i>or</i> | |
| <i>Brown Top Millet</i> | <i>50# per acre (April 1 - Aug. 15)</i> |