

NEW BERN



CITY OF NEW BERN
Department of Public Utilities

***WATER & SEWER DESIGN
STANDARDS***

Adopted December 9th, 2014

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SECTION 1.0

INTRODUCTION

1.1 GENERAL

The purpose of this document is to provide a guideline for Property Owners, Developers and Engineers to assist with design of plans and specifications for projects which will become part of the City of New Bern water and/or sewer system. All proposed utility projects shall meet or comply with all applicable requirements set forth by the North Carolina Department of Environmental and Natural Resources (NCDENR) and the standards contained herein. A project which shall require a variation from these requirements must be approved by the City of New Bern Department of Public Utilities prior to permitting.

1.2 CONTACT INFORMATION

All correspondence regarding proposed utility projects shall be directed to the City Engineer at the following address:

Mr. Jordan B. Hughes, P.E.
City Engineer

City of New Department of Public Utilities
210 Kale Road
New Bern, N.C. 28563
Phone: (252) 639-7527
Fax: (252) 636-4103
Email: hughesj@newbern-nc.org

1.3 SYSTEM INFORMATION

1.3.1 Water System

Name: City of New Bern
Owner: City of New Bern
PWS I.D. No.: 04-25-010
WSMP No.: 01-00769
County: Craven

1.3.2 Sanitary Sewer System

The City of New Bern WWTF – Permit Number NC0025384

1.3.3 Low Pressure S.T.E.P. Sanitary Sewer System

The City of New Bern Township No. 7 Lagoon WWTF – Permit No.
WQ0003765

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SECTION 2.0

PLAN APPROVAL AND PERMIT SUBMITTAL

2.1 PLAN AND SPECIFICATION SUBMITTAL

Two (2) complete sets of plans, specifications, design calculations, and all other relative information shall be submitted for review to the City of New Bern Department of Public Utilities for any project which proposes to tap, extend, or otherwise alter the existing City of New Bern water or sanitary sewer systems. All modifications to the project plans and specifications which are requested after review by the City Engineer must be complete and shown on revised plans prior to the project approval.

2.2 PERMIT APPLICATIONS

2.2.1 Commercial Sewer Use Permits

All businesses requesting to connect to the City of New Bern low pressure S.T.E.P sewer system will have to make application for and obtain a Commercial Sewer Use Permit. The permit application has to be submitted to and approved by the Department of Public Utilities prior to establishing a water and sewer account with the City. Permit applications can be picked-up at the City of New Bern Department of Public Utilities Administration Office or downloaded from the City of New Bern webpage at www.newbern-nc.org.

The permit shall be non-transferable and shall be issued to the business owner not the property owner. Therefore, the permit will have to be renewed upon change of business owner or building occupancy use.

Businesses applying for a commercial sewer use permit for an existing building must have a daily designed sewer flow of less than 1,000 gallons per day or less than 120% of the average daily flow of the previous business, whichever is greater. The average daily flow of the previous business shall be based on actual water use records from the most recent 12 month period that the business was in operation. The daily designed sewer flow rate for the new business shall be based on the flow rate allocation criteria set forth in the most recent version of the City of New Bern Schedule of Capital Recovery and Connection fees.

Businesses applying for a new S.T.E.P system connection to serve a newly constructed building must meet the requirements of Section 4.4

2.2.2 State Water and Sewer System Extension Permits

Projects which will require an extension of the City of New Bern water system or sanitary sewer system shall be permitted through the appropriate State agency with the City of New Bern listed as the permit applicant. Once the proposed plans and specifications have been approved by the City of New Bern Department of Public Utilities, permit applications shall be executed by the City and returned to the responsible engineer for submittal to the appropriate State agency. The project engineer and/or developer shall be responsible for submitting all required fees and attachments that must accompany permit applications.

SECTION 3.0

DESIGN GUIDELINES FOR WATER & SEWER SYSTEM EXTENSIONS

3.1 GENERAL

At a minimum, all proposed water and sewer extensions shall be required to meet the design requirements contained in this sections as well as all requirements set forth by the NCDENR. In any case where the City of New Bern standards and the NCDENR are not the same, the more stringent of the two shall apply.

3.2 PROPOSED WATER & SEWER MAINS

3.2.1 Sizing of Water and Sewer Mains

All proposed water and sewer main extensions shall be sized according the latest requirements of NCDENR and the standards set forth by the North Carolina Administrative Code. The City of New Bern reserves the right to increase the size of proposed mains as needed to accommodate future development within the general vicinity of the proposed project area as outlined in Section 74-74 of the Code of Ordinances of the City of New Bern.

3.2.2 Horizontal Location of Proposed Water & Sewer Mains

All proposed water and sewer mains shall be located within existing street rights-of-way or within a permanent utility easement. The minimum width of permanent utility easements for water mains and sewer force mains shall be ten feet (10'). The minimum width of permanent utility easements for gravity sewers shall be twenty feet (20'). All proposed water and sewer mains shall be located a minimum of ten feet (10') away from any existing or proposed permanent structure.

3.2.3 Vertical Location of Proposed Water & Sewer Mains

All proposed water and sewer mains shall be designed to provide at least three feet (3') of cover from the top of the pipe to the finished grade. At locations where this requirement cannot be met the main shall be constructed with ductile iron pipe.

Sewer force mains shall be designed where possible with uniform grade between low points and high points of the alignment. Air release valves shall be installed at all high points as described in section 3.6. Sewer force mains shall be installed to the designed grade to ensure that all high points are accounted for and air release valves are installed in the proper locations.

3.2.4 Separation of Water Mains and Sanitary Sewer Mains

Water mains shall be laid at least ten feet (10') laterally from existing or proposed sewers, unless local conditions or barriers prevent a ten foot (10') lateral separation in which case the following is required:

The water main shall be laid in a separate trench, with the elevation of the bottom of the water main at least eighteen inches (18") above the top of the sewer;

or

The water main shall be laid in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least eighteen inches (18") above the top of the sewer.

3.2.5 Water and Sewer Main Crossings

3.2.5.1 Crossing a Water Main over a Sewer Main

Whenever it is necessary for a water main to cross over a sewer main, the water main shall be laid at such an elevation that the bottom of the water main is at least eighteen inches (18") above the top of the sewer. If location conditions or barriers prevent an eighteen inch (18") vertical separation then both the water main and the sewer main shall be constructed of ductile iron pipe and with joints that are equivalent to water main standards for a distance of ten feet (10') on each side of the point of crossing.

3.2.5.2 Crossing a Water Main under a Sewer Main

Whenever it is necessary for a water main to cross under a sewer main, both the water and sewer main shall be constructed of ductile iron pipe and with joints equivalent to water main standards for a distance of ten feet (10') on each side of the point of crossing.

3.2.6 Fire Flow Requirements for Water Mains

Fire Flow requirements for all proposed development shall be determined by the City of New Bern Fire Department (252) 639-2931.

3.2.7 Pressure Requirements for Water Mains

Water mains shall be designed to maintain a minimum residual pressure of twenty (20) psi at peak demand during fire flow. Peak Demand shall be determined as described in Title 15A, Subchapter 18C of the North Carolina Administrative Code.

3.2.8 Reaction Anchorage and Thrust Blocking

All exposed piping with mechanical couplings, push-on, mechanical joints, or similar joints subject to internal pressure shall be blocked, anchored, or harnessed to preclude separation of joints. All mechanical joint tees, all horizontal bends, vertical bends deflecting twenty two and one half (22 ½) degrees or more, and plugs which are installed in buried piping (subjected to internal hydrostatic heads in excess of thirty feet (30')) shall be provided with suitable reaction blocking, anchors, joint harness, or other acceptable means for preventing movement of the pipe caused by internal pressure. Concrete blocking shall extend from the fitting to solid undisturbed earth and shall be installed so that all joints are accessible for repair. The fittings shall be wrapped in plastic to protect the fitting, bolts, and nuts from being permanently set in concrete and facilitate access for repair.

3.2.9 Detectable Tape and Tracer Wire

Detectable warning tape shall be installed on all water and sewer main extensions. Tracer wire shall be installed on all water and sewer main extensions, and all water/sewer services. The color of the detectable tape shall meet the standards of the AWWA color code.

All tracer wire must be maintained as a single strand in order to be effective. Breaks, gaps or distortion shall be cause for the contractor to repair the wire to the proper working order. The tracer wire shall be brought to the surface and located in a standard meter box at the following locations:

- At all bends and changes in horizontal direction.
- At all valves the tracer wire shall run along the exterior of the valve box and through a notch cut in the top (see detail W-4).
- At the ends of a directional bore.
- Any location where two sections of tracer wire need to be spliced together. No underground wire connections shall be permitted.
- On straight runs of pipe, at 500' intervals.

3.3 PROPOSED WATER & SEWER SERVICES

3.3.1 Location of Water & Sewer Services

All projects shall provide for individual water and sewer services to be installed at each lot or residential unit. Services shall be installed flush to finished grade along the limit of the street right-of-way and at the center of the parcel or lot to be served. Services shall not be located within

sidewalks, driveways, or other paved areas which are subject to vehicular traffic. Service pipe or tubing shall be installed perpendicular to the main.

3.3.2 Water Service Sizing

Water meters shall be sized by the City of New Bern Department of Public Utilities based on water demand data provided by the Developer and/or Engineer.

3.3.3 Water Service Connections

Water services shall be designed with a corporation stop, an angle stop, polyethylene service tubing, and a meter box.

3.3.3.1 Corporation Stops

Taps shall be located at 10:00 or 2:00 o'clock with respect to the circumference of the pipe. Taps shall alternate from one side of the pipe to the other side, whenever possible, and be at least 12" apart. In the event two taps are made on the same side of the pipe in succession, they must be a minimum of 24" apart. Service taps on PVC pipe shall be made using a double strap service saddle. Service taps on four inch (4") or larger ductile iron pipe may be installed by direct tapping of the main.

3.3.3.2 Angle Stops

Angle stops shall be installed so as not to cause a bind on the pipe once the meter is installed. The angle meter stop shall be perfectly plumb, 3" to 5" from the back of the meter box, centered between the sides of the meter box, and 3" to 4" above the bottom of the meter box.

3.3.3.3 Service Tubing

The water service tubing shall be one continuous piece of pipe from the corporation stop to the angle meter stop, with no unions. Each water service line shall run perpendicular to the main and straight to the meter with no kinks and/or bends.

3.3.3.4 Meter Boxes

Water meter boxes shall be placed on, no less than four (4), common brick to prevent settling. Meter boxes shall have four inches (4") of stone under the brick to aid in drainage.

3.3.4 Gravity Sewer Service Connection

Gravity sewer services shall be designed with a wye connection, a clean-

out placed at the right-of-way and service piping. The minimum size of a gravity sewer service shall be four inches (4”).

3.3.4.1 Wye Connections

Gravity sewer service line taps shall be located at 10:00 or 2:00 with respect to the circumference of the pipe. The sewer service line tap fitting shall be appropriate for the type of pipe being used.

3.3.4.2 Clean-outs

The sewer service line clean-outs shall be made using a long sweep wye on the sewer service line. A one foot (1') extension shall be placed on the through section of the wye with a cap glued in place. A single piece of sewer service line pipe shall be extended to grade from the wye, with a cap glued in place. Residential developments with multiple lots shall leave the clean-outs stubbed up 3' to 4' above grade until the private sewer has been connected to the clean-out, at which point the clean-out shall be lowered to be flush with the finished grade. The final clean-out cap shall have a slotted top or inverted nut. No raised nut clean-out caps will be permitted.

3.3.4.3 Service Piping

The sewer service line shall be constructed with the longest piece of pipe available from the manufacturer and the least amount of fittings. Couplings shall not be allowed on the sewer service lines to join short pieces together.

3.4 PROPOSED FIRE HYDRANTS

3.4.1 Location of Fire Hydrants

Proposed fire hydrants shall be placed within the street right-of-way and where possible at street intersections. On curbed streets the hydrant shall be placed no closer than two feet (2') and no further than five feet (5') from the back of the curb. On streets without curbing the hydrant shall be placed between the top of the ditch back slope and the right-of-way boundary. In no case will the hydrant be allowed to be placed in the ditch slopes. All hydrants shall be installed so that the pumper nozzle is perpendicular to the roadway and the centerline of the nozzle is a minimum of eighteen inches (18”) and a maximum of twenty-four inches (24”) above finished grade.

3.4.2 Spacing of Fire Hydrants

The spacing of proposed fire hydrants shall meet the following requirements:

- Residential Areas: Hydrants shall be spaced with a maximum of 1000 feet between hydrants.
- Commercial Areas: Hydrants shall be spaced with a maximum of 400 feet between hydrants.
- Industrial Areas: Hydrants shall be spaced with a maximum of 200 feet between hydrants.

The spacing length shall be measured along vehicle access routes which will allow for proper hose placement.

3.4.3 Fire Hydrant Assembly

All proposed fire hydrant assemblies shall include a water main tee, a hydrant leg, a gate valve, a riser, and the hydrant. Hydrants shall be installed perpendicular to water mains. Hydrant elbow shall be tied through all fittings and valves to the hydrant tee with the use of stainless steel threaded rods.

3.5 PROPOSED GATE VALVES

Gate valves shall be provided at all intersection of proposed water and sewer force mains. At each intersection a valve shall be provided for all but one of the branches (i.e. two (2) valves at a tee and three (3) valves at a cross).

3.6 PROPOSED AIR RELEASE VALVES

3.6.1 Location of Air Release Valves

Air release valves shall be located at all high points along pressure mains where the distance between the high point and the low point in the pressure main exceeds ten feet (10') in elevation. The City of New Bern Department of Public Utilities may require additional air release valves to be provided at other locations where it is determined that the possibility exists for the accumulation of excess air in the main.

3.6.2 Air Release Valve Assembly

All air release valves other than temporary blow-offs shall be automatic in type. The proposed ARV manholes shall be installed so that the manhole cover is flush with the existing grade and they shall not be installed in the centerline of any existing ditch or swale. If needed, these manholes shall be installed to back of the existing ditch and the ARV will be piped to the force main with the appropriate sized brass pipe.

3.7 PROPOSED BLOW-OFFS

3.7.1 Location of Blow-Offs

Manual blow-off assemblies shall be provided at dead-ends of all pressure mains.

3.7.2 Six Inch (6") and Larger Water Mains

At dead-end locations on all water mains six inches (6") in diameter and larger a standard fire hydrant shall be provided as a blow-off assembly.

3.7.3 Four Inch (4") and Smaller Water Mains

At dead-end locations on all water mains four inches (4") in diameter and smaller a manual blow-off assembly shall be provided in a meter box. The meter box shall be located at the limit of right-of-way. (See Detail W10)

3.7.4 Sewer Force Mains

At dead-end locations on all sewer force mains a manual blow-off assembly shall be provided in a meter box. The blow-off assembly shall have a brass ball valve and a two inch (2") hose connection in the meter box. The hose connection shall be equipped with a removable cap. The meter box shall be located at the limit of right-of-way. (See Detail W10)

3.8 PROPOSED BACKFLOW PREVENTION ASSEMBILES

Backflow prevention assemblies shall be required for all applications if which the potential exists for the public water supply to be contaminated by the backflow from a private water system. The degree of protection required shall depend on the severity and type of possible contaminant. Protection requirements and device locations may vary by project and will be reviewed on an individual basis by the City of New Bern Department of Public Utilities.

3.9 PROPOSED SANITRY SEWER MANHOLES

3.9.1 Location of Proposed Manholes

All proposed gravity sanitary sewer mains shall be designed so that a manhole is installed at all locations where changes in horizontal alignment, vertical grade, or pipe diameter are required. The maximum distance between manholes as measured along the sewer main shall be 425 feet.

3.9.2 Manholes in Paved Areas

Where practical design allows, all manholes located within paved areas shall be set along the center line of the road and out of designated parking spaces.

3.9.3 Manhole Structure

3.9.3.1 Base

Installation of all precast concrete manholes shall consist of a minimum of 6 inches of stone leveling course beneath the base section.

3.9.3.2 Sections

All manholes shall be constructed using precast concrete sections conforming to ASTM C-478.

3.9.3.3 Steps

Manhole steps shall be constructed of 0.5" diameter, grade 60 steel bars. The steps shall be have a plastic coating and meet the requirements of Federal Specification RR-F-621C.

3.9.3.4 Ring and Cover

Manhole rings and covers shall be constructed of Class 30 cast iron conforming to ASTM A48, and shall be traffic bearing. The words "SANITARY SEWER" shall be cast in top of the cover. Rings and covers shall be manufactured by Capital Foundry, East Jordan Iron Works, Charlotte Pipe and Foundry, or approved equal.

3.9.3.5 Flexible Pipe Sleeve

Pipe sleeves with stainless steel clamps conforming to ASTM C-923 shall be used for pipe to manhole connections. The pipe sleeve shall be design and constructed to provide a flexible watertight seal.

3.9.3.6 Inverts

Inverts shall be precast into the bottom section of the manhole.

3.9.3.7 Grout

All perforations pick holes, seams, transitions, joints and leaks shall be sealed with hydraulic cement or approved equal.

3.9.3.8 Drop Manholes

Manholes with sewer pipes entering 2 ½ feet, or more, above the bottom shall have an inside drop manhole connections installed. All drop manholes shall have a minimum inside diameter of 5 feet.

3.10 PROPOSED PUMP STATIONS

3.10.1 Option to Use Pump Stations

In the design of all proposed sanitary sewer system extensions every effort and consideration shall be made to use conventional gravity sewer for the system extension. The use of pump stations and force mains shall only be permitted when the proposed extension can not be properly connected to the existing gravity system due to local conditions or when existing gravity sewer is unavailable.

3.10.2 Sizing of Proposed Pump Stations

Proposed pump stations shall be sized as required by the NCDENR guidelines for the proposed property usage. The City of New Bern reserves the right to increase the size of proposed pump stations as needed to accommodate anticipated future development within the general vicinity of the proposed project area as outlined in Section 74-74 of the Code of Ordinances of the City of New Bern.

3.10.3 Pump Station Site

All proposed pump stations shall be placed on a site (50'x 50' min.) within the project area with a ground elevation above that of the flood plain. The site shall be graded to direct drainage away from the wet well structure. The site shall be accessible by an access road. At a minimum, the access road shall be twelve foot (12') wide and constructed of six inches (6") of compacted ABC stone. The site shall be enclosed by a vinyl coated, galvanized chain-link fence with a lockable gate. Compacted stone shall be placed within the entire fenced area. A concrete pad shall be poured to create a level surface between the wet well access and the control panel. An elevated area light shall be installed at the site, as well as a frost proof yard hydrant.

3.10.4 Pump Station Structure

3.10.4.1 Wet Well

All proposed wet well structures shall be constructed of precast concrete sections with the diameter as required by design and in no case less than six feet (6'). The top section shall be flat with the access openings cast in. Access openings and covers shall be sized and placed to allow for pump removal. A mushroom style vent shall also be cast in the top section of the wet well.

3.10.4.2 Pumps

All proposed pump stations shall use a duplex pump system. Pumps shall be submersible in type and of equal size and pumping capacity. Pumps shall be mounted on a guide rails and have a chain lifting system. Pumps shall be sized per the recommendations of the pump manufacturer for the designed flow.

3.10.4.3 Check Valves

Check valves shall be installed on each of the pump discharge lines. Check valves shall be the spring and lever type and installed in precast concrete valve vault. The valve vault shall be equipped with a lockable access cover.

3.10.4.4 Control and Electrical Components Rack

All electrical components and pump controls shall be located on a single rack within the pump station site. The rack and rack supports shall be constructed of stainless steel or aluminum and installed on a concrete slab. The rack shall have a minimum thickness of ¼ inch. A sun shield shall be provided across the entire length of the rack.

3.10.4.5 Pump Station Piping

All piping in the wet well, check valve vault, and additional piping within the pump station site shall be ductile iron. All piping within the pump station site shall have the same diameter.

3.10.4.6 Alternative Power Source

The alternative power source for all proposed pump stations shall be a generator or an independently powered back-up pumping system.

For pump stations with a designed average daily flow of less than 15,000 gallons per day, the pump station shall be equipped with a manual emergency transfer switch and hook-up for the generator.

For pump stations with a designed average daily flow of 15,000 gallons per day or more, the pump station shall be equipped with a permanently mounted generator and an automatic emergency transfer switch capable of running both pumps under full load or an independently powered back-up pumping system with a pumping rate equal to both of the primary pumps. For either application, a concrete pad shall be provided along with a fuel tank capable of handling enough fuel to operate for 24 hours.

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SECTION 4.0

GUIDELINES FOR USE OF THE TOWNSHIP NO. 7 LOW PRESSURE S.T.E.P. SEWER SYSTEM

4.1 GENERAL

This section identifies special requirements which are applicable to all customers located within the City of New Bern S.T.E.P. System Coverage Area. The boundaries of the S.T.E.P. System Coverage Area are illustrated in Figure 4.1 at the end of this Section.

Existing S.T.E.P. System users that are not within the boundaries of the S.T.E.P. system coverage area will be required to connect to the City's Conventional Sewer System for any new development or substantial redevelopment. "*Substantial Redevelopment*" will include development activities on a parcel in which the total cost (cumulative over 5 year period) of the proposed improvements to the existing structures exceeds 50% of the assessed, pre-construction value of the structures.

4.2 GENERAL REQUIREMENTS FOR S.T.E.P. SYSYEM USE

4.2.1 The City of New Bern will only provide (1) S.T.E.P. service per building lot. To be considered eligible for connection to the S.T.E.P. sewer system, a building lot shall meet one of the following conditions:

- A. For parcels platted prior to July 1, 2014: The parcel shall be located in an area currently served by the S.T.E.P. system and the lot must front a road right-of-way or utility easement where a S.T.E.P. system main currently exist.
- B. For parcels which are subdivided after July 1, 2014: The parcel shall be a minimum of 10,000 square feet and have at least 60 feet of frontage along a road right-of-way or utility easement where a S.T.E.P. system main currently exist.

New permits for the extension of S.T.E.P. system mains shall be prohibited.

4.2.2 The City of New Bern Department of Public Utilities will have final determination on service availability and shall have the right to refuse service if the existing infrastructure in a particular area cannot handle additional loading.

4.2.3 To determine if a lot will be eligible for connection to the S.T.E.P. sewer system, the property owner shall contact the City of New Bern Customer Service Representative at (252) 639-7596. No lot will be provided service

without a Sewer Availability letter issued by the City of New Bern Department of Public Utilities.

4.2.4 The required Capital Recovery and Connection fees for S.T.E.P. system users will be based on the schedule of fees as set forth by the City of New Bern Board of Aldermen.

4.2.5 Once S.T.E.P. system service is established at a property, the property owner shall be responsible for repairing or replacing the S.T.E.P. tank, at his/her own expense when notified in writing by the City of New Bern that tank repairs, tank replacement, or the removal of solids is necessary.

4.3 REQUIREMENTS FOR RESIDENTIAL INSTALLATION AND USE

4.3.1 Only one residence per eligible building lot will be allowed to connect to the S.T.E.P. system. However, duplexes and other multi-family units will be allowed by meeting the following requirements:

4.3.1.1 Each unit shall be on a separate lot as recorded at the Craven County Register of Deeds.

4.3.1.2 Each unit shall pay the applicable Capital Recovery and Connection based on the schedule of fees as set forth by the City of New Bern Board of Aldermen

4.3.1.3 Each unit shall be responsible installation of the electrical service and S.T.E.P. tank as outlined in Sections 4.3.4 and 4.3.5.

4.3.1.4 A common onsite S.T.E.P. System will also be permitted for multifamily buildings provided that the onsite tank is sized by a N.C. Professional Engineer, the electrical service is provided as outlined in Section 4.4.6 and that the electrical service for the onsite S.T.E.P. system be a common building service, separate from any of the unit services.

4.3.2 For residential properties wanting to connect to the S.T.E.P. system, the property owner shall be responsible for obtaining a Sewer Availability letter, paying the required Capital Recovery and Connection fees, providing the required electrical service, and installing the S.T.E.P. tank.

4.3.3 After the City Engineer has determined sewer service is available and issued the property owner a sewer availability letter, the applicable Capital Recovery and Connection fees can be paid during normal business hours at the City of New Bern Customer Service Office located at 606 Fort Totten Drive.

4.3.4 The property owner shall install (2) twenty amp three wire electrical circuits stubbed out from the residence as described below:(Also as approved by Craven County Building Inspections Department).

- 4.3.4.1 The power supply wiring should be installed within 20 feet of the discharge end of the S.T.E.P. tank. The control panel location should be visible from the road.
- 4.3.4.2 Two (2) twenty amp circuits on separate circuit breakers are required. One circuit is required for the pump and the other for the control panel.
- 4.3.4.3 The control panel will be mounted by the City as part of the pump installation.
- 4.3.4.4 Note that special provisions may be necessary for installations below the flood plain elevation of 10 feet above mean sea level. Any exceptions must meet the latest applicable National Electric Code
- 4.3.5 The S.T.E.P. tank to be installed by the property owner shall be a 1,300 gallon vacuum tested precast concrete septic tank/pump tank combination. A concrete riser ring shall be provided if needed to adjust ring and cover to final grade. A watertight manhole ring and cover shall be provided for access to the pump. The tank shall be manufactured by Futrells Precast, Inc. of Deep Run, N.C. (252- 568-3481) or The Stallings Company, Inc. of Greenville, N.C. (252-756-0267). The tank installer will need to contact the City of New Bern at (252) 639-7597 to witness the installation and vacuum testing of the S.T.E.P. tank at the time of installation.
- 4.3.6 Once the tank and electrical service have been installed, and the Capital Recovery and Connection fees are paid, the City of New Bern will schedule the installation of the pump components and the connection of the sewer service. The actual installation time will depend on the City's current work load

4.4 REQUIREMENTS FOR COMMERCIAL INSTALLATION AND USE

- 4.4.1 For commercial developments wanting to connect to the S.T.E.P. system, the property owner shall be responsible for obtaining a Sewer Availability letter, a Commercial Sewer Permit, paying the applicable Capital Recovery and Connection fees, providing the required electrical service, and installing the S.T.E.P. tank.
- 4.4.2 To be eligible for connection to the S.T.E.P. system, a commercial development must meet the requirements outlined in Section 4.2.1 and the proposed development shall have an average daily designed flow of less than 1,000 gallons per day based on the flow rate allocation criteria set forth in the most recent version of the City of New Bern Schedule of Capital Recovery and Connection fees.

- 4.4.3 After the City Engineer has determined sewer service is available and issued the property owner a sewer availability letter, the applicable Capital Recovery and Connection fees can be paid during normal business hours at the City of New Bern Customer Service Office located at 606 Fort Totten Drive.
- 4.4.4 Occupants of commercial buildings shall obtain a Commercial Sewer Permit prior to occupying a commercial building which is connected to the S.T.E.P. System. To obtain a Commercial Sewer Use Permit, the building occupant shall contact the City of New Bern Customer Service Representative at (252) 639-7596. All occupant use of commercial buildings connected to the S.T.E.P. System must meet the requirements of Sections 4.4.2. .
- 4.4.5 If the existing onsite S.T.E.P tank and electrical service for an existing building does not conform to the requirements of Section 4.4.5, Section, 4.4.6 and Section 4.4.7, then these components will be required to be brought into compliance as part of issuing a new Commercial Sewer Use Permit.
- 4.4.6 The property owner shall install (1) Single pole, 20 amp circuit and (1) double pole, 40 amp circuit for the electrical supply to the pumps and control panel as described below:(Also as approved by Craven County Building Inspections Department).
- 4.4.6.1 The power supply wiring should be installed within 20 feet of the discharge end of the S.T.E.P. tank. The control panel location should be visible from the road.
- 4.4.6.2 Two circuits on separate circuit breakers are required. One circuit is required for the pumps and the other for the control panel.
- 4.4.6.3 The control panel will be mounted by the City as part of the pump installation.
- 4.4.6.4 Note that special provisions may be necessary for installations below the flood plain elevation of 10 feet above mean sea level. Any exceptions must meet the latest applicable National Electric Code
- 4.4.7 For proposed commercial developments with an average daily designed flow of less than 400 gallons per day, the developer shall install the onsite S.T.E.P. tank outlined in Section 4.3.5.
- 4.4.8 For proposed commercial developments with an average daily designed flow of more than 400 gallons per day and for all multiple occupant developments, the developer shall have the onsite S.T.E.P. tank sized by a N.C. professional engineer. The engineer shall certify that the designed onsite S.T.E.P tank has adequate septic and storage capacity to be used in conjunction with the City's standard S.T.E.P. system pumps.

New Bern Sewer Coverage Area in Township No. 7

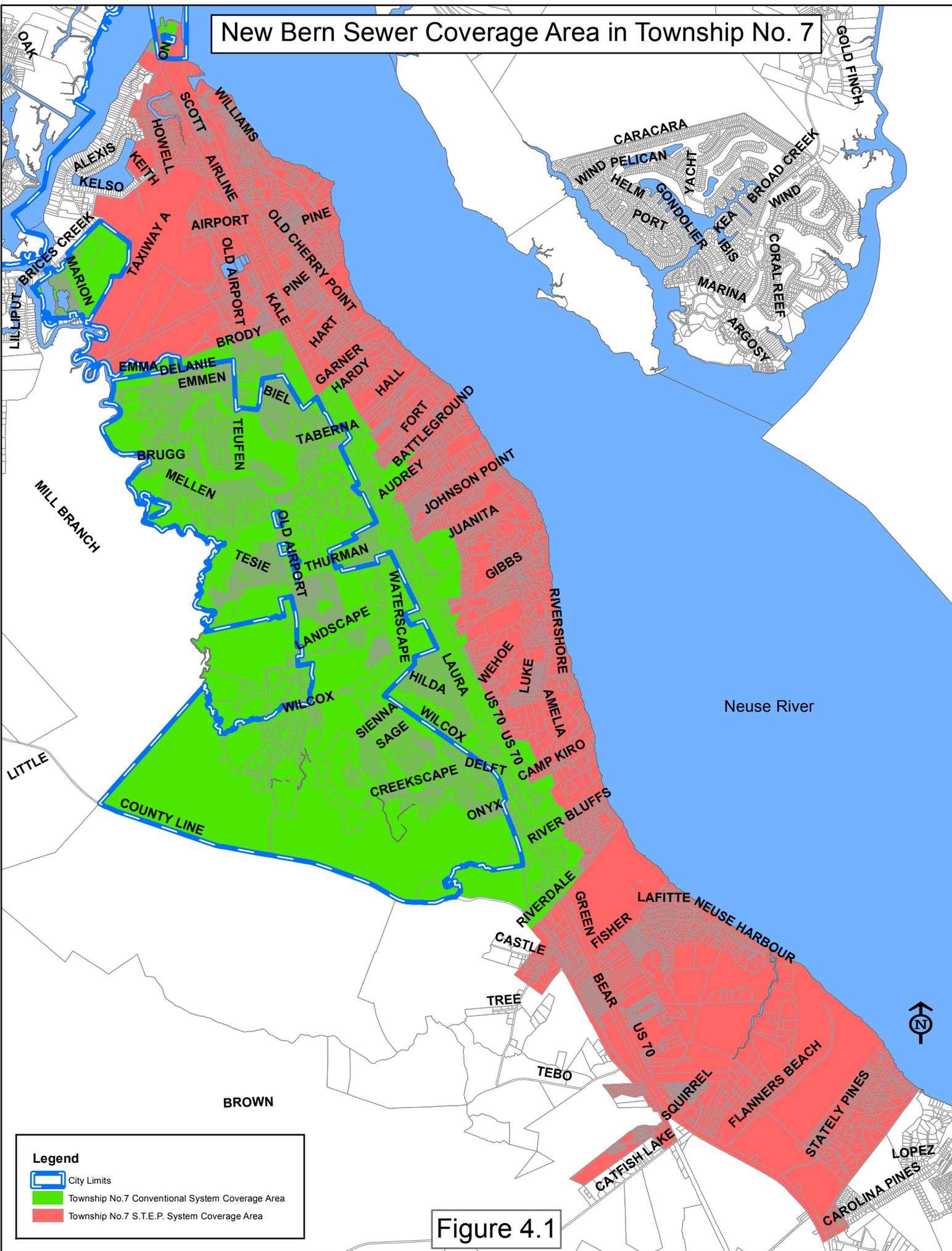


Figure 4.1

Legend

-  City Limits
-  Township No.7 Conventional System Coverage Area
-  Township No.7 S.T.E.P. System Coverage Area

SECTION 5.0

MATERIAL SPECIFICATIONS FOR WATER & SEWER EXTENSIONS

5.1 PIPE FOR GRAVITY SEWER MAINS

5.1.1 PVC Pipe

All Polyvinyl Chloride (PVC) pipe used in the construction of gravity sewer main extensions shall meet the following standards:

Pipe: Pipe shall meet the requirements of ASTM D3034

Dimensions: Standard Dimension Ratio (SDR) 35

Material: Pipe shall be constructed of PVC conforming to ASTM D1784, Minimum cell classification of 12454B.

Joints: Joints shall be push-on type with elastomeric gaskets conforming to ASTM F477

Fittings: PVC fittings shall conform to ASTM D3034, 7.4

5.1.2 Ductile Iron Pipe

All Ductile Iron Pipe (DIP) used in the construction of gravity sewer main extensions shall meet the following standards:

Pipe: Class 50 Ductile iron conforming to ANSI/AWWA A21.51/C-151

Fittings: Ductile Iron conforming to ANSI/AWWA A21.11/C-110

Joints: Mechanical joints conforming to ANSI/AWWA A21.11/C-111 or push-on joint conforming to ANSI/AWWA A21.51/C-151

Lining: All pipes and fittings shall be lined with Protecto 401 or approved equal.

Coating: All pipes and fittings shall be coated on the exterior with bituminous coating approximately 1 mil thick.

5.2 PIPE FOR SEWER FORCE MAINS

5.2.1 PVC Pipe

All PVC used in the construction of sewer force mains shall meet the following standards:

- Pipe: Pipe shall conform to the standards of AWWA C-900
- Dimensions: Standard Dimension Ratio (SDR) 18 for both bell and pipe thickness
- Material: Pipe shall be constructed of PVC conforming to ASTM D1784, Minimum cell classification of 12454B.
- Pressure: Pipe shall be pressure rated at 150 psi
- Joints: Joints shall be push-on type with elastomeric gaskets conforming to ASTM F477
- Fittings: Ductile Iron conforming to ANSI/AWWA A21.11/C-110

5.2.2 Ductile Iron Pipe

All Ductile Iron Pipe (DIP) used in the construction of sewer force mains shall meet the following standards:

- Pipe: Class 50 Ductile iron conforming to ANSI/AWWA A21.51/C-151
- Fittings: Ductile Iron conforming to ANSI/AWWA A21.11/C-110
- Joints: Mechanical joints conforming to ANSI/AWWA A21.11/C-111 or push-on joint conforming to ANSI/AWWA A21.51/C-151
- Lining: All pipes and fittings shall be lined with Protecto 401 or approved equal
- Coating: All pipes and fittings shall be coated on the exterior with bituminous coating approximately 1 mil thick.

5.2.3 High Density Polyethylene (HDPE) Pipe

All HDPE used in the construction of sewer force mains shall meet the following standards:

- Pipe: Pipe shall meet the requirements of AWWA C-906

- Dimensions: Standard Dimension Ratio (SDR) 9 for pipe thickness
- Material: Pipe shall be constructed of PE 3408 conforming to ASTM D1248, Minimum cell classification of 345434E.
- Pressure: Pipe shall be pressure rated at 200 psi
- Joints: All pipe and fittings shall be butt fusion jointed utilizing procedures, tools and equipment recommended by the pipe manufacturer
- Fittings: Fittings for HDPE Pipe shall be miter fusion fabricated and shall provide a pressure rating equal to that of the pipe. Molded butt fittings shall be manufactured in accordance with ASTM D-3261.

5.3 PIPE FOR WATER MAINS

5.3.1 PVC Pipe 4” and Larger

All PVC used in the construction of water mains four inches (4”) in diameter and larger shall meet the following standards:

- Pipe: Pipe shall conform to the standards of AWWA C-900
- Dimensions: Standard Dimension Ratio (SDR) 18 for both bell and pipe thickness
- Material: Pipe shall be constructed of PVC conforming to ASTM D1784, Minimum cell classification of 12454B.
- Pressure: Pipe shall be pressure rated at 150 psi
- Joints: Joints shall be push-on type with elastomeric gaskets conforming to ASTM F477
- Fittings: Ductile Iron conforming to ANSI/AWWA A21.11/C-110

5.3.2 PVC Pipe 3” and Smaller

All PVC used in the construction of water mains three inches (3”) and smaller in diameter shall meet the following standards:

- Pipe: Pipe shall meet the requirements of ASTM D2241
- Dimensions: Standard Dimension Ratio (SDR) 21 for both bell and pipe thickness
- Material: Pipe shall be constructed of PVC conforming to ASTM D1784, Minimum cell classification of 12454B.

- Pressure: Pipe shall be pressure rated at 200 psi
- Joints: Joints shall be push-on type with elastomeric gaskets conforming to ASTM F477
- Fittings: Fittings shall be Schedule 80 PVC with solvent weld joints

5.3.3 Ductile Iron Pipe

All Ductile Iron Pipe (DIP) used in the construction of water mains shall meet the following standards:

- Pipe: Class 50 Ductile iron conforming to ANSI/AWWA A21.51/C-151
- Fittings: Ductile Iron conforming to ANSI/AWWA A21.11/C-110
- Joints: Mechanical joints conforming to ANSI/AWWA A21.11/C-111 or push-on joint conforming to ANSI/AWWA A21.51/C-151
- Lining: All pipes and fittings shall be lined in accordance with ANSI/AWWA A21.4/C-104
- Coating: All pipes and fittings shall be coated interior and exterior with bituminous coating approximately 1 mil thick.

5.3.4 High Density Polyethylene (HDPE) Pipe

All HDPE used in the construction of water mains shall meet the following standards:

- Pipe: Pipe shall meet the requirements of AWWA C-906
- Dimensions: Standard Dimension Ratio (SDR) 9 for pipe thickness
- Material: Pipe shall be constructed of PE 3408 conforming to ASTM D1248, Minimum cell classification of 345434E.
- Pressure: Pipe shall be pressure rated at 200 psi
- Joints: All pipe and fittings shall be butt fusion jointed utilizing procedures, tools and equipment recommended by the pipe manufacturer
- Fittings: Fittings for HDPE Pipe shall be miter fusion fabricated and shall provide a pressure rating equal to that of the pipe. Molded butt fittings shall be manufactured in accordance with ASTM D-3261.

5.4 SANITARY SEWER SERVICES

5.4.1 Gravity Sewer Services

All materials used in the construction of gravity sewer services shall meet the following standards:

Pipe: Schedule 40 PVC - Drain, Waste, and Vent (DWV) conforming to the requirements of ASTM D2665

Material: Pipe shall be constructed of PVC conforming to ASTM D1784, Minimum cell classification of 12454B.

Fittings: Fittings shall be Schedule 40 PVC conforming to ASTM F1866 with solvent weld joints. Joint primer shall conform to ASTM F656 and joint solvent shall conform to ASTM D2564

Clean-out: Service clean-out shall use a standard wye and clean-out plug as made or recommended by the pipe manufacturer

Service

Connection: Service connection shall use a standard wye made or approved by the pipe manufacturer

5.4.2 S.T.E.P. System Services

All materials used in the construction of S.T.E.P system services shall meet the following standards:

Tank: All individual S.T.E.P systems shall use a vacuum tested, precast concrete septic tank/ pump tank combination. A concrete riser ring shall be provided to adjust ring and cover to final grade. A standard manhole ring and cover shall be provided for access to the pump chamber. Tanks for residential use shall be manufactured by The Stallings Company, Inc. of Greenville, N.C. (252-756-0267) or Futrells Precast, Inc. of Deep Run, N.C. (252- 568-3481).

Pump: The effluent pump shall be of the submersible type capable of delivering a flow and total dynamic head (TDH) as determined for each installation, and shall be sufficient to pump effluent to the mainline pressure pipe for elimination. The maximum pump shutoff head shall not exceed seventy-five percent (75%) of the working pressure of the pipe. Pump shall comply with the following:

- a. Pump shall be specifically designed and rated to pump sewage effluent into pressure wastewater collection systems.
- b. All residential effluent pumps shall be Zoeller model 163 pumps or approved equal.
- c. All pumps supplied must be constructed per (and bear the label of) an authorized testing authority such as Underwriter's Laboratories, Inc. (UL) for effluent duty.
- d. Pumps shall have a thirty-five-foot (35') long extra heavy-duty (SO) multiconductor NEC rated electrical cord with ground to motor plug.
- e. The submersible pump shall pass a ¾ " spherical solid.
- f. Pump motor shall be of the submersible type.
- g. Motor shall be Single Phase, 230 Volts, 60 Hertz, 3500 RPM minimum or equal.
- h. Single-phase motors shall be thermally protected with an automatic reset feature.

Control
Panel:

The pump control panel shall be CSI or approved equal simplex pump control/alarm panel with the following features:

- a. All control components shall be contained in a single NEMA 4X fiberglass enclosure. The enclosure shall be of one piece, weatherproof construction and gray in color. Enclosure cover shall be hinged with a stainless steel piano hinge and be lockable with two (2) stainless steel latches.
- b. The panel shall be equipped with a red alarm light and an integrated audible alarm to indicate "high level" alarms. A silence switch for the audible alarm shall be located on the exterior of the panel. The audible alarm shall produce a minimum of 80 decibels of sound pressure.
- c. Level indication and pump operation shall be controlled with the use a pressure bell assembly with a rolling diaphragm. A single float switch shall be provided to serve as a redundant high level indicator.

Pipe:

Service pipe shall be 1 ½ inch CTS, polyethylene conforming to the standards of ANSI/AWWA C901. Pipe shall be made of PE3408 material with a standard dimension ratio of 9 (SDR 9) and a pressure rating of 200 psi. The pipe shall be green in color.

Service
Saddles:

Service saddles shall be brass with stainless steel straps and/or bolts. Saddles shall have (AWWA) CC threads. Saddles with straps shall be the double strap type. Saddles shall be manufactured by McDonald, Ford, Romac, or approved equal.

Corporation Stops:	Corporation stops shall be bronze body with (AWWA) CC tapered threaded inlet and compression connection outlet. Corporation stops shall be manufactured by McDonald, Ford, Muller, or approved equal.
Ball Valve:	Ball valves shall be bronze body and have a stainless steel ball, with a quarter turn, lever handled shut-off. Ball valves shall be manufactured by McDonald, Ford, Muller, or approved equal.
Check Valve:	Check valves shall be PVC wye-Check valves having IP threaded type pipe connections. The valve shall incorporate a weighted piston seat carrier as the sealing closure. Valve end (bonnet) shall be configured with a removal eye pin. Valve body shall be constructed of PVC which meets or exceeds the requirements of ASTM D-1784. The valve shall have a minimum pressure rating of 150 psi. The check shall be a 1 ½", wye-check threaded to accept 1 ½" MIP brass fitting on both ends. The wye-check shall have a continuous stainless steel reinforcing ring around the outside of the threads to prevent fittings from being over tightened. Check valves shall be manufactured by Spear, George Fischer or approved equal.
Meter Box:	Meter Boxes shall be constructed of cast iron conforming to ASTM A-48 Class 30B, with an asphalt coated finish. Dimensions shall be 20" L x 10" W x 12" H. The word "SEWER" shall be cast into the lid. Box shall be manufactured by Capital Foundry, East Jordan Iron Works, Charlotte Pipe and Foundry, or approved equal.

5.5 WATER SERVICES

All materials used in the construction of water services shall meet the following standards:

Pipe:	Service pipe shall be one inch (1") "CTS" polyethylene tubing conforming to the standards of ANSI/AWWA C901. Pipe shall be made of PE3408 material with a standard dimension ratio of 9 (SDR 9) and a pressure rating of 200 psi. The tubing shall be blue in color.
Service Saddles:	Service saddles shall be brass with stainless steel straps and/or bolts. Saddles shall have (AWWA) CC threads. Saddles with straps shall be the double strap type. Saddles shall be constructed of No-Lead brass in accordance with AWWA C-800. Saddles shall be manufactured by McDonald, Ford, Muller, or approved equal.

Corporation

Stops: Corporation stops shall be bronze body with (AWWA) CC tapered threaded inlet and compression connection outlet. Corporation stops shall be constructed of No-Lead brass in accordance with AWWA C-800. Corporation stops shall be manufactured by McDonald, Ford, Muller, or approved equal.

Angle

Stop: Angle stops shall be bronze body with compression connections for the inlet and outlet. Ball valves shall have a stainless steel ball and a lockable, quarter turn, tee handled shut-off. Angle stops shall be constructed of No-Lead brass in accordance with AWWA C-800. Ball valves shall be manufactured by McDonald, Ford, Muller, or approved equal.

In shallow water service installations straight meter valves shall be utilized instead of angle stops at locations where the service tubing has to come through the side of the meter box instead of up through the bottom. The straight meter valves shall be either Muller Model B-24350 or Ford Model B43. Both valves will have a swivel meter nut on one side and a compression type pack joint for CTS tubing on the other side, along with a lockable wing.

Meter

Box: Meter Boxes shall be constructed of cast iron conforming to ASTM A-48 Class 30B, with an asphalt coated finish. Dimensions shall be 20" L x 10" W x 12" H. The Box shall be manufactured by Capital Foundry, East Jordan Iron Works, Charlotte Pipe and Foundry, or approved equal. The box lid shall be the standard "City of New Bern" polymer lid constructed by Nicor, Inc.

5.6 VALVES AND VALVE BOXES

5.6.1 Gate Valves

Gate valves shall be resilient seated and conform to AWWA C-509 for water and other liquids. Gate valves shall be iron bodied bronze mounted having non-rising stems and mechanical joints. Gate valves shall open counter clockwise, have a standard 2 inch square operating nut, and a cast-on direction arrow. Gate valves shall be manufactured by Mueller, Clow, American, or approved equal.

5.6.2 Butterfly Valves

Butterfly valves 20" and smaller shall conform to AWWA C504 for class 150B. Butterfly valves shall be iron bodied mechanical point with cast iron valve discs ASTM A-436 Type 1, Stainless steel valve shafts Type

316 recognized synthetic compound valve seals bonded to withstand 75 lbs. Pull butterfly valves shall be fitted with sleeve-type corrosion resistant bearings and self-adjusting valve packing. Valve operators for butterfly valve shall conform to AWWA C 504 with 2 inch square operating nut. The valve operators shall be the self-locking type designed to hold the valve in any position without creeping or fluttering. Butterfly valves shall open counter-clockwise. Butterfly valves shall be manufactured by American, Clow, Mueller, Pratt, or approved equal.

5.6.3 Tapping Sleeve & Valve

Tapping sleeves and all required hardware shall be constructed of stainless steel and have a minimum working pressure of 150 psi. Tapping sleeves shall be manufactured by Ford, Muller, Romac or approved equal. Tapping valves shall meet all the requirements for gate valves as set forth in Section 4.6.1.

5.6.4 Valve Box

Valve boxes shall be constructed of cast iron and rated for H-20 traffic loading. Valve boxes shall be two (2) piece adjustable screw type telescopic valve boxes with the tops marked SEWER or WATER for their relative use and location. Valve Boxes shall be manufactured by Capital Foundry, East Jordan Iron Works, Charlotte Pipe and Foundry, or approved equal.

5.7 AIR RELEASE VALVES

5.7.1 Automatic Air Release Valves

Automatic Air Release Valves shall be automatic float operated valves designed to release accumulated air from a piping system while the system is in operation and under pressure.

The valve body, cover, orifice, float and linkage mechanism shall be constructed of Type 316 stainless steel. Non-metallic floats or linkage mechanisms are not acceptable. The orifice button shall be Viton for simple lever valves and Buna-N for compound lever designs. Automatic air release valves shall be Crispin AX20.

5.7.2 Manual Air Release Valves

Manual air release valves shall consist of the same materials as specified in Section 5.5 and shown in Detail W-8.

5.8 FIRE HYDRANTS

Fire hydrants shall conform to AWWA C502. Fire hydrants shall be manufactured with two (2) 2 ½ inch hose nozzles and one (1) 4 ½ inch pumper nozzle. All threads shall conform to the standard for the City of New Bern. All hydrant legs

shall be six inch (6") ductile iron pipe with a mechanical joint valve. All hydrants furnished shall have a minimum 3'-6" inch bury depth hydrant. Hydrants shall be ordered for the correct bury depth so that extensions are not needed to properly set the final fire hydrant grade. All hydrants furnished are to be bronze to bronze threads between the seat or seat ring and the seat attaching assembly with a drain ring. Fire hydrants shall be dry top type with a breakable traffic feature assuring the hydrant remains closed should it be broken off at the ground level. In addition to the factory coat, all hydrants shall be painted after installation using high grade exterior enamel paint. All fire hydrants shall be Mueller Cat. No. A421, 4 ½" with New Bern standard Storz connector on the pumper nozzle.

5.9 MANHOLES

All materials used in the construction of manholes shall meet the following standards:

5.9.1 Base

Installation of all precast concrete manholes shall consist of a minimum of 6 inches of stone leveling course beneath the base section.

5.9.2 Sections

All manholes shall be constructed using precast concrete sections conforming to ASTM C-478. Manholes that are 10 feet in depth or deeper shall be provided with an extended base section.

5.9.3 Steps

Manhole steps shall be constructed of 0.5" diameter, grade 60 steel bars. The steps shall be have a plastic coating and meet the requirements of Federal Specification RR-F-621C.

5.9.4 Ring and Cover

Manhole rings and covers shall be constructed of Class 30 cast iron conforming to ASTM A48, and shall be traffic bearing. The words "SANITARY SEWER" shall be cast in top of the cover. Rings and covers shall be manufactured by Capital Foundry, East Jordan Iron Works, Charlotte Pipe and Foundry, or approved equal.

5.9.5 Flexible Pipe Sleeve

Pipe sleeves with stainless steel clamps conforming to ASTM C-923 shall be used for pipe to manhole connections. The pipe sleeve shall be design and constructed to provide a flexible watertight seal.

5.9.6 Inverts

Inverts shall be precast into the bottom section of the manhole.

5.9.7 Grout

All perforations pick holes, seams, transitions, joints and leaks shall be sealed with hydraulic cement or approved equal.

5.9.8 Drop Manholes

Manholes with sewer pipes entering 2 ½ feet, or more, above the bottom shall have an inside drop manhole connections installed. All drop manholes shall have a minimum inside diameter of 5 feet.

5.10 PUMP STATIONS

All materials used in the construction of pump stations shall meet the following standards:

5.10.1 Wet Well Structure

All components of the wet well structure shall conform to the requirements for manholes as described in Section 5.9.

5.10.2 Pumps

Sanitary sewer wastewater pumps shall be manufactured by Flygt, or approved equal which meets the following requirements:

Pump

Construction: Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

Cooling
System:

Motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required.

Cable Entry
Seal:

The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

Motor:

The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the

terminal board shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. The motor and the pump shall be produced by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

Bearings: The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable.

Mechanical

Seal: Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance

nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.

Seal lubricant shall be FDA Approved, nontoxic.

Pump
Shaft:

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be stainless steel – ASTM A479 S43100-T.

If a shaft material of lower quality than stainless steel – ASTM A479 S43100-T is used, a shaft sleeve of stainless steel – ASTM A479 S43100-T is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided for in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

Impeller:

The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, double shrouded non-clogging design having a long throughlet without acute turns. The impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Whenever possible, a full vaned, not vortex, impeller shall be used for maximum hydraulic efficiency; thus, reducing operating costs.

Wear

Rings: A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a brass, or nitrile rubber coated steel ring insert that is drive fitted to the volute inlet.

Volute: Pump volute(s) shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller.

Protection: All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm.

5.10.3 Control Panel

All pump stations shall be provided with a control panel capable of operating the pump station across all flow requirements. The control panel shall be sized to match the voltage, phase, and load requirements of the station pumps. The control panel shall be configured as indicated on the New Bern standard control panel schematic. The control panel shall be produced by Multitrode, Inc. , Pete Duty & Associates, Inc., Southern Flow, Inc. RS Integrators, Inc., or approved equal and be provided with the following general options:

- NEMA 4X Stainless steel enclosure with inner dead-front door, 3 point latch handle, enclosure light, and stainless steel sun shield.
- The Entire panel shall be UL/CUL approved
- Distribution, neutral & ground blocks
- Main & Generator(if needed) circuit breakers interlocked
- Generator Receptacle(if needed) – size and model to be determined by City
- Pump & control circuit breakers
- Control transformer
- Full voltage motor starters
- Indicator lights as illustrated on the New Bern standard schematic
- Hand-Off-Auto switches on the inner door
- Condensation strip heater for enclosure
- 12VDC battery, charger, and power supply
- Voltage phase monitoring
- 3-phase surge protection
- Hour meters mounted on inner door
- Convenience 120V power outlet and circuit breaker
- Current transformers for amps monitoring
- Multitrode - Multismart Pump Station Manager:
 - DNP3/MODBUS communication enabled
 - Flow calculation enabled
- MDS – iNET 900 MHz radio kit (New Bern Standard)

- 1.5 meter primary liquid level sensing probe
- Ball float backup liquid level sensing system
- Alarm light and audible horn

For stations with pumps 25 HP or greater, the control panel shall be provided with a variable frequency drive (VFD) for each pump. Control panels with VFDs shall also be provided with appropriately sized auxiliary cooling system for the control panel.

5.10.4 Pressure Gauges

Each discharge pipe leaving the pump station shall be provided with a pressure gauge. The pressure gauge shall be located on top of the discharge pipe located within the valve vault. Each pressure gauge shall be oriented in a manner in which it is easily readable from above grade, without the need to enter the valve vault. Each gauge shall be provided with a ¼ turn brass ball valve that separates that gauge from the discharge pipe. The pressure gauge shall be liquid filled with single PSI indicator marks. The pressure gauge shall cover the full operational pressure range of the pump station.

5.10.5 Piping

All piping within the wet well structure and through the valve vault shall be Ductile Iron Pipe (DIP) conforming to the following standards:

Pipe:	Class 50 Ductile iron conforming to ANSI/AWWA A21.51/C-151
Fittings:	Ductile Iron conforming to ANSI/AWWA A21.10/C-110
Joints:	Flanged joints conforming to ANSI A21.4
Lining:	All pipes and fittings shall be lined in accordance with ANSI/AWWA A21.4/C-104
Coating:	The exterior of all exposed pipes, fittings, and valves shall be coated with 2 coats (total 8 mils dried thickness) of Tnemec N69 Hi-Build Epoxoline II.

5.10.6 Check Valves

Check valves shall be provided on each pump discharge line and be located in a precast concrete valve vault. Check valves shall be horizontal mounted, swing type with a bronze disc and cast iron body. Check valves shall be manufactured by Muller, American Darling, Apco Valves or an approved equal.

5.10.7 Access Hatches

Aluminum access hatches shall be provided for both the wet well and the valve vault. The frame shall be one piece and constructed of aluminum or stainless steel with integral concrete anchors. The cover(s) shall be constructed of one-quarter inch (1/4") thick diamond pattern plating, reinforced to withstand a live load three hundred pounds-per-square foot (300 psf). The cover(s) shall include a handle for raising and have a safety handle for locking in the open position. Access hatches shall be provided with a factory installed padlock hasp for locking each cover. All hatch hardware and hinges shall be constructed on stainless steel.

5.10.8 Vent Pipe

All proposed pump stations shall include a mushroom type vent for the wet well structure. The vent shall be constructed of four inch (4"), class 150 cast iron vent pipe. Vent outlets shall be provided with a two (2) mesh, 14 gauge, bronze wire screen.

5.10.9 Guide Bracket Assembly

Two (2) guide bars shall be provided for the raising and lowering of each pump. Guide bars shall be stainless steel pipe, extending from the lower guide holders to the upper guide holders. Lower guide holders shall be integral with the pump discharge connection. Guide bars shall not support any portion of the weight of the pumps.

5.10.10 Conduit

All conduit utilized in the construction of pump stations shall meet the NEC standards of for location and use. All conduits between the control panel and the wet well shall be no smaller than 1.5" and the conduits for the pump leads shall be no smaller than 2". All conduit from the wet well shall have a pull box (C-box) located prior to entering any panel. The pull box shall be sealed on both sides with removable sealer.

5.11 GENERATOR

All pump stations with a calculated average daily design flow of 15,000 gallons per day or more shall be provided with an onsite backup diesel generator with an automatic transfer switch. The generator shall be sized to provide full load of all pumps along with any auxiliary items located at the station. The generator shall be produced by Atlantic Cummins, MTU Onsite Energy, CAT Electric Power, Power Secure or approved equal and be provided with the following general options:

- Tier 3 EPA Emissions Certified.
- UL2200 Listed.
- NFPA 110 alarm package.
- Radiator with engine driven fan.

- Output breaker mounted on generator.
- Steel weather protective enclosure, Level 2 sound attenuation.
- Sub-base fuel tank sized for min. of 24 hours at full load.
- Battery rack with battery and charger.
- Control panel with auto starts/stops, alarms, & shut downs.
- Coolant/block heater.

The generator shall be provided with the appropriate size automatic transfer switch housed in a NEMA 4X cabinet. The transfer switch shall include an integrated engine exerciser/exercise clock.

5.12 ENCASEMENT PIPE

Encasement pipe be uncoated steel pipe conforming to the standards of AWWA C200. Pipe sections shall be joined by a continuous weld. The minimum wall thickness shall be as follows:

<u>Encasement Pipe Dia.</u>	<u>Wall Thickness</u>
14"	0.216"
16" – 24"	0.250"
30"	0.312"
36"	0.375"
42"	0.438"
48"	0.500"

Encasement pipe install under a railroad shall meet the minimum wall thickness requirements as set forth by the governing railroad authority.

SECTION 6.0

TESTING REQUIREMENTS

6.1 GENERAL

All items which require testing shall be promptly cleaned and ready for testing after installation. Meeting all testing requirements specified herein shall be a condition of acceptance of the item by the City of New Bern. In no case shall an item be accepted into the City of New Bern municipal water or sanitary system without passing the required testing. A representative of the City of New Bern Department of Public Utilities must be on site to witness all required testing procedures. The City of New Bern Department of Public Utilities (252-639-7526) requires a 48 hour notice for each test.

6.2 WATER MAINS

6.2.1 Leakage Testing

All pressure pipe shall be tested in accordance with current AWWA standards; AWWA C600 for ductile iron pipe and AWWA605 for PVC pipe. All proposed water mains shall be subjected to a leakage test under the specified hydrostatic pressure. The pressure shall be maintained constant at one hundred fifty pounds per square inch (150 psi) (plus or minus five psi) during the entire time that line leakage measurements are being made.

The water lines are to be flushed thoroughly to remove all dirt and debris which may have collected in the line. After flushing has been completed, the pipelines shall be tapped on top at a point furthest from the point that the lines are to be filled with water. The valve at the end of the line shall be left open, and the valve between the new water line and the City Water System opened slightly to allow the water to enter the new pipe slowly. Once the pipe is full, the valve at the end of the line shall be left open until the valve between the new water line and the City Water System is completely shut off. At no time shall the City Water System valve be open with out an outlet in the new pipe system. A representative of the City of New Bern is the only authorized operator of valves within the City Water System.

Leakage measurements shall not be started until a constant test pressure has been established; compression of air trapped in unvented pipes or fittings will give false leakage readings under changing pressure conditions. After the test pressure to be used has been established and stabilized, the line leakage shall be measured by means of a water meter installed on the line side of the force pump, and the leakage test shall extend over a total period of not less than four (4) hours.

Line leakage is defined as the total amount of water introduced into the line as measured by the meter during the leakage test. The pipeline or section being tested will not be accepted if it has a leakage rate in excess of:

$$L = \frac{S \times D \times (\text{square root of } P)}{148,000}$$

where L = allowable leakage in gallons per hour, S = length of pipe in feet, D = nominal diameter of the pipe in inches, and P = average test pressure during the leakage test in pounds per square inch (150 psi).

All visible leaks shall be repaired. The Contractor shall locate and repair leaking joints to the extent required to reduce the total leakage to an acceptable amount. All joints in piping shall be watertight and free from visible leaks during the prescribed test. Each leak which is discovered within one year after final acceptance of the work shall be located and repaired by and at the expense of the Contractor.

6.2.2 Disinfection

After passing the leakage test, all water mains shall be disinfected in accordance with AWWA C-651, and as specified herein. The valve at the end of the line shall be left open, and the valve between the new water line and the City Water System opened slightly to allow the water to enter the new pipe slowly. Chlorine is then to be applied under pressure by an ejector pump (or equal) to the water entering the new pipeline. Chlorine will be added in sufficient quantities to give an overall chlorine residual to the water of at least fifty (50) parts per million. Once the pipe is fully chlorinated, a representative of the City of New Bern Department of Public Utilities shall be contacted to perform a high chlorine test. At no time during testing shall the City Water System valve be open with out an outlet in the new pipe system. A representative of the City of New Bern is the only authorized operator of the valves within the City Water System.

After the water main passes the high chlorine test the pipeline is to be valved off and the chlorinated water allowed remaining in the line for twenty four (24) hours. After the twenty four (24) period, the chlorine residual in the line must be at least ten (10) parts per million. After passing the chlorine residual test, the pipe line is to be thoroughly flushed until no evidence of chlorine exists as determined by the Orthotolidine Test.

After flushing the line, the Contractor shall furnish sterilized bottles and take water samples from various points along the line as directed and witnessed by the City of New Bern. A minimum of two samples shall be taken in any instance. The Contractor shall send the samples to an approved testing laboratory, for bacteriological analysis. If the analysis reveals that no bacteria is present and the requirements for final inspection have passed, the pressure pipe system may be placed into service upon written notification from the City Engineer.

The City of New Bern reserves the right to modify and/or change the test, test procedures, and/or passing level results without prior notice.

6.3 SANITARY SEWER MAINS

6.3.1 Gravity Sewer Mains

Each section of proposed gravity sewer shall be promptly cleaned and tested after installation. The following test shall be performed on proposed gravity sewer mains:

Air Test – All proposed gravity sewer mains shall be air tested in accordance with ASTM C-828, ASTM C-924 and the following. Such tests shall consist of securely plugging the sewer line between manholes, pumping the section full of air to 4.0 psi and holding this pressure for at least two (2) minutes. Then the pressure should be reduced to 3.5 psi and the time recorded for the pressure to drop 1.0 psi to the new pressure of 2.5 psi. If groundwater is present, all test pressures shall be adjusted by adding 0.43 psi for each foot of groundwater head that exist above the pipe invert. The time required for the pressure drop shall exceed the minimum test time given in the chart below,

Pipe Diameter (in)	Minimum Test Time (Min)	Length for Minimum Test Time (ft)	Time for Longer Lengths (sec)	Specification Time for Length (L) Shown (min:sec)								
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	
4	3:46	597	.380 (L)	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 (L)	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520(L)	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24	
10	9:26	239	2.374(L)	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	
12	11:20	199	3.418(L)	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38	
15	14:10	159	5.342(L)	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04	
18	17:00	133	7.692(L)	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41	

Deflection Test - A Deflection test shall be performed on all sanitary sewer mains constructed of non-ferrous materials. This test shall be performed after all grading, paving, and compaction work has been completed. The allowable deflection shall be 4.5% of the nominal inside diameter of the pipe. The deflection shall be measured by the use of the mandrel test.

Closed Circuit T.V. Inspection – All proposed gravity sewer mains shall undergo a closed circuit T.V. inspection prior to being accepted by the City of New Bern. The City of New Bern will conduct the inspection. Any slumps, high points, low points, swells, standing water, accumulations of dirt and debris, rolled gaskets, leaks or other defects shall be corrected by the Contractor prior to any other test being performed. The City Engineer shall have the final decision on all discrepancies.

6.3.2 Sewer Force Mains

All proposed sewer force mains shall be subjected to a leakage test under the specified hydrostatic pressure. The test pressure shall be one and one-half times the maximum working pressure of the pipe segment, and in no case shall be less than 150 psi. The test pressure shall be maintained constant (plus or minus five psi) during the entire time that line leakage measurements are being made.

The water lines are to be flushed thoroughly to remove all dirt and debris which may have collected in the line. After flushing has been completed, the force main shall be filled slowly with water. One end of the pipe shall be vented to allow the release of air during filling. Once the force main is full of water all vents shall be closed and a pump shall be used to increase the pressure in the force main to the required test pressure.

Leakage measurements shall not be started until a constant test pressure has been established; compression of air trapped in unvented pipes or fittings will give false leakage readings under changing pressure conditions. After the test pressure to be used has been established and stabilized, the line leakage shall be measured by means of a water meter installed on the line side of the force pump, and the leakage test shall extend over a total period of not less than four (4) hours.

Line leakage is defined as the total amount of water introduced into the line as measured by the meter during the leakage test. The pipeline or section being tested will not be accepted if it has a leakage rate in excess of:

$$L = \frac{S \times D \times (\text{square root of } P)}{148,000}$$

Where L = allowable leakage in gallons per hour, S = length of pipe in feet, D = nominal diameter of the pipe in inches, and P = average test pressure during the leakage test in pounds per square inch.

All visible leaks shall be repaired. The Contractor shall locate and repair leaking joints to the extent required to reduce the total leakage to an acceptable amount. All joints in piping shall be watertight and free from visible leaks during the prescribed test. Each leak which is discovered within one year after final acceptance of the work shall be located and repaired by and at the expense of the Contractor.

6.4 MANHOLES

All manholes on proposed sewer main extensions shall be vacuum tested as specified herein. Manholes shall be tested after complete assembly. Stub-outs, manhole boots and pipe plugs shall be secured to prevent movement while the

vacuum is drawn. A measured vacuum of 10 inches of mercury shall be established in the manhole. Acceptance standards for leakage shall be established from the elapsed time for a negative pressure change from 10 inches to nine inches of mercury. The maximum allowable leakage rate for a four-foot diameter manhole shall be in accordance with the following:

Minimum Elapsed Time for a

<u>Manhole Depth</u>	<u>Pressure Change of 1" Hg</u>
10 ft. or less	60 seconds
> 10 ft. but < 15 ft.	75 seconds
> 15 ft. but < 25 ft.	90 seconds

For manholes five feet in diameter, add an additional 15 seconds and for manholes six feet in diameter, add an additional 30 seconds to the time requirements for four foot diameter manholes.

If the manhole fails the test, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the manhole passes the test. The extent and type of repairs that may be allowed shall be subject to the approval of the City Engineer. Leaks shall be repaired on the outside of the manhole unless otherwise approved by the City Engineer.

If manhole joint mastic is completely pulled out during the vacuum test, the manhole shall be disassembled and the mastic replaced.

6.5 PUMP STATION TESTING AND START-UP

Prior to the acceptance of a pump station, a run test and start-up shall be completed by a representative of the pump and generator manufacturer. During the start-up the pump station will be required to operate under the anticipated loading and system conditions. All pumps and control functions shall be tested during the start-up procedure. All possible run situations shall be tested to ensure proper flow is maintained at actual system pressures. The City of New Bern Department of Public Utilities shall be contacted at least 48 prior to conducting the pump station start-up. The contractor shall not discharge the new pump station into the existing City system without approval from the City of New Bern. The following items should be complete prior to scheduling the pump station start-up:

- Electrical work inspected and an energizing permit issued by the appropriate agency.
- The electrical service established with the City of New Bern as the customer.
- Verify the rotation of the pumps.
- Confirm that all main line valves and air release valves are open and in proper working order.

6.6 S.T.E.P. SYSTEM TANKS

All S.T.E.P. system tanks shall be vacuum tested by the manufacturer prior to delivery. Upon delivery all tanks shall be set in place and vacuum tested again by the tank installer to insure that no seals were damaged in the delivery and installation of the tank. The onsite test shall be performed in the presence of a City of New Bern representative. Tanks shall be tested with the riser and manhole ring installed. All testing equipment shall be supplied by the tank provider.

All tank inlets and outlets shall be sealed and a measured vacuum of 3.5 inches of mercury shall be established in the tank and held for a period of five (5) minutes. During the test period no leakage shall be allowed. If the tank fails the test, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the tank passes the test. The extent and type of repairs that may be allowed shall be subject to the approval of the City Engineer.

6.7 TAPPING SLEEVES

Prior to making any tap on an existing City of New Bern water or sewer main, the tapping sleeve or saddle shall pass a pressure test. The tapping sleeve shall be hydrostatically tested through the test plug for a period of five (5) minutes. During the test period, no leakage shall be allowed. Air testing of tapping sleeves shall not be permitted.

SECTION 7.0

REQUIREMENTS DURING CONSTRUCTION AND PROJECT CLOSEOUT

7.1 PRIOR TO CONSTRUCTION

The following shall be completed prior to any construction commencing on water or sewer extension projects:

7.1.1 Notice to Proceed Issued The City of New Bern

Once the City of New Bern Department of Public Utilities has approved the proposed design and confirmed that all required permits, encroachment agreements, and utility easements have been executed and issued by the appropriate agencies, a notice to proceed will be issued by the City to the Contractor.

7.1.2 Material Inspection

Once all materials are on site, the Contractor shall contact the City of New Bern Utility Construction Inspector (252-639-7523) to schedule an onsite inspection of all proposed construction materials. No material shall be used in utility construction until the material inspection has been performed.

7.1.3 Shop Drawing Submittal

Shop Drawings shall be submitted to the City of New Bern Department of Public Utilities for review of the following items:

- Pumps
- Control Panels
- Lift Station Electrical Components
- Generator
- Booster Pumps
- RPZ
- Automatic Air Release Valves

7.1.4 N.C. ONE CALL

The NC One Call Center (1-800-632-4949) shall be contacted a minimum of forty-eight (48) hours prior to beginning excavation. The Contractor shall be responsible for keeping locate tickets current and contacting the One Call Center if unmarked utilities should be encountered.

7.1.5 Contractor to Notify The City of New Bern

At least forty-eight (48) hours prior to the start of any construction, the contractor shall notify the City of New Bern Department of Public Utilities (252-639-7526). Depending on the nature of the project the City Engineer may require that a preconstruction conference be held to discuss the details of the project.

7.2 DURING CONSTRUCTION

7.2.1 Notices to Property Owners and Local Utilities

The Contractor shall notify adjacent property owners and utilities when the project execution may affect adjacent properties. The contractor shall notify the appropriate authorities when the project operations will interrupt access or utility service to the property owner or tenant. Utilities and other agencies shall be contacted at least twenty four (24) hours prior to cutting or closing streets, or excavating near underground utilities or pole lines.

7.2.2 General Safety Requirements

Excavations shall provide adequate working space and clearance as necessary to provide proper pipe installation and work safety. Excavations performed on NCDOT rights of way shall be protected from traffic utilizing the NCDOT Uniform Traffic Control Manual (latest edition). Minimum requirements shall include proper signage, flagmen, protective vests and hardhats as outlined in the manual. The Contractor shall provide a Competent Person for trench construction on site, as outlined in OSHA regulations, for all excavations that exceed four feet (4') in depth. The City Engineer may stop work for any violation of the aforementioned regulations when the safety of any person acting as a representative, agent, or employee of the Contractor is considered in imminent danger. Work may continue only after the violation has been rectified and the City Engineer grants permission to proceed.

7.2.3 Connections to Existing Water or Sewer Mains

The Contractor shall make all necessary connections to existing water lines, unless otherwise directed by the City of New Bern. The City shall be notified at least twenty four (24) hours prior to making such connections. Taps shall be made only in the presence of the City of New Bern Utility Construction Inspector or a duly assigned representative of the City of New Bern Department of Public Utilities. At all times, the Contractor shall protect existing facilities against adverse conditions or substances and damage.

Connections to existing water and sewer lines shall be planned in advance with all required equipment, materials, and labor on hand prior to undertaking the connections. Work shall proceed continuously around the

clock if necessary to complete connections in minimum time. Operation of valves or other equipment on the existing water system shall be under the direct supervision of the City of New Bern.

7.2.4 Site Administration

The Contractor shall be responsible for all areas of the site under construction or occupied for administrative or storage purposes. The Contractor shall be responsible for all Subcontractors in their performance on the project. The Contractor will be responsible for the actions of all employees and other persons on the project to insure proper use and preservation of property and existing facilities, except when these responsibilities are specifically reserved to others. The Contractor has the right to exclude from the construction site any persons who are not directly related to the construction process or the inspection of the work by the Owner. The contractor may require all persons on the construction site to observe all operational or safety regulations required of his employees. The Contractor shall keep the project site free from accumulations of waste materials and rubbish at all times.

7.2.5 Project Inspections

For all proposed water and sewer extension projects, the Developer shall provide complete engineering services which shall include construction observation. It shall be the responsibility of the Project Engineer and ultimately the Developer, to insure that all construction is completed as shown on the plans which have been approved for construction by the City of New Bern.

The City of New Bern Utility Construction Inspector will periodically visit the site during construction and will be on site for all testing and inspections as required by the City of New Bern. It is NOT the duty of the City of New Bern Utility Construction Inspector to direct construction, provide solutions to design problems or maintain record drawings. These services shall be provided by the Project Engineer.

7.3 PROJECT CLOSEOUT

7.3.1 General

All items listed in this section must be completed before the City of New Bern will accept any new construction as part of the City's municipal water and sewer system.

7.3.2 Final Inspection

Upon completion of construction and all required testing, the Contractor shall contact the City of New Bern Utility Construction Inspector to schedule a final inspection. During the final inspection the Utility

Construction Inspector will insure that all aspects of the water and sewer construction have been completed in compliance with the current City standards. The Contractor shall provide all personal and tools which will be required for opening manholes, exercising valves, and flowing hydrants. **The City of New Bern prefers for the streets within the development to be paved at the time of final inspection. If the streets have not been paved, then all structures within the street shall be set in place with concrete prior to requesting the final inspection. Valve boxes shall be set in a minimum of an 18"x18"x18" block of concrete and manhole rings shall be set in a minimum of a 36"x36"x18" block of concrete.**

During the final inspection, the Utility Construction Inspector will create a punch-list if any deficiencies are discovered. The Contractor shall complete all items described on the punch-list prior to requesting a re-inspection.

7.3.3 Record Drawings

Upon completion of all utility projects, the Project Engineer shall submit an "As Built" set of plans to the City of New Bern Department of Public Utilities. All As Built information on the plans shall be clearly identified (bold text, different text, boxed-out, etc.). Proposed information which has changed shall be marked through. The "As Built" plans shall indicate the horizontal and vertical location of all installed utilities. All bends, reducers, and valves shall be located with at least two (2) measurements to existing features (back of curb, utility pole, hydrant, etc.). Horizontal pipe location shall be shown at one hundred foot intervals along the pipe as measured from the back of curb or the edge of pavement. **For sewer force mains the elevation of the installed pipeline shall be indicated on the record drawings in 50' intervals. All elevations shown shall be based on a datum elevation from an existing USGS monument.** The record drawings shall be submitted in the following formats:

1. (2) – Sets of Plans 24" x 36" on Standard Bond Paper
2. (1) – Compact Disk containing the project drawing files in PDF format.

7.3.4 Utility Easements

Prior to project acceptance, a final plat of the development shall be recorded with the Craven County Register of Deeds. The final development plat shall clearly illustrate all proposed utility easements.

7.3.5 Engineer's Certification

For projects which involve the extension of the City of New Bern water system the Project Engineer shall submit to the City a copy of the

Engineer's Certification stating that the completed water system extension conforms to the approved plans and specifications as required by the North Carolina Division of Environmental Health.

For projects which involve the extension of the City of New Bern sewer system the Project Engineer shall submit to the City a copy of the Engineer's Certification stating that the completed sewer system extension conforms to the approved plans and specifications as required by the North Carolina Division of Water Quality.

7.3.6 Total Project Cost

Upon completion of all construction, the Project Engineer shall submit to the City of New Bern Engineering Department the total cost all improvements related to the water and sewer system. This submittal shall include the Contractor's original Bid and all additional Change Orders.

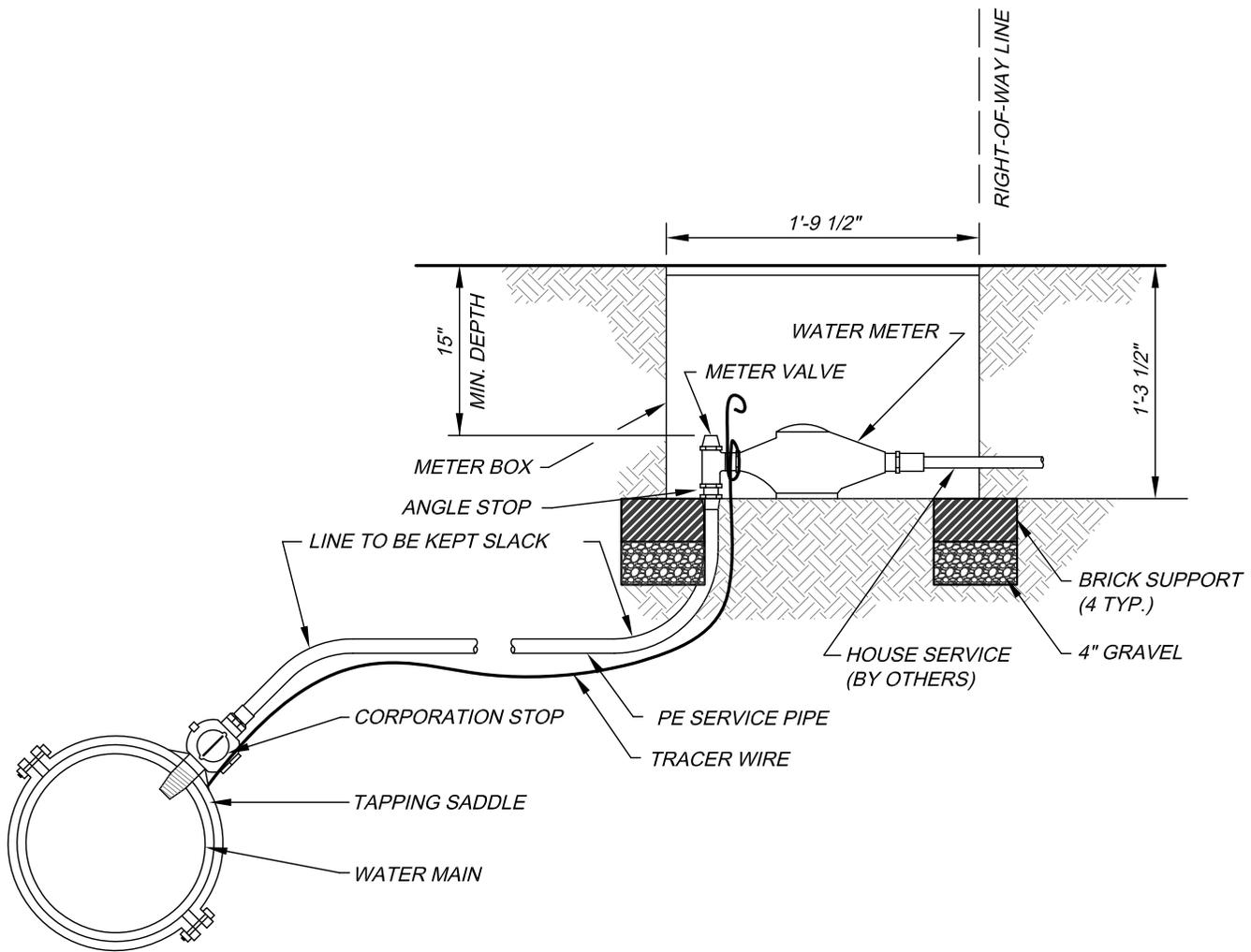
7.3.7 Warranty

The Developer shall warrant all water and sewer work to be free of defects in materials or workmanship for a period of two (2) years. The warranty period shall begin from the date of City's acceptance of the project for permanent operation and maintenance.

7.3.8 Final Acceptance

Once the items listed in 7.3.1 – 7.3.6 have been completed the City Engineer will present the project to the City of New Bern Board of Aldermen for acceptance. As part of the acceptance process the City of New Bern and the Developer shall enter into a final acceptance agreement which will outline the terms, if any of the infrastructure acceptance and set the start/end dates for the (2) year warranty period.

SECTION 8.0
STANDARD WATER & SEWER DETAILS



NOTES:

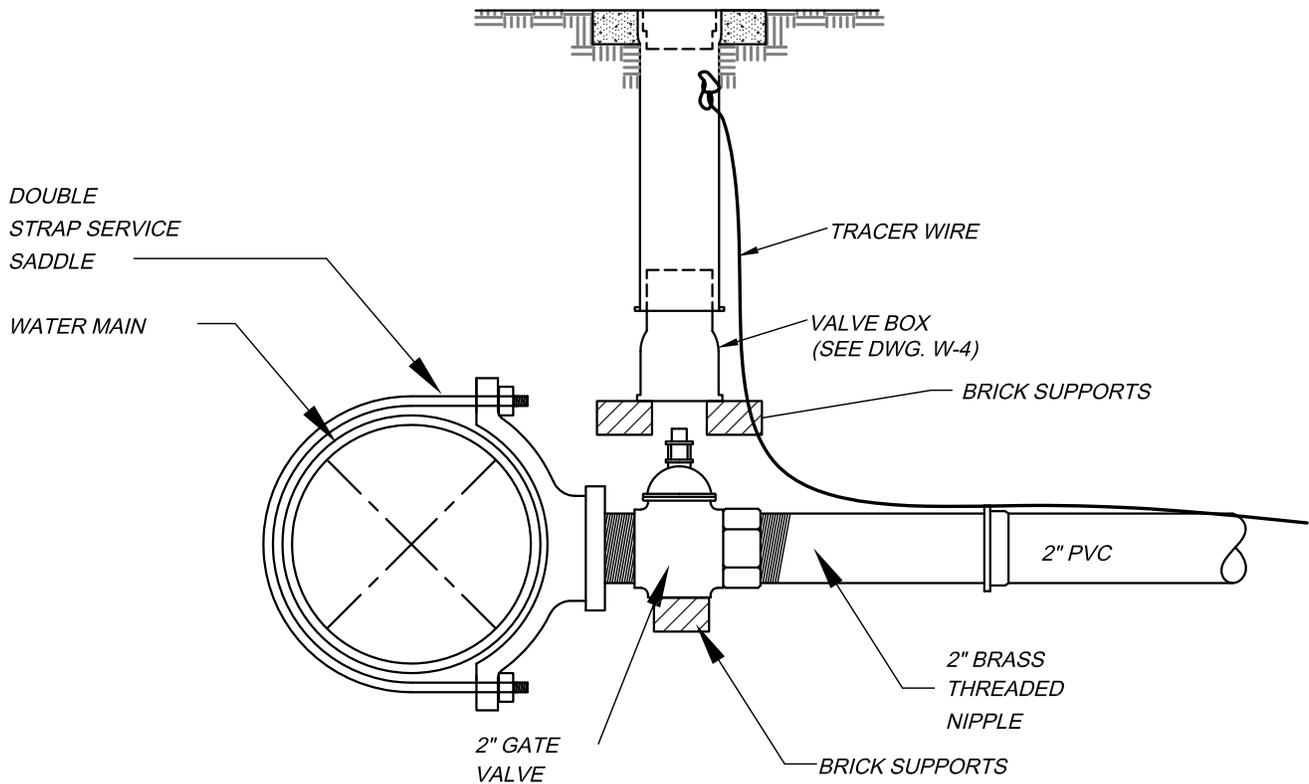
1. METER TO BE SUPPLIED AND INSTALLED BY THE CITY.
2. METER BOX SHALL BE A STANDARD MBX-1 BOX AND LID SHALL BE THE "NEW BERN" STANDARD POLYMER LID PRODUCED BY NICOR, INC. METER BOX FOR 2" METERS AND LARGER SHALL BE A MBX-5 BOX.
3. TRACER WIRE SHALL BE INSTALLED ON ALL WATER SERVICES EXTENDING CONTINUOUS FROM THE MAIN INTO THE METER BOX. THE WIRE SHALL BE 12 GA. HDPE COATED, SOLID CORE COPPER. 18"-24" OF TRACER WIRE SHALL BE COILED UP IN THE METER BOX

NOT TO SCALE

NEW BERN
 NORTH CAROLINA
 Department of Public Utilities
 P.O. Box 1129, New Bern, NC 28563
 252.639.7526 (FAX) 252.636.4103

**TYPICAL WATER SERVICE
 CONNECTION**

STANDARD DRAWING No. W-1



NOTES:

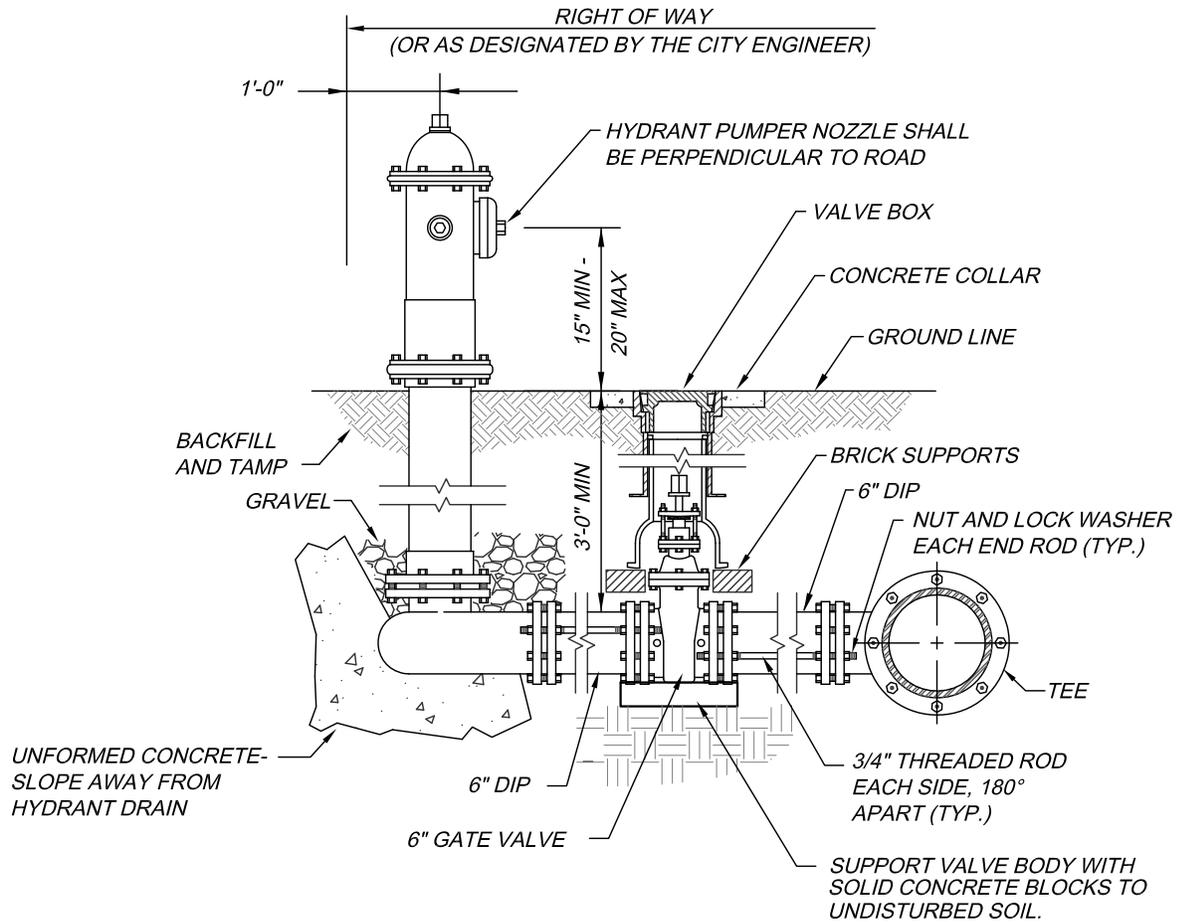
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NOT TO SCALE

NEW BERN
 NORTH CAROLINA
 Department of Public Utilities
 P.O. Box 1129, New Bern, NC 28563
 252.639.7526 (FAX) 252.636.4103

TYPICAL 2" WATER SERVICE CONNECTION

STANDARD DRAWING No. W-2



NOTES:

1. HYDRANT SHALL BE MULLER MODEL NO. A421, 4-1/2".
2. HYDRANT SHALL BE PROVIDED WITH STANDARD NEW BERN STORZ CONNECTION ON THE PUMPER NOZZLE .

NOT TO SCALE

NEW BERN

NORTH CAROLINA

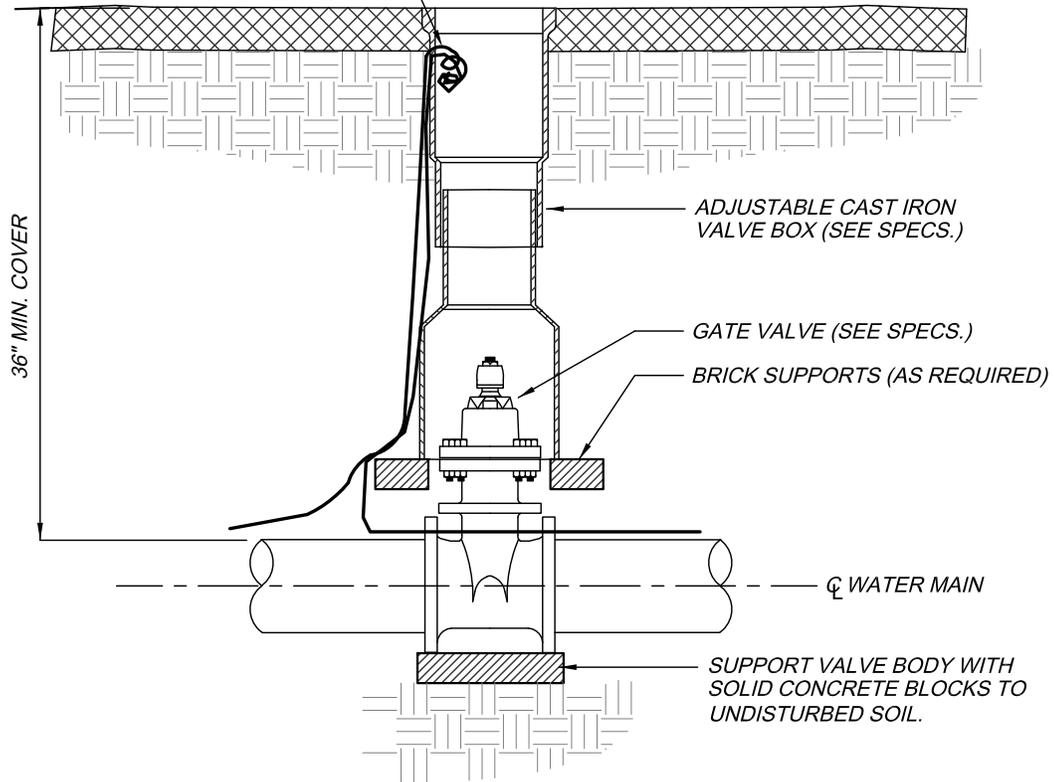
Department of Public Utilities

P.O. Box 1129, New Bern, NC 28563
252.639.7526 (FAX) 252.636.4103

**TYPICAL FIRE HYDRANT
ASSEMBLY**

STANDARD DRAWING No. W-3

BRING TRACER WIRE INTO
AND OUT OF VALVE BOX
THROUGH 1/2" HOLE.
LEAVE 24" OF WIRE COILED
IN BOX.



NOTES:

1. PROVIDE PRECAST COLLAR FOR VALVES IN UNPAVED AREAS.

NOT TO SCALE

NEW BERN

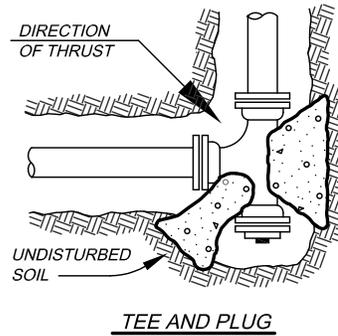
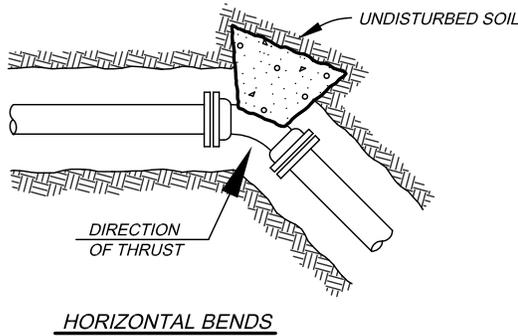
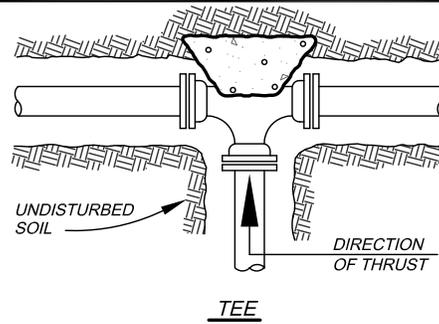
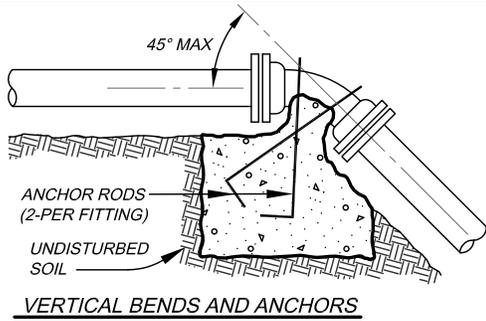
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Department of Public Utilities

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**TYPICAL VALVE AND
VALVE BOX**

STANDARD DRAWING No. W-4



CONCRETE THRUST BLOCKING SCHEDULE						CONCRETE SCHEDULE VERTICAL BENDS				ANCHOR ROD SIZE
FITTING SIZE	BEARING AREA IN SQUARE FEET					MIN. CU. YARDS CONCRETE				FOR VERTICAL BEND AND ANCHORS
	TEE/PLUG	90°	45°	22-1/2°	11-1/4°	90°	45°	22-1/2°	11-1/2°	
4"	1	2	1	1	1	1	1	1	1	1/2"
6"	3	3	2	1	1	1	1	1	1	
8"	4	6	3	2	1	2	2	1	1	3/4"
10"	7	9	5	3	2	3	3	2	1	
12"	9	12	7	4	2	5	3	2	1	7/8"
14"	12	17	9	5	3	6	4	3	2	
16"	16	22	12	6	3	8	6	3	2	
18"	20	27	15	8	4	10	7	4	2	
20"	24	34	18	10	5	12	9	5	3	1-1/8"
24"	34	48	26	14	7	17	12	7	4	
30"	53	75	41	21	11	27	19	10	5	
36"	77	108	59	30	15	38	27	15	8	

NOTES:

1. MINIMUM BEARING AREA (IN SQUARE FEET) AGAINST UNDISTURBED TRENCH WALL OF SAND.
2. AREAS SHOWN ARE FOR 150 PSI TEST PRESSURE. IF TEST PRESSURE IS OTHER THAN 150 PSI, ADJUST AREA OF REACTION BACKING IN DIRECT PROPORTION.
3. OTHER SOIL CONDITIONS :
 - CEMENTED SAND OR HARDPAN - MULTIPLY ABOVE BY 0.5
 - GRAVEL OR HARD DRY CLAY - MULTIPLY ABOVE BY 0.7
 - SOFT CLAY - MULTIPLY ABOVE BY 2.0

MUCK: SECURE ALL FITTINGS WITH APPROVED HARNESS OR TIE ROD CLAMPS, WITH CONCRETE REACTION BACKING THE SAME AS LISTED FOR SAND CONDITIONS.

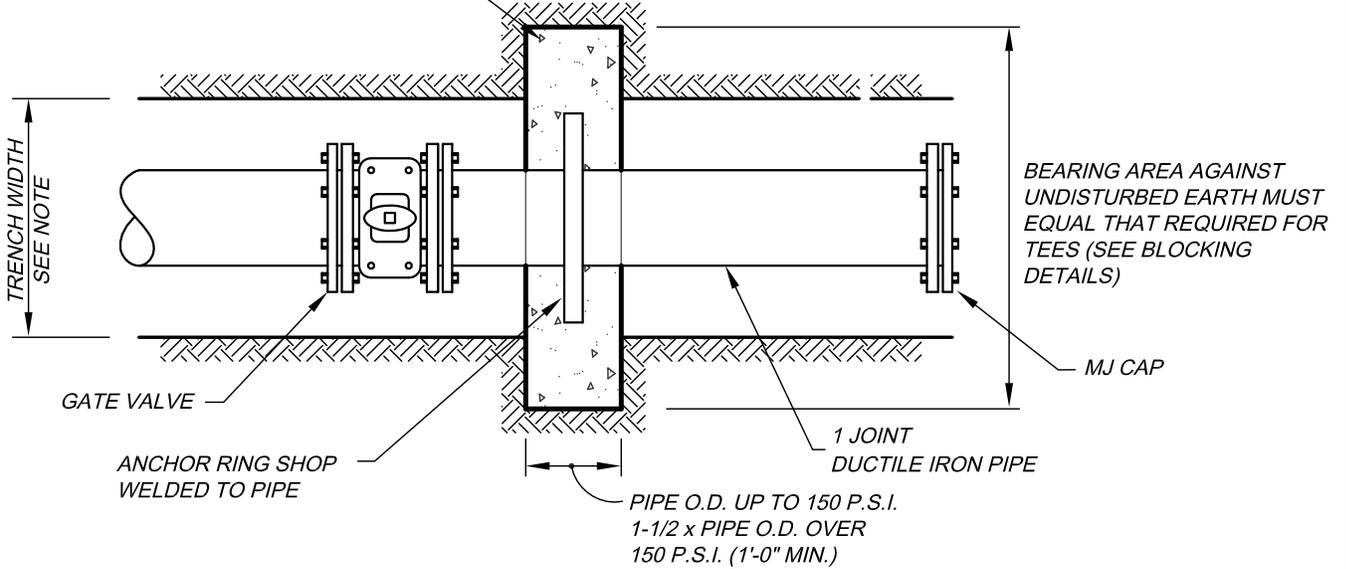
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THRUST BLOCKING AND ANCHORING SCHEDULE

STANDARD DRAWING No. W-5

2500 P.S.I. CONCRETE ENCASEMENT ALL AROUND FOR REACTION BACKING



ANCHOR RING DIMENSIONS

NOMINAL PIPE SIZE	O.D. OF RINGS	THICKNESS
4" - 12"	PIPE O.D. + 6"	1/2"
16" - 24"	PIPE O.D. + 7"	3/4"

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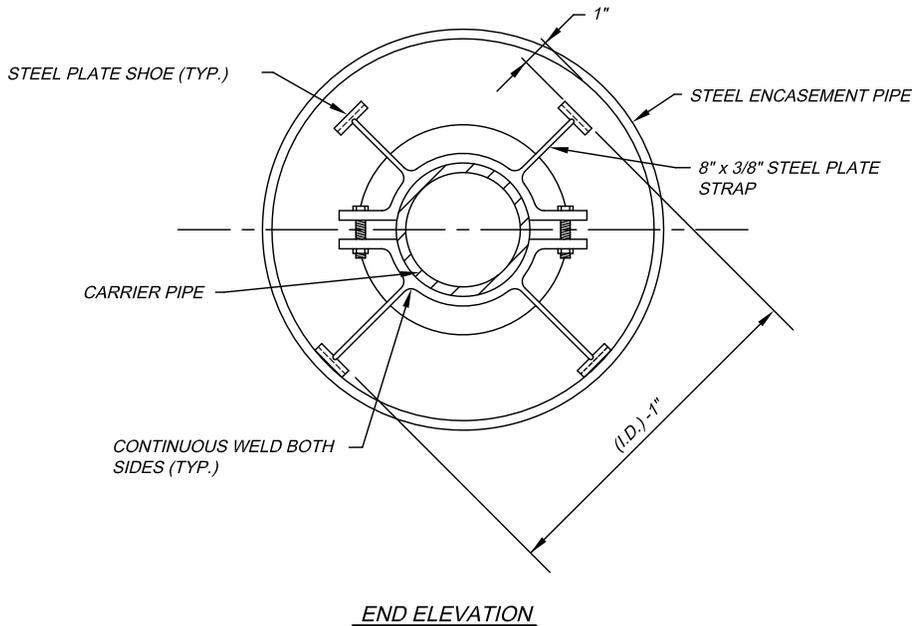
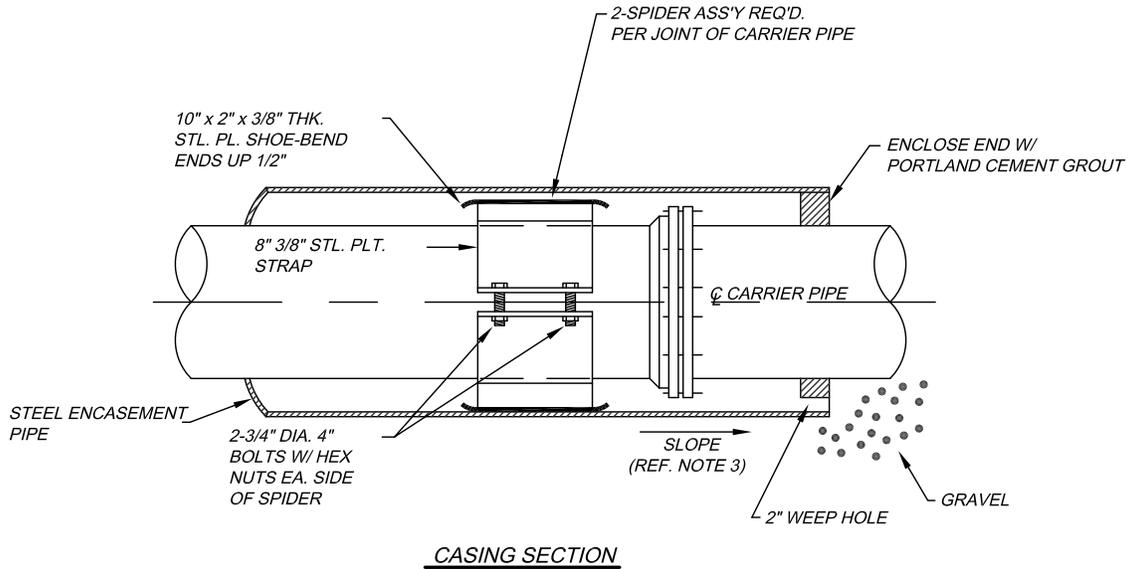
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**TYPICAL THRUST COLLAR
 DETAIL**

STANDARD DRAWING No. W-6



NOTES:

1. ENTIRE SPIDER ASSEMBLY TO BE BITUMINOUS COATED AFTER FABRICATION
2. FIELD MODIFY AS REQUIRED TO PROVIDE DESIGN SLOPE IN CARRIER PIPE.
3. STEEL ENCASEMENT TO BE INSTALLED IN ACCORDANCE WITH APPROVED DESIGN PLANS, ALL REVISIONS OR MODIFICATIONS ARE SUBJECT TO APPROVAL.

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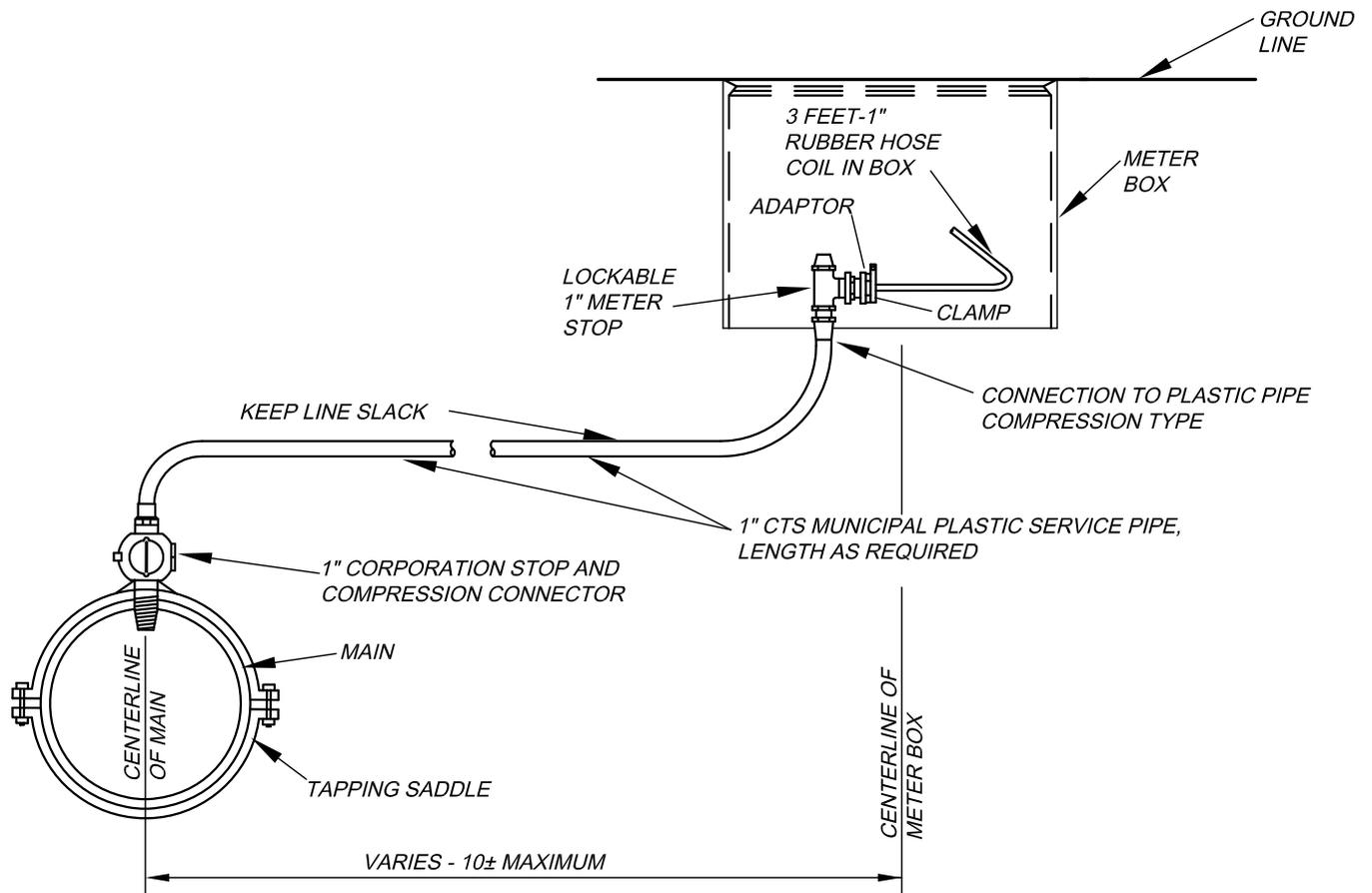
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**TYPICAL PIPE ENCASEMENT
DETAIL**

STANDARD DRAWING No. W-7



NOTES:

1. TAP ON THE MAIN SHALL BE MADE IN THE POSITION SHOWN.
2. LOCATE METER BOX AS SHOWN ON THE PLAN OR AS DIRECTED IN THE FIELD.
3. PIPE FROM MAIN TO METER STOP TO BE LEVEL OR CONTINUOUS UPGRADE.
4. TOP OF BOX TO BE GREATER THAN OR EQUAL TO 10" BELOW ELEVATION OF ADJACENT EDGE OF PAVEMENT WHEN SET IN ROAD/STREET SHOULDER. EXACT LOCATION OF BOX TO BE DETERMINED IN THE FIELD. SET FLUSH WITH FINISH GRADE WHERE NO PAVEMENT EXIST.

NOT TO SCALE

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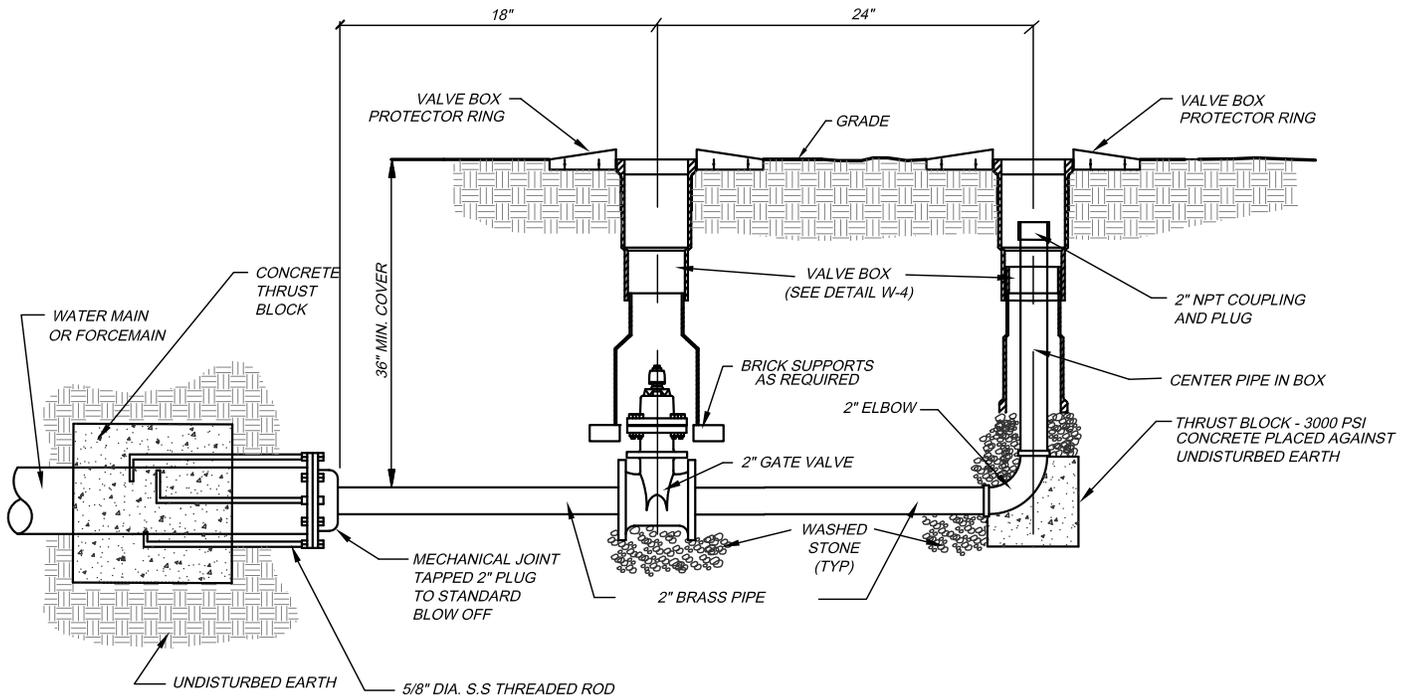
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**MANUAL AIR RELEASE
VALVE**

STANDARD DRAWING No. W-8

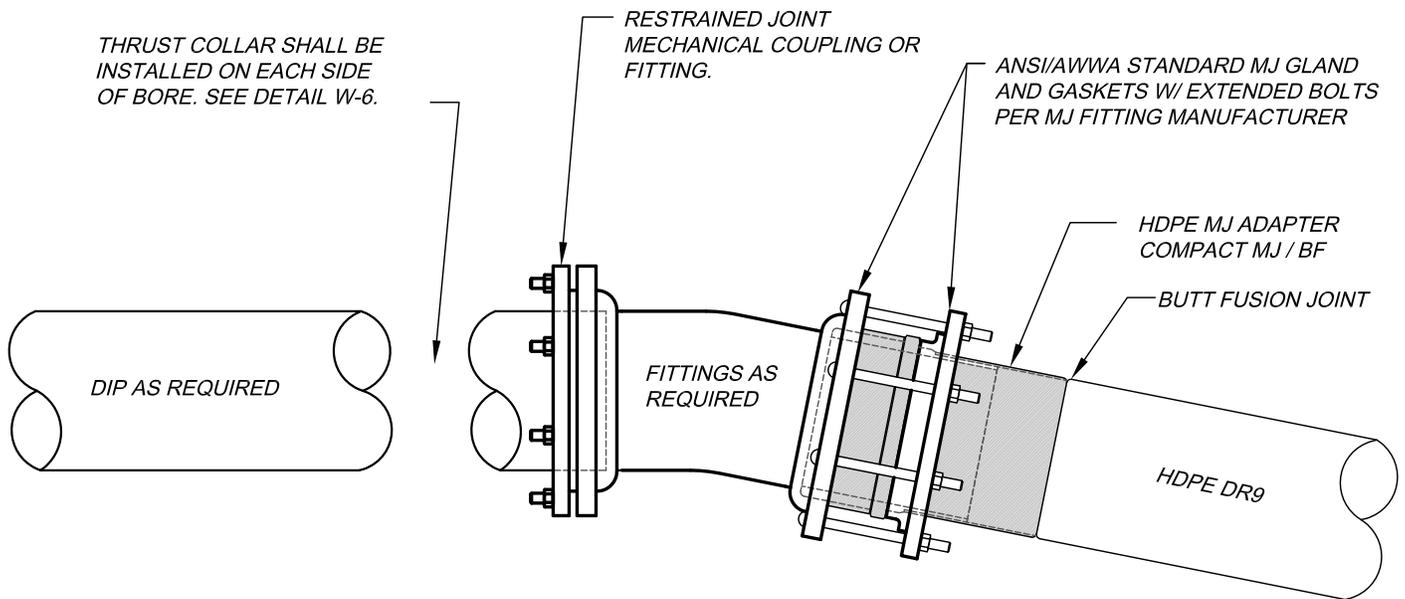


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**PERMANENT 2"
 END-OF-LINE BLOWOFF**

STANDARD DRAWING No. W-9



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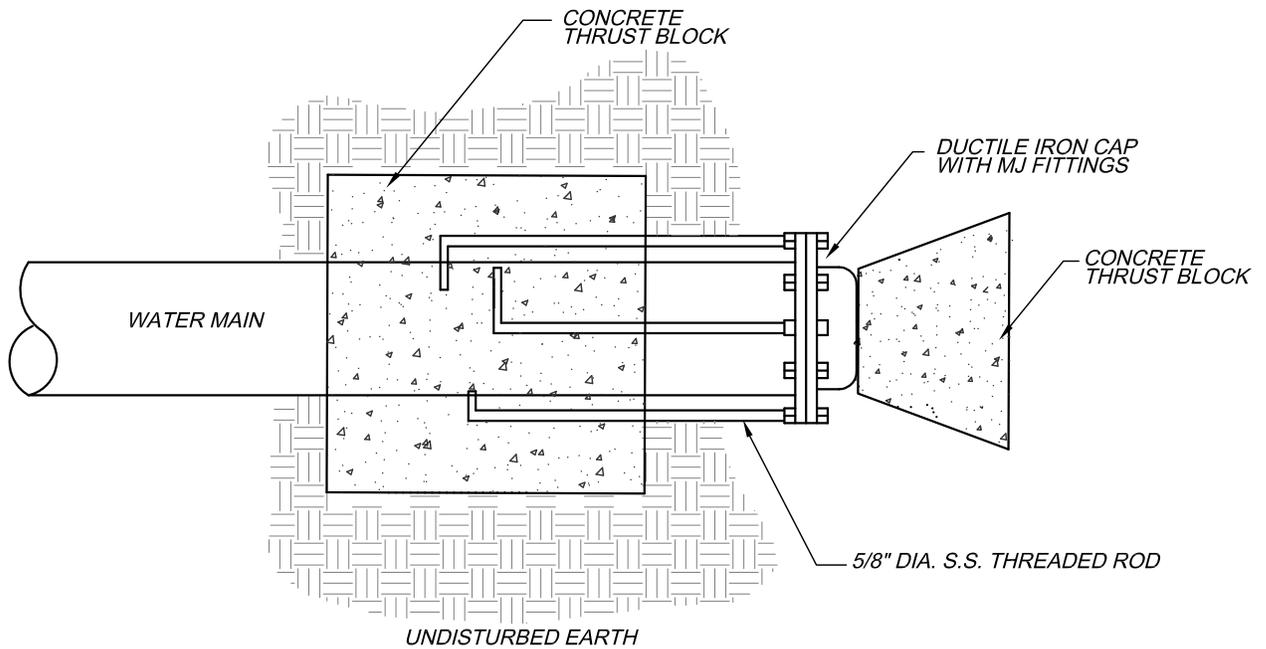
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**TYPICAL HDPE TO DIP
TRANSITION**

STANDARD DRAWING No. W-10



NOTES:

1. CONCRETE RESTRAINT BLOCK SHALL BE SIZED TO PROVIDE RESTRAINT OF A 100PSI FORCE ON THE END CAP, WITH A FACTOR OF SAFETY OF 2.0.
2. THE MINIMUM SIZE FOR THE RESTRAINT BLOCK SHALL BE 1 CUBIC YARD.

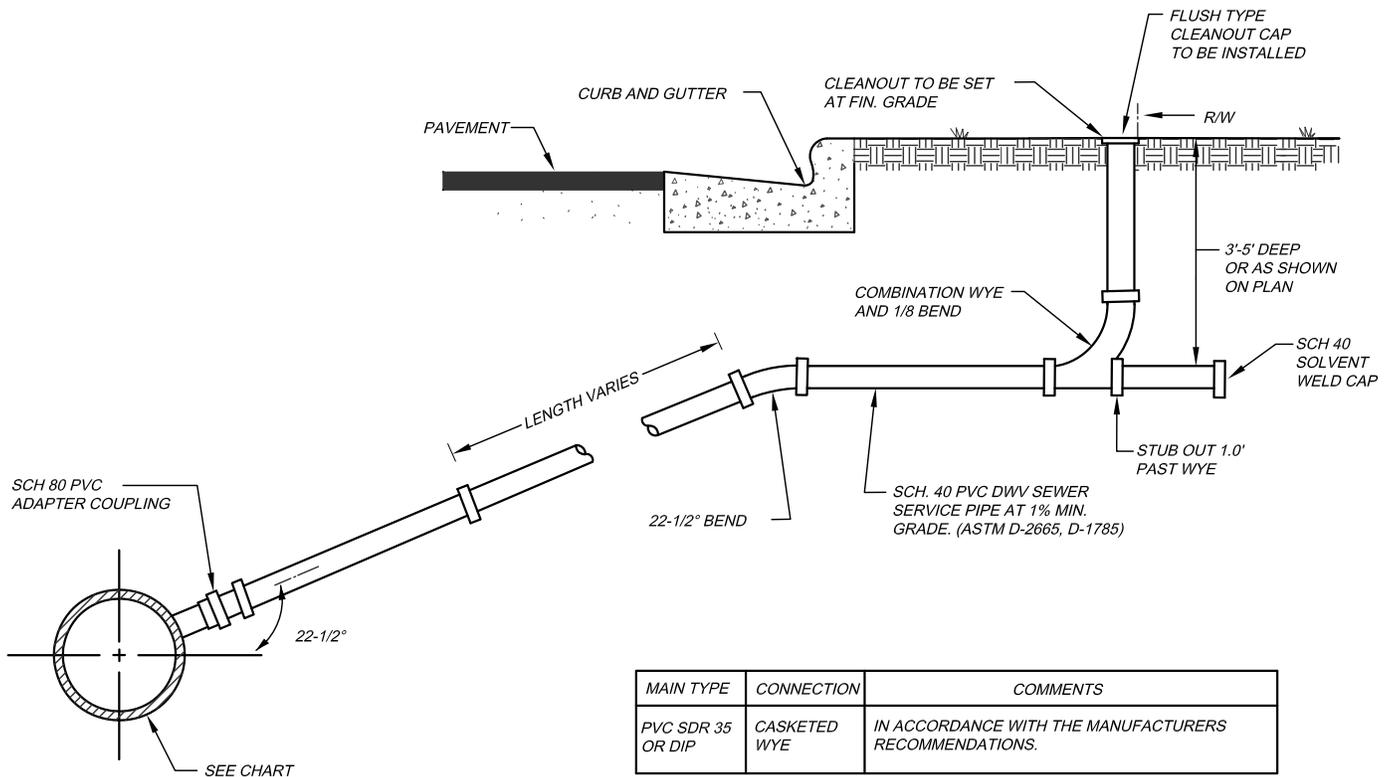
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**TYPICAL RESTRAINED
 END CAP**

STANDARD DRAWING No. W-11



MAIN TYPE	CONNECTION	COMMENTS
PVC SDR 35 OR DIP	CASKETED WYE	IN ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.

NOTE:

1. LOCATION OF THE SERVICE CLEANOUT SHALL BE AT THE RIGHT-OF-WAY LINE.
2. CONTRACTOR SHALL PROVIDE CAST IRON CLEANOUT BOX FOR EACH CLEANOUT THAT IS LOCATED IN SIDEWALK, DRIVEWAY, OR OTHER PAVED AREA.
3. ALL CLEANOUT CAPS SHALL SLOTTED OR HAVE AN INVERTED NUT.

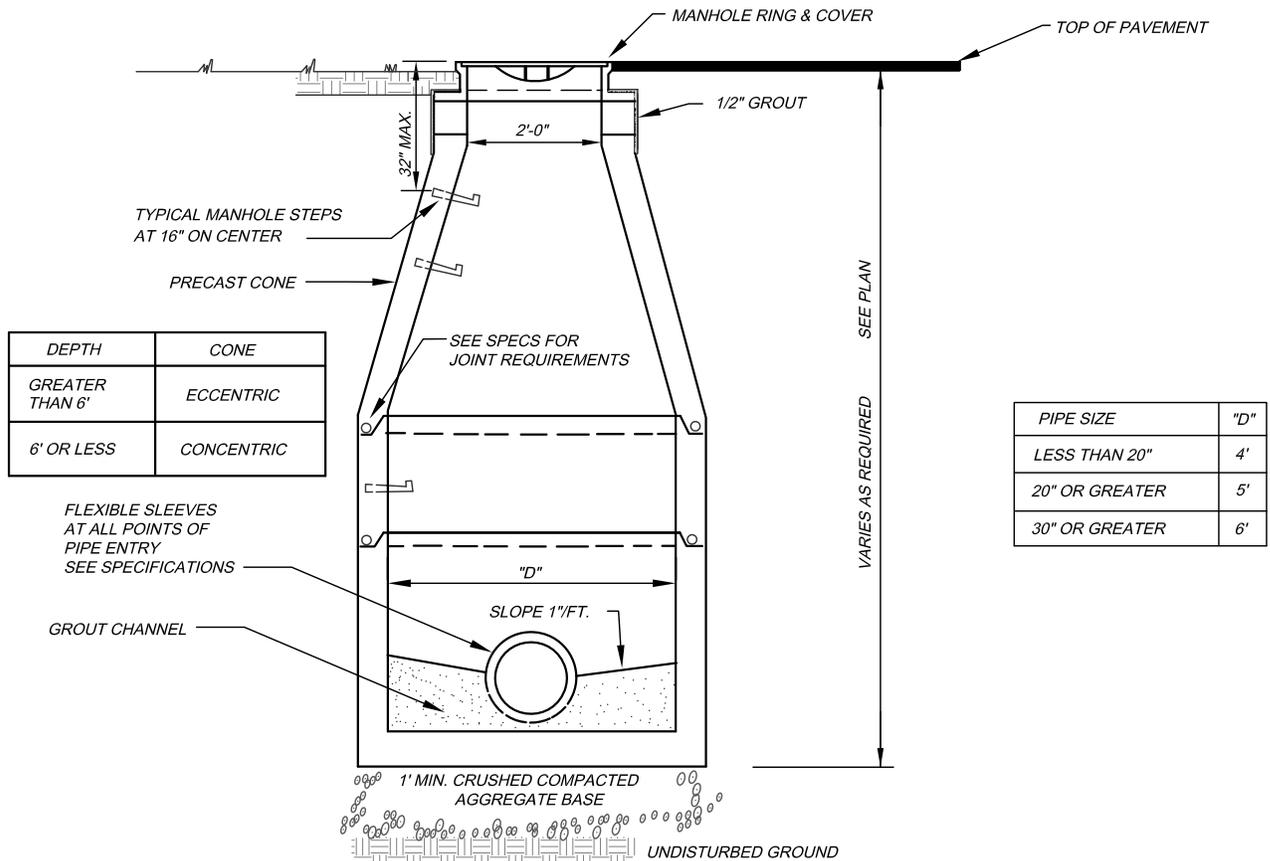
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TYPICAL SEWER SERVICE CONNECTION

STANDARD DRAWING No. S-1



NOTES:

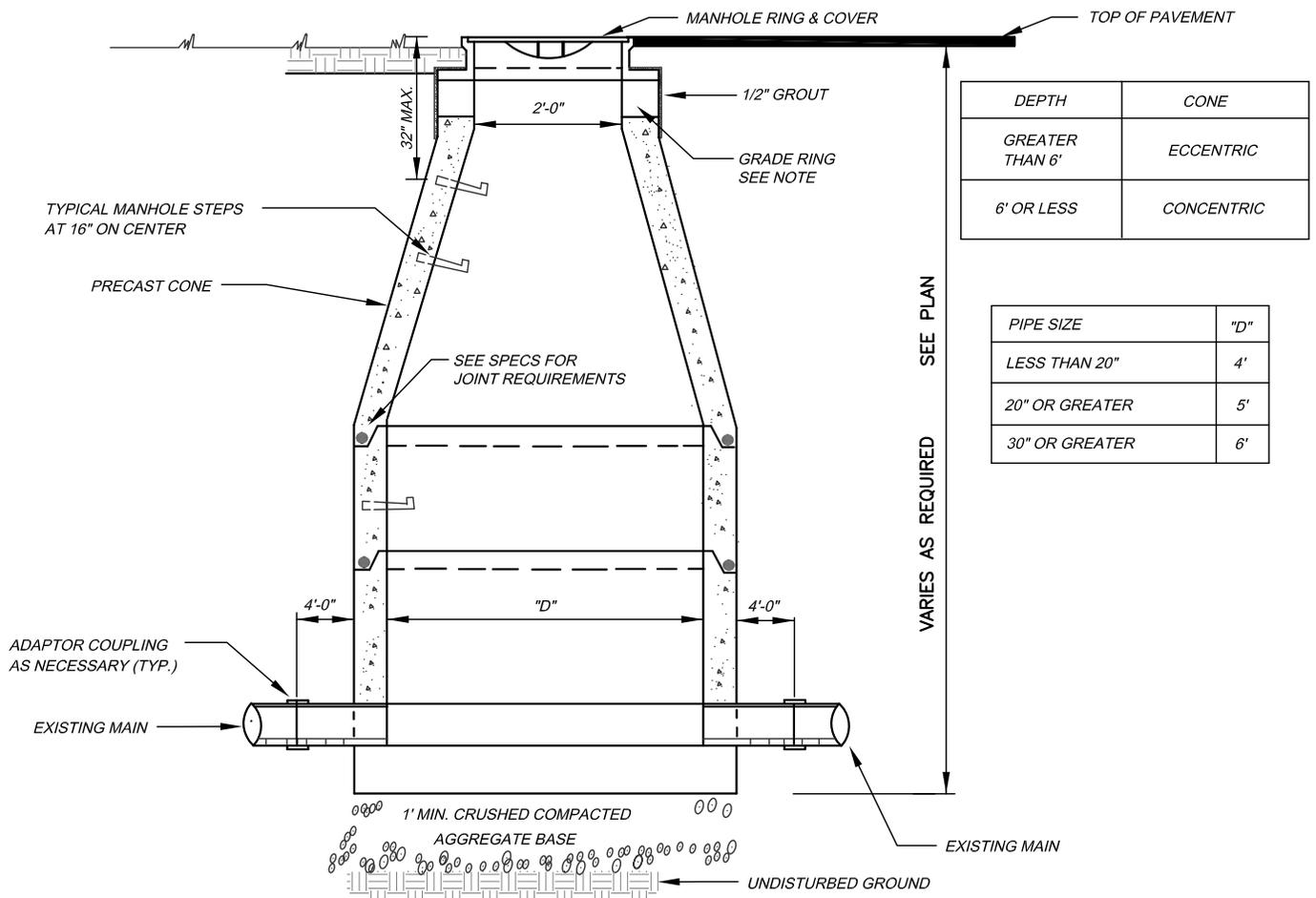
1. WHEN INSTALLED IN PAVEMENT MANHOLE SHALL BE FLUSH WITH THE FINISHED PAVEMENT
2. THE DISTANCE FROM THE TOP OF MANHOLE RING AND COVER TO FINISHED GRADE MAY VARY WIDELY, SEE PLAN.
3. EXTEND PIPE INSIDE MANHOLE WALL MAX. OF 2", AT CLOSEST POINT.
4. MIN. (1) GRADE RING REQUIRED IN NON-PAVED AREAS. IN PAVED AREA, GRADE RING NOT REQUIRED EXCEPT AS NECESSARY TO MEET FINISHED ELEVATION.
5. NO MORE THAN (2) 4" GRADE RINGS SHALL BE INSTALLED.

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**TYPICAL PRECAST
 CONCRETE MANHOLE**

STANDARD DRAWING No. S-2



NOTES:

1. SAW CUT EXISTING SEWER MAIN AND REMOVE SECTION TO ALLOW INSTALLATION OF PRECAST MANHOLE AND NEW SEWER MAIN. INSTALL NEW MAIN THROUGH MANHOLE.
2. INSTALL ABS COUPLINGS (EXISTING MAIN TO PROPOSED MAIN) AND ADAPTER COUPLINGS AS NECESSARY.
3. THE DISTANCE FROM THE TOP OF MANHOLE RING AND COVER TO FINISHED GRADE MAY VARY WIDELY, SEE PLAN.
4. POINTS OF EXIT AND ENTRY FOR PIPE SHALL BE PROVIDED WITH FLEXIBLE SLEEVES, PREFORMED INTO THE MANHOLE.
5. MIN. (1) GRADE RING REQUIRED IN NON-PAVED AREAS. IN PAVED AREA, GRADE RING NOT REQUIRED EXCEPT AS NECESSARY TO MEET FINISHED ELEVATION.
6. NO MORE THAN (2) 4" GRADE RINGS SHALL BE INSTALLED.

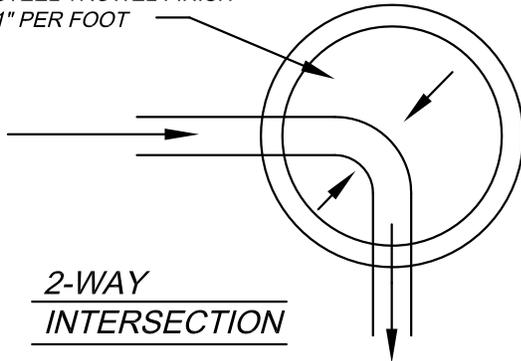
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**TYPICAL MANHOLE OVER
 EXISTING SEWER MAIN**

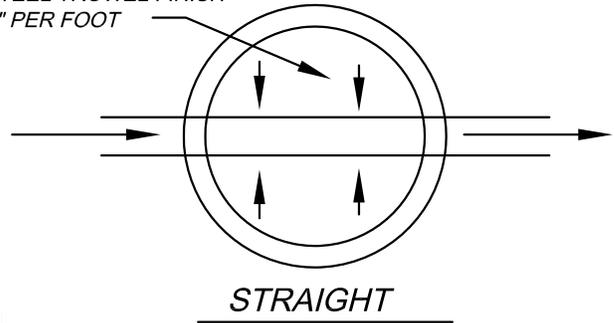
STANDARD DRAWING No. S-3

STEEL TROWEL FINISH
1" PER FOOT

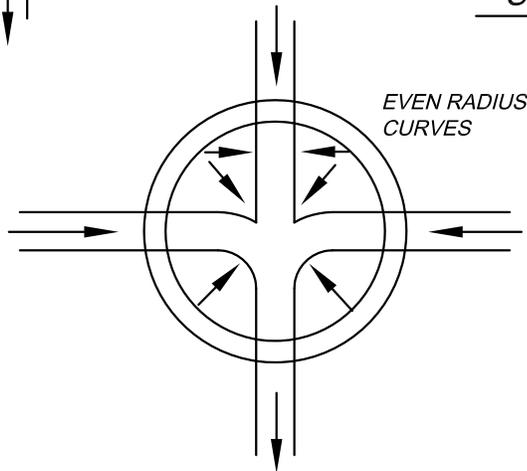


2-WAY
INTERSECTION

STEEL TROWEL FINISH
1" PER FOOT



STRAIGHT



EVEN RADIUS
CURVES

3 OR 4-WAY
INTERSECTION

NOTES:

1. ACCURATELY SHAPE THE INVERTS TO A SMOOTH SEMI-CIRCLE CONFORMING TO THE INSIDE CONTOUR OF THE ADJACENT SEWER SECTIONS.
2. ALL ENTERING BRANCHES AND CHANGES IN DIRECTIONS SHALL BE FORMED BY A CIRCULAR CURVE IN THE INVERT OF AS LARGE A RADIUS AS THE SIZE OF MANHOLE WILL PERMIT.
3. CHANGES IN SIZE AND GRADE OF THE CHANNELS SHALL BE MADE GRADUALLY AND EVENLY.
4. THE INVERT CHANNELS SHALL BE FORMED DIRECTLY IN THE CONCRETE OF THE MANHOLE BASE, OR SHALL BE BUILT UP WITH BRICK AND MORTAR.
5. THE FLOOR OF THE MANHOLE OUTSIDE THE CHANNELS SHALL BE SMOOTH AND SHALL SLOPE TOWARD THE CHANNELS NOT LESS THAN 1 INCH PER FOOT NOR MORE THAN 2 INCHES PER FOOT.

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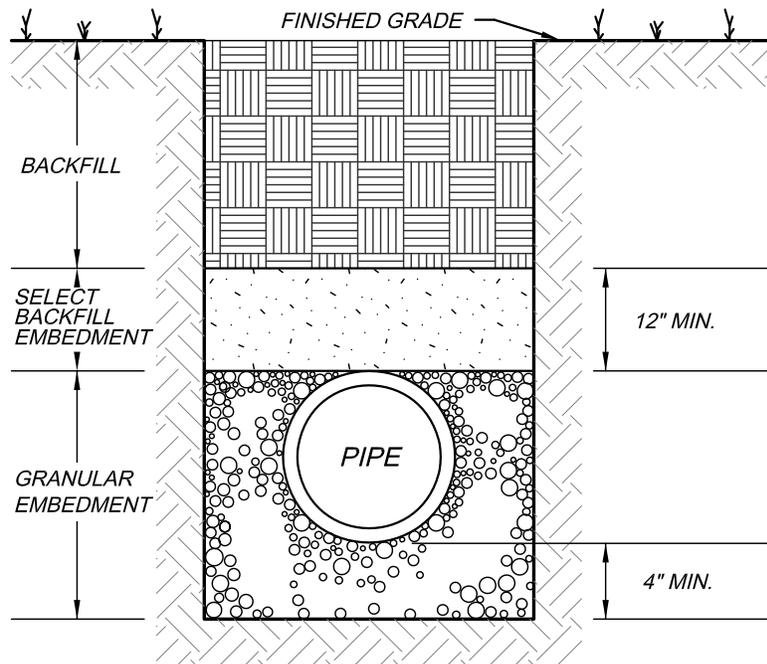
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**TYPICAL MANOLE
INVERTS**

STANDARD DRAWING No. S-4



NOTES:

1. BACKFILL SHALL BE PLACED AND COMPACTED IN 9" LIFTS.
2. SELECT FILL SHALL BE USED FOR ALL BACKFILL IF LOCAL SOIL IS CONSIDERED TO BE UNSUITABLE.

NOT TO SCALE

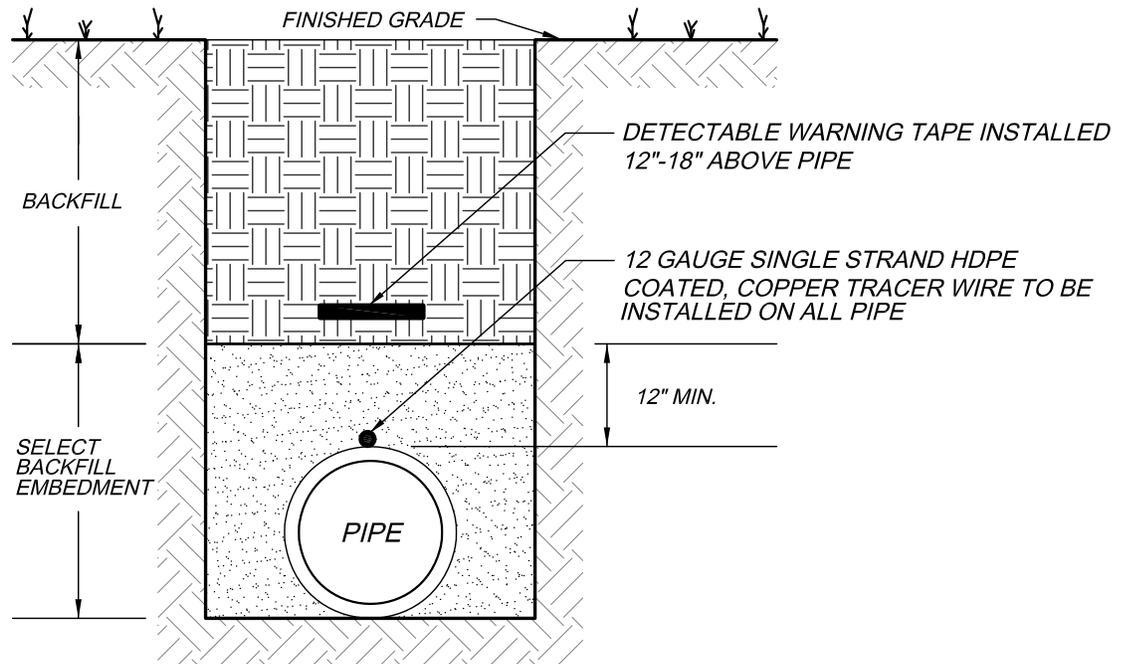
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**BEDDING FOR GRAVITY
 SEWER PIPE**

STANDARD DRAWING No. S-5



NOTES:

1. BACKFILL SHALL BE PLACED AND COMPACTED IN 9" LIFTS.
2. THE CITY ENGINEER MAY REQUIRE GRANULAR EMBEDMENT AS NECESSARY BASED ON LOCAL SOIL CONDITIONS.
3. SELECT FILL SHALL BE USED FOR ALL BACKFILL IF LOCAL SOILS IS CONSIDERED TO BE UNSUITABLE.

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**BEDDING FOR WATER MAINS
 AND SEWER FORCE MAINS**

STANDARD DRAWING No. S-6

12" DRAIN HOLE
FILLED W/ STONE

MANHOLE STEPS

12" SQUARE

FORCE MAIN

TRAFFIC RATED MANHOLE
FLAT-TOP

24" MH FRAME AND
COVER

SHORT BODY
COMBINATION
AIR VALVE

4' DIA. PRECAST MANHOLE

DEPTH AS REQUIRED

GROUT OPENING BETWEEN
PIPE AND MANHOLE

2" GATE
VALVE

2" 90°

2" THREADED BRASS PIPE

6"

CONCRETE PAD

2" CORP. STOP

12"

ABC STONE BASE

2" TAPPING SADDLE

FM

NOTES:

1. TAP ON THE MAIN SHALL BE MADE IN THE POSITION SHOWN.
2. LOCATE MANHOLE AS SHOWN ON THE PLAN OR AS DIRECTED BY THE CITY ENGINEER.
3. ARV VENT DISCHARGE SHALL BE PIPED WITH BRASS PIPE IN A DIRECTION THAT WILL PREVENT SPLASHING.

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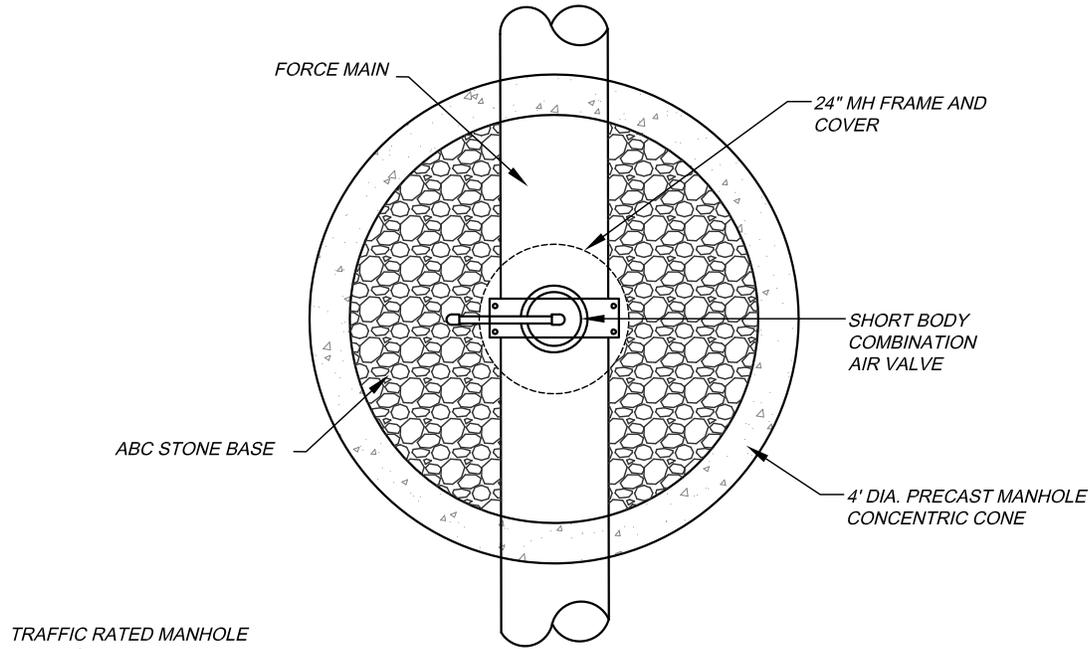
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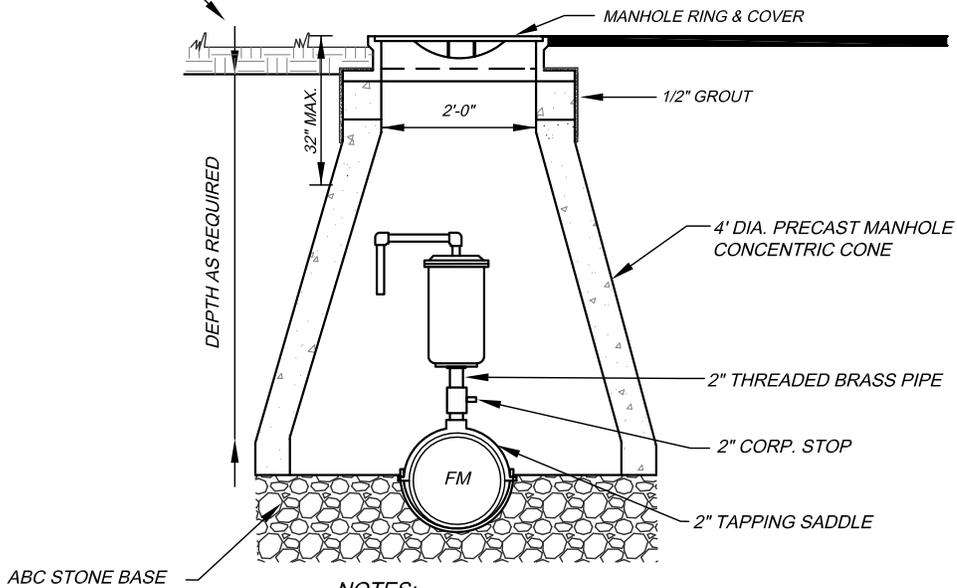
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AUTOMATIC AIR RELEASE VALVE - OFFSET

STANDARD DRAWING No. S-7



TRAFFIC RATED MANHOLE
FLAT-TOP



NOTES:

1. TAP ON THE MAIN SHALL BE MADE IN THE POSITION SHOWN.
2. LOCATE MANHOLE AS SHOWN ON THE PLAN OR AS DIRECTED BY THE CITY ENGINEER.
3. ARV VENT DISCHARGE SHALL BE PIPED WITH BRASS PIPE IN A DIRECTION TO PREVENT SPLASHING

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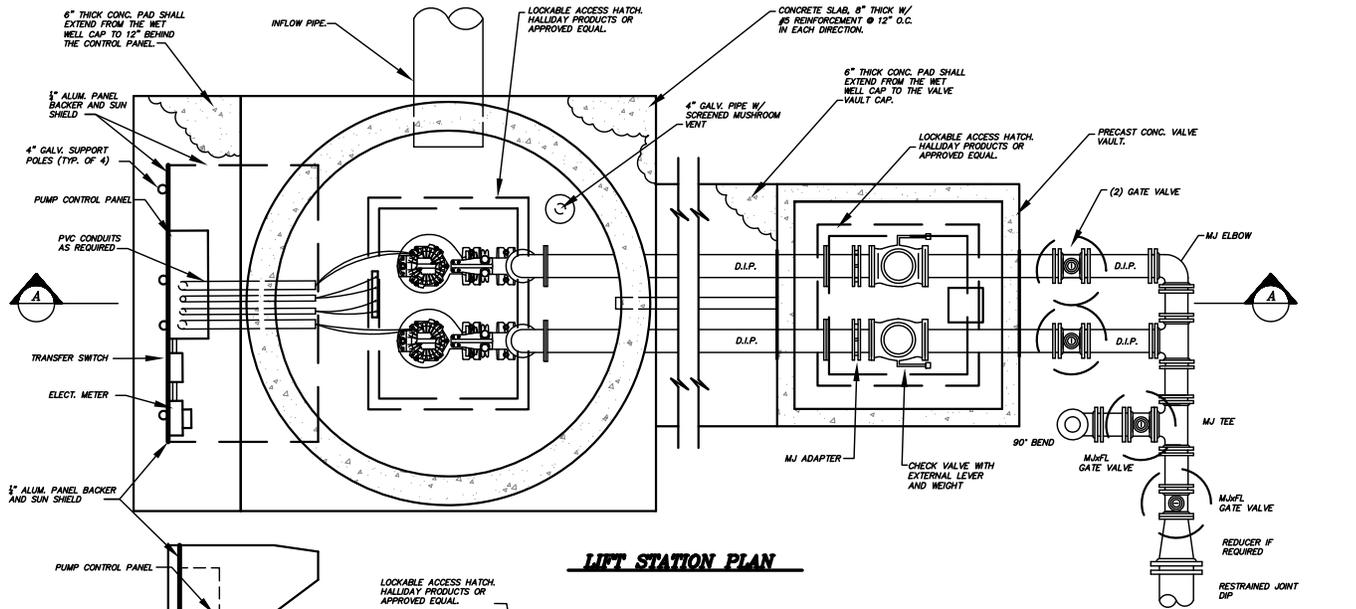
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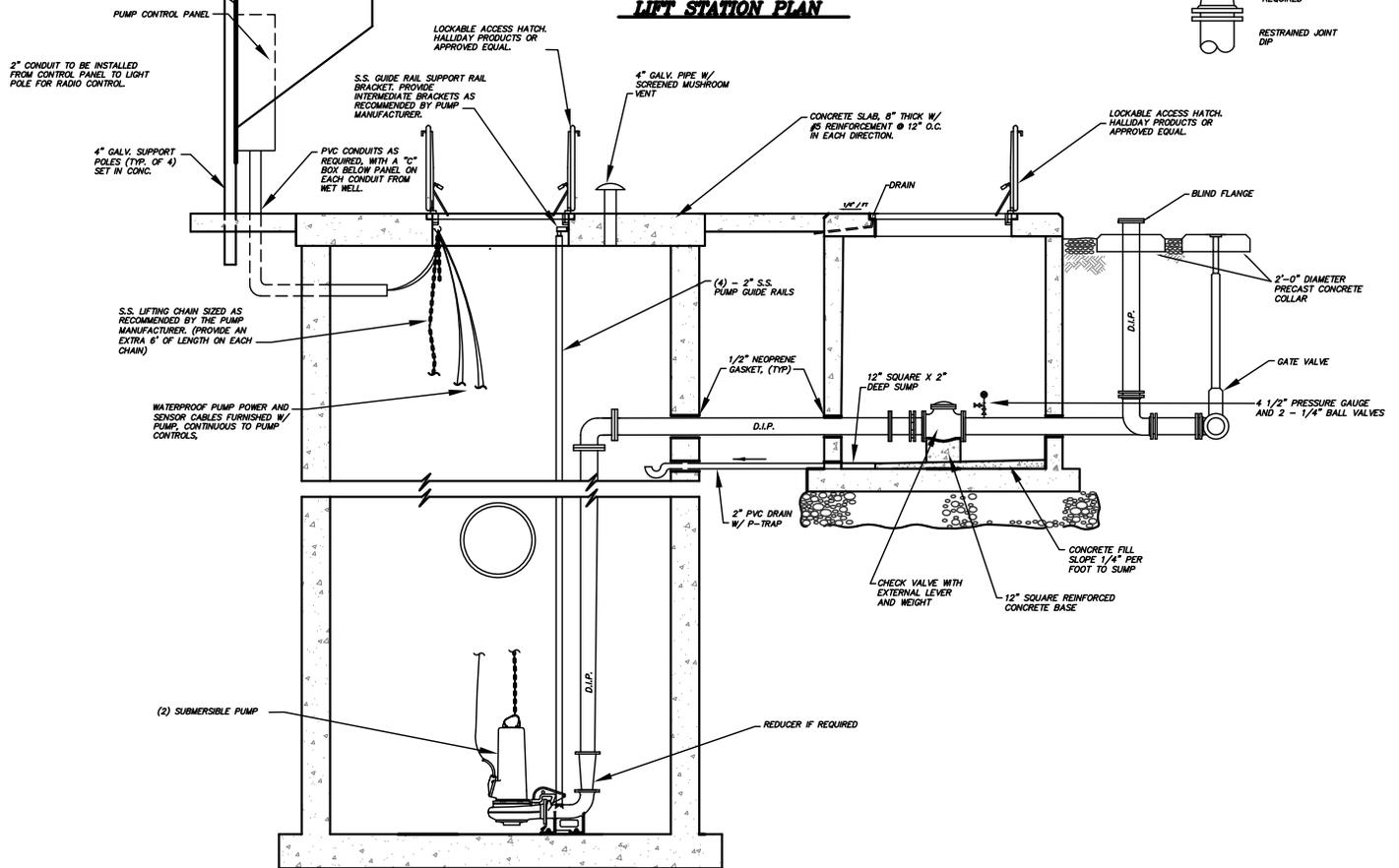
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**AUTOMATIC AIR RELEASE
VALVE - DIRECT**

STANDARD DRAWING No. S-8



LIFT STATION PLAN



LIFT STATION PROFILE - SECTION-A

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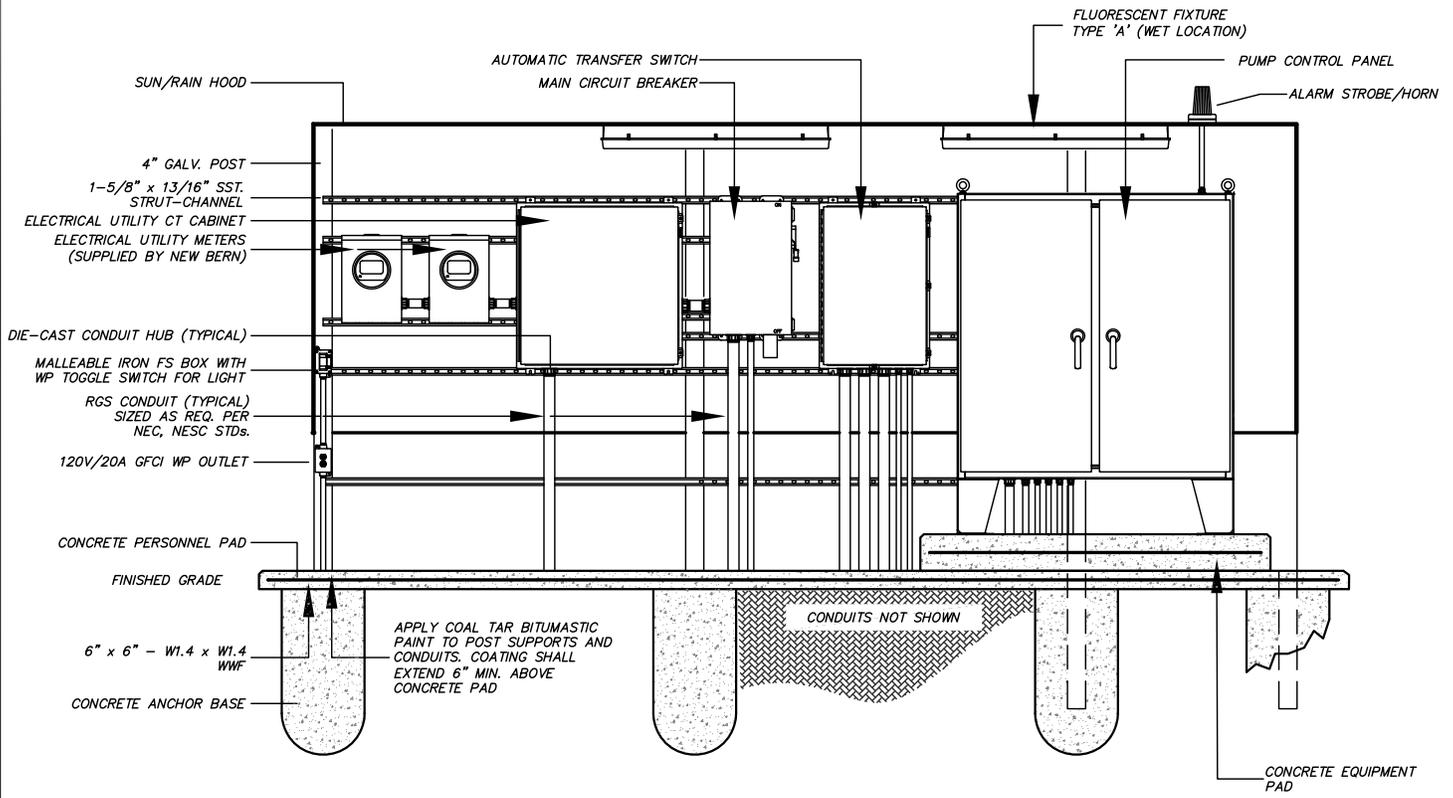
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**TYPICAL DUPLEX
SUBMERSIBLE LIFT STATION**

STANDARD DRAWING No. S-9



NOTES:

1. ALL EQUIPMENT MOUNTING HARDWARE SHALL BE 316 STAINLESS-STEEL.
2. CONCRETE SHALL BE 3,000PSI, PADS TO BE REINFORCED w/ 6x6 WWF. THE PAD SHALL EXTEND 36" OUT FROM DEEPEST PANEL AND 6" OUT SIDES OF THE SUN SHIELD.
3. PROVIDE WEATHERPROOF CORROSION RESISTANT FLUORESCENT FIXTURE MOUNTED UNDERNEATH SUN SHIELD, LIGHT SWITCH AND GFI RECEPTACLE.
4. THE BOTTOM OF THE EQUIPMENT SHALL BE MOUNTED NO LESS THAN 20" ABOVE FINISHED CONCRETE PAD.
5. CONDUITS SHALL BE INSTALLED UNBROKEN (NO FITTINGS) THROUGH THE CLASS-1/DIV II BOUNDARY.

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**TYPICAL LIFT STATION
 PUMP CONTROL PANEL**

STANDARD DRAWING No. S-10