# POTABLE WATER/SANITARY SEWER
# POLICIES/STANDARD DETAILS/SPECIFICATIONS
# SEWER USE ORDINANCE

# TOWN OF BUNN,
# NORTH CAROLINA
## FRANKLIN COUNTY


**June 23, 2023**

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MESCO Project No. G-22116

# Town of Bunn, North Carolina
# Water & Sewer Policies/Standard Details/Specifications

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NPDES Permit WWTP – NC0042269
NC Water System ID – NC00235025
Water Supply Management Plan Serial No. 03-00-182

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## Sewer Use Ordinance

# ABBREVIATIONS

| | |
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| **AASHTO** | American Association of State Highway and Transportation Officials |
| **ANSI** | American National Standards Institute |
| **ASTM** | American Society for Testing and Materials |
| **AWWA** | American Water Works Association |
| **CSA** | Calcium Sufflaminated Cement |
| **DI** | Ductile Iron |
| **DIPRA** | Ductile Iron Pipe Research Association |
| **FDC** | Fire Department Connection |
| **GPCD** | Gallons per Capita per Day |
| **GPD** | Gallons per Day |
| **GPM** | Gallons per Minute |
| **$H_2S$** | Hydrogen Sulfide |
| **MJ** | Mechanical Joint |
| **MUTCD** | Manual for Uniform Traffic Control Devices |
| **NTU** | National Turbidity Unit |
| **IEC** | International Electrotechnical Commission Standards |
| **NCDEQ** | North Carolina Department of Environmental Quality |
| **NCDOT** | North Carolina Department of Transportation |
| **NEMA** | National Electrical Manufacturers Association |
| **O&M** | Operations & Maintenance |
| **OS&Y** | Outside Screw & Yoke |
| **OD** | Outside Diameter |
| **OSHA** | Occupational Safety and Health Administration |
| **PLC** | Programable Logic Controller |
| **PSI** | Pounds Per Square Inch |
| **PVC** | Polyvinyl Chloride |
| **RPZ** | Reduced Pressure Zone |
| **RR** | Rail Road |
| **RTU** | Remote Terminal Unit |
| **SCADA** | Supervisory Control and Data Acquisition |
| **UL** | Underwriters Laboratory |
| **VCP** | Vitrified Clay Pipe |

# Water System Specifications

## SECTION 1 – GENERAL NOTES

Unless otherwise indicated, all standards apply to the public water system. This section describes the general design standards, which are to be followed by all parties in preparing subdivision, utility extension, and utility replacement plans for the Town of Bunn. These design standards will ensure that the citizens of Bunn will continue to have quality water facilities and an adequate fire protection system.

All engineering plans for the public water system must meet the State and/or the Town of Bunn minimum design standards as indicated in the most recent amended Rules Governing Public Water Supplies by the N.C. Department of Environmental Quality (NCDEQ) or the Town of Bunn Public Works Specifications, whichever is the more stringent. An engineer must certify all projects. The Town of Bunn reserves the right to revise or amend the following specifications to ensure water quality or facilitate system maintenance. Exceptions may occur without notice on a case-by-case basis as determined by the Public Works Director and Town Manager or designee.

Plans Approval and Requirements. Preliminary water main and hydrant plans shall be submitted with the Zoning Application to the Town Administrator. These plans shall be inspected and approved by the Fire Chief, the Public Works Director, and Town Administrator before review by the Planning Board or any work done on the project.

Plan and profile drawings shall be prepared by a North Carolina registered Professional Engineer signed, sealed, and dated showing the various elements of the utility mains and shall include an overall utility plan layout on a single sheet with a scale no smaller than 1 inch = 200 feet. The design of improvements must be based upon the Owners record drawings and actual field verification of existing facilities by the Engineer. The utility drawings shall be on separate sheets, free of landscaping and other details not pertinent to the utility plans. A separate landscaping plan must be submitted with the utility plan showing any proposed landscaping and all water and sewer utilities or easement. All adjacent tracts and topographic information must be shown on the landscaping plan. The water drawings and sewer drawings may be on the same sheets. Landscaping plans shall show all utility engineering drawings and shall be on paper 24 inches by 36 inches.

Once installed, certified "as built" plans shall be provided to the Town of Bunn, showing the utilities. **"As built" drawings for the utilities shall be submitted to the Public Works Department before the Town of Bunn accepts the project.**

## SECTION 2 - WATER DESIGN – PUBLIC

a. Location Conditions for Design

1) All mains are to be within dedicated street rights-of-way except major transmission mains not affording direct service connection. Mains within the street right-of-way shall be a minimum of 5 feet from the outside of the pipe to the edge of the right-of-way. Greater separation may be required for greater depth.

2) No person shall place any part of a structure, permanent equipment, or impoundment on the Town of Bunn Utility Right of Way/Easements or mains. Prohibited structures include, but are not limited to, buildings, houses, air conditioning units /heat pumps, decks, garages, tool or storage sheds, swimming pools, walls, and fences. Fences may be allowed across the right of way/easements as long as there is an access gate the full width of the right of way/easement, provided that written approval is first received from the Public Works Department. No fences may be installed longitudinally (lengthwise) within the right-of-way/easements

b. Size

1) Major mains (8" and above) are to be sized according to the Town of Bunn Water Specifications to meet all fire flow requirements.

2) In residential areas, mains shall be a minimum of 6" in diameter. Eight-inch lines shall be used when the minimum flow requirements cannot be met. Preliminary water lines and hydrant plans shall be submitted to the Town Administrator, Public Works Director, and Town Engineer. The total maximum length of a 6-inch water line, without connecting to a larger main, is 600 feet. Without connecting to a larger main, the maximum length of an 8-inch water line is 1,000 feet unless looped. A copy of the Engineering Report shall accompany the permit application. The Engineer shall supply either by water model or calculations the anticipated water flow and pressure at the furthest hydrant to be installed within the development.

3) All residential or commercial cul-de-sacs require a 6-inch water main and must end with a fire hydrant; blow-offs are not allowed. Water main sizes shall not be reduced except at street intersections or fire hydrant locations on cul-de-sacs.

4) When the proposed project or subdivision is confined by natural topographic features or existing developments, and it is determined that the streets will not be extended to serve adjacent properties. The mains shall be sized to provide adequate domestic and fire flows. In this case, the minimum main size for single-family residential zoning districts shall be 6 inches, and for all other zoning districts shall be 8-inch.

5) The Town of Bunn is required to provide a minimum residual pressure of 20 pounds per square inch (psi) at a minimum flow of 500 Gallons per Minute. The static pressure shall be a minimum of 30 pounds per square inch (PSI). If an individual needs greater pressure, it is his/her responsibility to incorporate the necessary booster pumping facilities.

6) The developer shall loop water mains to the existing system where feasible. If streets are extended to the property line for a future extension where no service connection is located, the developer shall extend the water main to the property line and terminate the line with a Mechanical Joint plug and appropriate size concrete thrust block. The terminus of the said plug shall be indicated on the "as-built" drawings.

c. Fire Hydrants

1) All fire hydrants shall be installed on a 6-inch branch with a hydrant valve on each branch. All hydrants are to be located at the right-of-way or in a two-foot easement adjacent to the right-of-way. Fire hydrants on private property greater than 10 feet from the public right of way shall be private with the appropriate backflow devices. Fire hydrants on private property less than 10 feet from the public right of way shall be installed in recorded Town of Bunn water easements. The branch valve shall be no greater than one foot from the main and inside the pavement when possible. The valve shall be mechanically restrained to the main. Only one fire hydrant may be installed on a dead-end 6-inch line.

2) A fire hydrant shall be located at each street intersection and the end of cul-de-sacs. The Town of Bunn no longer allows water lines less than 6-inches in diameter nor blow-offs. All dead-end water mains shall be terminated at a fire hydrant with a gate valve. Any variation to this requirement will require written permission from the Public Works Director, Town Administrator, Town Engineer, or designee.

3) The maximum distance between fire hydrants, measured along street centerlines, shall be 500 feet, except when residential intersections are not more than 700 feet apart; no hydrant is required between the intersections.

4) In all other districts, the maximum distance between fire hydrants, measured along the street centerline, shall be 300 feet except when business, office, and institutional areas are not more than 450 feet apart; no fire hydrant is required between intersections.

5) On major thoroughfares and collector streets with access points only at street intersections, hydrants shall be located at each street intersection and 1,000 feet intervals along the street. Where these intersections are less than 1,200 feet apart, no hydrant is required between the intersections. Fire hydrants shall be placed in a staggered arrangement on both sides of any roadway classified as a major or minor thoroughfare with the hydrant spacing as stated above.

6) When the relocation of an existing fire hydrant is approved by the Public Works Department, the existing hydrant branch will be plugged at the tee or tapping valve with a mechanical plug with no bends. If the existing main/tee is a lead joint, the tap or tee will need to be cut out and a new section of pipe (nipple) installed with a ductile iron repair joint.

7) Installation. Hydrants shall be set plumb with a finish grade, measuring 18" from the ground to the center of the steamer cap. Hydrants shall be properly located, so the pumper nozzle faces the closest curb. The back of the hydrant opposite the pipe connection shall be firmly blocked against the trench's vertical face with 1/3 cubic yard of concrete. Double bridle rods and collars shall be connected from the tee to the hydrant. Rods shall not be less than 5/8-inch diameter stock and coated with bituminous paint. A minimum of eight (8) cubic feet of stone shall be placed around the drains. The backfill around the hydrants shall be thoroughly compacted. Hydrant installation shall be in accordance with the Town Ordinances or as directed by the Public Works Director. All hydrants will have individual controlling valves no more than fifteen (15) feet from the hydrant. When hydrant extensions are used, they must be manufactured by the same manufacturer as the hydrant on which they are being used and installed in accordance with the manufacturer's instructions.

8) No services are permitted on any fire hydrant branch.

9) The Fire Department may require additional fire hydrants.

10) There shall be a 3-feet minimum clear distance around all fire hydrants. This means that nothing shall be within a 3-feet radius of all hydrants, including but not limited to trees, shrubs, fencing, guardrail, signs, light, and utility poles, etc.

11) Minimum Flows. The minimum acceptable flow is 500 gallons per minute in residential areas and 750 gallons per minute in other districts. These flows will be computed at 20 psi residual. A flow test shall be conducted at hydrant locations deemed necessary by the Public Works Director or his designee. The Owner shall coordinate with the Town of Bunn to schedule these tests, which shall be conducted in the presence of a person designated by the Public Works Director.

12) Square Footage and Sprinkler Requirements. When new buildings are constructed or existing buildings are expanded and contain 10,000 total square feet of floor space (all floors of all buildings, new and existing, added together), hydrants shall be installed at 300-foot intervals along all sides of the building that are accessible to Fire Department pumpers. These hydrants shall be within a minimum of twenty (20) feet and a maximum of forty (40) feet away from the building. Existing hydrants along streets can be counted in the 10,000 square foot requirements. Where sprinkler systems are used, a fire department connection shall be provided on the building.

The fire department connections (FDC) shall be within fifty (50) feet of a fire hydrant. There shall be no obstruction or fencing between the fire department connection and its closest hydrant. Where sprinkler systems or a riser room are required, outside access in accordance with the North Carolina State Building Code shall be provided. Backflow prevention for sprinkler systems shall be as specified in NC Building Code or as directed by the Franklin County Fire Marshal.

d. Valves

1) Each proposed new intersection shall have a main line valve for every leg, i.e., a four-way intersection shall have three main line valves, and a TEE intersection shall have two main line valves. All valves shall be rodded to a tee or cross with concrete blocking.

2) Each fire hydrant shall have a hydrant branch valve.

3) Main line valves on straight runs between street intersections shall be spaced no greater than the distances given below and shall be located within fifty (50) feet of the nearest hydrant to their location.

| Main Size | Maximum Spacing |
|---|---|
| 6" | 600' |
| 8" | 900' |
| 12" | 1000' |
| 16" | 1000' |
| 24" | 1500' |

4) The high and low-pressure water distribution systems may be connected with specific approval of the Public Works Director. Such connections shall be made with approved check valves positioned with the direction of flow from low to high pressure, and a fire hydrant shall be installed on the high-pressure side of the check valve. The check valve shall be installed in a standard manhole. A four-foot manhole shall be used for six and eight-inch valves and a five-foot manhole for twelve-inch valves. Check valves shall be housed in a vault, and the Public Works Director shall approve the vault size.

5) Mains twelve inches and larger in diameter, which has a change in elevation of ten-feet or greater, shall have an air release valve installed at the highest elevation of such change. The Public Works Director may require additional air release valves or fire hydrants on mains less than 12-inches based on elevation changes of fifteen-feet or greater.

6) Any water service customer who has a water static pressure greater than eighty (80) psi is required by North Carolina State Building Code to install and maintain a pressure-reducing valve. The pressure-reducing valve will be installed on the building service line after the meter. Such a device must be

installed before the Town of Bunn will allow the actual water connection. This installation is covered by the Plumbing Code and is not maintained by the Public Works Department.

7) Pressure-reducing and/or sustaining stations shall be installed when directed by the Public Works Director or Town Engineer to connect high and low-pressure systems. The pressure-reducing valve shall allow enough flow from the high side to maintain a specified pressure on the low side and will not reduce the high side below a certain amount. This type of valve will be a pressure-sustaining/pressure-reducing valve.

8) Valves over 4' in depth must have a valve stem extension to bring the operating nut to a depth of no more than 4'.

9) Insert valves are only to be installed on a case-by-case basis as approved by the Public Works Director.

e. Meters

All water services will be metered, and the meter will be located in the rights-of-way or a 2-foot easement adjacent to the rights-of-way.

Meter sizes shall be 5/8" x 3/4", 1", 1 ½", 2", 3, 4", 6", 8", or 10", with no exceptions.

All meters shall be capable of AMR drive-by reading of the type and model as specified by the Town of Bunn.

Any single water service that is to be used for fire service will have a minimum pipe size of 6-inch in diameter, pressure class 350 ductile iron pipe.

All single water services used for fire service will require a Fire Service Meter with a by-pass meter.

Meters will be the same size in diameter as the service. The only exceptions are a 10-inch Fire Service Meter with a by-pass on a 12-inch water service line and a 5/8" residential meter on a 3/4" water service line.

1) If one common meter is used, it should be located in the right-of-way. However, when a sidewalk exists, the meter may be located in a 2-foot easement adjacent to the right-of-way. In no case shall meters be located inside buildings.

2) The City will maintain all water connections within the street right-of-way at no charge to the property owner. Repairs on private property shall be the property owner's or customer's responsibility.

3) The Town's responsibility will end at the customer's side of the meter; any and all repairs beyond that point will be the responsibility of theContractor or home owner.

4) All home owners within the Town's corporate limits and attached to the Town's water system will be required to have a cutoff (either gate valve or butterfly valve installed within a cast iron or composite meter box for the water service on their side of the meter. The homeowner will maintain service lines outside the Town's meter box, and meter or valve boxes subject to vehicular traffic shall be H-20 traffic rated.

## SECTION 3-WATER MATERIAL STANDARDS

### 1. GENERAL MATERIAL REQUIREMENTS

Current specifications of the American Society for Testing Materials (ASTM), American Water Works Association (AWWA), Ductile Iron Pipe Research Association (DIPRA), American Association of State Highway and Transportation Officials (AASHTO), and the American National Standards Institute (ANSI) shall apply in all cases where the material is covered by an item in these specifications. All material used shall conform fully to these current standards or be removed from the job at the direction of the Public Works Director.

An independent testing laboratory shall test pipe specimens at such time as the Public Works Department may direct or as specified herein. Pipes not meeting these specifications will be ordered removed by the inspector, and such pipe shall be immediately removed from the job site and not transported to any portion of the project being constructed.

Detail or shop drawings of fire hydrants, valves, air release valves, tapping sleeves and tapping saddles, or any materials used for construction must be approved by the Public Works Department prior to installation.

These specifications are not to be considered proprietary in any way. When a particular brand is listed, it is only used as an aid in describing the type of material being requested.

### 2. MATERIALS – WATER MAIN AND FITTINGS

a. Water Mains

All water mains shall be pressure class or thickness class of either ductile iron or PVC pipe designed in accordance with AWWA Standard C-150 (ductile iron) or AWWA Standard C-900 & C-905 (PVC). The design shall be done for external and internal pressures separately, using the larger of the two for the design thickness.

Ductile Cast Iron Pipe:

Ductile cast iron pipe shall be centrifugally cast of ductile cast iron (Class 50) having a minimum tensile strength of 60,000 psi, a minimum yield strength of 42,000 psi, and a minimum elongation of 10 percent (Grade 60-42-10). It shall be

designed, manufactured, and conform to ANSI A21.50 and ANSI A21.51 (AWWA C151) - Current Standards for a minimum 150 psi operating pressure plus a minimum allowance of an additional 150 psi for a surge. Unless otherwise approved by the Public Works Director.

Nominal laying lengths shall be 18 to 20 feet nominal maximum of 20 percent of each size for each order being as much as 24 inches shorter than the nominal laying length and an additional 10 percent as much as 6 inches shorter than the nominal laying length.

Pipe joints shall be bell and spigot, push-on, gasketed type except where flanged ends are specifically required by the Plans.

Dimensions shall conform to the applicable requirements of ANSI A21.6, ANSI A21.8, ANSI A21.11, and WW-P-42 1C. Dimensions shall be gauged at sufficiently frequent intervals to assure dimensional control. Insides of sockets and outside of spigot ends shall be tested with circular gages.

Tolerances below the standard thickness of pipe and bell shall not exceed the following:

| **Size (inches)** | **Allow. Minus Tolerances (inches)** |
|---|---|
| 4 - 8 | 0.05 |
| 10 - 12 | 0.06 |
| 14 - 42 | 0.07 |

All pipes shall be tested at the factory in accordance with AWWA requirements for each type.

Each pipe shall be coated on the outside with a standard bituminous coating of either coal tar or asphalt base approximately one-mil thick. The coating shall be continuous, smooth, and strongly adherent to the pipe and shall not become brittle from cold or sticky from heat.

The interior surfaces of each pipe for water service shall be cement lined in accordance with ANSI 21.4, with a minimum thickness of 1/16-inch for 3 to 12-inch pipe and 3/32-inch for 14 to 24-inch pipe, and 1/8-inch for 30 to 48-inch pipe.

Each pipe shall be weighed prior to placing of the inside lining. Weight, nominal thickness, sampling period, and pipe class shall be shown on each pipe. The manufacturer's year of production and the letters DI or DUCTILE shall also be cast or stamped on the pipe. All markings shall be clear and legible and on, or near, the bell end.

Polyvinyl Chloride Pipe:

PVC pipe shall be rigid polyvinyl chloride with integrally formed, factory fabricated for rubber ring-type joints. It shall be suitable for all conditions imposed by Plan locations and for a minimum working pressure of 150-psi, plus an additional 150-psi surge allowance at 73 degrees F. The pipe shall be Type 1, Grade 1, made from clear virgin material, and shall conform to all requirements of AWWA Specifications C-900, Class 150. All pipes shall bear the manufacturer's name, specification, and class pipe. Each pipe length shall be 20-feet plus or minus 1-inch, or 38-feet plus or minus 1 inch except that random lengths may be furnished for special connections and other special uses. Unless otherwise approved by the Public Works Director.

Provisions must be made for expansion and contraction at each joint through the rubber gasket and pipe bell. Laying lengths shall be 20 feet 11 inches or 38-feet 1-inch, except that random lengths may be furnished for special connections and other special uses.

b. Fittings

All fittings shall be manufactured in accordance with AWWA C-110 or C-153 for ductile iron compact fittings. The fittings shall be tested, and the manufacturer shall provide certified test results when requested by the Town of Bunn. This testing shall include hydrostatic proof testing of the fittings.

All fittings shall be mechanical joints except for certain above-ground piping, which may require flange fittings. Mechanical joints shall be manufactured in accordance with AWWA Standard C-111.

All fittings shall be cast iron or ductile iron and shall have a minimum working pressure rating of 250 psi and minimum iron strength of 30,000 psi.

All fitting interiors shall be cement-mortar lined with a seal coat in accordance with AWWA Standard C-104, and the outside shall be bituminous coated.

Restrained mechanical glands may be used where restraint is needed, except when welded restraining rings are required. Restrained mechanical glands provide additional restraint but do not take the place of required concrete blocking.

Two (2) 45° bends shall be utilized for 90° turns of the water mains or branches. 90° bends are not allowed in the water distribution system without prior approval from the Town of Bunn Public Works Director.

All bends shall have concrete thrust blocks appropriately sized in accordance with the Town of Bunn standards.

c. Gate Valves

Cast iron or ductile iron resilient wedge style vertical or horizontal gate valves and tapping valves shall be used for all main line and hydrant branch valves in sizes from 6 inches through 24 inches. In accordance with AWWA C-509-94, C-515, or the appropriate AWWA standard as applicable, Mueller and Clow valves shall be used. All resilient wedge valves shall have an internal and external epoxy coating, O-ring seals at the stuffing box and bonnet to the body, and dual O-rings at the stem seal above the thrust collar.

Tapping valves shall be the same valves as gate valves listed above, subject to the standards, providing that tapping valves shall have the tapping ring.

Gate valves twelve (12) inches in diameter and smaller shall be mechanical joints. They shall be "O" rings; open-left valves of the non-rising stem type. These valves shall be designed for a minimum of 175-psi working pressure and 300-psi hydrostatic test pressure with a two (2) inch operating nut. Valves shall be cast iron or ductile iron. Gate valves 10-inches and larger shall have a by-pass.

Valves sixteen (16) inches in diameter or greater must be butterfly-type.

d. Valve Boxes

Adjustable screw-type valve boxes shall be class 35 gray cast iron and manufactured in accordance with ASTM A48. All castings must be domestically cast and indicated by the manufacturer's name and "USA" cast into all sections of the valve box. All castings must meet or exceed the AASHTO H-20 load rating.

e. Butterfly Valves

Butterfly valves sixteen greater than (16) inches in diameter shall be Class 150B and shall conform to the latest AWWA Standards C-504, as manufactured by Mueller, Kennedy, Pratt, or American for rubber-sealed butterfly valves and valve operating assemblies. "O" ring seals shall also be used exclusively with worm gear.

All valve end connections shall be mechanical joints or Victaulic®, as required by the detail drawings. Valve seats shall be stainless steel, bronze mating, or resilient material. The resilient seat shall be mechanically attached to the valve disc or mechanically retained in the valve body. The resilient seat shall be fully field-adjustable by mechanical means. The valve disc shaft shall be stainless steel or either stub or thru-shaft design. Shafts shall be provided with two-way disc thrusters that are fully adjustable from the outside. Valve shaft bearings shall be heavy-duty bronze, properly fitted into hubs integrally cast in the body of the valves.

All butterfly valve operators shall be worm gear type as manufactured by Philadelphia Gear Works, EPI, or approved equal. The valve operator shall be furnished with a two-inch square operating nut and be so mounted that the valve will open-left (counter-clockwise). The butterfly valve operator shall have AWWA

stops, be suitable for submersible service, and be sized in accordance with AWWA torque requirements for a full 150 B-rated valve.

The manufacturer of the butterfly valve shall be fully responsible for the satisfactory performance of the assembled valve and operator unit. The specified operators shall be factory mounted by the valve manufacturer and shipped to the job site as an operating unit. External painting, hydrostatic testing, travel stop adjustments, and crating for shipment shall be in complete compliance with the latest AWWA specification for butterfly valves.

f. Fire Hydrants

Hydrant Specifications. Hydrants shall be Medallion manufactured by Clow Valve Co. or Mueller and conform to the AWWA C502 with a minimum valve opening of 4-1/2-inches. Hydrants shall be furnished with a 4-1/2-inch steamer and double 2-1/2-inch hose connections with caps and chains, National Standard Threads, mechanical joint, 1-1/2-inch pentagonal operating nut, open left, painted fire hydrant red, bronze-to-bronze seating, a minimum 3-$V_2$ foot bury depth with a breakaway ground line flange and breakaway rod coupling.

The hydrant bonnet will be designed with a sealed oil or grease reservoir, O-ring seals, and Teflon thrust bearing furnished by Clow or Mueller. Fire hydrant caps shall be attached to the body of the fire hydrant with a minimum 2/0 twist link and heavy-duty, non-kinking machine chain.

Hydrants shall be open-left and have a six-inch hub-end or mechanical joint elbow. The 5-inch hydrant barrel shall be of sufficient length to provide a minimum of three and one-half feet of bury and be of the break-away impact type.

g. Air Release Valves

Air release valves shall be two-inch Crispin Pressure Air Valves, Model P 20, with a vacuum check unit, or two-inch Val-Matic, Model VM-45, with a vacuum check unit or equal as approved by the Public Utilities Director. These valves shall be suitable for 150 psi working pressure and designed to allow air to escape automatically while the main is in service and under pressure. The valve shall be housed in a Town of Bunn-approved eccentric manhole and shall be installed in accordance with standard water details for the Town of Bunn. Air release valve locations shall be approved by the Public Works Department as shown on the plans. The Engineer must field stake the air release location.

h. Tapping Sleeves and Tapping Saddles

Tapping sleeves shall be Mueller mechanical joint, Mueller Outlet Seal, American Uniseal, Kennedy Square Seal, Clow F5205 or F5207. 100% stainless steel sleeves may also be used, as manufactured by Rockwell, Romac, Ford, or JCM, provided all metallic parts of the sleeves shall be 100% stainless steel, including bolts. Ductile iron flanges may be included on sleeves or saddles. All sleeves shall have a minimum of 150 psi working pressure. All taps shall be machine drilled--no burned

taps will be allowed. The "pipe coupon" shall be tagged with the location and date and turned over to the Town prior to acceptance of the water main.

Tapping Saddles shall be equipped with a standard AWWA C-110-98 flange connection. Sealing gaskets shall be "O" ring type, high-quality molded rubber having an approximate seventy durometer hardness, placed into a groove on the curved surface of the tapping saddle. Straps shall be of Stainless steel. Saddles may be used for taps one-half the size of the main or less (i.e., an 8-inch tapping saddle for use on a 16-inch main). Unless otherwise approved by the Public Works Director.

i. Water Service Connections

Water service pipe for 3/4 - to 2-inch connections shall be CTS Poly Tubing or type "K" soft copper with no joints or couplings in the right-of-way. The fittings shall be NL-brass no lead compression type fittings on these water services.

All fittings and valves shall be manufactured in accordance with AWWA Standard C-800, the latest revision, and as further specified in these technical specifications.

Exception: Any brass part of the fitting or valve in contact with potable water shall be made of a "No-Lead Brass," defined for this specification as UNS Copper Alloy No. C89520 or C89833 in accordance with the chemical and mechanical requirements of ASTM B584 and AWWA C-800. This "No-Lead Brass" alloy shall not contain more than nine one-hundredths of one percent (0.09% or less) total lead content by weight.

Any Brass part of the fitting or valve not in contact with potable water shall be made of 85-5- 5-5 brass as defined for this specification as UNS Copper Alloy C83600 per ASTM B62, ASTM B584, and AWWA C-800.

All brass fittings and valves shall be certified by an ANSI-accredited test lab per ANSI/NSF Standard 61, Drinking Water Components – Health Effects, Section 8. Proof of certification is required. An ANSI-accredited test lab shall also verify the lead content of the wetted components in contact with potable water.

Brass fittings and valves shall comply with the United States Of America Safe Drinking Water Act and the U.S. Environmental Protection Agency (EPA).

All brass fittings and valves shall have the manufacturer's name or trademark permanently stamped or cast on it. Another marking identifying the "no lead" brass alloy, e.g., 'NL,' shall be cast or permanently stamped on the fitting or valve.

1 ½-inch and 2-inch taps may be made using a double strap saddle.

Corporation cocks for direct ¾" and 1" taps may not be used.

Mueller, or Ford, ball valve shall manufacture curb stops. All corporation stops and curb stops shall be bronze ball valves and shall be appropriate material to the

material corporation, and curb stops, as manufactured by Mueller or Ford, must have a complete ball valve with padlock wings and installed in the meter box.

Curb stops are required for 1 ½" and 2" meters and shall be located in the meter box on the street side.

Service saddles shall be double strapped with a neoprene "O" ring gasket attached to the body. The clamp shall have corporation cock threads.

For services greater than 2 inches, the water service pipe shall be 3, 4, 6, 8, or 12 inches in diameter. Cast iron or ductile iron fittings shall be used for these services. All taps will be made using the appropriate-sized sleeve and valve. On a "dry line," the connection will be made with a "Mechanical Joint TEE and Valve."

Coppersetters with dual check valves shall be 3/4 inch and 12 inches in height as manufactured by Ford or approved equal. All coppersetters shall have locking wings on the angle valve and be of the Ford angle check type and will be installed on all residential water services.

j. Meters

All water meters shall be the AMR type and compatible with the Town's drive-by reading system as specified by the Town of Bunn.

k. Meter Boxes and Vaults

All meter boxes shall be constructed of cast iron with cast iron lids. Fiberglass or ABS plastic meter boxes may be used with the approval of the Public Works Director.

Meter boxes shall not be placed within the sidewalk or asphalt unless no other alternatives are available and approval is obtained by the Public Works Director. Meter boxes installed in locations exposed to vehicular traffic shall be H-20 traffic rated.

l. Steel Encasement Pipe

Steel pipe for boring installations shall be high-strength steel, welded or smooth-wall seamless, manufactured in accordance with ASTM A252, and consisting of grade 2 steel.

The pipe shall be coated inside and outside in accordance with AWWA C203-97, ASTM standards, and any additional requirements of the N.C. Department of Transportation or the American Railway EngineeringAssociations' specifications if applicable. All encasement pipes must be approved by the appropriate controlling agency (i.e., NCDOT, RR, etc.) prior to ordering the material.

All carrier piping shall be slip joint ductile iron, and the inside diameter of the casing pipe shall not be less than 2-inches greater than the largest outside diameter

of the joints and couplings for carrier pipe less than 6" O.D., and 4" greater for carrier pipe 6" and larger. It shall, in all cases, be great enough to easily remove the carrier pipe without disturbing the casing pipe. The minimum steel casing size shall be as follows:

| *Nominal D.I. Carrier Pipe Dia. (Inches)* | *Steel Casing Minimum O.D. (Inches)* | *Min. Wall Thickness For Highways (Inches)* | *Min. Wall Thickness For Railroads (Inches)* |
|---|---|---|---|
| 3 | 8.625 | 0.250 | 0.250 |
| 4 | 10.750 | 0.250 | 0.250 |
| 6 | 12.0 | 0.250 | 0.250 |
| 8 | 16.0 | 0.281 | 0.312 |
| 10 | 20.0 | 0.312 | 0.312 |
| 12 | 24.0 | 0.312 | 0.375 |
| 15-16 | 30.0 | 0.406 | 0.406 |
| 18 | 30.0 | 0.406 | 0.500 |
| 20- 21 | 36.0 | 0.469 | 0.500 |
| 24 | 36.0 | 0.469 | 0.500 |
| 27 | 42.0 | 0.562 | 0.625 |
| 30 | 48 | 0.625 | 0.719 |
| 33-36 | 54 | 0.719 | 0.719 |

Both ends of the casing shall be mortared. Metal "spider" pipe alignment devices shall be installed in all casings with a minimum of two "spiders" per pipe joint one-fourth of the pipe joint length from both the bell and spigot ends.

## SECTION 4 - WATER CONSTRUCTION STANDARDS (Public and Private Systems)

The requirements contained in this section shall apply to water main installations constructed for the Public Works Department or for private developers who may or may not dedicate the water improvements to the Town of Bunn. All necessary construction permits must be obtained before construction may begin in accordance with North Carolina State Law.

Any Contractor performing work within the jurisdiction of the Town of Bunn shall have on each job site a copy of these specifications.

1. SCOPE OF WORK

a. TheContractor shall furnish all materials, equipment, and labor for excavation, installation, and backfilling of water mains and related appurtenances as shown on the plans. The Public Works Department shall conduct inspections on main extension projects.

b. It shall be theContractor's responsibility to notify the Public Works Departments at least forty-eight (48) hours in advance of beginning any construction work on any project. TheContractor must call the Public Works Department at (919) 496-2992,

and give the location, project name, individual's name, and company name, start date and indicate if it involves water extensions.

c. Contractor shall contact the Public Works department at (919) 496-2992 by 4:15 PM each day to notify where and what will be done the following day. Any work requiring construction observation outside of the normal workday, Monday-Friday, 8:00 a.m. to 5:00 p.m., will be charged to the Contractor/Owner at the current Town inspector's overtime rate.

d. If a developer, developer's engineer, orContractor proceeds with the water main installation prior to permit issuance, the Town of Bunn may require the work to be reinstalled, and the developer, engineer, orContractor shall be fully liable for all actions and costs, including prosecution by the Town of Bunn or the State for proceeding with installation prior to issuance of appropriate permit(s).

e. "Field changes" are not considered approved by the Public Works Department unless the inspector for the Town has initialed the construction drawings with the date of the change or unless revised plans have been submitted, reviewed, and approved. Therefore, the contractor that proceeds with construction prior to this approval is at his/her own risk.

## SECTION 5 - GENERAL TESTING REQUIREMENTS

The Town of Bunn may perform and shall require the contractor to perform such destructive and nondestructive testing as it deems necessary in order to inspect the materials and workmanship. These tests shall be in accordance with the procedures established by ASTM and AASHTO. The Town of Bunn shall reserve the right to modify the procedures in the testing ditch and backfill compaction.

## SECTION 6 - HANDLING AND STORAGE OF MATERIALS

a. TheContractor shall be responsible for the shipping and storing of all water materials. TheContractor shall replace any material which is damaged or defective.

b. The loading and unloading of all pipes, valves, hydrants, and other accessories shall be in accordance with the manufacturer's recommended practices. They shall at all times be performed with care to avoid any damage to the material.

c. TheContractor shall locate and provide the necessary storage areas for materials and equipment. If private property is being used for storage areas, then theContractor must have written consent from the owner. Without this written consent, all material and equipment shall be stored within the existing rights-of-way and easements of the project. Pipe may not be pre-strung along the job site; it must be delivered to and removed from the job site each day. In extenuating circumstances, when the inspector authorizes the pipe to remain on the project from one day to the next, the ends of the pipe must be sealed.

d. All materials, once on the job site, shall be stored in accordance with the manufacturer's recommendations.

e. All pipes shall be kept free of dirt and other debris. Any damage relating to the coating of the various materials for water mains shall be repaired in a manner approved by the Town of Bunn.

f. TheContractor shall be responsible for safeguarding and protecting all material and equipment stored on the job site. TheContractor shall be responsible for storing materials in a safe and workmanlike manner to prevent injuries during and after working hours until the project is complete.

## SECTION 7 - BARRICADES, SIGNS, AND STREET PROVISIONS

a. Signs, barricades, warning lights, guard rails, and flaggers shall be employed as necessary when construction endangers either vehicular or pedestrian traffic. These devices shall remain in place until the traffic may proceed normally again. TheContractor shall hold the Town of Bunn harmless for any damages or injuries caused by the construction of water mains.

b. Detours and all traffic control measures shall be set up and maintained by theContractor under the direction of the Town of Bunn and/or the North Carolina Department of Transportation. Notice must be given a week in advance of the detour so that necessary notification of the traveling public may be made. TheContractor will furnish all barricades, signs, lights, and other safety devices to protect his/her construction. TheContractor is in no way relieved of liability for providing this protection because others approve of the detour.

c. Construction work zone signs and signing procedures shall conform to the MUTCD and supplements and all applicable federal, state, and local codes. TheContractor shall be responsible for securing the necessary permits from the Town of Bunn and/or the State's Department of Transportation and Inspections for all work to be performed in the public right-of-way.

d. Access to homes and businesses shall not be blocked overnight without permission of the Town of Bunn. The Contractor is responsible for public safety and the school bus garage of street closures and detours.

## SECTION 8 - PROPERTY PROTECTION

Trees, fences, poles, and all other property shall be protected unless their removal is authorized. Any property not authorized for removal, but damaged by theContractor, shall be restored by theContractor to the owner's satisfaction.

## SECTION 9 - GENERAL CONSTRUCTION SAFETY

a. TheContractor and any subcontractors shall be fully responsible for total compliance with all federal, state, and local ordinances, laws, and regulations related to safe construction practices and to protect the employees' and the public's health and safety. The Town of Bunn assumes no responsibility for damage or injuries caused by the Contractor's actions.

b. The Contractor shall ensure that all Occupational Safety and Health Administration (OSHA) regulations and standards are followed during all phases of the construction project.

c. The Town of Bunn shall not be responsible for the Contractor's adherence to OSHA regulations and standards. However, the Town of Bunn may report known violations or unsafe practices to the appropriate enforcement agency.

d. TheContractor shall be required to furnish the safety equipment necessary to inspect the work, including ladders, gas detectors/oxygen sensors, blowers, etc.

## SECTION 10 - ENCROACHMENT CONTRACTS AND PERMITS

a. Prior to actual construction, the owner/engineer shall acquire the necessary encroachments from NCDOT when working within the rights-of-way of state system roads or highways. A copy of the encroachment permit shall be kept on the job site at all times.

b. The Owner/Engineer shall be responsible for securing all other local, state, and federal permits, bonds, and insurance required for the utility construction.

c. The Contractor must have an approved set of permitted construction plans and the Town of Bunn specifications on-site at all times.

d. The Contractor shall be properly licensed by the North Carolina Licensing Board for General Contractors. Verification of said license shall be required prior to beginning any work.

## SECTION 11 - PAVEMENT REMOVAL AND REPLACEMENT

a. All pavements to be removed shall be cut along straight lines with the appropriate saw-cut machine.

b. All cuts of Town of Bunn streets must be patched the same day with a temporary or permanent patch. Once work has been completed, all temporary patches shall be replaced with permanent ones. All work from patching shall be cleaned up at the same time of patching.

c, Pavement cuts shall be confined to maximum trench bottom width plus six inches on either side.

d. Asphalt compaction shall be done with gasoline or diesel-powered smooth drum asphalt roller.

e. Pavement cuts within NCDOT Right of Way shall not be performed without the proper encroachment permits on-site. All patching of NCDOT pavements shall conform to the approved on-site encroachment permit.

f. All repaved areas and new pavement will be proof rolled with a Town of Bunn inspector present during the test.

## SECTION 12 - VALVE OPERATIONS

a. No valve in the existing system shall be operated without following the procedure outlined below. Failure to comply with these requirements shall be grounds for suspension of pipe-laying operations until written assurance can be obtained from a company official that such noncompliance will not occur again. TheContractor should be aware that the Town of Bunn regards violations of these requirements as justifying punitive measures.

b. Notification procedures are as follows:

1) TheContractor shall notify the Public Works Department's Water Distribution Division at (919) 496-2992 to request the operation of any valves. At least forty-eight (48) hours' notice must be given to the Public Works Department, and at least forty-eight (48) hours notice must be given to each customer affected by a water cut-off. The owner is responsible for notifying the affected customers. All valve operations shall be done by Public Works Department personnel or supervised by the Town of Bunn inspector for a particular project. It is illegal for anyone other than a Town of Bunn employee to operate an existing water main valve unless accompanied by a Town of Bunn employee.

2) TheContractor shall provide the following information when calling the Water Distribution Division for valve operation:

(a) Name of person calling;
(b) Name of the company;
(c) Telephone number of the company;
(d) Location of valve
(e) Reason for requesting operation and whether to be closed or open;
(f) Time valve to be opened or closed, and
(g) Approximate time water line to be out of service.

c. Each time a contractor needs a valve operated, he/she shall again secure permission, following the steps outlined.

d. System valves shall be defined as any valve with main pressure against either gate face. Newly installed tapping valves and control valves to networks not yet accepted for service are considered system valves. Valves within a network still under construction are not considered system valves.

## SECTION 13 - CONSTRUCTION WATER

The Town of Bunn does not provide free or unmetered construction water for any construction project. Contractors are responsible for adequate construction water for their job sites. Contact Town Hall for the use of a hydrant meter. (919) 496-2992

**Note: Individuals caught using water unmetered and/or unauthorized by the Public Works Department will be prosecuted to the fullest extent of the law.**

## SECTION 14 EXCAVATION

a. Prior to any excavation or construction, theContractor shall call the North Carolina One-Call Center at 1-800-632-4949 or (811) 48 hours prior to digging; the contractor shall be responsible for the location of all existing utilities in the field. If help is needed in locating utilities operated by the Public Works Department, theContractor shall call the Public Works Department at (919) 496-2992.

b. Trench width shall be a minimum of twelve inches plus the outside diameter of the pipe and a maximum of twenty-four inches plus the outside diameter of the pipe unless OSHA requires additional trench width. Trench width shall be measured between the faces of the cut at the top elevation of the pipe bell.

c. Trench bottom conformation, where no special bedding is required, may be referred to herein as flat bottom, where the trench bottom is excavated slightly above grade and cut down to pipe grade by hand in the fine-grading operation. Where the trench bottom is inadvertently cut below grade, it shall be filled to grade with approved material and thoroughly compacted to 95% or use #57 or #67 stone to bring to grade.

d. The maximum length of the open trench shall be no more than three hundred feet unless approval is obtained from the Public Works Director.

e. TheContractor shall, at their own expense, keep all trenches free from water during the excavation to construct foundations, masonry, and water mains. The water shall be pumped out of the trench or build check dams to keep it out of the ditch so as not to cause injury to public health, private property, or the work in progress. Erosion control measures shall be utilized during this pumping.

f. In trenches where water is present, or dewatering is required, the trench shall be stabilized with #57 or #67 stone. When theContractor encounters material during trench excavation, at the opinion of the inspector, or Public Works Director, that is unsuitable (i.e., "muck"), this material shall be replaced with material that is considered suitable prior to the pipe laying operations. In this case, construction fabrics may be required to prevent the migration of side support away from the pipe.

g. Safety and convenience of the public necessitate that all work, including excavation, be done in such a manner as to cause minimum traffic interruption, both pedestrian and vehicular. Utilities, such as fire hydrants, valves, etc., shall be

accessible at all times. Gutters and drains shall be left open and clear at all times, and theContractor shall be responsible for all drainage around his work. Provisions shall be made to maintain vehicular traffic on all streets in which work is in progress, and suitable walkways shall be maintained for pedestrian travel.

h. Sheeting or bracing shall be used wherever necessary to prevent failure of the trench banks. All sheeting shall conform to AASHTO and OSHA safety standards. The decision of the Public Works Director or Engineer relative to bracing for the protection of property of the Town of Bunn shall be binding upon theContractor. The removal of sheeting shall be done in such a manner as to minimize the loss of friction between the backfill and trench walls.

## SECTION 15 - ROCK EXCAVATION

a. Rock shall be defined as that solid material that cannot be excavated, in the opinion of the Public Works Director or Engineer, by any means other than drilling and blasting, drilling and wedging, or boulders and broken concrete exceeding ½ cubic yard in volume. Rock shall be excavated to the same limits as earth excavation except that the trench shall be made 6- inches lower than the outer bottom of the pipe, and 6-inches shall be refilled with 6-inches of #57, #67, or select material and thoroughly compacted to the sub-grade level. All blasting shall be done under the supervision of the Town of Bunn Inspector or Engineer and subject to all applicable regulations. The Town of Bunn reserves the right to require the removal of rock by means other than blasting where any pipe or conduit is either too close to or so situated with respect to the blasting as to make blasting hazardous. Rock taken from the ditch shall immediately be hauled away and disposed of by theContractor.

b. Blasting procedures shall conform to all applicable local, state, and federal laws and ordinances. A blasting permit shall be obtained from the Town of Bunn Fire Marshal's Office prior to any blasting. The application shall be obtained 24 hours before blasting, and the Fire Marshal may specify the hours of blasting. TheContractor shall take all necessary precautions to protect life and property, including the use of an approved blasting mat where there exists the danger of throwing rocks or overburden. TheContractor shall keep explosive materials that are on the job site in special constructed boxes provided with locks. Failure to comply with this specification shall be grounds for suspension of blasting operations until full compliance is made. No blasting shall be allowed unless a galvanometer is employed to check cap circuits. Where blasting occurs within five hundred (500') feet of a utility, structure, or property damaged by vibration, concussion or falling rock, theContractor shall be required to take seismograph readings and keep a blasting log containing the following information: for each and every shot.

1) Date of the shot
2) Time of shot
3) Crew Supervisor
4) Number and depth of holes
5) Approximate depth of overburden
6) Amount and type of explosive used in each hole

6) Type of caps used (instant or delay)
7) The weather
8) Seismograph instrument and readings
9) Pre Blast Surveys

c. This blasting log shall be made available to the Public Works Director or Engineer upon request and shall be kept in an orderly manner. It shall be theContractor's responsibility to have adequate insurance to cover any damages resulting from blasting so as to hold the Town of Bunn harmless from any claims.

## SECTION 16 - TRENCH PREPARATION

a. Trench excavation shall conform to the line and depth shown on the plans. The trench shall be properly braced and drained so that workers may work therein safely and efficiently. When water is being pumped from the trench, the pump discharge shall follow natural drainage channels, drains, or storm sewers. In discharging trench water, it will be necessary to follow standard erosion control measures so as to minimize erosion and sedimentation. In no case may trench water or groundwater be pumped into or allowed to enter the sanitary sewer system.

b. The width of the trench may vary with the depth of cut and other conditions. The trench shall be in accordance with the dimensions set forth by OSHA.

c. The foundation for ductile iron shall be a firm and stable flat bottom trench with bell holes so that the pipe rests uniformly on the entire barrel length.

d. Pipe clearance in rock shall be a minimum of six inches below and on each side of the pipe for sized sixteen inches and less in diameter. For sizes larger than sixteen inches in diameter, the minimum clearance shall be nine inches below and on each side. Engineer to review (remove if rock excavation above is removed)

## SECTION 17 - PIPE INSTALLATION

a. All water pipes shall be installed in accordance with the requirements of AWWA Standard C-600-87.

b. Water pipe shall be laid to the line and grade shown on the plans, with all valves and hydrants located as shown on the plans.

c. Protection shall be afforded to all underground and surface structures using methods acceptable to the Public Works Director or Town's Engineer. TheContractor shall furnish this protection at theContractor's own expense.

d. Deviation from line and grade may be made only on revised plans upon approval by Public Works Department and identified on "as-builts" when such deviations arise from grade or line conflicts with existing utilities, structures, or other sources of conflict.

e. Subsurface explorations shall be made by the contractor at the direction of the Public Works Director or Engineer where it is necessary to determine the location of existing pipes, valves, or other underground structures.

f. The depth of the pipe cover, unless shown otherwise on the plans, shall be three feet above the top of the pipe. The depth of cover shall be measured from the established street grade or the surface of the permanent improvement to the top of the barrel of the pipe.

g. After the foundation has been properly graded, bedded when applicable, and the bell holes dug, the pipe and accessories shall be carefully lowered into the trench by approved methods. Under no circumstances shall the pipe or accessories be dropped or dumped into the trench. All damaged pipes and accessories shall be removed from the job.

h. Any pipe showing evidence of oil, tar or grease shall be permanently marked and removed from the job.

i. Laying of pipe and jointing of pipe shall be done according to the manufacturer's recommendation, with care being taken to provide a uniform bearing for the pipe. Bell and pipe spigot shall be cleaned and properly lubricated where a mechanical joint of a "push on" type joint is employed. No chlorine powder or tablets shall be put in the lines during installation.

j. Open ends of the pipe shall be plugged with a standard plug or cap when pipe laying is not in progress. Trench water shall not be permitted to enter the pipe.

k. Pipe cutting for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner in accordance with the manufacturer's recommendations and without damage to the pipe.

l. Bell ends will face the direction of laying unless otherwise directed by the Public Works Director or Engineer. For lines on an appreciable slope, the Public Works Director or Engineer may also require that bell ends face upgrade.

m. Maximum horizontal deflections for ductile iron pipe shall not exceed the manufactures recommended maximum deflection for an eighteen-foot joint of pipe:

n. When installing the water main, the horizontal separation between water and sewer shall be ten-feet. Suppose this separation cannot be maintained due to existing conditions. In that case, the only variation allowed is the water main in a separate trench with three feet of separation. The elevation of the water main is at least 24-inches above the top of the sewer, and both water and sewer must be Ductile Iron pipes for 10 feet in either direction on both pipes. All distances are measured from outside diameter to outside diameter.

o. When a water main crosses over a sewer main, there must be twenty-four inches of vertical separation. If the water main must go under the sewer main, both these lines

must be of ductile iron for a distance of ten feet on either side of the crossing with a twenty-four-inch vertical separation. Crossing other underground pipes requires a minimum of twenty-four inches of vertical separation. The Public Works Director must approve any changes in these clearances. All crossings within these vertical clearances shall be filled with #67 stone. All distances are measured from outside diameter to outside diameter.

p. When a water line passes over or under a storm sewer, a vertical separation of 18-inches shall be maintained.

q. Railroad crossings shall be made following all precautionary construction measures required by the railroad officials.

r. All water crossings under the state system roads shall be made in accordance with the requirements of the NC DOT as defined in their encroachment permits.

s. Where conditions are, in the opinion of the Town of Bunn Inspector, unsuitable for laying pipe because of weather or trench conditions, theContractor shall be required to cease work until the Town of Bunn Inspector gives permission for work to commence again, providing such conditions have been corrected.

## SECTION 18 - REACTION BLOCKING

a. The use of concrete thrust blocks shall securely anchor all fittings or components subject to hydrostatic thrust poured in place unless otherwise directed by the engineer.

b. material for reaction blocking shall be transit-mixed concrete. This concrete shall have a twenty-eight day compressive strength of 2500 psi. Any metal used to resist thrust which is not encased in concrete shall be "hot dipped" galvanized.

## SECTION 19 - BACKFILLING PIPE

a. Ductile iron pipe shall be backfilled with suitable native material. No rocks, boulders, or stone four inches or larger shall be included in the backfill for at least two feet above the top of the pipe.

b. All backfill shall be compacted in six-inch lifts measured from the pipe foundation upward. Backfill for the roadway shall be compacted to at least 95% of maximum soil density in those areas where the supporting capacity of the soil is of prime consideration. Any tests shall be conducted at the direction of the Town of Bunn Inspector, and theContractor will bear the cost of such tests. TheContractor shall then be required to submit satisfactory evidence that his ditch compaction meets the specifications.

c. Deficiency of backfill material shall be supplied by theContractor where this deficiency results from any cause other than the rejection of unsuitable backfill material (other than rock) by the Town of Bunn Inspector. In cases where the Town

of Bunn Inspector directs, theContractor shall dispose of unsuitable backfill material and provide suitable backfill material.

Where excavated material has been rendered unsuitable, either before or after excavation, by inclement weather or type of material, theContractor must correct the moisture or furnish replacement backfill material.

d. Backfilling shall not be allowed except with permission of the Town of Bunn Inspector. When a ditch is flooded or the weather is unsuitable, theContractor shall not backfill unless the Town of Bunn Inspector gives permission. No backfilling with frozen material shall be allowed.

## SECTION 20 - SETTING VALVES AND VALVE BOXES

a. Valves shall be set at locations shown on the plans, with care being taken to support the valve properly and accurately position the valve box over the operating nut. Where pavement is existing, the box shall be adjusted to the finished street grade, and a concrete pad two-feet square and six inches thick shall be poured around the box two inches from the top of the finished grade. When valves are located in the street right-of-way, but out of the pavement, the boxes shall be adjusted to finished grade, and a concrete pad two-feet square and six inches thick shall be poured around the box one-half inch from the top. When valves are located outside street rights-of-way, the boxes shall be at the finish grade, and a concrete block two-feet square and six inches thick shall be poured around the box at the grade line. Valve locations out of street rights-of-way shall be marked with a concrete valve marker. The exposed portion shall be placed so that a valve-operating tool can operate freely.

b. When a tapping sleeve and valve are being used, the valve, sleeve, and machine assembly shall be air tested to hold at 150 psi for a five-minute duration in the presence of the inspector prior to drilling or tapping the main. All tap coupons shall be given to the Town of Bunn inspector. The valve shall be in the closed position during the testing.

## SECTION 21 - SETTING FITTINGS

Fittings shall be set at locations shown on the plans, with care being taken to properly "bell-up" joints and support the body of the fitting. All dead-end lines shall be plugged with mechanical joint plugs or caps and be restrained.

## SECTION 22 - SETTING HYDRANTS

a. Hydrants shall be set plumb with a finish grade, measuring 18" from ground to center of the steamer cap. Hydrants shall be properly located on the right side of the road, with the pumper nozzle facing the closest curb. The back of the hydrant opposite the pipe connection shall be firmly blocked against the trench's vertical face with 1/3 cubic yard of concrete. Double bridle rods and collars shall be connected from the tee to the hydrant. Rods shall not be less than 5/8 inch diameter stock and coated with bituminous paint. A minimum of eight (8) cubic feet of stone

shall be placed around the drains. The backfill around the hydrants shall be thoroughly compacted. Hydrant installation shall be in accordance with the Town Ordinances or as directed by the Public Works Director. All hydrants will have individual controlling valves located no more than fifteen (15) feet from the hydrant.

b. Before a hydrant is set, all dirt and foreign matter shall be removed from the interior of the hydrant.

c. Hydrants shall be bagged to indicate "out of service" until all testing is complete and the mains are placed in service. Bags shall be large enough to cover the entire hydrant and shall be black in color. Bags shall be secured with duct tape at the hydrant's base and removed immediately after the hydrants are placed in service.

## SECTION 23 - SETTING BLOW-OFFS AND AIR-RELEASE VALVES

a. Blow-offs and drainage branches shall not be connected to any sewer, submerged in any stream, or be installed in any other manner that will permit back siphon into the distribution system. **Blow-offs are not permitted within the Town of Bunn without the permission of the Public Works Director or Town Engineer.**

a) All blow-offs to be installed with the effluent end at the Valve box finished grade height will have the threaded portion of the blow-off 1" below the final resting height of the cover bottom as to allow the connection of an extender to allow for water to be directed away from the blow-off point. * Blow-offs shall be permitted only when written permission is received from the Town of Bunn.

b) All air release valves and blow-offs shall be installed such that the Contractor can make provisions to get the flow of water to a natural drainage way.

c) All air release valves shall be installed either in a pre-cast concrete vault or pre-cast concrete manhole with CI frame and lid.

## SECTION 24 - SURFACE RESTORATION

a. All disturbed surfaces and property thereon shall be restored to a condition equal to that existing before construction begins. The Contractor shall maintain and be responsible for all ditches in paved streets, curbs, gutters, or sidewalks until the Contractor repaves the trench cuts. The Contractor, with permission of the Inspector, may place temporary or permanent asphaltic material in the cut. Asphalt compaction shall be done with a gasoline or diesel-powered smooth drum asphaltic roller.

b. All easements will be seeded with grass and left so they can be mowed by conventional mowers unless approved by the Public Works Department for rip-rap or other specified material. TheContractor shall guarantee a good uniform stand of

grass and shall reseed any bare or thin spots. TheContractor will be responsible for a one-year warranty on materials and workmanship.

## SECTION 25 - EROSION CONTROL

Erosion control measures shall be performed by theContractor, conforming to the requirements of and in accordance with plans approved by the State of North Carolina Department of Environmental Quality, North Carolina Sedimentation Control Commission, the Town of Bunn, and as per the erosion control plan portion of the construction drawings and these specifications. The sedimentation and erosion control plan and the permit shall remain on-site at all times. TheContractor shall not allow mud and debris to accumulate in the streets. Should theContractor pump water from trenches during construction, appropriate siltation preventative measures shall be taken prior to the entry into any storm drain or stream. All measures must be taken so that stormwater runoff does not go to the pipes or manholes of the utility system. The project Engineer shall approve all materials used for erosion control before theContractor's installation.

a. Temporary and permanent erosion control measures shall be shown on the plans. Temporary and permanent erosion control work shall be coordinated throughout the project to provide effective and continuous erosion control throughout construction and post-construction, which minimizes siltation of streams, lakes, reservoirs, other water impoundments, ground surface, or other property. Seeding and mulching shall be carried out immediately behind the construction.

b. Temporary erosion control measures shall include but not be limited to swaled easements, silt fences, crushed stone check dam devices, silt basins (sedimentation traps), mulching, earth berms, and rip-rap.

c. Permanent erosion control measures shall include but not be limited to swaled easements, rip rap, and seeding of disturbed areas.

d. Erosion and siltation shall be controlled on projects by using swales to control run-off and convey run-off to controlled discharge points, by silt fences, rip-rap, crushed stone, and earth berms to contain silt, with pipe culverts where major access or haul roads cross drainage ditches or streams, silt basins where pipelines cross drainage ditches or streams. Seeding and mulching will be performed as soon after pipe installation as possible. When temporary measures are removed after the completion of the project, the disturbed area must be stabilized, if necessary.

## SECTION 26 - MAINTAINING SERVICE

TheContractor shall maintain existing water services when replacing or extending water mains.

## SECTION 27 - GUARANTEE

TheContractor shall guarantee all material, equipment, and workmanship for a period of at least one year after final acceptance by the Town of Bunn. The Public Works Department is responsible for issuing final acceptance letters by the Town of Bunn.

## SECTION 28 - WETLAND/STREAM BUFFERS

Conditions of 401/404 permits shall be strictly followed to the satisfaction of the United States Army Corps of Engineers. All Tar-Pamlico Riparian buffers shall be maintained as required by the North Carolina Division of Environmental Quality.

## SECTION 29 - GENERAL WATER MAIN TESTING SEQUENCE

Water mains shall be tested in the following general sequence:

a) "Pigging" main (mains with gate valves)

b) Flush the main (all flush water shall be de-chlorinated using methods acceptable to the Town of Bunn Public Works Department);

c) Perform the hydrostatic tests;

d) Introduce the appropriate amount of chlorine by tapping the main;

e) Hold the chlorine solution in the main for at least twenty-four hours and no more than seventy-two hours;

f) Flush the main (all flush water shall be de-chlorinated using methods acceptable to the Town of Bunn Public Works Department);

g) Sample for the bacteriological tests; Contractor's expense) and

h) Water mains shall be placed into service within 48 hours of meeting bacteriological analysis requirements and after receipt of the Engineers Certification. If no activity is anticipated on water mains for the first 30 days after it is placed into service, theContractor shall notify the Town of Bunn Public Works Department at (919) 496-2992.

## SECTION 30 - PIGGING

All new mains with gate valves must be pigged with a polyethylene "pig," 5#/cubic foot density, at the conclusion of the installation.

The Contractor shall clean all new water mains installed in this project by using a flexible polyurethane swab ("pig"). The pig shall be of 5lb/cf density polyurethane of the proper size for the cleaned water mains. The pig shall be inserted into the pipe's first section and remain there until the construction of that line segment is completed. Cleaning shall be accomplished by propelling the pig down the water main by system pressure to the exit point as determined by the Contractor; the project inspector shall observe this process. After the pig exits the pipe, flushing shall be performed until the water is completely clear and the turbidity level is less than 1.0 NTU.

Cleaning of water mains with diameters larger than 12 inches or water mains that utilize butterfly valves shall be performed in the same manner, excepting that the Contractor will be required to pig the main from valve to valve or in a manner acceptable to the Engineer and the Owner.

## SECTION 31 - HYDROSTATIC TESTS

a. All main installations, including private distribution and fire lines to the buildings, shall be pressure tested between each mainline valve in accordance with AWWA C-600-87. The test shall be performed using a suitable pump and an accurate pressure gauge. Immediately upon completion of a section of the main, 150 psi (± 5 psi) of pressure shall be applied and held for two hours. The acceptable leakage rate shall not exceed .092 gallons per inch of pipe diameter per 1,000 feet of pipe per hour.

Failure of the water main to comply with the above acceptable leakage rate shall require the contractor to replace any defective materials to ensure a watertight installation. If it is deemed that the existing blow-off valve is the cause of failure, the party responsible for the water main extension shall also be responsible for adding a valve at that location and abandoning the existing valve. After correcting any inadequacies, the leakage rate will again be tested. This test shall be repeated until that portion of the main is brought to compliance with the permissible leakage rate.

b. Prerequisite conditions for inspection prior to testing shall be as follows:

1) Hydrants shall be properly located, operable, plumb, and at the correct elevation.

2) Valves shall be properly located, operable, and at the correct elevation. Valve boxes or manholes shall be centered over operating nuts, and the top of the box or manhole shall be at the proper elevation.

3) Lines shall be properly vented where entrapped air is a consideration.

## SECTION 32 - CHLORINATION/DISINFECTION

a. All additions or replacements to the water system, including fire lines and backflow prevention devices, shall be chlorinated before being placed in service. Such chlorination must take place under the supervision of an inspector.

b. Pipe subjected to contaminating materials shall be treated as directed by the Public Works Department or Engineer. A replacement shall be required if such treatment fails to cleanse the pipe. The Town of Bunn shall bear no portion of any cost sustained by theContractor in meeting this specification.

c. Chlorination of a completed line shall be carried out after completing the pressure test and in the following manner.

1) Taps will be made at the control valve at the upstream end of the line and all extremities of the line, including valves. These taps shall be located in such a manner as to allow sodium hypochlorite (HTH) solution to be fed into all parts of the line.

2) A solution of water containing high-test sodium hypochlorite (70%) available chlorine or chlorine gas solution shall be introduced into the line by regulated pumping at the control valve tap. The solution shall be of such a concentration that the line shall have a uniform concentration of 50 ppm total chlorine immediately after chlorination. The chart below shows the required quantity of 70% HTH compound to be contained in solution in each 1000-foot section of the line to produce the desired concentration of 50 ppm.

| **Pipe Size** | **Pounds High Test Hypochlorite (70%) Per 1000 Feet of Line** |
|---|---|
| 6" | 0.88 |
| 8" | 1.56 |
| 10" | 2.42 |
| 12" | 3.50 |
| 14" | 4.76 |
| 16" | 6.22 |
| 20" | 9.76 |
| 24" | 14.00 |
| 30" | 21.00 |
| 36" | 31.50 |
| 48" | 56.00 |

3) The HTH solution shall be circulated in the main by opening the control valve and systematically manipulating hydrants and taps at the line extremities. The HTH solution must be pumped in at a constant rate for each discharge rate so that a uniform concentration will be produced in the mains.

4) Services shall be sterilized by methods acceptable to the Public Works Director or Engineer, and theContractor shall have the same responsibility for laterals as for mains regarding bearing the full cost of any corrective measures needed to comply with bacteriological or other requirements.

5) HTH solution shall remain in lines for no less than twenty-four hours unless otherwise directed by the Public Works Director or Engineer.

6) Extreme care will always be exercised to prevent the HTH solution from entering existing mains.

## SECTION 33 - BACTERIOLOGICAL SAMPLING

a. Free residual chlorine shall be at least 10 ppm after twenty-four hours, or the Public Works Department or Engineer will require the lines to be re-chlorinated.

b. Mains will be flushed with a blow-off assembly of sufficient size to effectively clean the main. Flushing of lines may proceed after twenty-four hours, provided the free residual chlorine analysis is satisfactory. Flushing shall be continued until chlorine returns to the normal level. In times of water shortages or distribution main problems, the flushing operation may be delayed. The Public Works Department shall determine when flushing is allowable. The contractor shall advise the inspector prior to the chlorination and flushing so that the inspector can advise the Public Works Department of the construction location, size, and length of mains. All tests will be done in the presence of an inspector. Flushing will be for a short duration. Sufficient precautions must be taken to the satisfaction of the inspector to ensure that the impact of the water is absorbed and the water is conveyed without erosion or property drainage. All flush water shall be de-chlorinated using methods acceptable to the Town of Bunn Public Works Department.

c. After flushing is completed, the Public Works Department (or their designee) shall collect bacteriological analysis samples for each section of pipe between mainline valves. Sample point locations shall be determined by a representative of the engineer or owner.

   A custody seal shall be placed on each set of bacteriological bottles. A chain of custody form must be completed for the sample set(s) collected and delivered along with the sample(s). A certified lab will perform the bacteriological analysis.

d. Samples will be accepted between 8:00 AM and 12 NOON and 1 PM and 3:30 PM Monday through Thursday, excluding holidays. Special arrangements for samples to be accepted outside of this time frame may be made by calling the laboratory in advance.

e. If two successive bacteriologic tests fail, that section of the main shall be re-chlorinated by theContractor, and new tests performed prior to moving to the next section of the main.

## SECTION 34 - SERVICE CONNECTIONS

a. Taps shall be made only on a line under pressure and after the main has been tested and chlorinated. No taps on dry lines shall be allowed unless specific authorization from the Town of Bunn is obtained.

b. Taps shall be at an angle of forty-five degrees to a perpendicular plane through the center line of the pipe.

c. The maximum size of a tap shall be ½ the diameter of the mains using a tapping saddle.

d. Larger taps shall be made by using a tapping sleeve and resilient wedge gate valve.

e. No taps or services shall be made on the 24-inch or larger transmission mains.

f. Before any water services are installed, the main shall be thoroughly flushed using a flow velocity sufficient to scour the pipe interior.

g. Each meter setter shall be flushed before the installation crew proceeds to the next service installation.

## SECTION 35 - WATER MAIN AND SERVICE ABANDONMENT

a. Contractors abandoning water services shall turn off the corporation cock, and at least one foot of the remaining portion of the service shall be removed from the main toward the right-of-way line and disposed of properly.

b. Water main abandonment must be performed in accordance with a plan approved by the Public Works Department.

**Note:** Service and main abandonment require inspection by the Public Works Department at (919) 496-2992.

## SECTION 36 - SEALED AS-BUILT PLANS

Certified surveyed "As built" plans and profiles, sealed by a Professional Land Surveyor (PLS) and/or Professional Engineer (PE), shall be furnished to the Public Works Department by the Engineer upon completion and prior to acceptance of the public main by the Town of Bunn and completion of private systems. The surveyed "as built" plans shall have North Carolina Geodetic Survey grid coordinates to all meter boxes, valves, manholes, and mains, along with the depth information. The water permit number information must also be included. Surveyed "As built" plans of installed utilities shall be furnished to the Town of Bunn prior to issuance of the letter of acceptance. All service stubs shall be shown on the surveyed "as built" plans.

Certified surveyed "As-Builts" should be provided in a digital format and written. The digital file of utilities needs to show the overall water and sewer system layout along with the property or subdivision boundaries and connecting manhole. The water distribution system drawings should show mains sizes, materials, hydrants, valves, blow-off assemblies, and other relevant information (backflow preventers, air release valves, etc.). The digital file should be delivered in DXF format. If this is not possible, then DWG is an acceptable format.

## SECTION 37 - GENERAL ACCEPTANCE

In writing, the developer or his representative must notify the Public WorksDepartments' Inspector before installation and scheduling inspection. Once the project is complete, a punch list and inspection are scheduled, noting any deficient items. Once the deficient items are repaired and/or replaced to meet Town of Bunn standards and specifications, the

developer or his/her representative shall submit the following items to the Town of Bunn Public Works Department.

a. A Professional Engineer's certified statement of the cost of the public utilities installed.

b. A Professional Engineer's certified statement indicating that the work has been built in accordance with the approved set of construction plans.

c. A Release of Liens statement from the owner/developer stating that all materials and workmanship associated with the water main have been paid in full.

d. Certified surveyed "As-Built" plans and profiles shall be furnished by the engineer upon completion and prior to acceptance by the Town of Bunn as stated above.

e. The developer is responsible for ensuring a one-year written warranty to the Town of Bunn prior to issuance of the letter of acceptance.

f. The developer and/or engineer shall provide a recorded map to the Town of Bunn showing all public rights-of-way and easements.

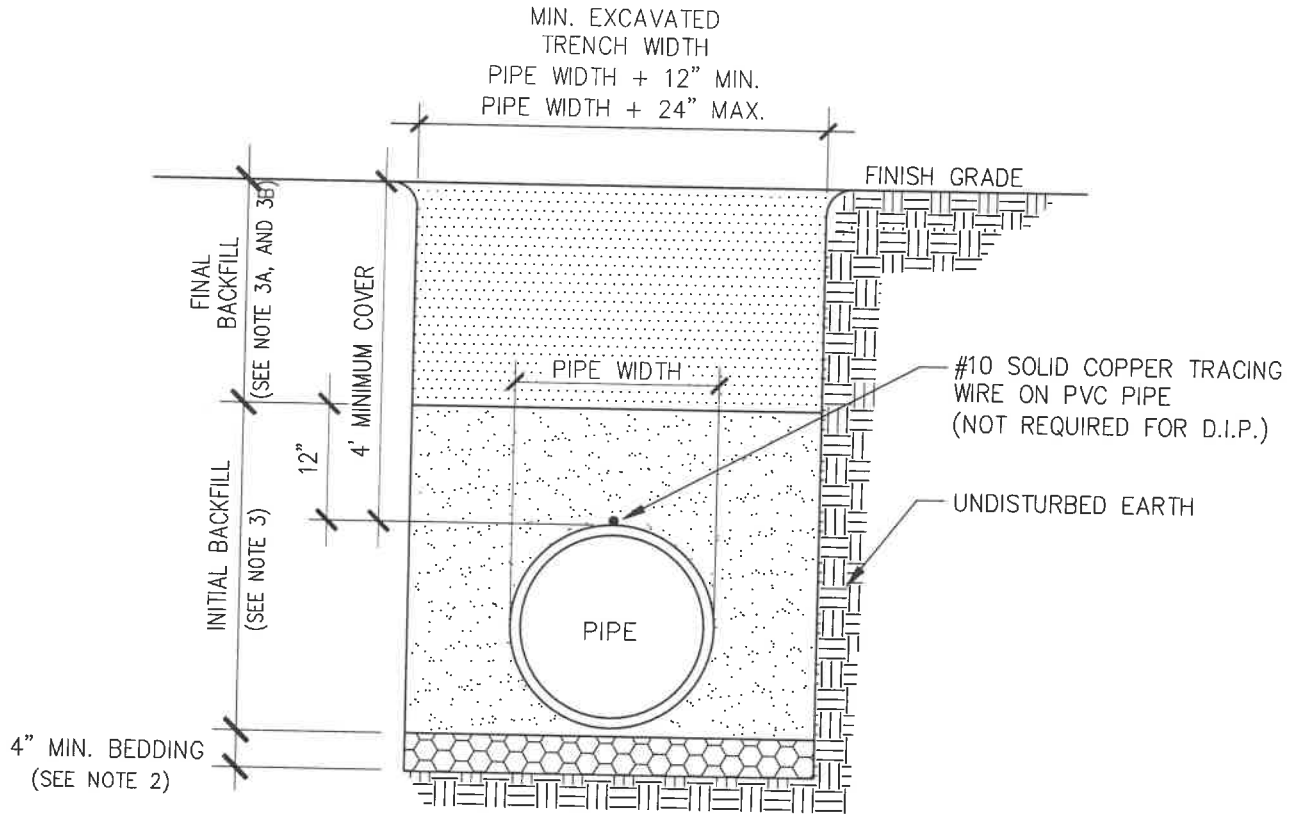
h. The engineer shall keep a copy of the "as-built" plans on file indefinitely.

i. A minimum of 2 (1 Paper copy and 1 Digital copy) (two) copies of "as-built" plans will be supplied to the Owner.

j. Prior to acceptance of the water system by the Town, a letter of credit from the owner will be required of 110% of the value until the one-year warranty period expires.

END OF SECTION

# Water System Details




NOTES:

1. LAYING CONDITIONS AS PER AWWA C-600 AND C-605 STANDARDS.
2. BEDDING MATERIAL SHALL BE 4" MINIMUM THICKNESS, LOOSE SOIL (DEFINED AS NATIVE SOIL EXCAVATED FROM THE TRENCH), FREE FROM ROCKS AND SHALL PROVIDE UNIFORM SUPPORT FOR THE FULL LENGTH OF THE PIPE. COMPACT TO 95% OF MAXIMUM DENSITY.
3. INITIAL BACKFILL SHALL BE LIGHTLY CONSOLIDATED IN MAXIMUM 6" LOOSE LIFTS, COMPACTED TO 95% OF MAXIMUM DENSITY.
   A. UNDER AREAS TO BE SEEDED OR SODDED, COMPACT SUCCEEDING LAYERS OF FINAL BACKFILL IN 12" LOOSE LIFTS TO 85% OF MAXIMUM DENSITY.
   B. UNDER STRUCTURES, PAVEMENTS AND ROAD SHOULDERS, COMPACT SUCCEEDING LAYERS OF FINAL BACKFILL IN 6" LOOSE LIFTS TO 95% OF MAXIMUM DENSITY EXCEPT COMPACT TOP 12" OF SUBGRADE TO 98% OF MAXIMUM DENSITY.
4. PROVIDE SOLID COPPER WIRE IN SUFFICIENT LENGTH FOR ALL BURIED PVC PIPING. AT VALVE BOXES, BRING WIRE TO WITHIN 6" OF THE TOP OF BOX AND INSERT INTO BOX THROUGH A DRILLED HOLE. NOT REQUIRED FOR D.I.P. ATTACH WIRE TO PIPE @ 4'-0" INTERVALS WITH CABLE TIES.

| DATE | BY | DESCRIPTION |
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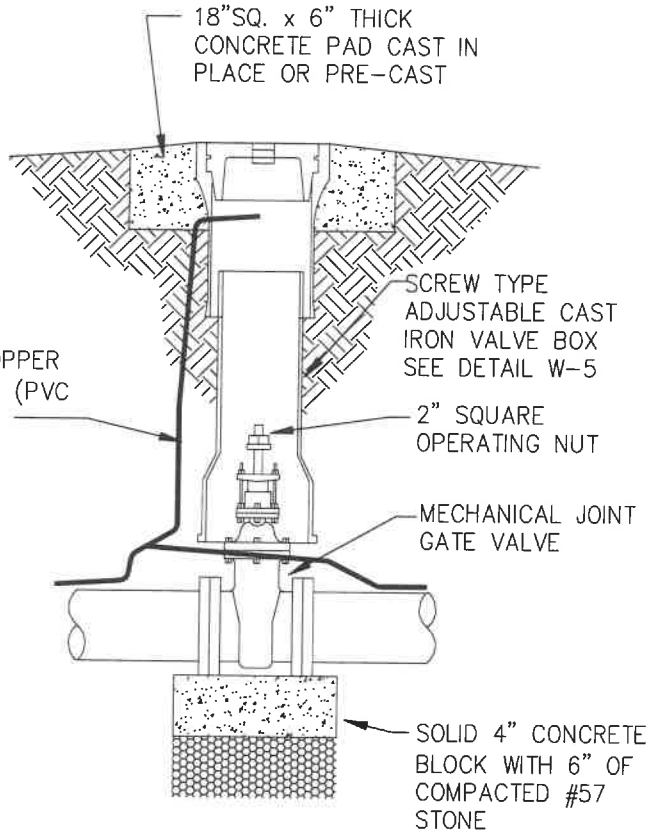
REVISIONS

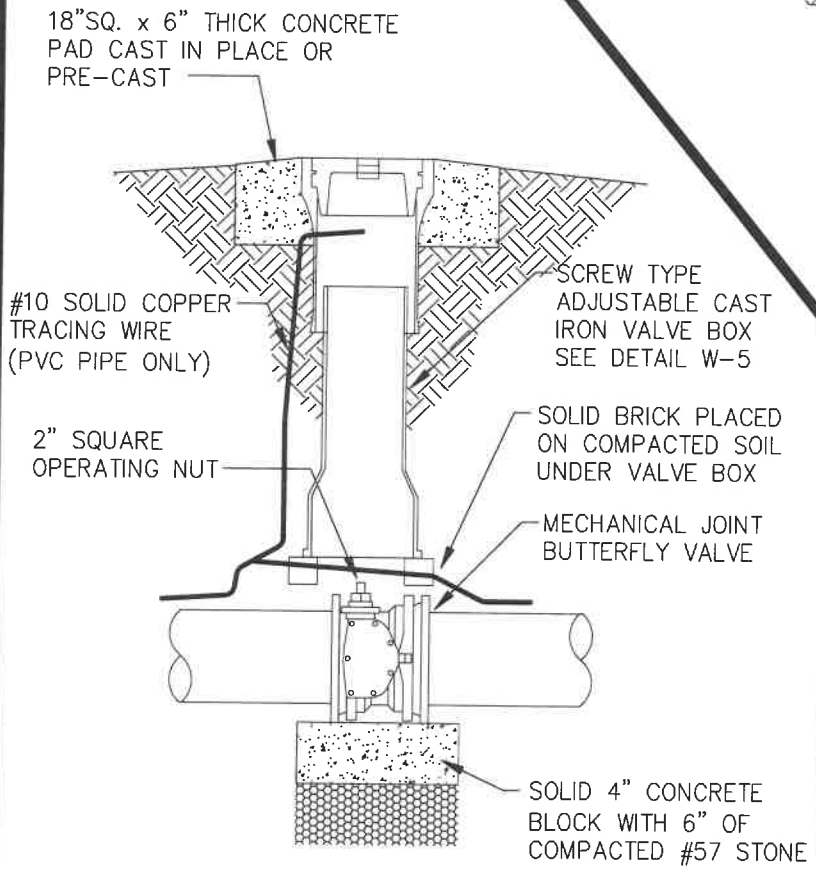
**TOWN OF BUNN PUBLIC WORKS**

WATER MAIN
TRENCH DETAIL

| SCALE | DRAWING # |
|---|---|
| N.T.S. | W-1 |




GATE VALVE ASSEMBLY




BUTTERFLY VALVE ASSEMBLY

NOTES:

1. INSTALL MARKER POSTS (DETAIL W-3) ON THE EDGE OF THE DOT RIGHT-OF-WAY LINE.
2. PROVIDE MARKER POSTS AT ALL LINE VALVES.
3. ABBREVIATION "MV" SHALL BE STAMPED ON POSTE TO INDICATE "MAIN VALVE".
4. BRING #10 SOILD COPPER TRACING WIRE (PVC PIPE ONLY) TO WITHIN 6" OF TOP OF VALVE BOX AND INSERT INTO BOX THROUGH DRILLED HOLE.

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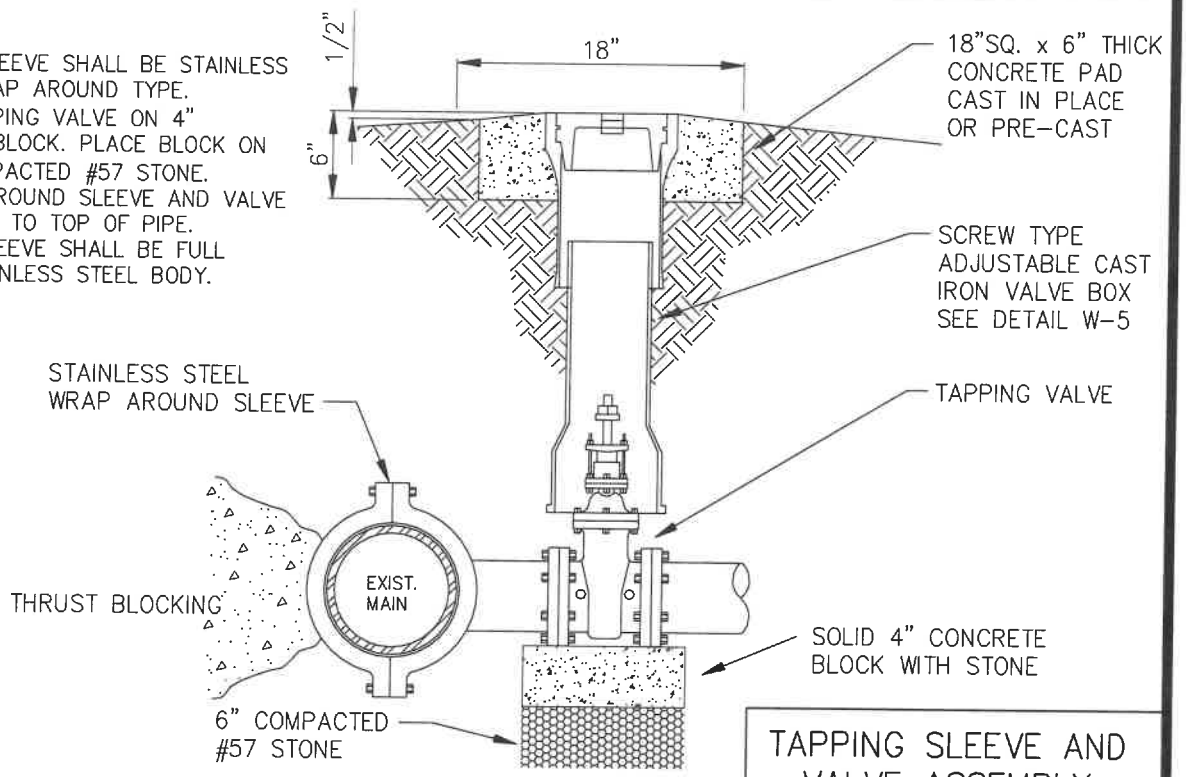
REVISIONS

**TOWN OF BUNN PUBLIC WORKS**

| GATE AND BUTTERFLY VALVE ASSEMBLY DETAILS | SCALE | DRAWING # |
|---|---|---|
| | N.T.S. | W-2 |

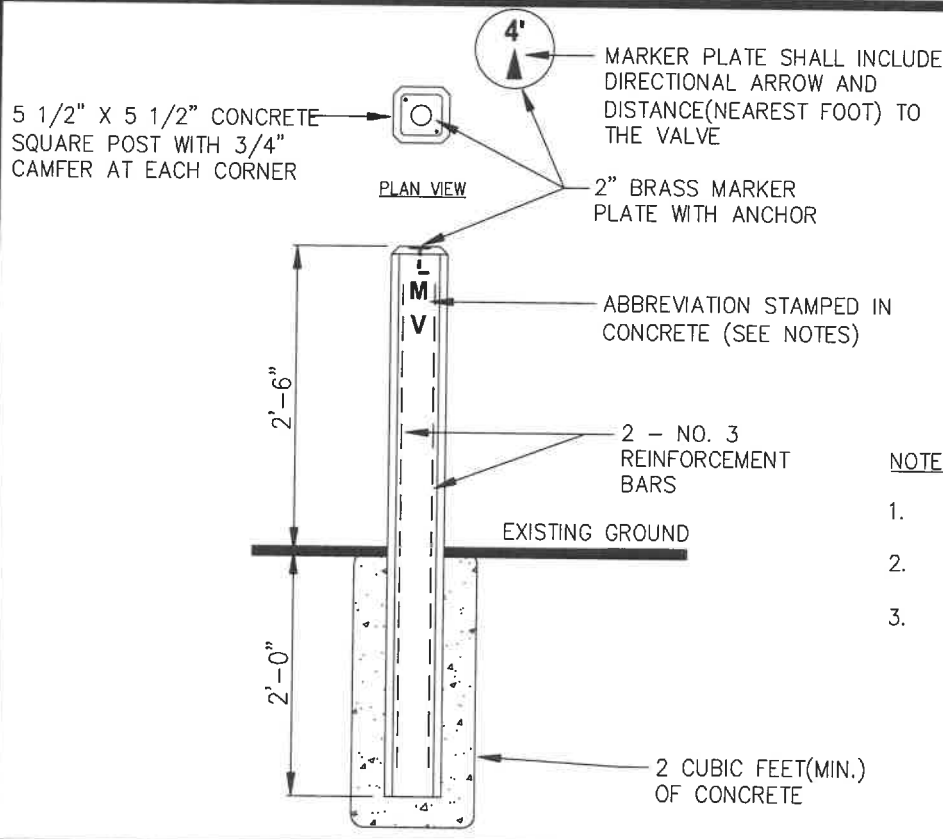
NOTES:

1. TAPPING SLEEVE SHALL BE STAINLESS STEEL WARAP AROUND TYPE.
2. PLACE TAPPING VALVE ON 4" CONCRETE BLOCK. PLACE BLOCK ON 6" OF COMPACTED #57 STONE. BACKFILL AROUND SLEEVE AND VALVE WITH STONE TO TOP OF PIPE.
3. TAPPING SLEEVE SHALL BE FULL CIRCLE STAINLESS STEEL BODY.




## TAPPING SLEEVE AND VALVE ASSEMBLY

## MARKER




NOTES:

1. INSTALL MARKER POSTS ON THE EDGE OF THE DOT RIGHT-OF-WAY LINE.
2. PROVIDE MARKER POSTS AT ALL LINE VALVES.
3. ABBREVIATION "MV" SHALL BE STAMPED ON POST TO INDICATE "MAIN VALVE".

| DATE | BY | DESCRIPTION |
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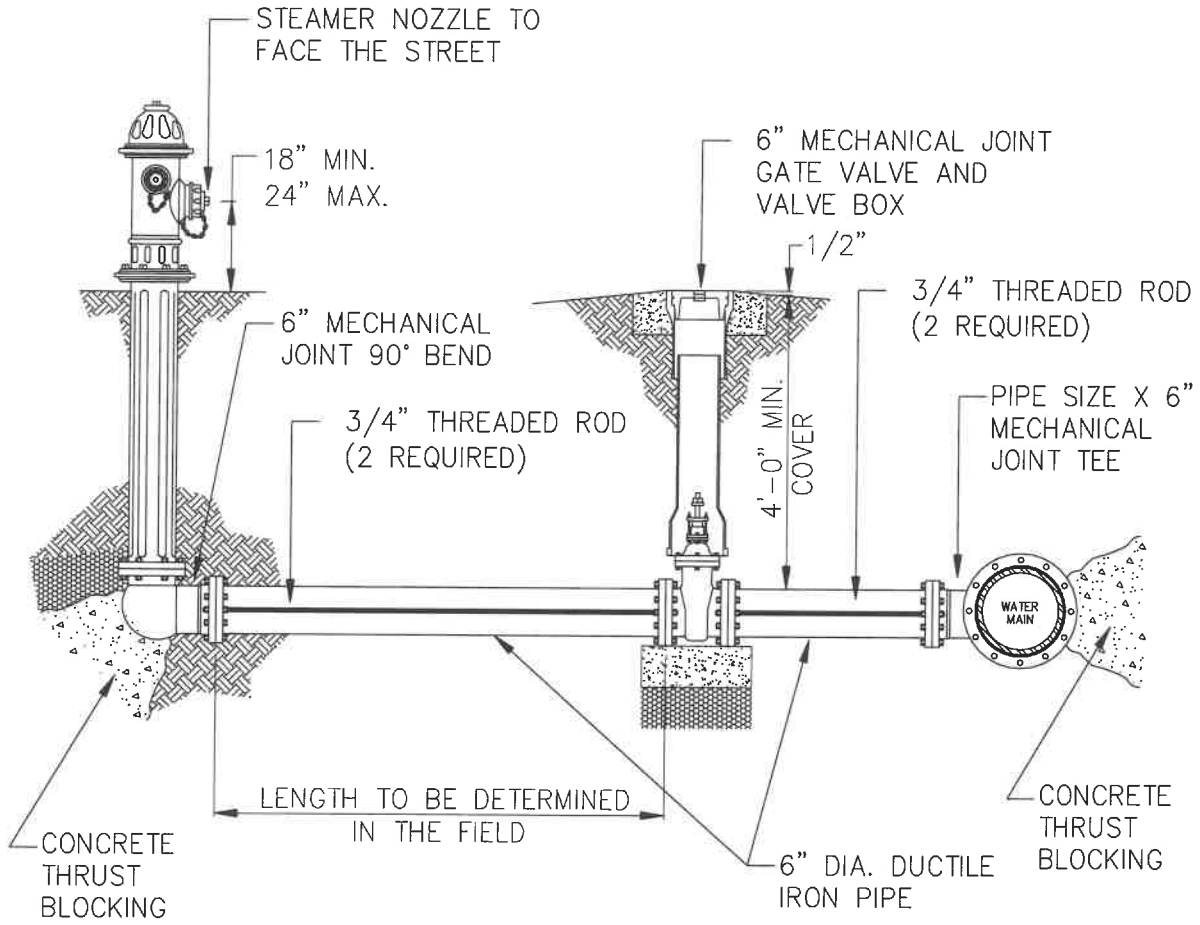
REVISIONS

**TOWN OF BUNN PUBLIC WORKS**

| TAPPING SLEEVE AND VALVE ASSEMBLY AND MARKER DETAIL | SCALE | DRAWING # |
|---|---|---|
| | N.T.S. | W-3 |




NOTES:

1. ALL PIPE JOINTS SHALL BE MECHANICAL RESTRAINED JOINTS.
2. ALL HYDRANTS SHALL BE PLACED AT THE PROPERTY LINES AS DIRECTED BY THE TOWN.
3. ALL HYDRANTS SHALL RECEIVE 2 SHOP COATS AND ONE FIELD COAT OF OSHA SAFETY COLOR RED AS DESCRIBED IN AWWA C-502. ALL NOZZLE CAPS AND BONNETT SHALL BE PAINTED WHITE, PAINT SHALL BE HIGH GLOSS ENAMEL.
4. FIRE HYDRANTS SHALL BE CLOW "MEDALLION", OR MUELLER.
5. APPT 2 COATS OD BITUMASTIC MATERIAL TO RODS OR PROVIDE GALVANIZED RODS.

| DATE | BY | DESCRIPTION |
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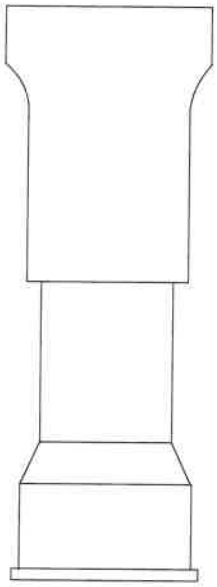
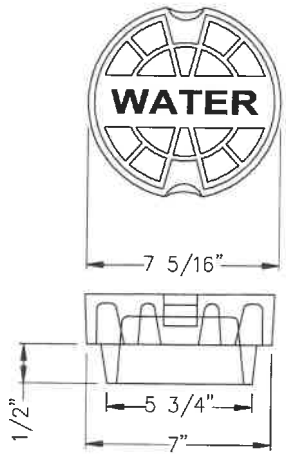
REVISIONS

**TOWN OF BUNN PUBLIC WORKS**

| STANDARD FIRE HYDRANT INSTALLATION DETAIL | SCALE | DRAWING # |
|---|---|---|
| | N.T.S. | W-4 |

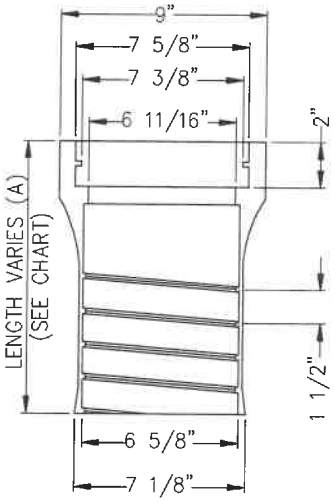


COMPLETE BOX

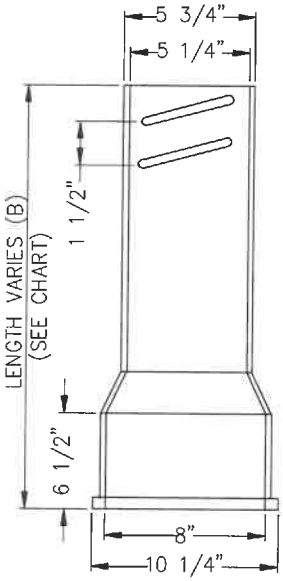



LID

| LENGTH (INCHES) | |
|---|---|
| A | B |
| 10 | 15 |
| 10 | 24 |
| 16 | 24 |
| 16 | 36 |
| 26 | 36 |
| 26 | 48 |
| 26 | 60 |




TOP




BOTTOM

NOTES:

1. VALVE BOX SHALL HAVE RAISED LETTERS "WATER" CAST INTO COVER.
2. VALVE BOX ACCOMMODATES 4" THROUGH 12" VALVES.
3. VALVE BOX SHALL HAVE 3/8" HOLE DRILLED IN TOP SECTION THROUGH WHICH A 1/4" X 1 1/2" GALVANIZED BOLT SHALL BE USED TO SECURE A #10 TRACER WIRE FOR NON-FERROUS PIPE. A 1/2" WASHER SHALL BE USED BETWEEN THE NUT AND INSIDE OF BOX, HAND TIGHTENED.
4. DIMENSIONS SHOWN ARE FOR INFORMATION ONLY AND VARY BASED ON THE MANUFACTURER.
5. CASTINGS SHALL BE MANUFACTURED IN THE U.S.A.

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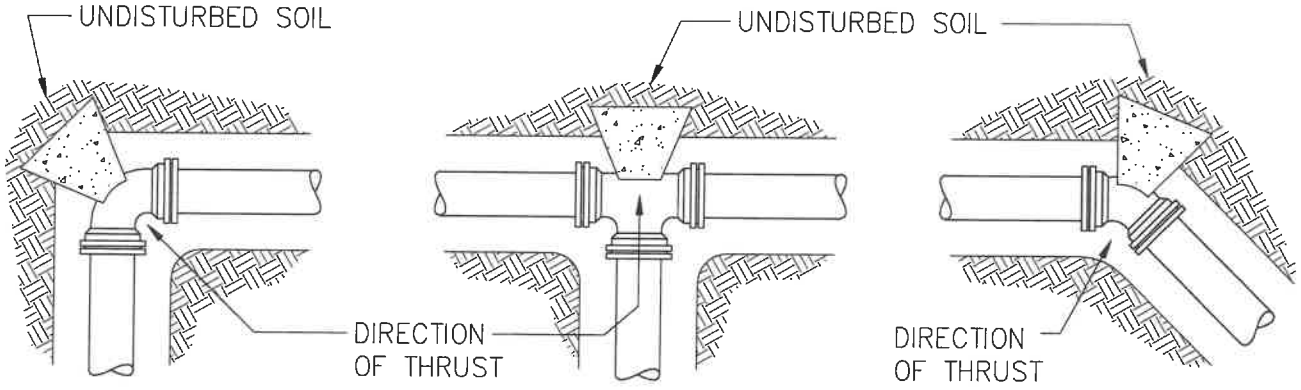
REVISIONS

**TOWN OF BUNN PUBLIC WORKS**

| SCREW TYPE VALVE BOX DETAIL | SCALE | DRAWING # |
|---|---|---|
| | N.T.S. | W-5 |



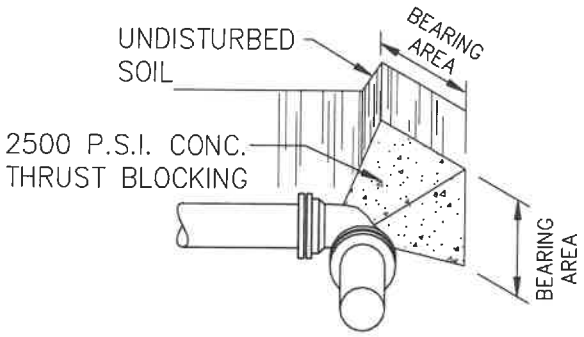

90° BEND

TEE

45° BEND

## NOTES

1. ALL BENDS AND TEES SHALL HAVE CONCRETE THRUST BLOCKING.
2. MINIMUM BEARING AREA SHALL BE AS GIVEN IN TABLE (SEE W-6, SHEET 2 OF 2).
3. CONCRETE SHALL BE 2500 P.S.I. MINIMUM.
4. CONCRETE SHALL NOT CONTACT BOLTS OR FLANGES OF MECHANICAL JOINT FITTINGS.




ISOMETRIC

| SHEET |
|---|
| 1 OF 2 |

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REVISIONS

**TOWN OF BUNN PUBLIC WORKS**

CONCRETE THRUST BLOCKING DETAIL

| SCALE | DRAWING # |
|---|---|
| N.T.S. | W-6 |

## REACTION BEARING AREAS FOR HORIZONTAL WATER PIPE BENDS

BASED ON TEST PRESSURE OF 200 P.S.I. AND SAFETY FACTOR OF 1.5

| SIZE AND DEGREE OF PIPE BEND | | STATIC THRUST IN POUNDS | $S_b$ | SOFT CLAY (#/SF) | SILT (#/SF) | GRAVEL OR COURSE SAND (#/SF) | SANDY SILT (#/SF) | SAND (#/SF) | SANDY CLAY (#/SF) | HARD CLAY (#/SF) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1,000 | 1,500 | 1,600 | 3,000 | 4,000 | 6,000 | 9,000 |
| | | | | BEARING AREA ($A_r$) IN SF | | | | | | |
| 6" PIPE | 11 1/4° | 1,462 | | 2 | 1 | 1 | 1 | 1 | 0 | 0 |
| | 22 1/2° | 2,911 | | 4 | 3 | 3 | 1 | 1 | 1 | 0 |
| | 45° | 5,710 | | 9 | 6 | 5 | 3 | 2 | 1 | 1 |
| | 90° | 10,550 | | 16 | 11 | 10 | 5 | 4 | 3 | 2 |
| | PLUG & BRANCH | 7,460 | | 11 | 7 | 7 | 4 | 3 | 2 | 1 |
| 8" PIPE | 11 1/4° | 2,521 | | 4 | 3 | 2 | 1 | 1 | 1 | 0 |
| | 22 1/2° | 5,018 | | 8 | 5 | 5 | 3 | 2 | 1 | 1 |
| | 45° | 9,843 | | 15 | 10 | 9 | 5 | 4 | 2 | 2 |
| | 90° | 18,187 | | 27 | 18 | 17 | 9 | 7 | 5 | 3 |
| | PLUG & BRANCH | 12,860 | | 19 | 13 | 12 | 6 | 5 | 3 | 2 |
| 10" PIPE | 11 1/4° | 3,791 | | 6 | 4 | 4 | 2 | 1 | 1 | 1 |
| | 22 1/2° | 7,546 | | 11 | 8 | 7 | 4 | 3 | 2 | 1 |
| | 45° | 14,802 | | 22 | 15 | 14 | 7 | 6 | 4 | 2 |
| | 90° | 27,351 | | 41 | 27 | 26 | 14 | 10 | 7 | 5 |
| | PLUG & BRANCH | 19,340 | | 29 | 19 | 18 | 10 | 7 | 5 | 3 |
| 12" PIPE | 11 1/4° | 5,363 | | 8 | 5 | 5 | 3 | 2 | 1 | 1 |
| | 22 1/2° | 10,675 | | 16 | 11 | 10 | 5 | 4 | 3 | 2 |
| | 45° | 20,940 | | 31 | 21 | 20 | 10 | 8 | 5 | 3 |
| | 90° | 38,693 | | 58 | 39 | 36 | 19 | 15 | 10 | 6 |
| | PLUG & BRANCH | 27,360 | | 41 | 27 | 26 | 14 | 10 | 7 | 5 |
| 14" PIPE | 11 1/4° | 7,206 | | 11 | 7 | 7 | 4 | 3 | 2 | 1 |
| | 22 1/2° | 14,343 | | 22 | 14 | 13 | 7 | 5 | 4 | 2 |
| | 45° | 28,135 | | 42 | 28 | 26 | 14 | 11 | 7 | 5 |
| | 90° | 51,986 | | 78 | 52 | 49 | 26 | 19 | 13 | 9 |
| | PLUG & BRANCH | 36,760 | | 55 | 37 | 34 | 18 | 14 | 9 | 6 |
| 16" PIPE | 11 1/4° | 9,319 | | 14 | 9 | 9 | 5 | 3 | 2 | 2 |
| | 22 1/2° | 18,549 | | 28 | 19 | 17 | 9 | 7 | 5 | 3 |
| | 45° | 36,386 | | 55 | 36 | 34 | 18 | 14 | 9 | 6 |
| | 90° | 67,232 | | 101 | 67 | 63 | 34 | 25 | 17 | 11 |
| | PLUG & BRANCH | 47,540 | | 71 | 48 | 45 | 24 | 18 | 12 | 8 |
| 18" PIPE | 11 1/4° | 11,707 | | 18 | 12 | 11 | 6 | 4 | 3 | 2 |
| | 22 1/2° | 23,302 | | 35 | 23 | 22 | 12 | 9 | 6 | 4 |
| | 45° | 45,708 | | 69 | 46 | 43 | 23 | 17 | 11 | 8 |
| | 90° | 84,457 | | 127 | 84 | 79 | 42 | 32 | 21 | 14 |
| | PLUG & BRANCH | 59,720 | | 90 | 60 | 56 | 30 | 22 | 15 | 10 |
| 20" PIPE | 11 1/4° | 14,365 | | 22 | 14 | 13 | 7 | 5 | 4 | 2 |
| | 22 1/2° | 28,592 | | 43 | 29 | 27 | 14 | 11 | 7 | 5 |
| | 45° | 56,086 | | 84 | 56 | 53 | 28 | 21 | 14 | 9 |
| | 90° | 103,634 | | 155 | 104 | 97 | 52 | 39 | 26 | 17 |
| | PLUG & BRANCH | 73,280 | | 110 | 73 | 69 | 37 | 27 | 18 | 12 |
| 24" PIPE | 11 1/4° | 20,493 | | 31 | 20 | 19 | 10 | 8 | 5 | 3 |
| | 22 1/2° | 40,789 | | 61 | 41 | 38 | 20 | 15 | 10 | 7 |
| | 45° | 80,011 | | 120 | 80 | 75 | 40 | 30 | 20 | 13 |
| | 90° | 147,842 | | 222 | 148 | 139 | 74 | 55 | 37 | 25 |
| | PLUG & BRANCH | 104,540 | | 157 | 105 | 98 | 52 | 39 | 26 | 17 |

REACTION BEARING AREAS ARE IN SQUARE FEET MEASURED IN A VERTICAL PLANE IN THE TRENCH SIDE AT AN ANGLE OF 90 DEGREES TO THE THRUST VECTOR.

USE 6"–90 DEGREE BEND VALUE FOR THE HYDRANTS FOR ADDITIONAL SAFETY FACTOR.

SHEET 2 OF 2

| DATE | BY | DESCRIPTION |
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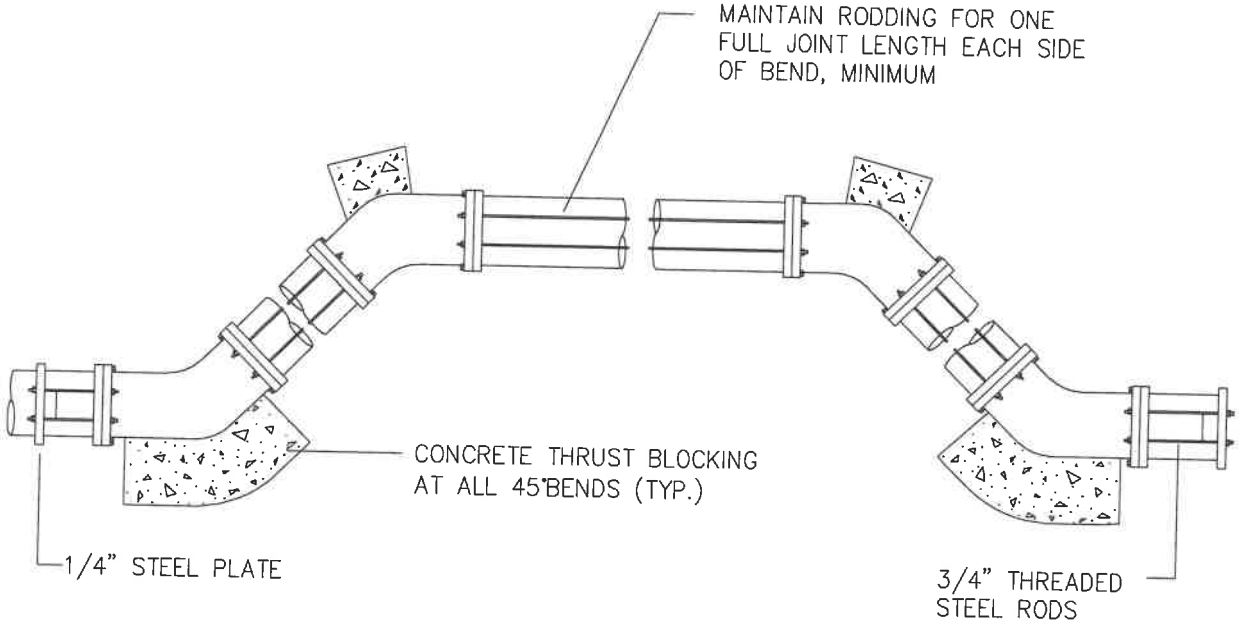
REVISIONS

# TOWN OF BUNN PUBLIC WORKS

CONCRETE THRUST BLOCKING DETAIL

| SCALE | DRAWING # |
|---|---|
| N.T.S. | W–6 |




ROD REQUIREMENTS

| SIZE OF 45° BEND | STATIC THRUST IN POUNDS | NO. OF RODS REQUIRED |
|---|---|---|
| 6" | 4,328 | 2 |
| 8" | 7,694 | 2 |
| 12" | 17,312 | 2 |
| 16" | 30,779 | 4 |
| 20" | 48,091 | 6 |
| 24" | 69,252 | 8 |

NOTES:

1. ONCE INSTALLED AND TIGHT, THE STEEL RODS AND BOLTS SHALL BE COATED WITH 2 COATS OF BITUMINOUS BASE PAINT.
2. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL BENDS.

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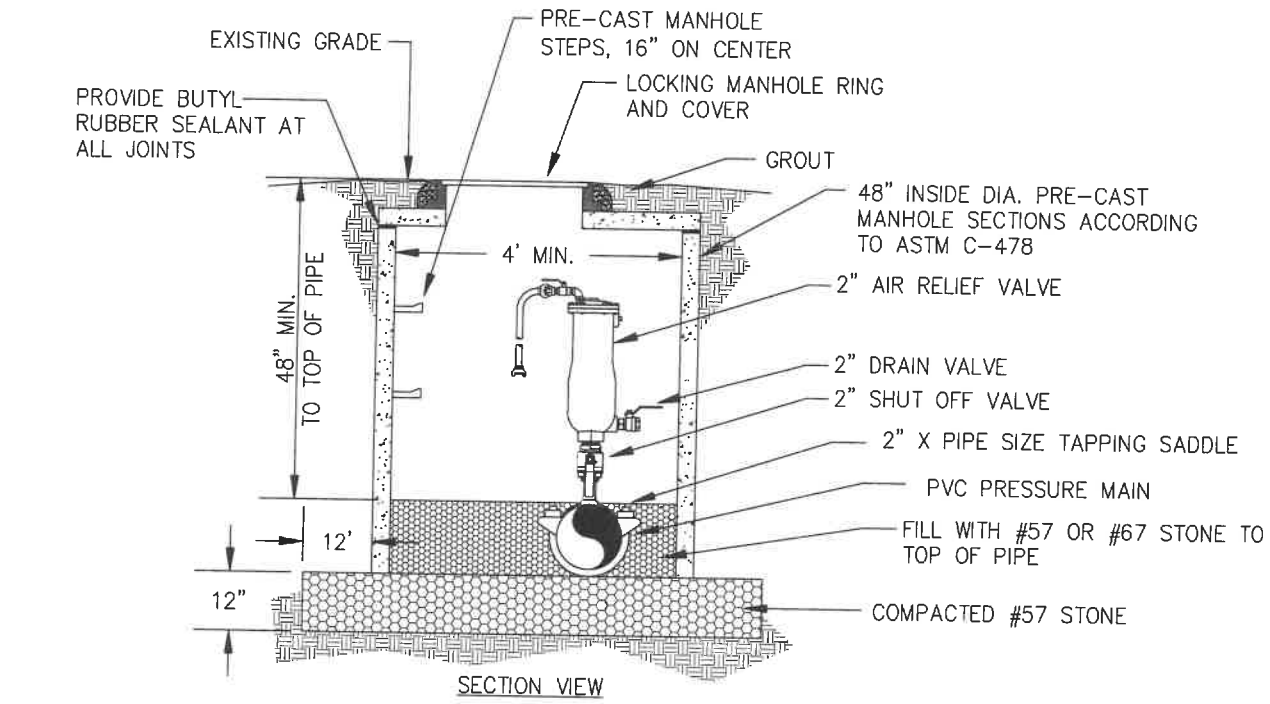
REVISIONS

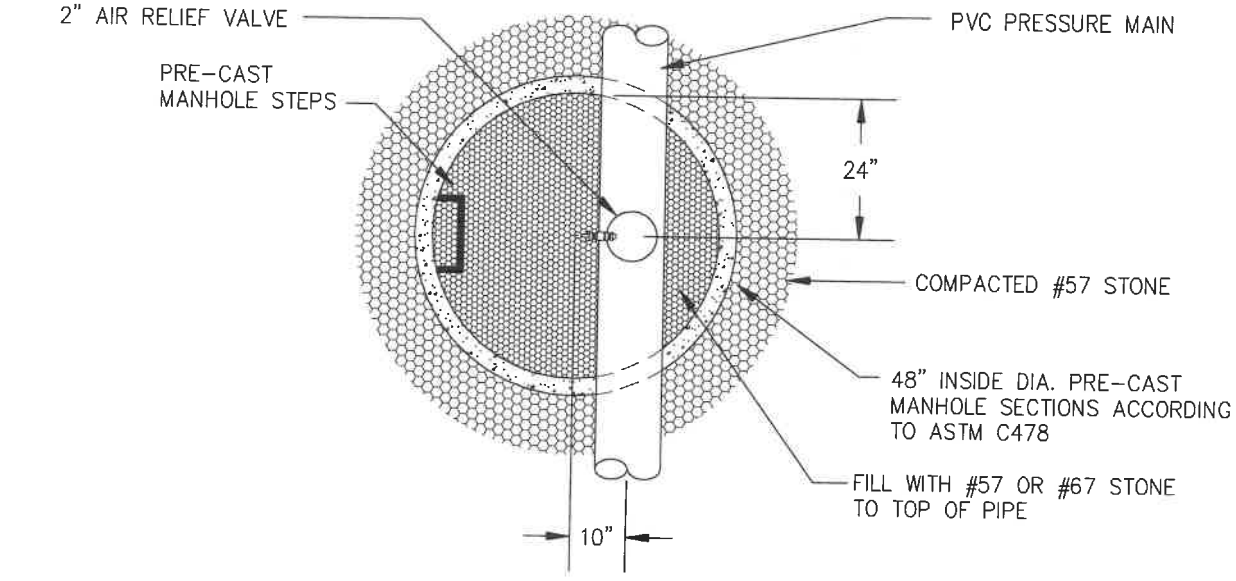
**TOWN OF BUNN PUBLIC WORKS**

VERTICAL BENDS DETAIL

| SCALE | DRAWING # |
|---|---|
| N.T.S. | W-7 |




SECTION VIEW




PLAN VIEW

| DATE | BY | DESCRIPTION |
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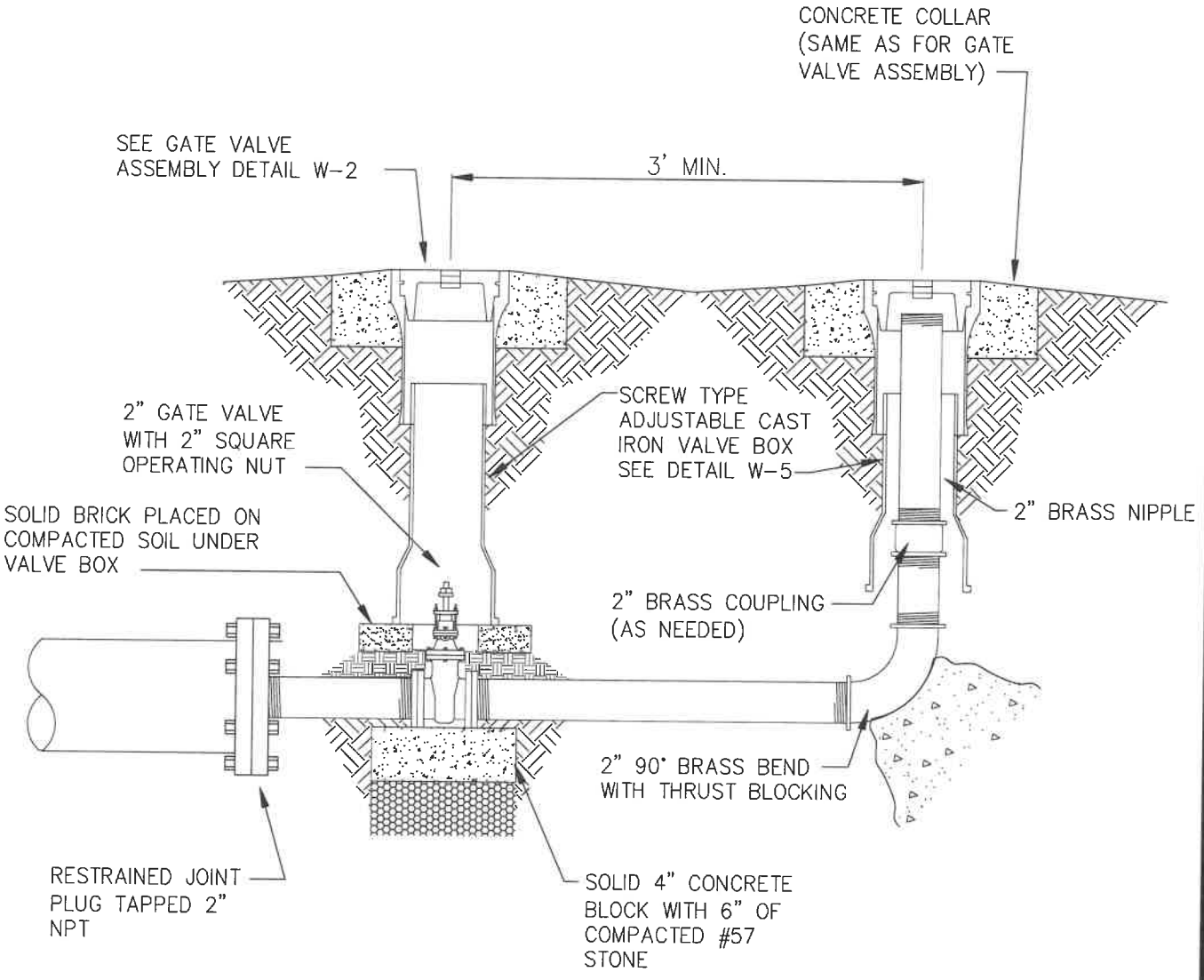
REVISIONS

# TOWN OF BUNN PUBLIC WORKS

AIR RELIEF VALVE ASSEMBLY DETAIL

| SCALE | DRAWING # |
|---|---|
| N.T.S. | W-8 |




NOTE:

THIS OPTION IS NOT ALLOWED WITHOUT PERMISSION OF THE TOWN OF BUNN

| DATE | BY | DESCRIPTION |
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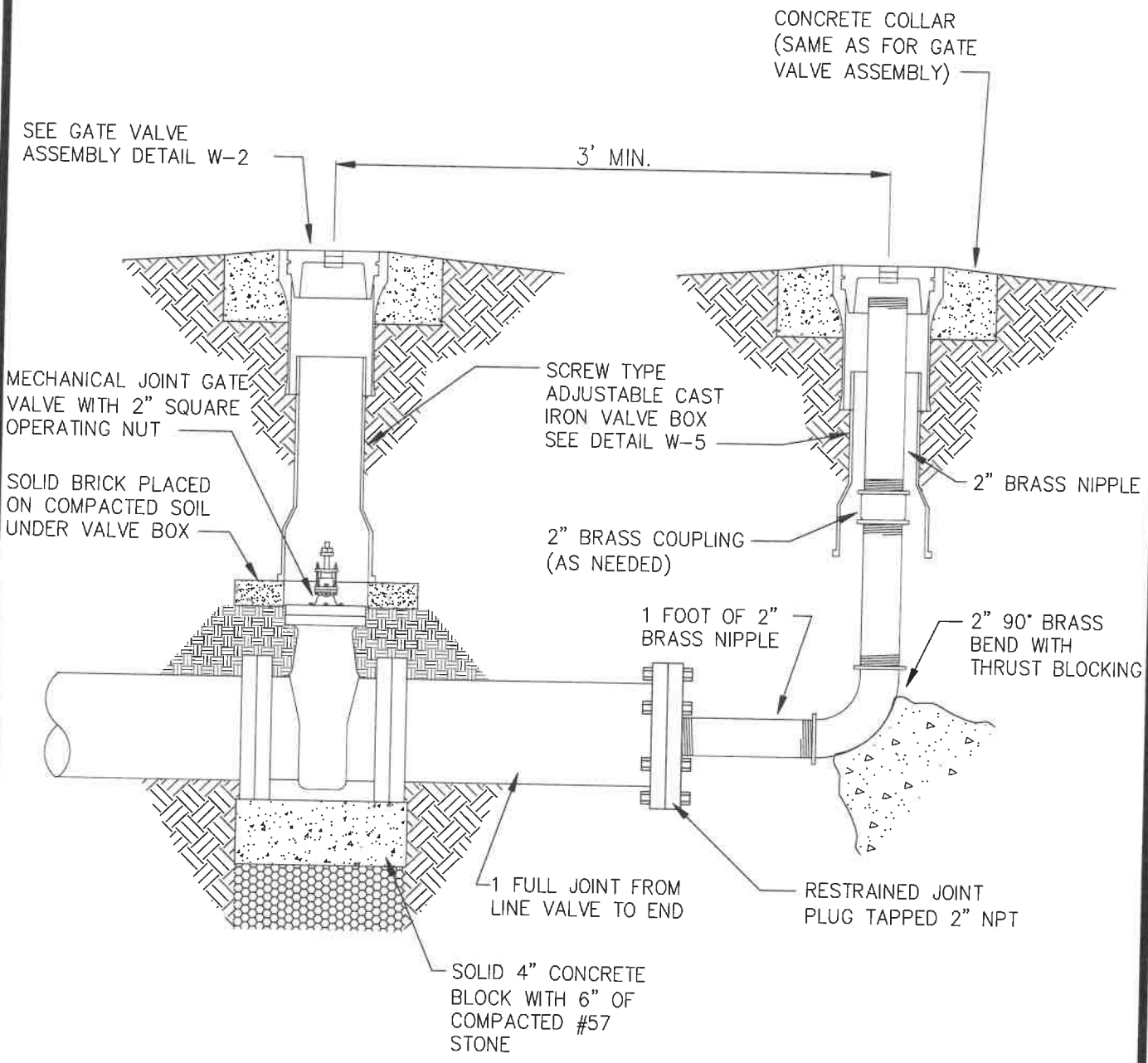
REVISIONS

**TOWN OF BUNN PUBLIC WORKS**

| 2" PERMANENT BLOW-OFF ASSEMBLY DETAIL | SCALE | DRAWING # |
|---|---|---|
| | N.T.S. | W-9 |

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REVISIONS

**TOWN OF BUNN PUBLIC WORKS**

2" TEMPORARY BLOW-OFF ASSEMBLY DETAIL

| SCALE | DRAWING # |
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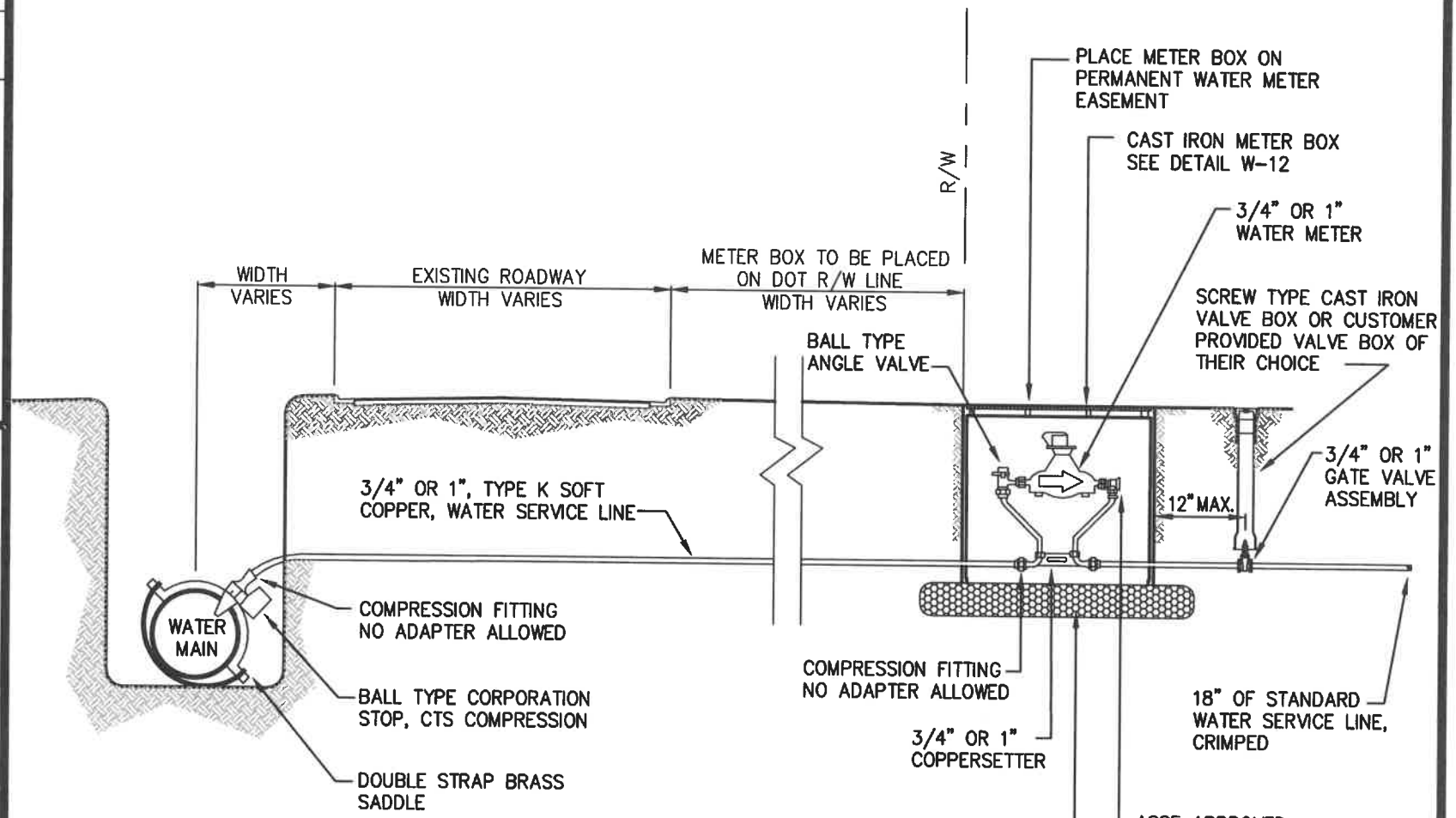
| N.T.S. | W-10 |




NOTES:

1. DOUBLE STRAP BRASS SADDLE REQUIRED FOR PVC PIPE.
2. DUCTILE IRON PIPE MAY BE DIRECT TAPPED.
3. ALL FITTINGS CTS COMPRESSION TYPE.
4. METERS SHALL BE 3/4" OR 1", AND REGISTER IN U.S. GALLONS.

REVISIONS

| DATE | BY | DESCRIPTION |
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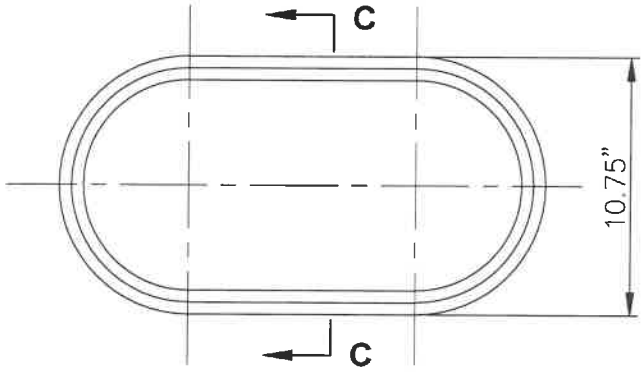
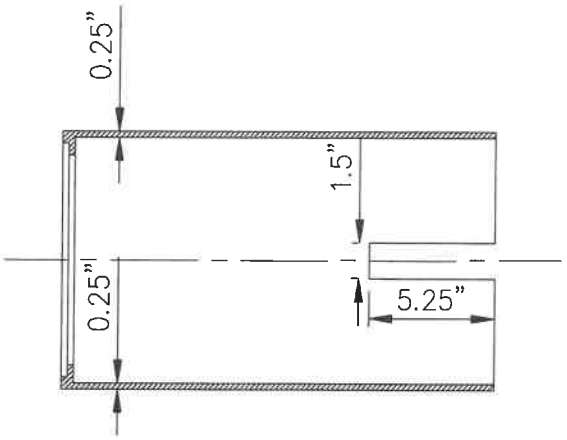
TOWN OF BUNN PUBLIC WORKS

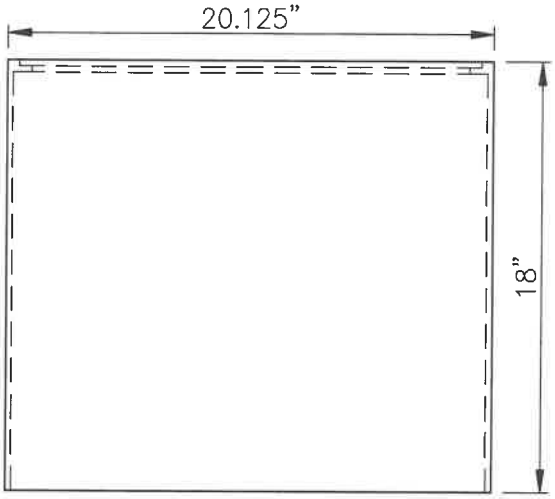
3/4" OR 1" RESIDENTIAL SERVICE CONNECTION DETAIL

| SCALE | DRAWING # |
|---|---|
| N.T.S. | W-11 |

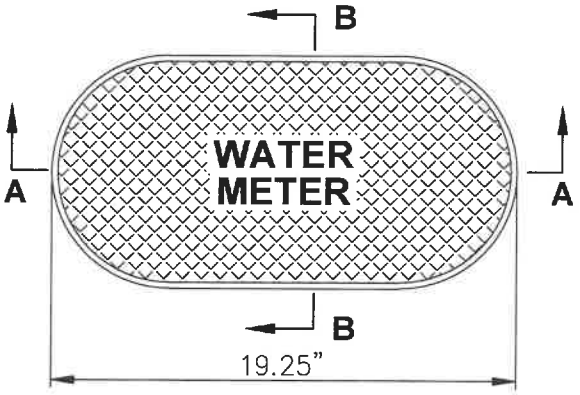


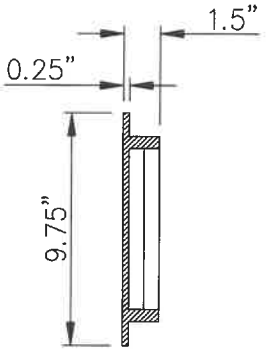




SECTION C–C

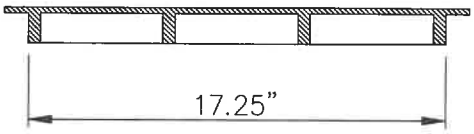



| MINIMUM AVERAGE WEIGHT | |
|---|---|
| FRAME | 50 LBS. |
| COVER | 20 LBS. |




SECTION B–B




SECTION A–A

NOTES:

1. ALL CASTINGS SHALL BE MANUFACTURED IN THE U.S.A.
2. FIBERGLASS BOX MAY BE USED, AS APPROVED BY THE TOWN.

| DATE | BY | DESCRIPTION |
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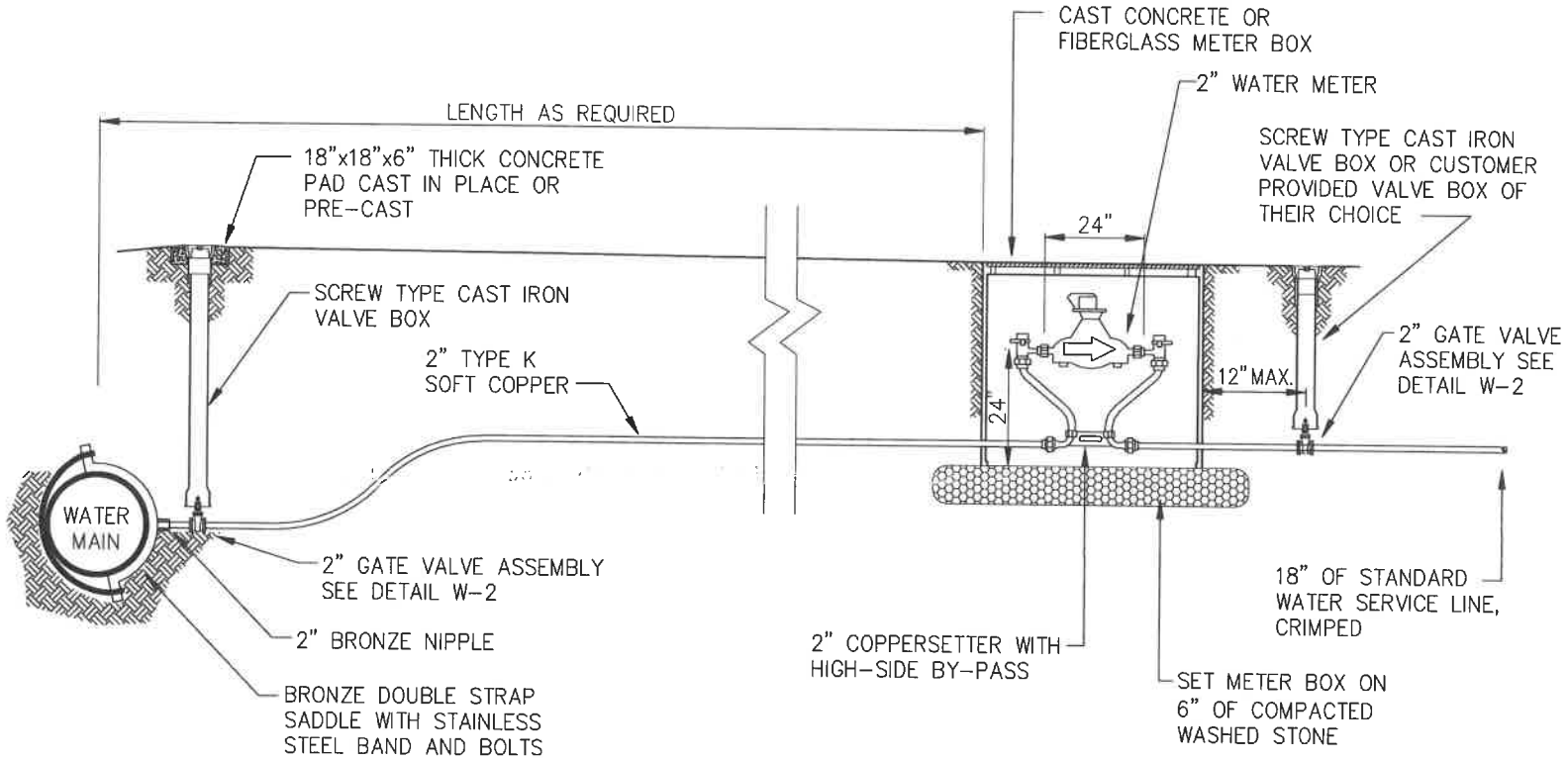
REVISIONS

**TOWN OF BUNN PUBLIC WORKS**

3/4" AND 1" WATER METER BOX DETAIL

| SCALE | DRAWING # |
|---|---|
| N.T.S. | W–12 |




NOTES:

1. WATER METER SHALL BE 2" AND REGISTER IN U.S. GALLONS.
2. 2" COPPERSETTER SHALL HAVE 1" HIGH-SIDE BY-PASS, 2" FIP INLET AND OUTLET, AND 24" METER SPACING.

REVISIONS

| DATE | BY | DESCRIPTION |
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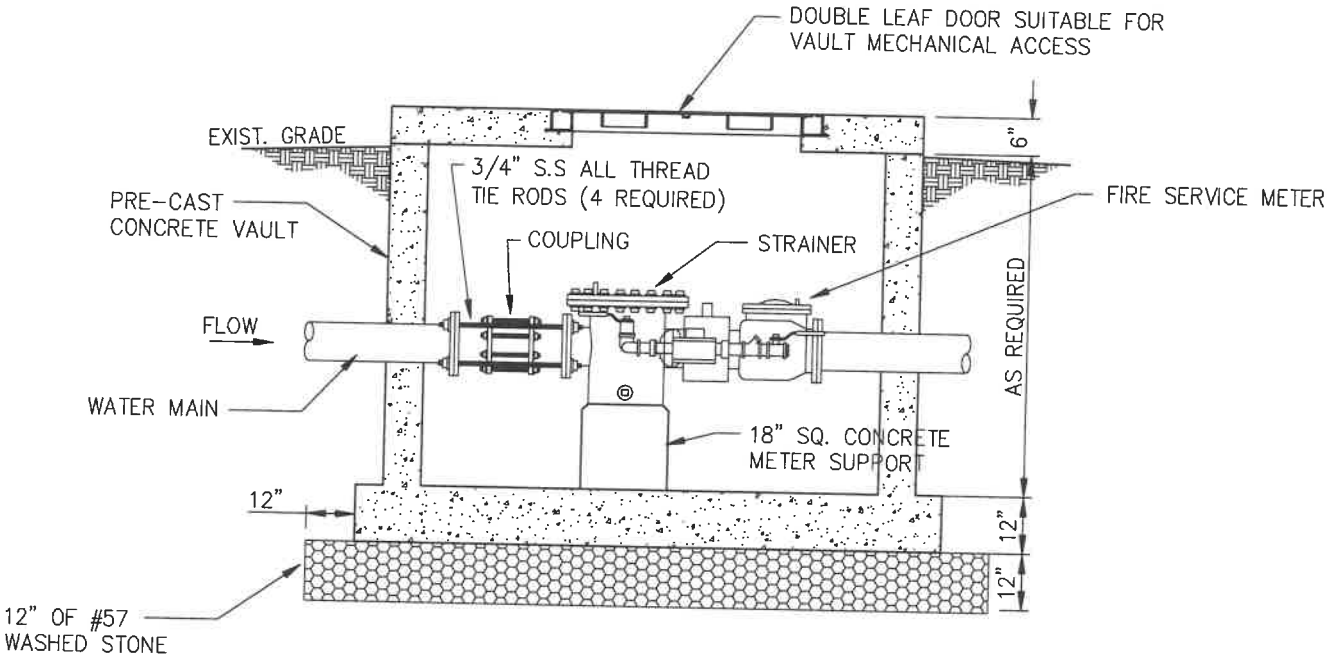
**TOWN OF BUNN PUBLIC WORKS**

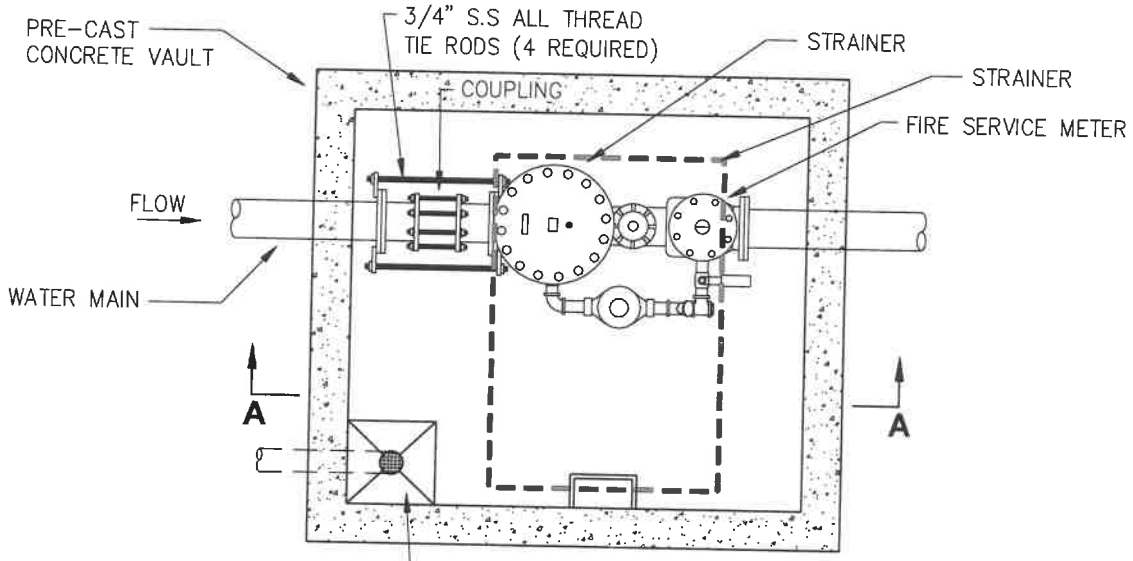
2" RESIDENTIAL SERVICE CONNECTION DETAIL

SCALE: N.T.S.

DRAWING #: W-13




SECTION A–A




PLAN VIEW

18" SQ. BY 8" DEEP SUMP WITH 4" FLOOR DRAIN, 4" SCH 80 PVC DRAIN LINE TO DITCH, AND A 4" FLAP VALVE @ OUTLET

NOTES:

1. METER ASSEMBLY SHALL BE NEPTUNE HP PROTECTUS III OR EQUAL.
2. THIS DETAIL PROVIDES GENERAL INFORMATION ONLY. ACTUAL DIMENSIONS WILL VARY WITH THE SIZE OF THE MAIN LINE METER.

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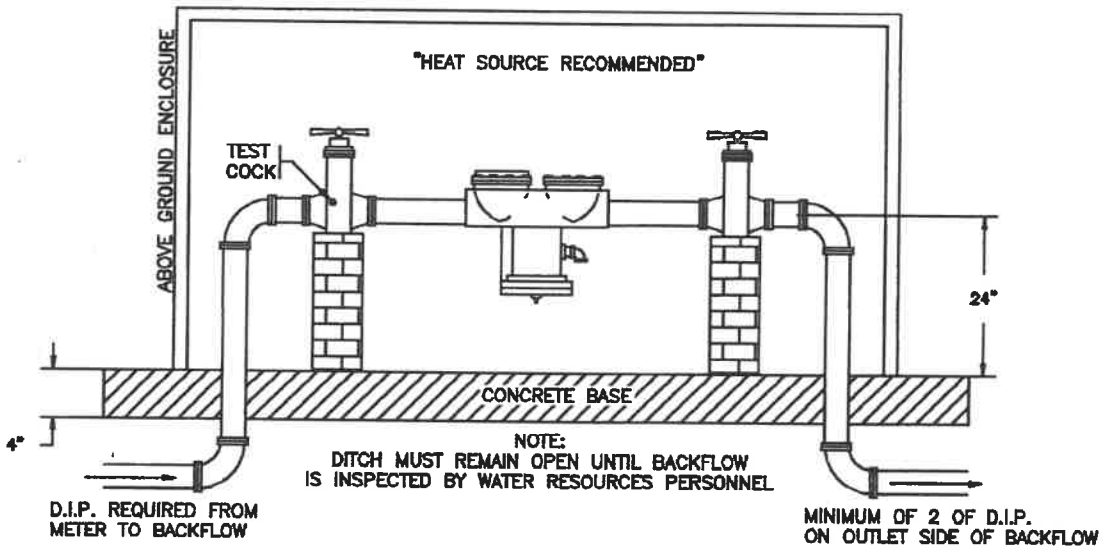
REVISIONS

**TOWN OF BUNN PUBLIC WORKS**

| FIRE SERVICE METER VAULT LAYOUT AND SECTION DETAIL | SCALE | DRAWING # |
|---|---|---|
| | N.T.S. | W–14 |




NOTES:

1. THE BACKFLOW DEVICE SHALL BE WITHIN 10 FEET OF AND ON THE PROPERTY SIDE OF THE METER.
2. ALL REDUCED PRESSURE BACKFLOW DEVICES SHALL BE INSTALLED ABOVE GROUND, IN HORIZONTAL POSITION.
3. SHUT OFF VALVES SHALL BE RESILIENT SEAT GATE VALVES WITH FLANGED ENDS AND HAND WHEEL.
4. ALL INTERIOR AND EXTERIOR IRON SURFACES SHALL HAVE EPOXY COATINGS TO CONFORM TO ANSI/AWWA C-550, OR MANUFACTURED OF STAINLESS STEEL.
5. THE BACKFLOW DEVICE SHALL HAVE 4 TEST COCKS WITH ONE INSTALLED ON THE CITY SIDE OF THE INLET GATE VALVE.
6. APPROVED UNITS: HERSEY, WILKINS, FEBCO, WATTS, CONBRACO, AND AMES.
7. APPROVED ABOVE GROUND ENCLOSURES: "HOT BOX", HYDROCOWL, SMI OR BFP MODEL, ENCLOSURES MUST HAVE A DRAIN.
8. TANDEM BACKFLOWS REQUIRED IF SERVING MULITPLE USERS OR SERVICE CONNOT BE INTERUPTED.

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REVISIONS

**TOWN OF BUNN PUBLIC WORKS**

| 3"- 8" REDUCED PRESSURE BACKFLOW PREVENTER DETAIL | SCALE | DRAWING # |
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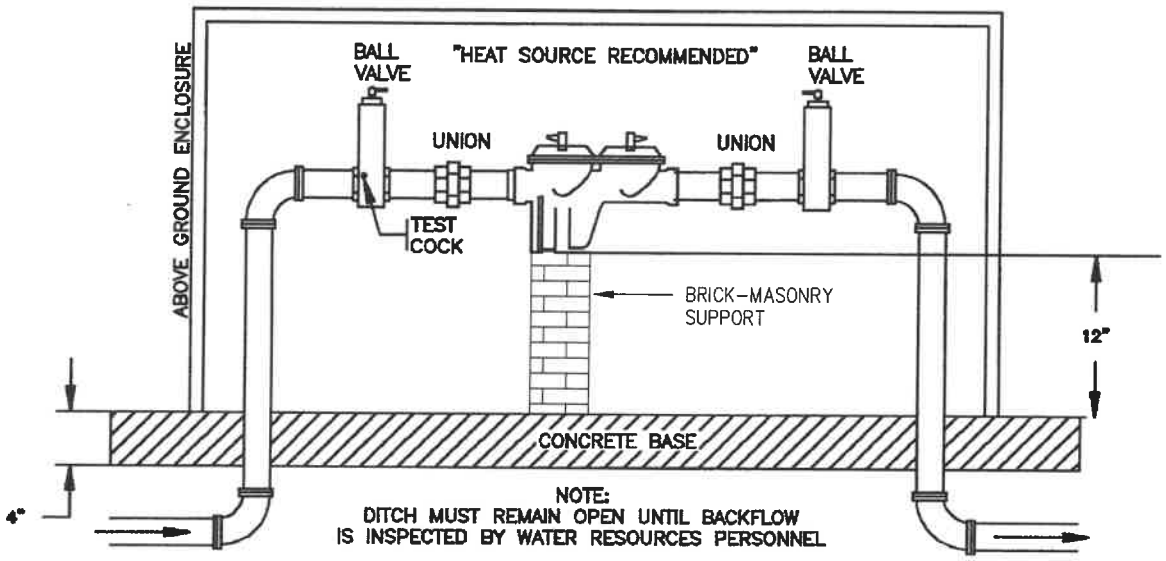
| | N.T.S. | W-15 |




NOTES:

1. THE BACKFLOW DEVICE SHALL BE WITHIN 5 FEET ON AND ON THE PROPERTY SIDE OF THE METER. FOR DOMESTIC IRRIGATION THE BACKFLOW DEVICE SHALL BE WITHIN 5 FEET OF THE METER.
2. ALL REDUCED PRESSURE BACKFLOW DEVICES SHALL BE INSTALLED ABOVE GROUND, IN HORIZONTAL POSITION.
3. SHUT OFF VALVES SHALL BE FULL PORT , LINE SIZE, LEVER TYPE, AND 1/4 TURN BRONZE BALL VALVES.
4. DEVICES SHALL HAVE TWO RESILIENT SEAT BRONZE UNIONS BETWEEN THE SHUT OFF VALVES FOR REMOVAL OF THE DEVICE.
5. THE BACKFLOW DEVICE SHALL HAVE 4 TEST COCKS WITH ONE INSTALLED ON THE CITY SIDE OF THE INLET GATE VALVE.
6. APPROVED UNITS: WILKINS, FEBCO, WATTS, AND CONBRACO.
7. APPROVED ABOVE GROUND ENCLOSURES: "HOT BOX", HYDROCOWL, SMI OR BFP MODEL, ENCLOSURES MUST HAVE A DRAIN.
8. TANDEM BACKFLOWS REQUIRED IF SERVING MULITPLE USERS OR SERVICE CONNOT BE INTERUPTED.

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REVISIONS

# TOWN OF BUNN PUBLIC WORKS

| 3/4"– 2" REDUCED PRESSURE BACKFLOW PREVENTER DETAIL | SCALE | DRAWING # |
|---|---|---|
| | N.T.S. | W–16 |

**FOR IRRIGATION ONLY**

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REVISIONS

# TOWN OF BUNN PUBLIC WORKS

IRRIGATION METER AND BACKFLOW DEVICE DETAIL

| SCALE | DRAWING # |
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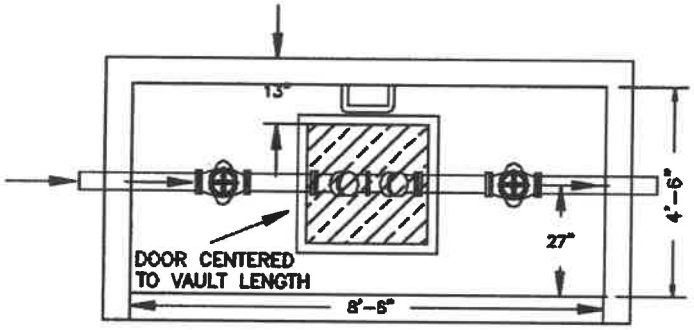
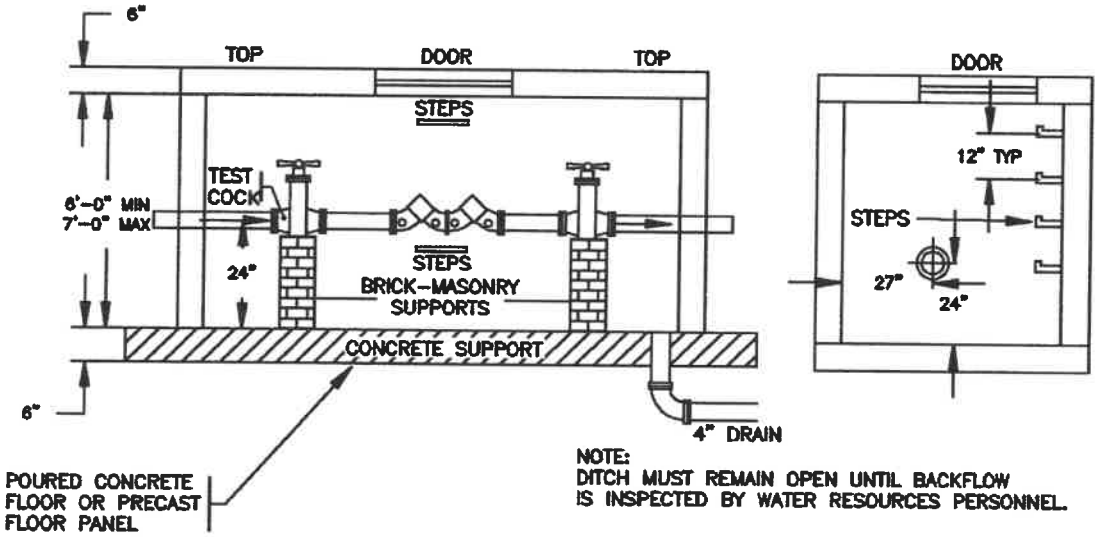
| N.T.S. | W–17 |




POURED CONCRETE FLOOR OR PRECAST FLOOR PANEL

NOTE:
DITCH MUST REMAIN OPEN UNTIL BACKFLOW IS INSPECTED BY WATER RESOURCES PERSONNEL.

APPROVED UNITS

HERSEY, WILKINS, FEBCO, WATTS CONBRACO, AMES, FEBCO AMES DCA ARE APPROVED FOR VERTICAL INSTALLATION.

NOTES:

1. THE BACKFLOW DEVICE MUST BE WITHIN 10 FEET OF AND ON THE PROPERTY SIDE OF THE METER.
2. SHUT OFF VALVES SHALL BE RESILIENT SEATED GATE VALVES WITH FLANGED ENDS AND HANDWHEELS.
3. ALL INTERIOR AND EXTERIOR IRON SURFACES SHALL HAVE EPOXY COATING TO CONFORM WITH ANSI/AWWA C-550, OR MANUFACTURED OF STAINLESS STEEL.
4. THE DEVICE SHALL HAVE 4 TEST COCKS WITH ONE INSTALLED ON THE TOWN SIDE OF THE INLET GATE VALVE.
5. ABOVE GROUND ENCLOSURE CAN BE USED, AS PER TOWN SPECIFICATIONS.
6. A 4" GRAVITY FLOOR DRAIN SHALL BE PROVIDED, OR A 2" SUMP PUMP, INSTALLED IN A 12" SQUARE BY 12" DEEP SUMP BASIN.
7. VAULT TOPS SHALL BE ONE PIECE, REINFORCED CONCRETE (SEPARATE UNIT FROM THE VAULT) WITH ACCESS DOOR CAST IN. ACCESS DOOR SHALL BE 36" BY 36" ALUMINUM WITH SPRINGS AND SLAM LOCK MECHANISM. ALL HARDWARE SHALL BE MANUFACTURED OF STAINLESS STEEL. USE U.S. FOUNDARY APS 300 OR APPROVED EQUAL. DOOR SHALL OPEN TO CENTER OF VAULT.
8. VAULT WALLS SHALL BE 6" PRECAST WALL SECTIONS OR 8" BLOCK. IF BLOCK WALLS ARE USED, COAT OUTSIDE OF WALLS WITH THORO-SEAL, OR APPROVED EQUAL.
9. TANDEM BACKFLOWS REQUIRED IF SERVING MULTIPLE USERS OR IF SERVICE CANNOT BE INTERRUPTED.
10. ALL DOUBLE CHECK VALVES SHALL BE INSTALLED IN A HORIZONTAL POSITION, EXCEPT FOR THOSE UNITS APPROVED FOR VERTICAL INSTALLATION.

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REVISIONS

# TOWN OF BUNN PUBLIC WORKS

3"- 8" DOUBLE CHECK VALVES DETAIL

| SCALE | DRAWING # |
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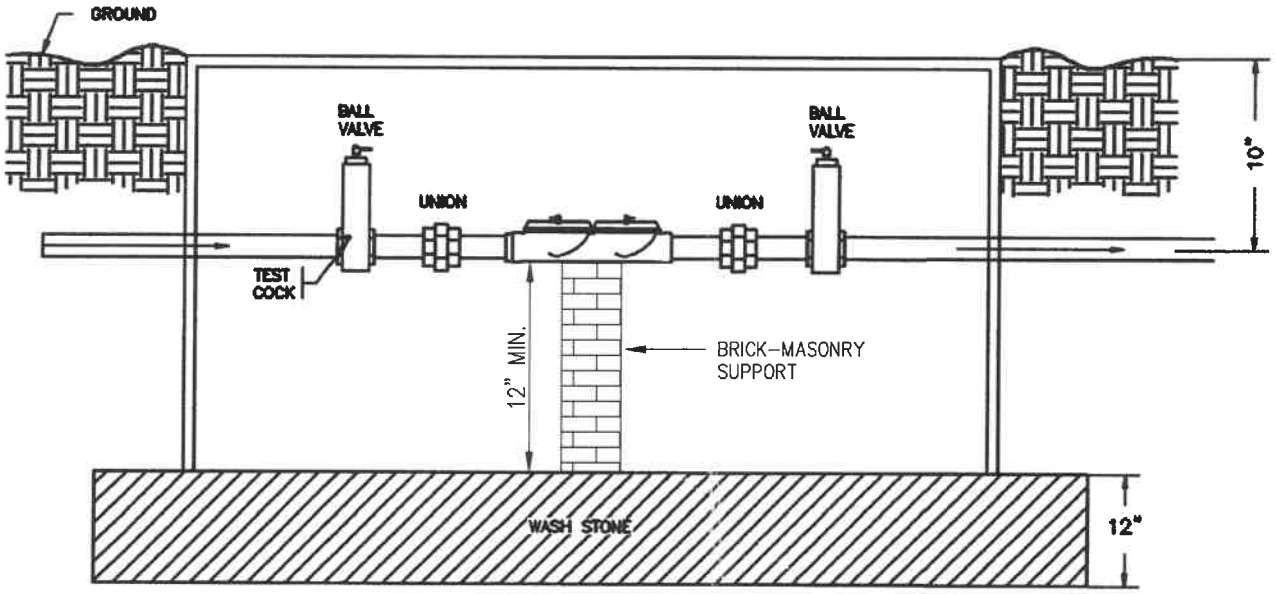
| N.T.S. | W-18 |




NOTES:

1. THE BACKFLOW DEVICE MUST BE WITHIN 5 FEET OF AND ON THE PROPERTY SIDE OF THE METER.
2. THE UNIT SHALL BE PURCHASED AS AN ASSEMBLY INCLUDING 4 TEST COCKS WITH ONE INSTALLED ON THE TOWN SIDE OF THE INLET BALL VALVE.
3. ALL DOUBLE CHECK VALVES MUST BE INSTALLED IN A HORIZONTAL POSITION.
4. SHUT OFF VALVES SHALL BE FULL PORT, LINE SIZE, LEVER TYPE, AND 1/4 TURN BRONZE BAL VALVES.
5. DEVICES SHALL HAVE 2 RESILIENT SEAT BRONZE UNIONS BETWEEN THE SHUT OFF VALVES FOR REMOVAL OF THE DEVICE.
6. THE BOX SHALL BE THE GALVANIZED OVAL SHAPED METER BOX AS MANUFACTURED BY THE SOUTHEASTERN DISTRIBUTORS (OR CAST IRON AS APPROVED BY THE TOWN).
7. APPROVED UNITS: HERSEY, WILKINS, FEBCO, WATTS OR CONBRACO.
8. DRAIN REQUIRED IF INSTALLED IN PAVED AREA.
9. TANDEM BACKFLOWS REQUIRED IF SERVING MULTIPLE USERS OR SERVICE CANNOT BE INTERUPTED.
10. DITCH MUST REMAIN OPEN UNTIL BACKFLOW IS INSPECTED BY WATER RESOURCES PERSONNEL.

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REVISIONS

**TOWN OF BUNN PUBLIC WORKS**

3/4"– 2" DOUBLE CHECK VALVES DETAIL

| SCALE | DRAWING # |
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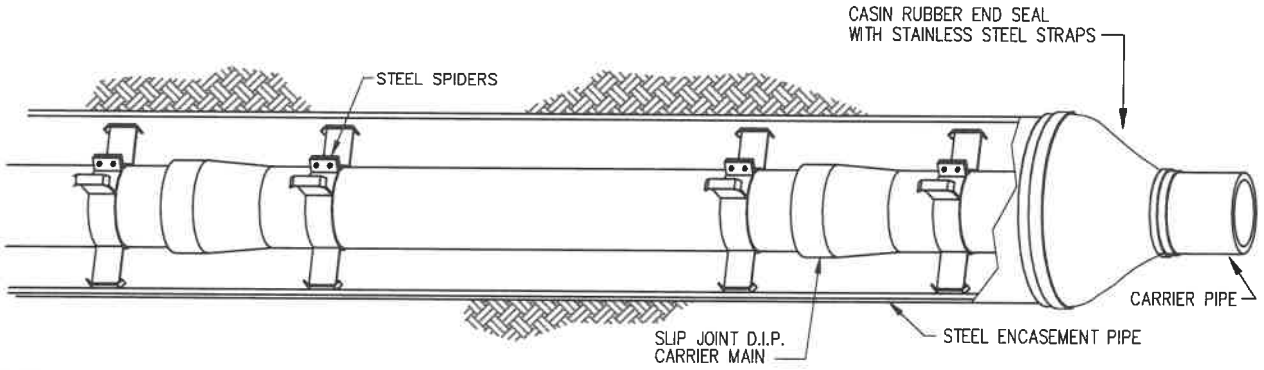
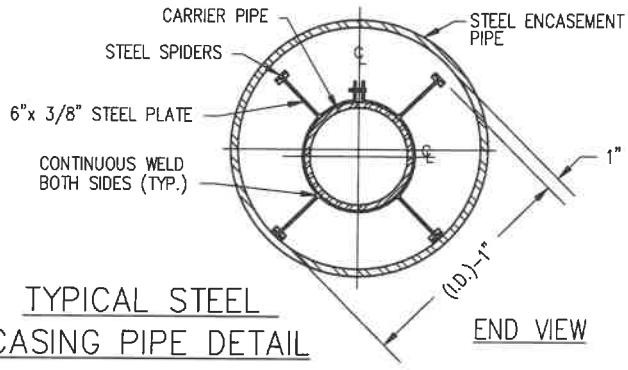
| N.T.S. | W–19 |

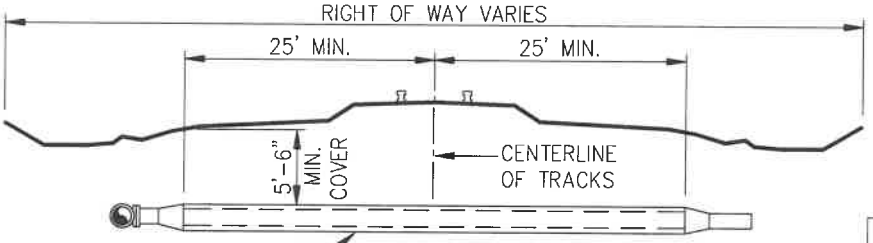



| NOMINAL D.I. CARRIER PIPE DIA. (INCHES) | STEEL CASING MINIMUM O.D. (INCHES) | MIN. WALL THICK. FOR HIGHWAYS (INCHES) | MIN. WALL THICK. FOR RAILROADS (INCHES) |
|---|---|---|---|
| 3 | 8.625 | 0.250 | 0.250 |
| 4 | 10.75 | 0.250 | 0.250 |
| 6 | 14.0 | 0.250 | 0.250 |
| 8 | 16.0 | 0.250 | 0.312 |
| 10 | 18.0 | 0.250 | 0.312 |
| 12 | 20.0 | 0.250 | 0.375 |
| 14 | 24.0 | 0.250 | 0.375 |
| 16 | 26.0 | 0.312 | 0.500 |
| 18 | 28.0 | 0.312 | 0.500 |
| 20 | 30.0 | 0.312 | 0.500 |
| 24 | 34.0 | 0.500 | 0.625 |




## TYPICAL STEEL CASING PIPE DETAIL

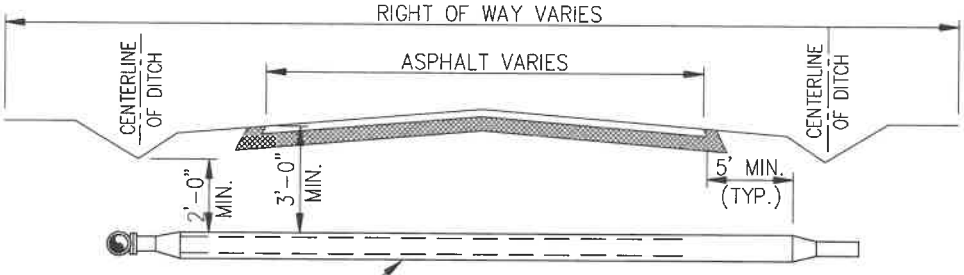
N.T.S.




## TYPICAL BORING UNDER RAILROAD

N.T.S.

NOTE:
THESE ARE TYPICAL BORING SECTIONS, THEY MAY VARY AS REQUIRED BY THE RAILROAD OR N.C.D.O.T.




## TYPICAL BORING UNDER HIGHWAYS

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REVISIONS

# TOWN OF BUNN PUBLIC WORKS

BORE AND JACK DETAILS

| SCALE | DRAWING # |
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| N.T.S. | W-20 |

REVISIONS

| DATE | BY | DESCRIPTION |
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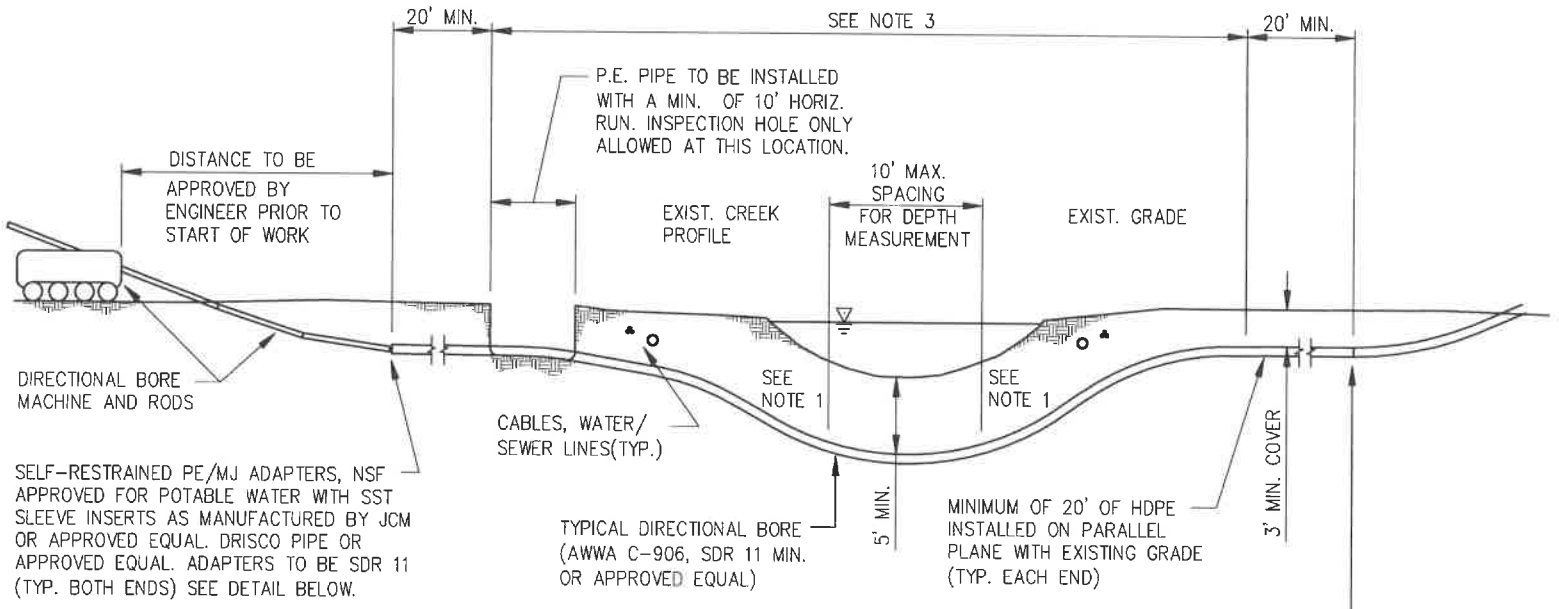
# TOWN OF BUNN PUBLIC WORKS

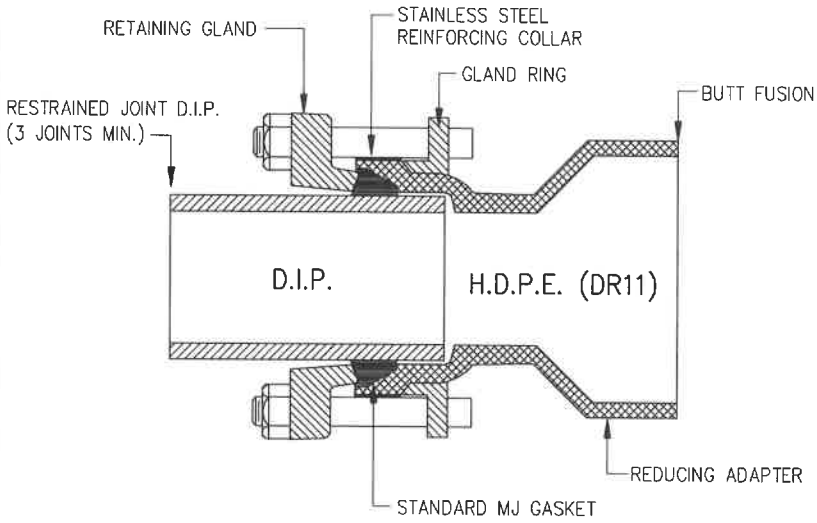
## DIRECTIONAL BORE DETAILS

SCALE: N.T.S.

DRAWING #: W-21




PROFILE VIEW
N.T.S.




HDPE TO MECHANICAL JOINT REDUCING ADAPTER
N.T.S.

NOTES:

1. A PROFILE AND PLAN SHALL BE PROVIDED FROM ENTRY TO EXIT FOR EACH DIRECTIONAL BORE SECTION BY THE DIRECTIONAL BORE CONTRACTOR.
2. ALL FUSED HDPE PIPE SHALL BE AIR TESTED PRIOR TO BORING.
3. ALL BORE SECTIONS SHALL BE HYDROSTATICALLY TESTED PER SPECIFICATION STANDARDS UPON COMPLETION OF INSTALLATION AND PRIOR TO PLACING THE WATER MAIN ON-LINE.
4. LENGTH OF CROSSING, LOCATION OF INSPECTION/OBSERVATION EXCAVATION, NUMBER OF P.E. PIPE JOINTS, LOCATION OF BORE MACHINE, AUGER ENTRANCE LOCATION, AND TIE-IN POINTS ARE TO BE APPROVED BY ENGINEER PRIOR TO ANY START OF WORK.
5. THIS DETAIL IS ALSO APPLICABLE TO STREAMS, WETLANDS, LARGE STORM DRAINS AND SIMILAR APPLICATIONS FOR DIRECTIONAL BORE WITH POLYETHYLENE PIPE.
6. THE BORE DEVELOPED FOR THE LEAD IN END OF THE PIPE SHALL BE KEPT AT A MINIMUM DIAMETER FOR THE PIPE INSTALLATION. THE LEAD IN END SHALL BE PULLED THROUGH WITHOUT THE M.J. FLANGE ATTACHED FOR LARGER THAN 6" PIPE INSTALLATIONS. THE M.J. FLANGE FOR SAID LEAD IN END SHALL BE INSTALLED AFTER THE PIPE INSTALLATION WITH THE USE OF A SPLIT M.J. FLANGE.
7. CONTRACTOR SHALL FURNISH TO THE ENGINEER THE AS-BUILT LOCATION OF THE BORE IN ACCORDANCE WITH THE SPECIFICATIONS FOR DIRECTIONAL BORING.

# Sewer System Specifications

## SECTION 1 - SANITARY SEWER DESIGN STANDARDS

Unless otherwise indicated, all standards apply to public and private sewer systems. This section describes the general design standards to be followed by all parties in preparing subdivision, utility extension, and utility replacement plans for the Town of Bunn. These design standards will ensure that the citizens of Bunn will continue to have a quality sewer collection system.

All Town Engineering plans for public and private sewer systems must meet State and Town of Bunn minimum design standards as indicated in the most recent amended rules entitled:" Waste not discharged to Surface Waters"; by the N.C. Department of Environmental Quality (NCDEQ) (North Carolina Administrative Code (NCAC) 15A NCAC 2T and/or the Town of Bunn Public Works Specifications, whichever, is the more stringent.

Plan and profile drawings shall be prepared by a Professional Engineer (PE) registered in the State of North Carolina, signed, sealed, and dated showing the various elements of the utility mains and shall include an overall utility plan layout on a single sheet with scale no smaller than 1 inch = 200 feet. The design of improvements must be based upon actual field verification by the Town Engineer of existing utilities. The utility drawings shall be on separate sheets, free of landscaping and other details not pertinent to the utility plans. The water and sewer drawings may be on the same sheets. A separate landscaping plan must also be submitted with the utility showing any proposed landscaping and all water or sewer utilities or easements. All adjacent tracts and topographic information must be shown on the landscaping plan. Landscaping plans shall show all utilities and Town Engineering drawings and shall be on paper 24 inches by 36 inches.

Once installed, "as built"plans shall be provided to the Town of Bunn, showing the utilities. These plans shall be accompanied by a certification from a Professional Town Engineer registered in the State of North Carolina that the utilities were constructed in accordance with the plans and specifications indicated on the construction documents.

**The contractors will prepare and submit three paper and one digital copy in PDF of the "As built" drawings for the utilities shall be submitted to the Public Works Department prior to final payment and acceptance of the project by the Town of Bunn.**

## SECTION 2 - SANITARY SEWER DESIGN - PUBLIC

1 All public sanitary sewer mains shall be installed within dedicated street rights-of-way and/or Town of Bunn dedicated sanitary sewer easements*. When sanitary sewer mains are installed in street rights-of-way, they shall be located in the center of the pavement or right-of-way where practical.
Larger-size easements may be required based on the depth of installation or other considerations as determined by the Public Works Department and the Town Engineers. Sewer mains shall be centered in the easement. Under special conditions, temporary construction easements may be required upon approval of the Public Works Department. All sewer easement boundaries must be field staked and flagged by the Developer's surveyor and at the Developer's expense.

2 The minimum right of way/easement width for a sanitary sewer main is 20 feet, measuring 10 feet on each side of the manhole. Such easements are recorded as "Town of Bunn Utility Easement."

3 The Developer shall acquire all off-site easements. These off-site easements shall have functional access to the public right of way and be recorded by the map and by deed of easement prior to construction approval. The easements shall be dedicated to the Town of Bunn and entitled "Town of Bunn Utility Easement." Plan and elevation drawings of all access roads shall be shown on the plans prior to approval.

4 No person shall place any part of a structure, permanent equipment, or impoundment within the Town of Bunn Road Right-of-Ways or Utility Easements. Prohibited structures include, but are not limited to, buildings, houses, air conditioning units /heat pumps, decks, garages, tool or storage sheds, swimming pools, walls, and fences. Fences may be allowed across the right of way/easements as long as there is an access gate the full width of the easement, provided that written approval is first received from the Public Works Department. No fences may be installed longitudinally (lengthwise) within the easements

5 No person shall plant trees, shrubs, or other plants within a Town of Bunn Utility Easement without prior written approval from the Public Works Director. Any such plantings approved by the Director shall be done so at the risk of the property Owner having to replace the plantings due to removal by the Town of Bunn during maintenance activities.

6 When preparing the plans for sanitary sewer gravity mains, deflection angles for all horizontal turns shall be shown on the drawings. The plans shall show the manhole number (MH #1 etc.), rim elevation, station, depth, invert elevations, sewer reach lengths, and slope (in percent).

7 Proposed sewers paralleling a creek shall be designed to a proper depth to allow lateral connections, such that all lateral sewer line creek crossings will be below the stream bottom elevation. When the Developer or Town Engineer can demonstrate that such gravity sanitary sewer mains would need to be at a depth greater than 16 feet to serve the opposite side of the creek, the Public Works Department may make an exception to this provision in the plan approval stage. The top of the sewer pipe should be at least 1 foot below the stream bed elevation and be of ductile iron pipe.

All aerial stream crossings will be Ductile Iron from manhole to manhole. The center line of a main paralleling a creek shall be a minimum of 40 feet or more from the top of the closest creek bank. Manholes along these sewers must be protected against the 100-year flood by raising the top elevation of the manhole one-foot above the 100-year flood plan or by providing sealed manholes. All sealed manholes must be vented every 1,000 feet along the sewer line.

8 On aerial sanitary sewer crossings, the bottom of the aerial creek crossing pipe must be at least one-foot above the 25-year flood elevation at the location.

9 Sewer cleanouts shall be placed 1 foot inside the Road Right-of-Way or dedicated easement provided that it does not conflict with any other utilities. Still, it must be a minimum of 18 inches off the edge of any paved surface or other surface intended for the vehicles to travel on. This is illustrated in the "Sanitary Sewer Standard Details." Sewer clean-outs are prohibited in driveways and parking lots and may only be approved upon special request to the Public Works Director. When necessary and approved, they must be installed with a standard watertight clean-out plug within a cast iron meter box with a cast iron lid indicating "Sewer. "

10 "Doghouse" manholes are allowed only on Ductile Iron Pipe (DIP) sewer mains. "Doghouse" manholes on Vitrified Clay Pipe (VCP) or Reinforce Concrete Pipe (RCP), or Poly Vinyl

Chloride (PVC) are prohibited unless they are upgraded to a 20-foot section of DIP, and then the doghouse manhole may be set over the DIP. Illustrated detail can be found in the "Sanitary Sewer Standard Details."

11 All existing utilities, such as catch basins, wells, drop inlets, water mains, or other treatment units, within 200 feet of the proposed sanitary sewer main shall be shown on the Town Engineering plans.

12 Sanitary Sewer Services are not allowed in private easements.

a. Size

1) All gravity sewer mains shall be designed and sized to serve the total natural drainage basin. The total off-site drainage area in acres must be shown on the plans, and calculations should be submitted to the Public Works Department upon request to justify pipe sizing. An 8-inch main shall be the minimum size permitted. The minimum size of manholes permitted shall be 4 feet in diameter.

2) Sewer size design shall be based on an average daily flow of 100 gpcd and a peak/average ratio of 2.5. This ratio includes an allowance for infiltration. The following table should be used as a guide for determining the Equivalent Persons/Acre and the peak flow for various zoning classifications:

| Zoning | Equivalent Persons/Acre | Average Flow (gpapd) | Peak Flow (gpapd) |
|---|---|---|---|
| R-2 | 5 | 500 | 1250 |
| R-4 | 8 | 800 | 2000 |
| R-6 | 14 | 1400 | 3500 |
| R-10 | 21 | 2100 | 5250 |
| Shop. Center | 18 | 1800 | 4500 |
| Bus. /Comm. | 25 | 2500 | 6250 |
| O&I-1 | 13 | 1300 | 3250 |
| O&I-2 | 30 | 3000 | 7500 |
| Industrial | 50 | 5000 | 12500 |

The sewer size design shall be half full or 50% capacity for the maximum flow depth for all grades. At a minimum, estimated flows shall be in accordance with 15A NCAC 2T.

3) Grades for sanitary sewers must be such that a minimum flow velocity of 2 feet per second is maintained, using Manning's Equation. The minimum grade for an 8-inch sewer line is 0.40%. Refer to the latest NCDENR document entitled "Minimum Design Criteria for the permitting of Gravity Sewers."

4) Any grades exceeding the maximum of 10% must be approved by the Public Works Director or Town Engineer and accompanied by details of a high-velocity manhole. Any time the grade exceeds 15%, ductile iron pipe shall be used with high-velocity blocking (anchoring).

5) Pipe diameter changes shall occur only in a manhole with the pipe crowns matched, provided a minimum drop of approximately 0.10 feet is maintained between inverts for straight pipe runs and 0.20 feet for bends greater than 45 degrees.

b. Manholes

1) Manholes shall be spaced a maximum distance of 400 feet apart.

2) The maximum "free" vertical drop for gravity main into a manhole shall be 30 inches. Outside drop manholes are permitted case-by-case, provided there are no other options but must be approved by the Public Works Director or Town Engineer. The maximum "free" vertical drop for a force main discharge into a manhole shall be 12 inches above the crown of the main and have support for the pipe in the side of the manhole.

3) Manholes will be supplied with a rubber boot sleeve that meets or exceeds ASTM C923 with stainless steel expansion bands and pipe clamps that meets ASTM C923 and A167 for connecting the sewer pipes with the barrel section. All traffic-bearing castings must be Class 35 or greater. All exterior joints shall be wrapped with a butyl resin sealant of 8" width.

4) Eccentric or concentric cones may be used on 8-inch through 12-inch mains. On 15-inch and larger mains, concentric cones must be used.

5) The following minimum diameter manholes shall be used dependent upon the size of mains and depth of installation. The larger manhole sizes will be required if either the main size or the depth warrants as follows:

| Diameter Manhole | Main Size | or | Depth of Installation |
|---|---|---|---|
| 4' - 0" | 8" to 12" | | 0' to 12' |
| 5' - 0" | 15" to 30" | | 12' to 20' |
| 6' - 0" | 36" to 54" | | 20' and greater |

Extended manhole bases may be used to minimize manhole diameter when a larger manhole is required because of the depth, in which case the main size will dictate manhole diameter. Manhole sizes must be clearly identified on the construction plans. Each manhole must be of consistent diameter throughout its height. Extended manhole bases may also be used as ballast to prevent floatation when installed where high ground water is encountered.

6) The maximum flow deflection angle in manholes for sewers is 60 degrees.

7) All interceptor/outfall manholes or manholes receiving a sanitary sewer force main discharge shall be internally lined with approved coating by the Public Works Department or Town Engineer to prevent hydrogen sulfide ($H_2S$) corrosion.

8) A confined space entry permit is required before entry into any manhole.

c. Installation Restrictions for Design

1) Extensions of sanitary sewer mains are to be to the farthest property line of the tract where necessary to serve adjoining properties with gravity sewer along natural drainage patterns. In all instances, plans shall show the total area in acres draining to the uppermost bounds of the tract on any established watercourse. Additional sewer extensions may be required if the Public Works Department determines adjacent property can be served from extensions from the proposed site.

2) The depth of sewer mains shall be great enough to serve the adjoining property, allowing for sufficient grade on the service line. Lateral connections are to be into manhole barrels (not the cone section) or the top quarter of sewer mains.

3) All 4" sewer services may be tapped directly into 8, 10, and 12-inch mains or manholes. Taps can only be made using a mechanical coring machine or other approved device. All sanitary sewer service connections 6 inches and larger shall be made into manholes only. On 4-inch services, sewer cleanouts shall be placed 1 foot inside the Right-of-Way or dedicated easement provided that it does not conflict with any other utilities. Still, it must be a minimum of 18 inches off the edge of any paved surface or other surface intended for the vehicles to travel on. This is illustrated in the "Sanitary Sewer Standard Details." The maximum vertical drop for a 6-inch and 4-inch service into a manhole shall be 30 inches. If the tap is above 30 inches, it will become the installer's responsibility to install a 6-inch combination outside drop (see "Sanitary Sewer Standard Details").

4) All sewer mains in traffic areas shall have a minimum cover of 5 feet measured from finished grade in traffic areas to the pipe crown unless the ductile iron pipe is provided in Class I bedding, where the minimum cover shall be three feet. Sewer mains and services shall be no deeper than 12 feet unless approved by the Public Works Director. For installations deeper than 12 feet, ductile iron shall be used for mains and services, provided that cast iron may also be used for 4" services. Four-inch service "stacks" may be PVC up to 12 feet in depth, but must be DI if the riser is more than 12 feet deep. Mains and services in non-traffic areas shall have a minimum cover of 3 feet (measured from the top of the finished grade) to the pipe crown. Service laterals shall be of PVC or ductile iron when installed in a public right-of-way. If the sewer lateral goes into a manhole within an easement, it may be constructed of PVC material. A clean-out must be constructed out of PVC for depths of 12 feet and under the ductile iron pipe for depths deeper than 12 feet deep. Sewer cleanouts shall be placed 1 foot inside of the Right-of-Way or dedicated easement provided that it does not conflict with any other utilities, but it must be a minimum of 18 inches off the edge of any paved surface or other surface intended for the vehicles to travel on. If PVC is used, it must be equipped with a bronze clean-out to facilitate the location if buried. Clean-out heights need to be 4 to 6 inches above the finished grade.

5) Placing fill dirt around and over existing sanitary sewer mains above the existing ground elevation is prohibited. It may only be approved upon written request to the Public Works Director. It is illegal to damage, cover, or bury a sanitary sewer manhole in the Town of Bunn. The fill must be compacted

under, beside and above the sanitary sewer main to 95% compaction when approved. Slopes may not exceed three-to-one, and sufficient cross drainage must be provided.

6) Pressure sewer services are prohibited except in existing pressure sewer collection system areas or by specific written approval of the Public Works Director. At the point where the private pressure system connects to the Town's collection system, the connection point must meet any and all current standards of the State and Town of Bunn minimum design standards as indicated in the most recent amended 15A NCAC 2T rules by the N.C. Department of Environmental Quality and/or the Town of Bunn Public Works Specifications, and the North Carolina State Plumbing Code, whichever, is the more stringent.

d. Pump Stations

1) The Town of Bunn policy is to utilize gravity sewer extensions to provide sewer services to all corporate properties within the Town's service area, the Extra-Territorial Jurisdiction (ETJ), and the corporate limits. Therefore, sewer pump stations are prohibited and may only be approved by a special written request to the Public Works Director. The Engineer of Record for the project shall address the following factors in considering a pump station and force main.

(a) The Town Engineer shall evaluate the capacity of the receiving sewer main at the point of discharge and downstream to determine that the system can handle the transferred sewer flow.

(b) The Engineer of Record shall perform a cost analysis of the pump system with appurtenances and gravity system. The gravity system must be at least 2.5 times more expensive or not possible due to limitations imposed by existing Public Works facilities for the Town of Bunn to consider a pump station.

(c) The Engineer of Record shall size the pump station to accommodate the total basin area that could gravity flow into it.

(d) The Town of Bunn and/or the Town Engineer shall determine if any downstream lines may need to be upsized, and it will be the Developers' responsibility to make these changes.

2) In some circumstances, the Public Works Department may choose to accept permanent Ownership and maintenance of pump stations designed in accordance with the Town of Bunn Standards. Those stations suitable for acceptance by the Public Works Department must meet the following criteria:

(a) Be determined by the Public Works Director to be in the "best interest" of the Town of Bunn.

(b) Be necessary due to limitations imposed by existing Public Works facilities.

3) General Conditions for a Pump Station

A dedicated and recorded driveway access easement to the pump station shall be obtained and shown on the as-built plans. In the case of phased development, future access shall also be addressed. Plan and elevation drawings of all access roads shall be shown on the plans prior to approval.

The Contractor/Developer shall be responsible for obtaining all permits and payment of all fees for construction.

The Contractor/Developer shall be responsible for establishing an account, paying fees, and connecting all utilities. The Contractor/Developer shall bear all associated utility costs until final acceptance, when the Town of Bunn shall assume these accounts and future costs.

Pump Station driveways must be a minimum of 12 feet wide with gravel 8-inches thick for the first 20 feet off the roadway and 6 inches thereafter, with curb cut and apron if on the curbed street, and not greater than 10 % slope. The Town of Bunn reserves the right to require concrete or asphalt paving of driveways. Sites with odor-control chemical tanks must be accessible by 18-wheel tanker trucks. The Developer or his Engineer shall be responsible for obtaining driveway permits from the North Carolina Department of Transportation if required.

An on-site diesel-fueled standby electrical generator in a weatherproof enclosure with automatic start and load transfer capacity sufficient to sequentially start and run all pumps and equipment located at the lift station shall be provided. The Town of Bunn reserves the right to require noise attenuation if the standby generator is located near an area where the noise may be a nuisance.

The Engineer of Record shall address the potential for odor at all sites. Unless exempted by the Public Works Director, odor control shall be required at all pump stations with force mains greater than 2,500 feet.

Remote monitoring equipment compatible with the Town of Bunn's current system shall be required. The Contractor/Developer shall be responsible for a radio site survey of the proposed pump station site to ensure compatibility with the Town of Bunn's existing system before submitting plans for final approval. The Contractor shall provide all equipment, including RTUs, PLCs, antennas, and poles. This system will send and receive data using the existing telemetry network owned and operated by the Town of Bunn. The Contractor is required to provide the RTU SCADA cabinet and equipment compatible with the existing Bunn SCADA system as instructed by the Public Works Department Director or his designee. The Contractor shall be required to provide the appropriate programming at the main server and test all communication points. The equipment must be equipped with minimum SCADA monitoring capability indicating pump run time; overload tripped, pump breaker tripped, priming failure, lag pump start, high wet well, low wet well, three-phase power fail, standby power run/fail, and control power fail.

Pump stations shall have 100% reserve peak pumping capacity (dual pumps) and shall be the wet well submersible type which will pass a 3-inch diameter sphere; no grinder pumps will be allowed unless specific approval is granted by the Public Works Director for the use of other type pumps. Detailed Engineering plans will need to be approved by the Public Works Director and Town Engineer prior to construction. Pumping stations must be able to pump peak flow with the largest pump out of service. The Town reserves the right to require a screen or comminutor device located on the gravity line prior to discharge into the pumping station.

Force mains shall be made of ductile iron or PVC in accordance with the Materials Section of these specifications and installed under the same construction specifications as water mains. Force mains shall include a plug valve ten feet outside the wet well but after the pigging point inside the fence, an access point for "pigging" the force main also inside the fence, and air release valves at all high points along the force main. Force mains shall convert to gravity flow where they can reasonably do so. The Engineer of Record shall provide calculations to confirm that a surge relief valve is not needed. Force main size and discharge point shall be shown on the as-built plans. The force main shall be of an appropriate size for the pump to achieve scour velocity (2 feet per second) within the force main.

Prior to a station being placed into service, all stations shall be equipped, at the expense of the Contractor/Developer, with a sign (green background with white reflective lettering) that reads;

**Town of Bunn**
"Name of "Lift Station"
Station Address
Private property
No Trespassing
Violators will be Prosecuted
After Hours Contact
Police Dept. (919) 496-2782

Start-up services will be required for all equipment and must be performed by a qualified factory representative and must have a Town representative present. A copy of all start-up reports and operation and maintenance (O&M) manuals will be due before the final pump station acceptance.

On-site training by a qualified factory representative is required for all equipment at the Contractor's and/or Developers' expense.

A six-foot high galvanized steel chain link fence with 3 strands of barbed wire at the top for restricted access to the site and equipment with a twelve-foot wide double-leaf access gate is required at all sites. Wire gauge shall be No. 9 minimum with 2 ½ inch minimum OD posts and 1 5/8-inch minimum OD top rails. Corner posts shall be 3-inch minimum OD, and gate posts shall be 4-inch minimum OD. Fence shall be no less than 10' from the property/easement line. See "Sanitary Sewer Standard Details."

A potable water source connected to an approved reduced pressure zone (RPZ) back flow prevention device with a freeze-proof yard hydrant and at least a 25' garden hose with an approved spray nozzle shall be provided at the site. A 36-inch square concrete pad shall be installed at the base of the yard hydrant. This must be a metered water service from the Town of Bunn unless approved by the Public Works Director.

A freeze-proof safety shower shall be installed at all new pumping stations. The Public Works Director or designee will determine the location of the shower.

Backflow prevention devices shall be provided for the water source per Town of Bunn standards. The unit shall be housed in a heated fiberglass enclosure above grade. The installer will test all backflow prevention devices, and a copy of the test results will be provided at the final inspection.

A minimum one-year warranty on all equipment shall commence when the Town of Bunn Public Works and the Town of Bunn Board of Commissioners accept the pump station for operation.

All sewer force main valve box caps must be marked SEWER.

The Contractor shall provide the Owner with a minimum of three sets of operating and maintenance manuals for all equipment. Manuals must be original as provided by the manufacturer and bound. As required by the Town of Bunn, spare parts shall be boxed for long-term storage with part numbers and identification labels. Items subject to handling damage will not be accepted if factory packaging has been opened. All manuals and spare parts are to be turned over at the town's acceptance of the pump station.

A screened vent shall be provided for the wet well. The vent shall be sized by the Engineer of Record for the wet well and installed so that gases are directed away from the equipment. The vent shall be 4" min. size and supplied with a stainless-steel insect screen.

An aluminum panel backboard and weather hood mounted on galvanized posts with a concrete standing pad are required. All electric service telemetry equipment, pump control, grinder system controls, flow meters, automatic transfer switches, etc. The weather hood shall be equipped with work lights and a 110 VAC convenience receptacle with weatherproof covers.

The service meter shall be located outside the fence. In the case of overhead electric distribution lines, the power shall be conveyed overhead via a weather head to the metered service. Power to the main disconnect located on the aluminum panel backboard shall be installed underground. The area light may be installed on the same pole as the service meter, provided it is immediately adjacent to the fence.

All wet wells, valve vaults, and any other vaults located on the side of the fence line will have mesh safety nets installed on all openings

Wet well components must be located so that normal maintenance can be performed without physically entering the wet well.

The site shall have a minimum of one overhead area light with a switch and photocell. Weather hoods over panels shall be provided with lights. The overhead area light shall be mounted 25 feet above the finished grade. The light shall be either mercury or sodium vapor with a rating of at least 9500 lumens.

On pump stations with submersible pumps, a manually operated winch shall be provided with adequate capacity to lift the pumps to the surface and out of the wet well.

All bolts, mounting brackets, pump lifting chains, etc., shall be stainless steel, sized, and mounted to support applicable loads.

New installations are required to meet the latest revised OSHA standards at final acceptance. The Contractor shall provide and install all site-specific OSHA-required labels and signs for the site.

The pump station shall have a high wet well alarm in the form of a horn and a light beacon. The horn shall be capable of being silenced through the telemetry system. The alarm light shall be red, waterproof, and mounted on top of the weather hood to be visible in a 360-degree radius. The aforementioned alarm and light beacon shall operate on 110 VAC or greater. 12-volt DC alarms and lights will not be allowed.

The pump station shall be one foot above the 100-year flood elevation. 100-year flood elevations shall be shown on the plans.

Pump station components that are submitted for installation are to be the latest models.

"As Built" plans, digital and paper of the pump station, access easement, force main indicating discharge point, all valves and air releases in the force main, initial float elevation settings, capacities, designed pumping capacity, and storage and all capacities must go to Town of Bunn Public Works Department.

The Engineer of Record or Contractor shall forward shop-drawing submittals for the generator, transfer switch, and package pump station to the Town of Bunn Public Works Department and Town Engineer for review.

Pump Stations will not be allowed to discharge to another pump station under any circumstance.

Site visits by Town of Bunn personnel will be required and scheduled as follows:

- Before final plan approval,
- When pumps are set,
- Pump and generator startup testing,
- Final Inspection and when the flow is applied, and the station is ready for service.

## SECTION 3 - REQUIREMENTS FOR PUMP STATION PUMPS

Multiple pumps (minimum of 2 duplex) each can pump at a rate of 2.5 times the peak average daily flow rate with any pump out of service. Pump-on/Pump-off elevations shall be set such that 2-8 pumping cycles per hour may be achieved in the pump station at average flow. The on/off elevations may be controlled by floats, ultrasonic, or radar sensors. In no case shall bubbler systems be allowed.

**It shall be the responsibility of the Contractor/Developer to provide the Public Works Department with one additional pump at their cost, to be stored by the Public Works Department in case of emergency or failure of one of the primary pumps located within the pump station.**

A spare rotating assembly consisting of an impeller, key, nut, washer, and a mechanical seal shall be included with each pump. Provided that all pumps installed are rotating in the same directions

The pumps must be equipped at a minimum with dry contacts for SCADA purposes indicating run time, O/L tripped, pump breaker tripped, priming failure, and lag pump start for remote telemetry purposes.

## SECTION 4 - REQUIREMENTS FOR PUMP STATION PERMANENT STANDBY GENERATORS

The generators shall be sized to sequentially start all pumps and operate all equipment at the site.

The generators shall be equipped with an automatic transfer switch to start the generator and transfer the load to an emergency in case of utility under-voltage, over-voltage, power loss, phase reversal, or phase loss.

There shall be a diesel fuel tank with the capacity to run the generator for a minimum of 24 hours with a 100% load. Fuel tanks shall be UL-listed double walls with leak detection. Low fuel and leak detection status shall be available both at the site and through the SCADA.

At the time of acceptance of operation by the Town of Bunn, the Contractor shall be responsible for topping off the fuel tank.

The generators shall be equipped with a 304 stainless steel (including all internal components) critical-grade exhaust silencer. The silencer shall be equipped with a rain cap and all connections, pipes, nuts, bolts, etc., which shall be 316 stainless steel.

There shall be dry contacts provided to indicate engine run, the common engine failure, common engine warning, transfer switch position, utility power loss, low fuel level, and fuel tank leak for remote telemetry purposes. More items may also be required based on the site.

The Owner shall be furnished with one complete set of spare air, oil, and fuel filters for the generator. The Owner shall also be furnished with one set of spare accessory belts.

The Owner shall be given three copies of the O&M and parts manuals for the generator unit and the automatic transfer switch.

The automatic transfer switch shall have a disconnect switch on the utility service main side.

The generator set, controls, and transfer switch shall be furnished by a single supplier. The supplier shall be the authorized dealer of the engine-generator set manufacturer and shall be fully qualified and authorized to provide service and parts for the engine and generator at any time during the day or night. The supplier must be located within a 100-mile radius of the site.

## SECTION 5 - ELECTRICAL REQUIREMENTS FOR THE PUMP STATION

All electrical work shall conform to the latest NEC and local guidelines.

Control panels shall be labeled as an assembled panel and bear the UL label.

Sewage pumping station utility voltage shall be 480 volts, three-phase, 60-hertz power for stations with larger than 5-hp pumps. The Owner/Developer/Contractor is responsible for ensuring adequate power is available at the proposed pumping station site.

All wiring shall be identified at each termination. Wiring shall have a unique wire number and be labeled at both ends. Wire numbers shall correspond with equipment terminal wire numbers as indicated in the accepted shop drawings. Where no wire numbers are indicated, the Contractor shall advise the Town Engineer in writing prior to assigning wire numbers. Wire numbers shall not be duplicated.

For instrumentation wiring, the Contractor shall provide a schedule indicating the wire number, color code if applicable, origin and destination devices, and terminals on the shop drawings.

Conductor insulation color-coding: (Tape for identification shall only be allowed on conductors larger than #6 AWG.)

480 Volt AC Power:

Phase A – Brown
Phase B – Orange
Phase C – Yellow
Neutral – White

120/208 Volt or 120/240 Volt Power

Phase A – Black
Phase B – Red
Phase C – Blue
Neutral – White

DC Power

Positive Lead – Red
Negative Lead – Black

DC Control

All Wiring – Blue

120 VAC Control

Single conductor 120 VAC control wire shall be RED except for a wire entering a motor control center compartment or control panel that is an interlock. This conductor shall be color-coded YELLOW.

All wiring – ORANGE

Equipment Grounding Conductor

All wiring - Green

Phase sequence shall be A-B-C from rear to front, top to bottom, or left to right when facing the equipment. The use of rigid hot-dipped galvanized steel or rigid aluminum electrical conduit is required. The Contractor shall apply a section of heat shrink tubing to the conduit extending through and 12" above and below concrete pads.

All panels shall be lockable and rated NEMA 4X minimum.

Weatherproof, insulated throat "Meyers" hubs shall be used on all conduit entries to panels, boxes, and devices without integral hubs.

All equipment shall be NEMA-rated; IEC will not be accepted.

All electrical and control panels shall have weatherproof identifying labels attached with stainless steel screws; adhesive will not be acceptable.

All electrical conduits from the wet well to the control panel must be sealed using a rubber grommet system to prevent gas entry to the control panel or pump house enclosure. This only applies to the conduit that enters the wet well area.

No electrical junction boxes or splices are permitted in the wet well.

All wires leaving the wet well shall be spliced inside an electrical junction box just outside the wet well (and properly labeled on both ends) before continuing to the control box.

All branch circuit panels shall have a typed index identifying breakers. Spare breakers are to be labeled "spare."

The Owner shall be provided with one complete set of spare fuses. Conduit size, origin, destination, wire size, and the number of wires shall be shown on the plans.

TOWN OF BUNN
BASIC TWO-PUMP SEWAGE LIFT STATION MONITOR POINTS

| DATA TYPE | DEFINITION | CONTROL HOOKUP |
|---|---|---|
| DI | CONTROL AC POWER FAIL | DRY CONTACT ON RELAY POWERED BY LOAD SIDE OF CONTROL CIRCUIT PROTECTED BY PHASE MONITOR THAT BREAKS CONTROL CIRCUIT |
| DI | HIGH WETWELL | DRY CONTACT ON HIGH WET WELL RELAY AND SEPARATE DIRECT FLOAT |
| DI | PUMP 1 RUNNING | AUX. DRY CONTACT ON THE MOTOR STARTER |
| DI | PUMP 2 RUNNING | AUX. DRY CONTACT ON THE MOTOR STARTER |
| DI | LAG PUMP RUNNING | DRY CONTACT, MANUFACTURER PROVIDED |
| DI | GEN. RUN & HOUR METER | DRY CONTACT GENERATOR RUN RELAY |
| DI | GEN. FAIL, | DRY CONTACT COMMON FAULT RELAY |

| | | |
|---|---|---|
| | COMMON FAULT | |
| DI | TRX SWITCH EMERG/UTILITY POSITION | DRY CONTACT, TRX. SWITCH |
| DI | TRX SWITCH UTILITY POWER AVAILABLE | DRY CONTACT, TRX. SWITCH |
| DI | GEN. FUEL LOW | DRY CONTACT, MANUFACTURER PROVIDED |
| DI | GEN. FUEL TANK LEAK | DRY CONTACT, MANUFACTURER PROVIDED |
| DI | LOW WET WELL | DRY CONTACT ON HIGH WET WELL RELAY AND SEPARATE DIRECT FLOAT |

Alarm wiring to be # 14 stranded MTW blue color. Pull alarm wiring in separate conduit from AC power circuits. Conduit size for alarm circuits to be min.1" from PS control to RTU, 1" from the generator to RTU, and ¾" from ATS to RTU.

TOWN OF BUNN, NEW SEWAGE PUMP STATION CHECKLIST

SITE:

THIS MUST BE COMPLETED IN FULL BEFORE THE TOWN OF BUNN WILL ASSUME OPERATION AND MAINTENANCE OF THE SITE.

| DATE | ITEM | COMMENTS | INITIAL |
|---|---|---|---|
| | AS BUILT PLANS PS & FORCE MAIN | Provide 3 hard paper, 1 digital on CD | |
| | O&M MANUALS PS | Provide 3 copies O&M, original and bound | |
| | O&M MANUALS GEN. & TRANSFER SWITCH | Provide 3 copies O&M, original and bound | |
| | O&M MANUALS CHEMICAL FEED | Provide 3 copies O&M, original and bound if applicable | |
| | O&M MANUALS AIR RELEASE VALVES | Provide 3 copies O&M, original and bound | |
| | SPARE PARTS PUMP STATION | Provide 1 CCW impeller key, nut and washer, 1 mechanical seal, gaskets,1 identical pump of the 2 pumps installed for an emergency backup | |
| | SPARE PARTS GENERATOR | Provide 1 set belts and air, fuel and oil filters | |
| | SPARE PARTS FUSES | Provide 1 complete set of each type and size used | |
| | GENERATOR START-UP TEST REPORT | | |
| | PS START-UP TEST REPORT | | |
| | CHEMICAL FEED START-UP TEST REPORT | If applicable | |
| | SITE ADDRESS | | |
| | ALL SCADA MUST BE INSTALLED AND OPERATIONAL | | |
| | KEYS, ELEC PANELS, GENERATOR, ETC. | Provide 3 minimum | |
| | UTILITY BILLING ELECTRICAL SERVICE | Provide account info, so Town can assume account | |
| | UTILITY BILLING WATER SERVICE | Provide account info, so Town can assume account | |

## SECTION 6 - SEWER MATERIAL STANDARDS

1. GENERAL MATERIAL

Current specifications of the American Society for Testing Materials (ASTM), American Water Works Association (AWWA), the American National Standards Institute (ANSI), the American Association of State Highway and Transportation Officials (AASHTO), and Ductile Iron Pipe Research Association (DIPRA) shall apply in all cases where the material is covered by an item in these specifications. All material used shall conform fully to these current standards or be removed from the job at the direction of the Public Works Director.

Pipe specimens may be subjected to tests by an independent testing laboratory at such time as the Public Works Department may direct or as specified herein. Pipe not meeting these specifications will be ordered removed by the inspector, and such pipe shall be immediately removed from the job site and not transported to any portion of the project being constructed.

These specifications are not to be considered proprietary in any way. When a particular brand is listed, it is only used as an aid in describing the type of material being requested.

2. PIPE MATERIALS (Mains Only)

a. Ductile Iron Pipe and Fittings

Ductile iron pipes and fittings used for sanitary sewers shall be manufactured in accordance with AWWA Standards C-150 and C-110, respectively. The minimum pressure class pipe shall be class 250, or a greater class may be required based on the depth of cover and laying conditions. Pipe shall be supplied in 18 or 20-foot nominal lengths or less, depending on size and class. Pipe and fittings shall have a minimum working pressure of 250 psi and minimum iron strength of 30,000 psi. Ductile iron may be used for any sewer main 8-inch and larger. Pipe joints shall be the "Push-on" type manufactured in accordance with AWWA Standard C-111-95.

b. Interior Linings for Force Mains, Sewer Mains, Interceptors, and Sewer Service Pipe

All Ductile Iron pipes and Fittings in high $H_2S$ areas shall be lined with an amine-cured novalac epoxy coating, minimum 40 mils nominal dry film thickness, and meet ASTM E 96-93 or the latest revision.

c. PVC Gravity Sanitary Sewer Pipe

PVC gravity sanitary sewer pipe and related fittings shall be manufactured in accordance with all the requirements of ASTM D-3034-98 SDR 35 Type PSM polyvinyl chloride sewer pipe. PVC gravity sewer pipe may be used for 6, 8, 10, 12, or 15-inch mains and shall be supplied in suitable lengths and shall be bell-and-spigot joints. ASTM F679-95 shall establish the requirements for 18, 21, 24, and 27-inch diameter PVC, SDR 35, or SDR 26 gravity sewer pipe. The length of joints shall be at least 11 feet for the larger PVC pipe unless approved differently by the Public Works Director. All fittings shall use rubber gaskets, which conform to the requirements of ASTM F477-99.

d. Steel Pipe (for casing)

Steel pipe for aerial creek crossings shall be high-strength steel, helical or straight seam welded, manufactured in accordance with ASTM A 139, and consisting of grade "B" steel with a minimum yield strength of 35,000 psi. Boring installations shall be high-strength steel, spiral welded, or smooth-wall seamless manufactured in accordance with ASTM A252 and consisting of grade 2 steel with a minimum yield strength of 35,000 psi. The minimum casing pipe wall thickness shall be 0.375" for bored encasement per the table provided in the sewer detail. Thicker encasement pipe may be required by the North Carolina Department of Transportation, railroads, or other agencies.

The pipe shall be coated inside and outside in accordance with AWWA C203-97, ASTM standards, and any additional requirements of the N.C. Department of Transportation or the American Railway To Engineering Associations' specifications. All encasement pipes must be approved by the appropriate controlling agency (i.e., NCDOT, RR, etc.) prior to ordering the material.

If the encasement pipe is used to carry a sewer main larger than 8-inch in diameter, then a vent pipe shall be installed in an area where it will not be a hazard to pedestrians or traffic. The vent pipe shall be made from ASTM A139, grade "B" steel, with a minimum yield strength of 35,000 psi and coated as described above or factory galvanized. The vent pipe location shall be approved by the appropriate agency prior to installation.

All carrier piping shall be slip joint ductile iron, and the inside diameter of the casing pipe shall not be less than 2 inches greater than the largest outside diameter of the joints and couplings for carrier pipe less than 6" O.D. and 4" greater for carrier pipe 6" and larger. It shall, in all cases, be great enough to easily remove the carrier pipe without disturbing the casing pipe. The minimum steel casing size for carrier pipe shall be as follows:

| ***Nominal D.I. Carrier Pipe Dia. (Inches)*** | ***Steel Casing Minimum O.D. For Highways (Inches)*** | ***Min. Wall Thickness (Inches)*** | ***Min.Wall Thickness For Railroads (Inches)*** |
|---|---|---|---|
| **3** | **8.625** | **0.250** | **0.250** |
| **4** | **10.750** | **0.250** | **0.250** |
| **6** | **12.0** | **0.250** | **0.250** |
| **8** | **16.0** | **0.281** | **0.312** |
| **10** | **20.0** | **0.312** | **0.312** |
| **12** | **24.0** | **0.312** | **0.375** |
| **15-16** | **30.0** | **0.406** | **0.406** |
| **18** | **30.0** | **0.406** | **0.500** |
| **20- 21** | **36.0** | **0.469** | **0.500** |
| **24** | **36.0** | **0.469** | **0.500** |
| **27** | **42.0** | **0.562** | **0.625** |
| **30** | **48** | **0.625** | **0.719** |
| **33-36** | **54** | **0.719** | **0.719** |

Both ends of the casing shall be mortared. Metal "spider" pipe alignment devices shall be installed in all casings with a minimum of two spiders per pipe joint, one-fourth of the pipe joint length from both the bell and spigot ends.

e. PLUG VALVES

All plug valves shall meet or exceed the following standards:
ANSI flange drilling conforms to ANSI B16.1, Class 125, and ANSI B16.5, Class 150.
ANSI/AWWA C517 Eccentric Plug Valves
Mechanical-joint end connections conform to ANSI/AWWA C111/A21.11.
Grooved joint end connections conform to ANSI/AWWA C606.

Direct buried plug valves shall have a 2-inch nut operator with a C.I. valve box and lid marked "Sewer." Valves installed above 4 feet deep shall have an extension on the nut operator.

## SECTION 7 - MANHOLES AND RELATED MATERIALS

Manholes will be precast reinforced concrete. Eccentric or concentric cones may be used on up to 12-inch mains. Concentric cones will be used on all 15-inch and larger mains. These different types of manholes shall conform to these specifications and the Town of Bunn Standard "Sanitary Sewer Standard Details." All manholes outside the public right-of-way must be one foot above the 100-year flood or sealed. Sealed manholes must be vented every 1000 feet. "Candy cane" vent stacks on sewer manholes must be "factory" fabricated and "hot dipped" galvanized, NOT field fabricated and galvanized. All manholes shall be watertight.

a. Interior Linings for Precast Reinforced Concrete Manholes

All sanitary sewer interceptor/outfall manholes and manholes receiving a sanitary sewer force main discharge shall be internally coated with one coat of a 20% solids, deeply penetrating, dual-component polyurea primer (0.5 – 1.0 mils dry film thickness, 150 $ft^2$/gal), one intermediate coat of a dual component polyurea (50-100 mils dry film thickness, 50 $ft^2$/gal) and one top coat of a 65% solids, two-part polyurea (7.5-10 mils dry film thickness, 125 $ft^2$/gal). All coats can be applied by brush, spray, or roller. Polyurea coatings shall be Duramer 1030 manufactured by SewerKote or approved equal.

b. Precast Reinforced Concrete Manholes

The concentric and eccentric manholes shall be designed and manufactured in accordance with ASTM C478-97. Manhole diameters shall be 4, 5, or 6 feet in diameter as determined by the table within Sewer Design standards for main size or depth. The walls shall be a minimum of 5 inches thick and have a 6-inch minimum base. The standard joint shall be sealed with cementitious grout meeting all Federal Specifications. An O-ring or "ram neck" joint seal may be used. All exterior joints shall be wrapped with a butyl resin sealant of 8" width. The "O" ring joint shall conform to the requirements of ASTM C443-98. A flexible rubber boot shall be supplied with the manholes to tie the pipe to the barrel section. These gaskets and clamps shall meet the requirements of ASTM C923.

The manufacturer shall submit drawings showing the reinforcing, pipe openings, and other details for approval by the Public Works Director. Also, the manufacturer shall provide certified test reports indicating that the materials comply with the requirements of ASTM C478-97.

c. Related Materials

1) Manhole rings and covers shall be manufactured to the dimensions shown on the Town's sanitary sewer details, and shall be made from Class 30 gray iron, meeting the requirements of ASTM A48-94ae1. All covers must be domestically cast and indicated by manufacturer name and "USA" in castings. Covers shall have "DANGER PERMIT REQUIRED – CONFINED SPACE DO NOT ENTER" cast onto the face. All manhole rings on flat-top manholes shall be cast into the manhole top, as shall be the flange for the vent stack, if applicable. The Town of Bunn will not accept manhole rings and covers manufactured outside the United States.

2) Manhole steps shall be made from reinforcing steel which is rubber plastic coated to provide for safer footing. These steps shall be furnished in accordance with the applicable OSHA regulations. Steps shall also be provided on the outside of raised manholes when the top elevation is greater than three (3) feet above the existing ground elevation. All traffic-bearing castings must be Class 35 or greater.

3) Cement used in masonry or reinforced concrete units shall be Type-I, CSA normal, meeting ASTM C150-99, unless otherwise approved by the Public Utilities Director.

4) Concrete shall be only plant-mixed or transit-mixed concrete conforming to ASTM C33-99ae1 as to aggregates and ASTM C94/C94M-99e1 for ready-mixed concrete.

Concrete shall be of three types based on 28-day compressive strength:

| | |
|---|---|
| Type AA | 4500 psi |
| Type A | 3000 psi |
| Type B | 2500 psi |

Concrete shall be air-entrained, unless specified otherwise, with 4 to 6% air. Retarders and accelerators shall be used only as directed by the Town Engineer.

Concrete used for structures such as sewage lift stations and other reinforced concrete structures shall meet all applicable provisions of the NCDOT specifications regarding the manufacture, delivery, and placement.

5) Steel reinforcing for concrete structures shall meet all applicable provisions of the NCDOT specifications as to manufacture, fabrication, and placement.

6) Mortar used for sewer structures shall conform to ASTM specification C144-99 as aggregate and strength. Mortar shall be prepared from cement in perfect condition and shall be prepared in boxes for that purpose. No mortar that has stood beyond forty-five minutes shall be used. The proportion by volume for different kinds of work shall be:

Brick Masonry 1 part cement to 2 parts sand
Pointing 1 part cement to 1 part sand

7) Rubber boot sleeves shall meet or exceed ASTM C923 for connecting pipes to thru the barrel section of the manhole. Boot sleeves shall have stainless steel expansion bands and pipe clamps that meet or exceed ASTM C923 and A167.

8) Manhole inverts shall be constructed with a width equal to that of the effluent pipe, height to the springline, and invert "shelves" from that point upward at a 60 deg. Angle to the manhole walls. The invert shall be brushed and troweled so that a minimum energy loss occurs in the manhole from invert roughness."Bowl" shaped invert will not be allowed.

## SECTION 8 - MISCELLANEOUS MATERIALS

a. PVC Sewer Service Pipe

PVC sewer service pipe shall be schedule 40 PVC, including the clean-out stack, provided that a brass clean-out slotted plug for location purposes when clean-out flush with finished grade is used. A PVC cap may be used when the clean-out extends 4-inches or more above the finished grade.

b. PVC Sewer Pipe and Saddles

PVC sewer pipes, saddles, and adapters shall not be allowed on new construction. If saddles are used on the existing sewer, the Contractor will submit details to the Town of Bunn for approval before installation.

c. Sewer Force Main Material

Sewer force mains shall be ductile iron and or PVC sewer pressure pipe. Fittings at bends and reducers shall be ductile iron mechanical joints.

d. Sewer Air Release/Vacuum Breaker Valve Material

Air release/vacuum breaker valves on sewer force mains shall be in accordance with the "Standard Sanitary Sewer Details." The air vent shall be filtered to prevent odor with an approved device.

e. All bends constructed on force mains shall include concrete thrust blocks.

f. Individual services shall be prohibited without the written permission of the Public Works Director or designee. If such service is allowed, the pumping station shall be a grinder positive displacement type and shall be maintained by the Owner. The Town of Bunn will not be responsible for these individual stations.

## SECTION 9 - CONSTRUCTION SPECIFICATIONS FOR SEWER MAINS

The requirements contained in this section shall apply to sanitary sewer main installations constructed for the Town of Bunn or for private Developers who may or may not dedicate the sewer improvements to the Town of Bunn. All necessary construction permits must be obtained before construction may

begin in accordance with the North Carolina State Law. A sewer plug must also be installed to prevent discharge to the Town of Bunn wastewater collection system before acceptance of work performed.

Any Contractor performing work shall have on each job site a copy of these specifications and all permits, encroachments, etc.....

1. SCOPE OF WORK

a. The Contractor shall furnish all materials, equipment, and labor for excavation, installation, backfilling of sewer mains and related appurtenances as shown on the plans. The Public Works Department will provide inspections on main extension projects.

b. It shall be the Contractor's responsibility to notify the Public Works Department at least 48 hours in advance of beginning any construction work on any project. The Contractor must call the Public Works Department and give the location, project name, individuals' name, company name, and start date, and indicate if it involves a sewer extension.

c. Once construction has begun, the Contractor shall contact Public Works at (919) 496-2992 each morning by 9:00 a.m. to notify the location and type of work to be accomplished that day. The Town of Bunn requires a 48-hour notice prior to an inspection. Any work requiring Construction Observation outside the normal workday shall not be done without prior written approval from the Public Works Director and will be charged to the Contractor at the Construction Observer's overtime rate of pay.

d. If a Developer, or his /her Engineer, or Contractor proceeds with the main installation prior to permit issuance, and the Town of Bunn requires the work to be reinstalled, the Developer, Engineer of Record, or Contractor shall be fully liable for all actions and costs, including prosecution by the Town of Bunn and/or the State for proceeding with installation prior to issuance of appropriate permit(s).

"Field changes" are not considered approved by the Public Works Department unless revised plans have been submitted to the Public Works Department, reviewed, and approved. Therefore any Contractor that proceeds with construction prior to this approval is at his/her own risk.

## SECTION 10 - GENERAL TESTING REQUIREMENTS

a. The Town of Bunn shall require the Contractor to perform, such destructive and nondestructive testing, as it deems necessary in order to inspect the materials and workmanship. See specific testing requirements within this section. These tests shall be in accordance with the procedures established by ASTM and AASHTO. The Town of Bunn shall reserve the right to modify the procedures.

b. All new sanitary sewer mains must be cleaned to the satisfaction of the Construction Observer by jetting or balling prior to final inspection and acceptance by the Town of Bunn.

c. Prior to final acceptance, all sanitary sewer mains shall be camera inspected at the Contractor/Developers expense, and three (3) copies provided in digital format to the

Town of Bunn Public Works Department. Failed inspections will require a follow-up inspection and subsequent re-inspection fee.

## SECTION 11 - SEWER CONSTRUCTION PLUGS

Mechanical plugs (non-pneumatic) must be installed throughout the time of construction of any sanitary sewer extension. Plugs are to be installed on the downstream end of the new main at the first manhole from the existing tie-in until final acceptance.

All plugs must be securely tied off with steel cable within the manhole and must have a secure marking attached to the plug indicating the utility Contractor to whom the plug belongs.

All plugs must be monitored during construction to insure the plug are functioning as required.

Prior to removing the plug, all accumulated water/debris must be removed and disposed of properly by the Contractor. The Contractor must remove all plugs upon acceptance that the sewer facilities are sufficient and functionally complete to accept flow and PRIOR to the mains above the plug location being placed into service and/or accepting any sewage flow.

## SECTION 12 - HANDLING AND STORAGE OF MATERIALS

a. The Contractor shall be responsible for the shipping and storing of all sewer materials. The Contractor shall replace any damaged or defective material at the Contractor's expense.

b. The loading and unloading of all pipe, manholes, and other accessories shall be in accordance with the manufacturer's recommended practices and shall at all times be performed with care to avoid any damage to the material.

c. The Contractor shall locate and provide the necessary storage areas for materials and equipment. If private property is being used for storage areas, then the Contractor must have the written consent from the Owner. Without this written consent, all material and equipment shall be stored within the existing rights-of-way and easements of the project. Any pipe strung out can not be left overnight; it must be delivered to and removed from the job site each day.

d. All materials, once on the job site, shall be stored in accordance with the manufacturer's recommendations. All PVC sewer pipes shall be protected from the sun's ultra violet rays if stored on the job site longer than twenty days. Pipes with prolonged sun exposure may be rejected for use by the Town of Bunn.

e. All pipes shall be kept free of dirt and other debris. Any damage relating to the coating of the various materials for sewer and water mains shall be repaired in a manner approved by the Town of Bunn. Machined manhole frames and covers shall remain intact until construction is complete.

f. The Contractor shall be responsible for safeguarding and protecting all material and equipment stored on the project. The Contractor shall be responsible for the storage of materials safely and professionally to prevent injuries during and after working hours until the project is complete.

## SECTION 13 - BARRICADES, SIGNS, AND STREET PROVISIONS

a. Signs, barricades, warning lights, guard rails, and flaggers shall be employed as necessary when construction endangers either vehicular or pedestrian traffic. These devices shall remain in place until the traffic may proceed normally again. The Contractor shall hold the Town of Bunn harmless for any damages or injuries caused by the construction of sewer mains.

b. Detours shall be set up and maintained by the Contractor under the direction of the Town of Bunn and/or the North Carolina Department of Transportation. The notice must be given a week in advance of the detour so that necessary notification of the traveling public may be made by the Contractor to the public. The Contractor will furnish all barricades, signs, lights, and other safety devices to protect his/her construction area. The Contractor is in no way relieved of liability for providing this protection because others approve the detour.

c. Construction work zone signs and signing procedures shall conform to the Manual of Uniform Traffic Control Devices and supplements and all applicable federal, state, and local codes. The Contractor shall be responsible for securing the necessary permits for all work to be performed in the public rights-of-way.

## SECTION 14 - PROPERTY PROTECTION

Trees, fences, poles, and all other property shall be protected unless their removal is authorized, and any property not authorized for removal, but damaged by the Contractor, shall be restored by the Contractor to the Owner's satisfaction. Existing manholes within the work zone and outside of the pavement shall be protected by an orange safety fence. At no time is work, storage of material, or construction access to occur on private property unless the work is within a recorded easement or with prior written authorization.

## SECTION 15 - GENERAL CONSTRUCTION SAFETY

a. The Contractor and any Sub-contractors shall be responsible for total compliance with all federal, state, and local ordinances, laws, and regulations as related to safe construction practices and to protect the employees' and the public's health and safety.

b. The Contractor shall ensure that all Occupational Safety and Health Administration (OSHA) regulations and standards are followed during all phases of the construction project.

c. The Town of Bunn shall not be responsible for the Contractor's adherence to OSHA regulations and standards. However, the Town of Bunn may report known violations or unsafe practices to the appropriate enforcement agency.

d. The Contractor shall furnish safety equipment necessary to inspect the work, including, but not limited to, ladders, confined space entry tripod/harness, gas detectors/oxygen sensors, blowers, etc.

e. Under no circumstances shall any roadway or driveway be blocked overnight. The roadway shall be open for access to residents, businesses, emergency vehicles, garbage pick-ups, school buses, etc. Furthermore, no driveways shall be blocked overnight without the express permission of the Town of Bunn Public Works. The

Contractor shall notify the Public Works Department, School Bus Garage, and Emergency Services of any temporary road closings and/or detours.

## SECTION 16 - ENCROACHMENT CONTRACTS AND PERMITS

a. Prior to actual construction, the Contractor/Town Engineer shall acquire the necessary encroachments from NCDOT when working within the rights-of-way of state system roads or highways. A copy of the encroachment permit shall be kept on the job site at all times.

b. The Contractor/Engineer of Record shall be responsible for securing all other local and state, and federal permits required for the utility construction. The Contractor must have an approved set of permitted construction plans on-site at all times.

## SECTION 17 - PAVEMENT REMOVAL AND REPLACEMENT

a. All pavements to be removed shall be cut along straight lines with the appropriate saw-cut machine. All material removed must also be removed from the job site the same day and disposed of properly.

b. All cuts of Town of Bunn streets must be patched the same day with ABC Stone or 2 inches of SF 9.5A asphalt. Once work has been completed, or if a hazard exists, all temporary patches shall be replaced with SF 9.5A asphalt. All work from patching shall be cleaned up at the same time of patching.

c. Asphalt compaction shall be done with gasoline or diesel-powered smooth drum asphalt roller.

d. Pavement cuts within NCDOT Right of Way shall not be performed without the proper encroachment permits on-site. All patching of NCDOT pavements shall conform to the approved on-site encroachment permit.

## SECTION 18 - CONSTRUCTION WATER

The Town of Bunn Public Works Department does not provide free or otherwise unmetered construction water for any construction project. Contractors are responsible for requesting a hydrant meter from Town Hall (deposit required). Hydrant meters may only be moved with the express written permission of the Public Works Department. Contractors are responsible for adequate construction water for their job sites.

**Note: Individuals caught using water unmetered and/or unauthorized by the Public Works Department will be prosecuted to the fullest extent of the law.**

## SECTION 19 - EXCAVATION

a. Prior to any excavation or construction, the Contractor shall be responsible for contacting NC 811 for the location of all existing utilities in the field. If help is needed in locating utilities operated by the Public Works Department, the Contractor should contact the Town of Bunn Public Works Department (919) 496-2992.

b. Trench width shall be a minimum of twelve inches plus the outside diameter of the pipe and a maximum of twenty-four inches plus the outside diameter of the pipe

unless OSHA requires additional trench width. Trench width shall be measured between the faces of the cut at the top elevation of the pipe bell.

c. Trench bottom conformation, where no special bedding is required, may be referred to as flat bottom, where the trench bottom is excavated slightly above grade and cut down to pipe grade by hand in the fine-grading operation. Where the trench bottom is inadvertently cut below grade, it shall be filled to grade with approved material and thoroughly tamped.

d. The Contractor shall, at the Contractor's own expense, keep all trenches free from water during the excavation for the construction of sewer mains. The water shall be pumped out of the trench or build check dams to keep it out of the ditch so as not to cause injury to public health, private property, or the work in progress. Erosion control measures shall be taken during this pumping.

e. In trenches where water is present or dewatering is required, the trench shall be stabilized with #57 or #67 stone. When the Contractor encounters material during trench excavation, at the opinion of the inspector or Public Works Director, that is unsuitable (i.e., "muck"), this material shall be replaced with material that is considered suitable prior to the pipe laying operations. In this case, construction fabrics may be required to prevent the migration of side support away from the pipe. Water shall be filtered prior to discharge to prevent sediments from escaping the site. The Contractor shall discharge said water so as not to erode the soil.

f. Safety and convenience of the public necessitate that all work, including excavation, be done in such a manner as to cause minimum traffic interruption, both pedestrian and vehicular. Utilities, such as fire hydrants, valves, etc., shall be accessible at all times. Gutters and drains shall be left open and clear at all times, and the Contractor shall be responsible for all drainage around his work. Unless specifically waived by the Public Works Director, provisions shall be made to maintain vehicular traffic on all streets in which work is in progress, and suitable walkways shall be maintained for pedestrian travel.

g. Under no circumstances shall any roadway or driveway be blocked overnight. The roadway shall be open for access to residents, businesses, emergency vehicles, garbage pick-ups, school buses, etc. Furthermore, no driveways shall be blocked overnight without the express permission of the Town of Bunn Public Works. The Contractor shall notify the Public Works Department, School Bus Garage, and Emergency Services of any temporary road closings and/or detours.

h. The time should be extended if wet weather occurs during the sanitary sewer construction; the Contractor and/or Owner shall be responsible for any additional stone to be installed to ensure the roadway is passable.

i. Sheeting or bracing shall be used wherever necessary to prevent failure of the trench banks. All sheeting shall conform to AASHTO and OSHA safety standards. The Town Engineer's decision relative to bracing for the protection of property of the Town of Bunn shall be binding upon the Contractor. The removal of sheeting shall be done in such a manner as to minimize the loss of friction between the backfill and trench walls.

## SECTION 20 - TRENCH PREPARATION

a. Trench excavation shall conform to the line and depth shown on the plans. The trench shall be properly braced and shored so the workers may work safely and efficiently. When water is being pumped from the trench, the pump discharge shall follow natural drainage channels, drains, or storm sewers. In no case may trench water or groundwater be pumped into or allowed to enter the sanitary sewer system. See the erosion control section for appropriate siltation prevention measures prior to pumping.

b. The width and type of trench may vary with the depth of cut, and the trench shall be constructed in accordance with the dimensions and other information.

c. Pipe clearance in rock shall be a minimum of six inches on each side and bottom for mains fifteen inches in diameter and less. For larger-size mains, the minimum clearance shall be nine inches on the sides and bottom.

d. If unstable conditions are encountered, the trench shall conform to the requirements stated in these specifications.

## SECTION 21 - PIPE INSTALLATION

a. The pipe material listed above shall be installed in accordance with the manufacturer's recommendations and the requirements of these specifications.

b. All gravity sanitary sewer mains and manholes shall be laid to the line and grade shown on the plans. Force mains shall be installed at the minimum depth indicated on the plans. In no case shall sewer mains have less than 3 feet of cover unless the piping material is ductile iron.

c. No deviations from line and grade shall be made unless the Public Works Department or Town Engineer has approved them and they have been identified on the construction drawings initialed by the individual authorizing the change and on the "as-built" plans.

d. The sewer pipe installation shall start at the outlet end and proceed upstream to the termination of the project, as shown on the plans. The bell ends shall point upstream. Exceptions to this provision will be considered on a case-by-case basis when requested in writing by the Owner of the development at the time construction plans are submitted to the Town of Bunn for review and approval. The development Owner must agree to hold the Town of Bunn harmless. He must accept full responsibility for compliance with state and federal regulations of the Clean Water Act, including any associated penalties, which could reach up to $25,000/ day, for the release of wastewater from sanitary sewer to the environment, which are not connected to existing sewer due to the granting of an exception to the pipe laying sequence required in the Public Works Specifications. The development Owner must further agree not to request building permits if an exception is granted for that portion of the development until the connecting sewer is constructed and accepted by the Town of Bunn.

e. While working on any part of an existing sewer main, the Contractor shall maintain the existing sewage flow. No discharge of sewage to the storm waters will be allowed. Water for the flushing of new sanitary sewer mains must be obtained through a fire hydrant meter and must be pumped out and may not be discharged into the

sanitary sewer system. Construction requiring existing sewer flow to be pumped from existing manholes shall be the Contractor's responsibility. It must be approved prior to proceeding by the Public Works Director or the Town of Bunn Construction Observer.

f. After the trench foundation has been properly graded with bell holes, the pipe shall be carefully lowered into the trench with approved methods. Under no circumstances shall the pipe or accessories be dropped or dumped into the trench. All damaged pipes shall be properly repaired or replaced at the Contractor's expense.

g. The pipe interior shall be kept clean before and after laying by means approved by the Public Works Director or Town Engineer. Pipe ends shall be plugged at the end of each workday or when work is temporarily stopped. The plugs shall be watertight so the water and debris will be kept out.

h. When installing a sewer main, the horizontal separation from any water main shall be 10 feet or 24-inches vertically with water over the sewer. If this separation cannot be maintained due to existing conditions, the variation allowed is the water main in a separate trench with three feet of separation and the elevation of the water main at least 24-inches above the top of the sewer, and both water and sewer must be Ductile Iron pipe. All distances are measured from outside diameter to outside diameter. If separation cannot be maintained, it will be the reasonability of the Contractor to upgrade both lines to ductile iron regardless of whether the water or sewer line previously existed for the entire length of the separation discrepancy. This will ensure that all parties concerned will be within minimum NCDEQ requirements.

i. When a water main crosses over a sewer main, there must be twenty-four inches of vertical separation. If the water main must go under the sewer main, both these lines must be of ferrous material for a distance of ten feet on either side of the crossing with a 24-inch separation. The crossing of other underground pipes requiring less than a minimum of twenty-four inches of vertical separation; the area must be of ductile iron pipe for ten feet in both directions of both pipes, and the sewer be encased in sleeves extending 10 feet in both directions and the water main be ductile iron. The Public Works Director must approve any changes in these clearances. All crossings within these vertical clearances shall be filled with #57 or #67 stone. All distances are measured from outside diameter to outside diameter.

j. Railroad crossings shall be made following all precautionary construction measures required by the railroad officials.

k. All sewer crossings under state system roads shall be made in accordance with the requirements of NC DOT as defined in their encroachment permits.

l. Where conditions are, in the opinion of the Public Works Department or Town Engineer, unsuitable for laying pipe because of weather or trench conditions, the Contractor shall be required to cease work until permission is given by the Public Works Department or Town Engineer for work to commence again, providing such conditions have been corrected.