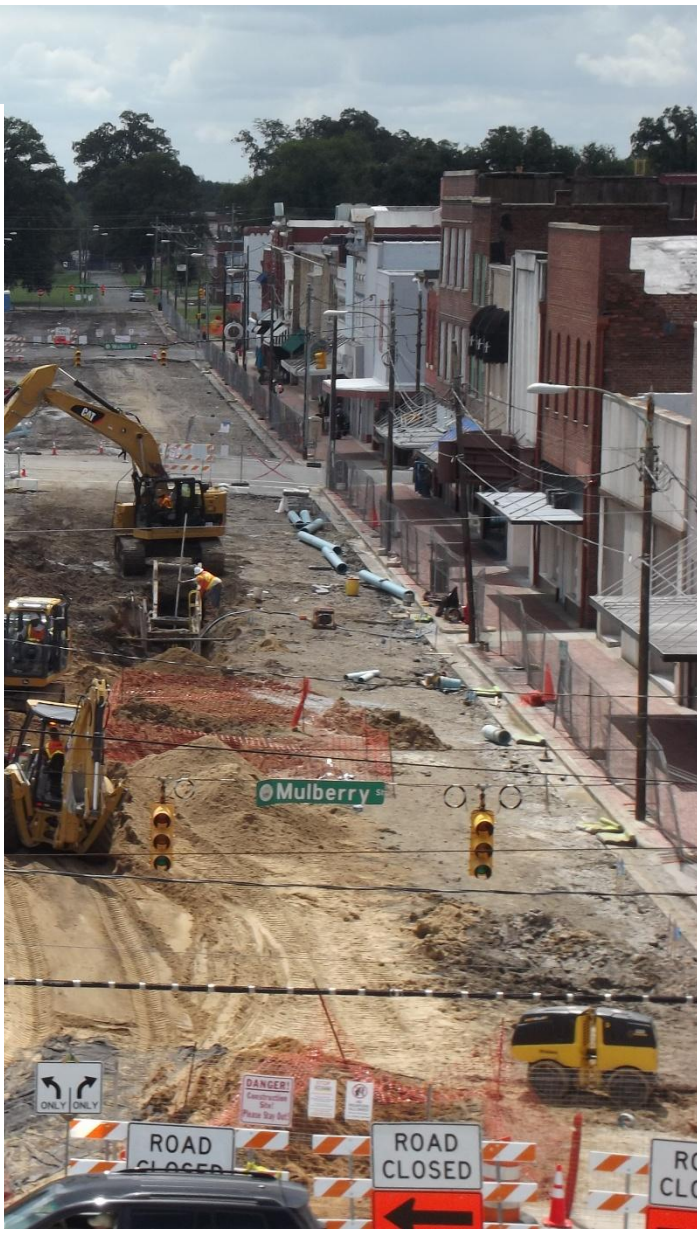
Standard Specifications and Details Manual



ENGINEERING DEPARTMENT

City of Goldsboro

Version 1.0
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CITY OF GOLSDBORO ENGINEERING DEPARTMENT SPECIFICATIONS AND DETAILS MANUAL

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SECTION 1 – GENERAL REQUIREMENTS AND PROVISIONS

General Requirements

Intent and Scope

The purpose of the Engineering Department's *Standard Specifications and Details Manual* is to protect the health, safety, and welfare of City of Goldsboro citizens by regulating construction of infrastructure such that what is improved is safe, reliable, and consistent throughout the City.

The *Standard Specifications and Details Manual* was originally adopted by Goldsboro's City Council on February, 4, 2019. The City Engineer may make minor revisions and implement them without formal adoption by the City Council. However, the revisions will be reviewed and duly adopted by the City Council periodically.

The City will notify the public of all revisions and updates by amending the *Standard Specifications and Details Manual* located on the City of Goldsboro's website.

Authority

The City will review, approve, and inspect the design and construction of infrastructure improvements within the public right-of-way, private right-of-way, easements, and site developments to ensure compliance with this Manual in addition to standards contained in the City of Goldsboro Unified Development Ordinance. The City has the authority for approving, accepting, or denying the design and construction of any improvement.

Minimum Standards

The *Standard Specifications and Details Manual* establishes minimum requirements that shall be met or exceeded when designing and constructing all public or private infrastructure improvements described in the Manual. Whenever the requirements of this Manual are found to be inconsistent with any other adopted standards, regulations, or codes, the more restrictive standards, regulations, or codes shall control. Reference to any code, regulation, standard, criterion, or manual of any technical society, organization, or association, or to any law or regulation of any governmental authority, whether such reference be specific or by implication, shall mean the most recently adopted or current law, code, regulation, standard, criterion, or manual in effect at the time of City review of any project.

The design of all public or private improvements shall be prepared by or under the direct supervision of a design professional duly registered and licensed by the State of North Carolina to perform such work. The construction of all public or private improvements shall be performed in a professional and workmanlike manner by a contractor licensed by the State of North

Carolina. The City of Goldsboro assumes no responsibility for supervising or directing construction activities performed by a contractor.

All materials used for public or private improvements shall be new and of good quality, to include products made of recycled material. Recycled materials and equipment may be used if they meet the quality standards and conditions equivalent to new materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the instructions of the applicable supplier or manufacturer, except as otherwise prescribed.

Using this Manual

This Manual provides design and construction requirements to be used when developing all public improvements and infrastructure within the City including private improvements that are used by and affect the public.

Inspections

All work must be inspected and approved by the City Engineer or designee to insure that the work is completed in accordance with the approved plans. The most recent set of approved plans must remain on the site at all times while construction activity is occurring for use by the City Engineer or designee. The designee will typically be a Construction Inspector.

The presence of the City Engineer or designee at the work site shall in no way reduce the contractor's responsibility for conformity with the plans and specifications. Should the City Engineer or designee accept materials or work that does not conform to the plans and specifications, whether from lack of discovery or for any other reason, it shall in no way prevent later rejection or corrections to the unsatisfactory materials or work when discovered. The contractor shall have no claim for losses suffered due to any necessary removals or repairs resulting from the unsatisfactory work.

Any work which cannot be visually observed by the City Engineer or designee at the time of inspection, shall, at the City Engineer's request, be exposed and be made available for inspection at the contractor's expense. Work performed before or after normal work hours, during the weekend, or on City holidays shall comply with the requirements of this Manual and shall include only such tasks that do not require observation by the City Engineer or designee.

Alternative Materials and Methods of Construction and Installation

The provisions of this Manual are not intended to prevent the use of any materials or methods of construction and installation not specifically prescribed in the Manual, provided that the alternative materials or methods of construction and installation have been approved and their use authorized by the City Engineer.

The City Engineer may approve an alternate material or method of construction or installation, provided the proposed design is satisfactory and complies with the provisions of this Manual and that the material, method, or work offered is, for the purpose intended, at least the equivalent of applicable requirements described in this Manual in suitability, strength, effectiveness, durability, safety, and sanitation.

The City Engineer will require that sufficient evidence be submitted to substantiate any claims that may be made regarding an alternate material or method of construction. The details of any action granting approval of an alternate material or method will be recorded and entered in the files of the City.

Alterations, Modifications, and Waivers

The following review criteria and process shall be utilized in requesting, evaluating, and approving any alteration, modification, or waiver of the requirements of this Manual.

Review Criteria. No substantial alteration, modification, or waiver of the strict application of any provision of this Manual shall be granted unless the applicant clearly demonstrates and the City Engineer agrees that: the alteration, modification, or waiver would result in a solution consistent with the goals of the City of Goldsboro as established in adopted plans, policies and guidelines; that the alteration, modification, or waiver will not harm the adjacent land owners, the neighborhood, or the welfare of the public at large; and that all of the following conditions exist:

- The strict application of the provision of this Manual would deprive an individual of the reasonable use of land or structure.
- Special circumstances peculiar to such land or development justify the requested alteration, modification, or waiver.
- The alteration, modification, or waiver will at least equal the suitability, strength, effectiveness, fire resistance, durability, safety, and sanitation performance requirements prescribed in this Manual.
- The alteration, modification, or waiver will not create an additional maintenance or financial burden for the public.

Process. A request for an alteration, modification, or waiver from this Manual shall be submitted in writing to the City Engineer. The request shall state in detail the specific sections and subsections of this Manual requested to be altered, modified, or waived, and the request shall describe in detail why the requested waiver, alteration, or modification meets the above criteria.

The City Engineer may require additional documentation to support the requests and shall require that sufficient evidence be submitted to substantiate any claims that may be made regarding alterations, modifications, or waivers from this Manual. Sufficient evidence may

include verification by a professional duly registered and licensed by the State of North Carolina possessing relevant expertise in the area.

Decision. The City Engineer will advise the applicant, in writing, of the decision on the requested alteration, modification, or waiver. The City Engineer's decision is a final administrative action that may be appealed as provided by law. In granting any alteration, modification, or waiver to the requirements of this Manual, the City Engineer may impose specific conditions necessary to ensure that the criteria described above are, and will remain, satisfied.

The City Engineer will consult with the Planning Director when evaluating issues that potentially impact urban design, zoning, or UDO requirements. The details of any decision granting approval of an alteration, modification, or waiver from this Manual will be entered in the form of written findings. A written log of all decisions granting alterations, modifications, or waivers from this Manual will be maintained in the office of the City Engineer and available for public inspection.

General Provisions

Clearing and Grubbing

The work of clearing and grubbing shall consist of the cutting, removal, and satisfactory disposal of all vegetation and all surface debris. Clearing and grubbing shall be conducted in a manner to prevent damage to vegetation that is intended to remain growing and also to prevent damage to adjacent property.

Earthwork

Earthwork shall be defined as removal of earth or soft rock from its natural location or as the depositing of such material into the proper fill areas as designated on the approved plans.

Trenches deeper than 10 feet located within the public right-of-way may require positive shoring. Trenches deeper than 4 feet located adjacent to a roadway may require positive shoring.

Fill material shall be free from construction material, debris, frozen material, organic matter, unstable material, or contaminated soils. For the top 2 feet below finished sub-grade, no fill material shall be used weighing less than 100 pounds per cubic foot. The top 2 feet of backfill material shall be free from stones greater than 2 inches.

For all areas under a proposed roadway, the top 12 inches of sub-base, and the entire base course shall be compacted to a density of 100 percent maximum Standard Proctor dry density

as determined by the American Association of State and Highway Transportation Officials (AASHTO) method T99. For that portion of fill under roadways and extending at a slope of 1:1 beyond the back of curb, compact to a density of no less than 95 percent of the maximum Standard Proctor dry density as determined by AASHTO method T99. Fill material shall be placed in lifts of 6 inches or less of uncompacted soil.

Other fill material shall be compacted to a density of no less than 90 percent of the maximum Standard Proctor dry density as determined by AASHTO method T99. Backfill material shall be placed in lifts of 8 inches or less of uncompacted soil.

Maintenance of Traffic

General. When construction occurs in a public right-of-way, traffic control devices must be erected, maintained, relocated, and removed in accordance with the current plans, specifications, *North Carolina Department of Transportation Supplement to the Manual of Uniform Traffic Control Devices,* and FHWA's *Manual on Uniform Traffic Control Devices.*

Traffic control devices shall include but not be limited to signs, drums, barricades, cones, delineators, flashing arrow panels, temporary guardrail, temporary concrete median barrier, vehicle-mounted temporary impact attenuators, pavement markings, raised reflective pavement markers, flaggers and pilot vehicles as specified in the current edition of the MUTCD.

It should be noted that the MUTCD has specific requirements to provide accessible alternate routes for pedestrians when sidewalks are closed and a contractor shall provide accessible alternate routes when applicable.

Notification of all applicable emergency service agencies must occur prior to closing a street. These agencies may include Goldsboro Fire Department, Goldsboro Police Department, Wayne County Sheriff's Department and Wayne County Emergency Services.

Materials. Materials used in the fabrication and installation of construction traffic control devices shall be in accordance with the applicable provisions of the MUTCD and verifiable as such.

Installation and Maintenance. Existing public streets and sidewalks shall be kept open to traffic at all times by the Contractor unless permission to close the street, or portions thereof, is granted by the City Engineer, the Fire Chief, and NCDOT's District Engineer or a designated representative (for NCDOT roads within city limits), a minimum of 5 days prior to any closing or partial closing. The City of Goldsboro Public Works Department is exempt from this approval process for City maintained streets.

Work on any project shall not start until all traffic control devices required for the particular work activity are properly installed. Traffic control devices shall be properly maintained, clearly visible, clean and operational during the time they are in use. During periods when use of the

devices is not warranted, they shall be removed from the work area, covered and/or otherwise positioned so that they do not convey their message to the traveling public.

The location, legends, sheeting, dimension, number of supports, and horizontal and vertical placement of warning signs, barricades, and other traffic control devices shall be as required by the approved plans and the MUTCD.

Weeds, brush, trees, construction materials, equipment, etc. shall not be allowed to obscure any operational traffic control device.

Competent and properly trained, attired and equipped flaggers, using “STOP” and “SLOW” paddles shall be provided when two-way traffic cannot be maintained or as determined by the City Engineer or designee.

The Contractor shall assume full responsibility for the continuous and expeditious maintenance or replacement of all construction warning signs, barricades, and other traffic control devices. The Contractor shall continuously review and maintain all traffic control measures to assure that adequate provisions have been made for the safety of the public and workers. Failure to maintain all traffic control devices in a satisfactory condition shall be cause for suspension of construction operations until proper traffic control is reestablished.

Concrete

Concrete shall be plant or transit mixed concrete conforming to ASTM C33 for aggregates and ASTM C94 for ready mixed concrete. Any concrete poured that has a slump over 4 inches as per ASTM C143, or has a batched time of more than 90 minutes, will be considered unacceptable. The City Engineer may allow a minimum plant mix of 4,000 psi with a slump over 4 inches provided that it is a certified pump mix. Concrete shall not be deposited on frozen sub-grade. Concrete shall not be poured when the air temperature is 40 degrees Fahrenheit or below, and the predicted low temperature for the succeeding 24 hour period is less than 32 degrees Fahrenheit. Also, concrete shall not be poured when the air temperature is over 95 degrees Fahrenheit.

All concrete when placed in forms shall have a temperature of between 50 and 90 degrees Fahrenheit and shall be maintained at a temperature of not less than 50 degrees Fahrenheit for at least 72 hours for normal concrete and 24 hours for high early strength concrete, or for as much time as is necessary to secure the proper rate of curing and designed compressive strength. Concrete shall be air entrained with 5-7% air. Retarders and accelerators shall be used only within the manufacturer’s specification and clearly documented on the loading tickets.

Placed concrete should not be allowed to free fall more than 48 inches. Forms should be pre-wetted prior to the placement of concrete.

Placement of pervious concrete shall be approved by the City Engineer prior to installation. A pervious pavement design will require maintenance plans if utilized as part of the stormwater management plan.

Permits

Although not exhaustive, typical permits and agreements from the City of Goldsboro's Engineering Department include:

Driveway Permit – Any project that requires a new access to a public street requires a driveway permit. For driveway access to City of Goldsboro maintained facilities, permits are to be submitted to the City Engineer. For driveway access to NCDOT maintained facilities within the Goldsboro city limits, completed permits are first submitted to the City Engineer. Once approved by the City of Goldsboro, permits are then submitted to NCDOT by the applicant. The fee is determined by NCDOT. For more information, see the *Transportation* section of this manual.

Encroachment Agreement – Any work proposed within a City of Goldsboro or NCDOT right-of-way or easement requires an Encroachment Agreement from the respective agency.

For the installation of utilities or landscaping in a NCDOT right-of-way or easement located within the City, a *Three Party Agreement* between the developer, the City, and NCDOT is required. These permits are to be completed and submitted to the City Engineer for signature. Once the City has approved, the applicant shall then submit to NCDOT for approval.

For roadway widening, sidewalk installation, curb and gutter, and storm drainage in a NCDOT right-of-way or easement located within the City, a *Two Party Agreement* between the developer and NCDOT is required.

Acceptance Procedures

All improvements intended to be dedicated to and maintained by the City of Goldsboro or another public entity are eligible for acceptance following these procedures:

Corrections Period. After the installation of improvements in accordance with approved plans and specifications, the Owner/Developer shall contact the City Engineer or designee and request an inspection. Once inspected, the City will respond with a punch list. The Owner/Developer must complete all items indicated on the punch list and any additional items noted within 60 days or the punch list will be void. The Owner/Developer must then request another inspection. Upon the acceptable completion of all punch list items and payment of any outstanding fees, the Owner/Developer will receive a letter from the City that indicates the corrections period for the improvements has started. During the corrections period, the Owner/Developer will be responsible for repairs or replacement of infrastructure as a result of poor workmanship or material failures or defects for not less than one year. The City may

perform routine maintenance during the corrections period only for infrastructure that is to be ultimately maintained by the City.

Final Acceptance. Upon the acceptable completion of all punch list items, the Owner/Developer will receive a letter of Final Acceptance from the City. Final Acceptance of City maintained improvements occurs only once this letter is issued. Until Final Acceptance, all materials and workmanship are the responsibility of the Owner/Developer.

Encroachments Within City Right-of-Ways or Easements

No part of any structure, permanent equipment, private utility line (including but not limited to water, irrigation, and sewer lines) or impoundment may be placed, and no grading may occur within any City of Goldsboro right-of-way or easement prior to obtaining full site plan approval, a building permit, or an encroachment agreement from the City. The City will not be held liable for any damage to any encroachment during maintenance of a City facility or structure.

Ground covers or grasses may be planted within the easement. Any improvements installed within a City right-of-way or easement are subject to disturbance or damage during the City's use of the area and may be removed and not replaced.

OSHA Standards

Contractors and their employees are responsible for safe work procedures and must comply with OSHA standards.

Safety and Health Hazards

The operations of any Contractor shall not expose City employees to any hazardous chemicals or other occupational safety and health hazards. All contractors working on City projects or on City property shall comply with OSHA standards concerning the handling and storage of hazardous chemicals, specifically the visible display of warning information placards for use by emergency services. The Contractor shall also advise the City of the appropriate control measures to be used by the City employees to prevent exposure and to minimize risk of exposure.

SECTION 2 – TRANSPORTATION

Design Controls and Criteria

Classifications

Transportation, quality of life, and economic development are undeniably connected to well-planned, well-designed, and context sensitive transportation solutions. The Transportation Design Standards are intended to provide for an integrated transportation system for all transportation modes.

Streets are classified according to the nature of the land uses they serve and the mode of travel (non-motorized and motorized) they accommodate. Streets are networked to provide a balance between access and mobility.

All streets shall be designed and located in proper relation to existing streets and the surrounding environment. Street design should be consistent with topography and preserve developed properties and community values.

All street networks are to provide safe and efficient access to all properties. No property shall be landlocked or excessively removed from the street facilities. All streets should be continued with the development of adjacent properties when there is a transportation and connectivity need.

- **Dead End/Cul-de-sacs –** Permanent dead end streets or cul-de-sacs are strongly discouraged on local and residential streets because they disrupt connectivity of streets for safety and access. If approved, they shall not exceed eight hundred feet in length and shall be provided with a turnaround having a paving diameter of at least eighty feet and a right of way diameter of at least one hundred feet. Temporary dead-end streets shall be provided with a turnaround having a radius of at least one half of the street right of way. Rural cul-de-sac access streets shall have a maximum length of eight hundred feet and shall be provided with turnarounds with a minimum right of way diameter of one hundred and twenty feet and a minimum paving diameter of eighty feet.
- **Alley** – A public or private way providing secondary or service access to abutting properties. All new alleys are to be privately maintained with measures to ensure the travel way is not obstructed in any manner, including by parking.
- **Local** – Local streets provide the highest degree of access and the least mobility. They are generally associated with residential areas and permit direct access to abutting land. Local streets shall be designed to discourage high speed traffic and minimize excessive cut and fill slopes. A right of way width of at least 60 feet should be provided with a 31 foot back of curb to back of curb cross section.

- **Collector** – Collector streets provide a balance between land access and mobility which penetrate various land use classifications. They typically serve as a link between local streets and thoroughfares. Collector street alignment and location may be modified at the time of development approval based on the location of uses, property lines, topography, soil types, stream features, etc. A right of way width of at least 66 feet should be provided with a 45 foot back of curb to back of curb cross section.
- **Arterial** – A public street carrying large volumes of through traffic while providing primary access to abutting properties, which are typically developed with commercial, industrial, or multifamily residential uses. A right of way width of at least 80 feet for Secondary Arterials and 90 feet for Primary Arterials should be provided. A cross section of 53 feet back of curb to back of curb for Secondary Arterials and 65 feet back of curb to back of curb for Primary Arterials should be constructed.

Street Intersections

Insofar as practical, streets shall intersect at an angle of 90 degrees for a minimum of 50 feet from the roadway intersection. Intersections with less than 90 degrees will be reviewed on a case by case basis. Intersections having more than four corners shall be prohibited.

Proposed streets that intersect at opposite sides of another street (either existing or proposed) shall be laid out to intersect directly opposite from each other. A minimum length of 150 feet between survey centerlines shall separate intersections that cannot be aligned.

Intersections with a major thoroughfare shall be at least 1,300 feet apart, measured centerline to centerline.

Property lines at street intersections shall be set as to provide appropriate design sight distance.

Street Names

When in alignment with another existing named street, a proposed street shall bear the assigned name of the existing street. In no case shall the name for a proposed street duplicate or be phonetically similar to existing street names, irrespective of the use of the suffix street, avenue, boulevard, drive, place or court.

Street signs shall be installed by the City. The developer shall reimburse the City for the full costs of installation.

Sight Visibility Triangles at Intersections

In order to ensure adequate sight visibility at intersections, sight visibility triangles shall be provided and maintained at all intersections with public streets, private streets, and driveway access points.

No structure, sign, plant, shrub, tree, berm, fence, wall, or other object of any kind or parking or storage of automobiles shall be installed, constructed, set out, or maintained so as to obstruct cross-visibility at a level between three and 10 feet above the level of the center of the street intersection. Exceptions shall include fire hydrants, public utility poles, street markers, governmental signs, and traffic control devices.

Curb and Gutter

Curb and gutter is recommended for all new privately maintained and publicly maintained streets that are constructed within the city limits of Goldsboro. The standard curb and gutter width is 24-inch (minimum) or 30-inch (desirable). Eighteen-inch curb and gutter is not acceptable (18-inch curb and gutter may be used within parking lots). Rolled or valley type curb may be used when the following conditions are satisfied:

- Residential streets that serve less than 20 homes.
- Catch basins must be installed every 150 feet unless stormwater calculations indicate a greater spacing to a maximum spacing of 250 feet.
- Water meter boxes must be located behind the sidewalk, if a sidewalk is required as part of the development, or at the property line.
- Street grade must be less than or equal to 5 percent.

Installation of curb and gutter on minor streets may be waived if approved stormwater control structures have been installed.

Sidewalks

Sidewalks, walkways and other pedestrian ways shall be provided by the developer within and/or adjacent to any major subdivision. All sidewalks shall be located within the public right of way, be installed to City standards and shall be approved by the City Engineer.

When sidewalk construction is required by the Unified Development Ordinance, the City Council for site plans requiring City Council approval or the Planning Director for plans requiring staff approval, may allow the developer the option of paying a fee in lieu for sidewalk

construction. The fees acquired from this ordinance shall be used for sidewalk projects within the city of Goldsboro and its extra-territorial jurisdiction. The City of Goldsboro reserves the right to require sidewalk construction and not allow a fee in lieu. The design and arrangement of all sidewalks shall be in accordance with City standards, provide for extension to adjoining properties and be shown on the preliminary plat.

Streetlights

The developer shall install streetlights within subdivisions in accordance with City standards. In instances where underground wiring is required, the developer shall pay to the applicable power company the charges for underground terminal facilities for all street lighting. If the developer desires a different lighting design, other than the City standards, the developer shall pay the City an amount equal to the difference in material and installation cost.

Easements

Utility easements shall be centered on the rear or side lot lines and shall be at least fifteen feet in width.

Where a subdivision is traversed by a watercourse, drainage way, channel or stream, there shall be provided a storm water easement or drainage right of way conforming substantially to the lines of such watercourse and such further width or construction as will be adequate for the purpose of storm water drainage. Parallel streets or parkways may be required in connection therewith.

Rural access streets and cul-de-sacs shall have a minimum easement of ten feet on either side of the right of way. Wider easements may be necessary as determined by the City Engineer to facilitate proper grading of cross sections and storm drainage systems.

The developer, as necessary to accommodate future utilities and adequate drainage, shall provide additional easements.

All access easements shall include a recorded instrument that provides for perpetual maintenance in a condition that permits access by emergency vehicles to all the properties served. All access easements shall be installed prior to the issuance of a certificate of occupancy by the City Inspections Department.

All easements are to be cleared and stabilized as approved by the City Engineer.

Utilities

Electric, cable, telephone and other communication lines within the subdivision and serving the subdivision shall be installed underground according to City standards and without expense to the City. The Council may grant modifications to these requirements upon recommendation from the City Engineer that topography, soil conditions or other practicable difficulties would result in an undue hardship.

SECTION 3 – UTILITY TRENCHES

Excavation and Preparation

Preparation. Trenching for pipelines shall be excavated to the required depth to permit the installation of the pipe (inclusive of pipes, wires, cables, ducts, and conduit) along the lines and grades shown on the construction drawings. Prior to trenching for the construction of any utility mains or connections, the Contractor shall locate all existing utilities within the construction zone. This may include at a minimum contacting the North Carolina One Call Center at 811 or 1-800-632-4949. Where critical City of Goldsboro water and sewer utilities cannot be located by traditional means, specialized utility locating, such as vacuum excavation or ground penetrating radar (GPR) may be required to locate existing utilities before excavating. In all cases where trenchless methods are planned to cross an existing utility corridor with water, sewer, force main, reclaimed water and/or other City maintained pipelines, a Subsurface Utility Exploration services firm shall be contracted to verify the depths of existing utilities prior to boring. The Contractor shall be responsible for implementing all required safety provisions for trenching in compliance with OSHA regulations and all other applicable safety requirements and procedures.

Trenching. The minimum trench width at the top of the pipe shall be at least 18 inches greater than the outside diameter of the pipe. Rock shall be removed to a depth of at least 6 inches below the bottom of the pipe and the trench backfilled with suitable material. Open trenches shall not exceed 100 feet. All trenches shall be confined to the limits of the right-of-way or utility easement. Trenches in paved areas shall not be sloped. All trenches in or along roadways shall be properly backfilled at the end of each working day.

Wet trenches shall be stabilized with a base layer of #78 M or #57 stone. The bottom of the trench shall be shaped to provide uniform support along the entire length of the pipeline. Severely unstable trench bottoms requiring undercut excavation shall receive a foundation support system for the pipeline designed by a registered Geotechnical Engineer licensed in the State of North Carolina. A space shall be excavated at each bell to provide ample space to join the pipes with no misalignment. The Contractor shall take all necessary measures to prevent water from entering the trench.

Pipe Laying and Backfilling

All pipe shall be laid in accordance with the manufacturer's recommendations. Pipe laying and backfilling shall be accomplished in a manner to prevent damage and misalignment of the pipe. The subgrade at the bottom of the trench shall be shaped to secure uniform support throughout the length of the pipe. A space shall be excavated under the bell of each pipe to provide space to relieve bearing pressure on the bell and to provide room to adequately make the joint. Open

ends of the pipe shall be plugged with a standard plug or cap at all times when pipe laying is not in progress. Trench water shall not enter the pipe. Backfill material shall be free from construction materials, debris, and frozen, organic, or unstable material. The top two feet of backfill material shall be free from stones greater than 2 inches in diameter. Under roadways and extending at a slope of 1 to 1 beyond the back of the curb, measured perpendicular from the centerline, backfill shall be compacted to a density of no less than 100% Standard Proctor maximum dry density as measured by AASHTO method T99.

Backfill shall be placed in lifts of 12 inches or less of uncompacted soil. Other fill material shall be compacted to a density of no less than 95% of the maximum dry density as measured by AASHTO method T99. Backfill material shall be placed in lifts of 12 inches or less of uncompacted soil. Suitable backfill material shall be utilized and compacted in accordance with the City compaction requirements and the pavement repair shall be in accordance with the applicable section of this Manual.

All trenches shall be properly backfilled at the end of each working day. All curb cuts shall be repaired within a maximum of 3 days from the date the cut is made. If conditions do not permit a permanent repair within the given time limit, permission to make a temporary repair must be obtained from the City Engineer.

In locations where backfill material is temporarily stockpiled on the roadway surface, a layer of 1.5 inches of screenings shall be used between the pavement surface and the backfill material.

Trenchless Pipe Installation

General. All utility crossings within City streets shall be made by trenchless methods. State maintained streets within the City's ETJ should also be crossed using trenchless methods. In cases where utility conflicts, rock, or other obstructions prevent trenchless crossings, the City may consider approving other methods. The preferred trenchless method shall be auger boring. Alternate trenchless methods including micro-tunneling, guided boring, conventional tunneling, horizontal directional drilling or hand tunneling may be approved after thorough evaluation by the Engineering Department. In addition to meeting or exceeding all City requirements, all trenchless crossings shall be approved by and meet the requirements of all controlling legal authorities, such as NCDOT, Norfolk Southern Railway and CSX Corporation. Direct bores may be made without a casing pipe on pipelines 6 inches in diameter and smaller. Encasement pipe shall be installed with all trenchless construction methods (excluding horizontal directional drilling when it is approved and as noted above). There shall be a minimum cover of 4 feet between the pavement subgrade and the top of the casing pipe. Under no circumstances shall the pavement subgrade be disturbed. Permanent easements shall be provided at all trenchless pits to allow for future access to casing pipes.

Encasement Pipe. Encasement pipe shall be new and manufactured of grade 'B' steel with minimum yield strength of 35,000 psi in accordance with ASTM A139 and A283. All casing

pipe shall have machine cut, bevel ends that are perpendicular to the longitudinal axis of the casing. Size and minimum wall thickness of smooth wall or spiral welded steel encasement pipe shall be as shown in the below table. Actual wall thicknesses shall be determined by the casing installer based on their evaluation of the required forces to be exerted on the casing when it is installed.

Minimum Wall Thickness of Steel Encasement Pipe

Encasement Pipe OD (inches)	Minimum Wall Thickness (inches)
12.75	0.188
14	0.250
16	0.250
18	0.250
20	0.250
24	0.250
26	0.312
28	0.312
30	0.312
36	0.375
42	0.500
48	0.500
54	0.500
60	0.500
66	0.625

Encasement pipe installed for railroad bores shall meet the requirements of the American Railway Engineering Association (AREA) for boring under railroads.

Minimum Allowable Steel Encasement Diameter Per Carrier Size (inches)

Carrier Pipe Size Inside Diameter	Carrier Pipe Outside Bell Diameter	Steel Encasement Nominal Diameter
6	9.19	12.75
8	11.33	16
10	13.56	18
12	15.74	20
14	19.31	24
16	21.43	26
18	23.7	28
20	25.82	30
24	29.88	36
30	36.34	42
36	42.86	48
42	49.92	60
48	56.36	66

Casing Pipe Spacers and End Closures. The carrier pipe shall rest on steel pipe alignment spacers. The spacers shall have either a bituminous or epoxy coating. A minimum of 2 steel spacers per joint shall be required on carrier pipe less than 36 inches. Carrier pipe greater than or equal to 36 inches shall have a third spacer. The steel spacers shall be located evenly along the carrier pipe alignment in such a manner that each spacer supports the same unit weight of carrier main. The spacing interval of the steel spacers shall assure the necessary grade, clearance, and support of the carrier main. The spacers shall be manufactured for the specific carrier pipe and casing pipe diameters being used such that the risers do not allow the pipe to float within the casing.

In cases where the encasement pipe is installed in closed proximity to facilities with stray current, such as gas lines, high voltage power transmission lines, petroleum lines, railroad tracks, etc. the steel spacers shall be provided with composite contacts on the runners such as an EPDM rubber liner or an ultra-high molecular weight polyethylene plastic skid to prevent transmitting the stray current to the carrier pipe.

The carrier pipe bells shall not be allowed to contact the interior of the encasement pipe under any circumstances. No blocks or temporary spacers shall be wedged between the carrier pipe

and the top of the encasement pipe. The ends of the encasement pipe shall be sealed using 8 inch bricks and a non-shrink grout. A 2 inch galvanized vent pipe shall be provided on the upper end of the casing on all stream and railroad crossings.

Carrier Pipe. All carrier pipe shall be locking joint ductile iron pipe resting on steel skids as shown in the Standard Detail Drawings to prevent damage to the pipe bell. A minimum of 2 skids per joint of carrier pipe spaced evenly in the encasement pipe shall be required. Pipe bells shall not contact the interior of the casing pipe. No blocks or spacers shall be wedged between the pipe and the top of the casing.

External Corrosion Protection

External corrosion can occur at an accelerated rate in metallic pipelines such as steel and ductile iron when they are installed in aggressive soils or when they are installed near other structures or utilities that carry impressed currents. Such facilities that typically utilize impressed current cathodic protection are gas pipelines. Other potential sources that may create stray currents that contribute to accelerated pipeline corrosion are high voltage power transmission lines and railroad crossings.

In cases where metallic steel and ductile iron pipelines or encasement pipes are planned for installation in close proximity to any potential sources of stray current or aggressive soils, zinc coated pipe shall be specified and a field analysis consisting of stray current evaluation and soil testing shall be conducted by an experienced technician, as certified by the National Association of Corrosion Engineers, (NACE), to determine the potential for external corrosion and the need for additional protection measures. In cases where stray current conditions and/or aggressive soils are prevalent, a corrosion specialist certified by the NACE or other applicable certification board shall be consulted regarding the design of pipeline protection measures.

At a minimum, all stray current protection systems should include bonded joints and sacrificial anodes with a 50 year or longer design life and test facilities in lieu of polyethylene encasement, unless otherwise approved by the City of Goldsboro. The cathodic protection element of the pipeline design package shall be sealed by Professional Engineer licensed in the State of NC. Full impressed current cathodic protection shall only be utilized when extreme corrosion potential has been proven and/or as otherwise directed by the City Engineer and the certified corrosion engineer of record.

Trench and Cut Repairs

To protect cuts the street infrastructure and safety, all utility trench and cut repairs must be perpendicular or parallel to the existing edge of pavement and square or rectangular in shape

with a minimum cut size to be 2 feet from any fixed object on all sides (manholes, utility valves, concrete infrastructure). Repairs shall be completed in accordance with the following:

Asphalt Utility Cuts. If an asphalt trench and cut repair inside a City of Goldsboro maintained right-of-way is left open for 10 calendar days, it shall consist of ABC compacted to 100% Standard Proctor. From 11 to 30 calendar days, it shall consist of bituminous binder course of Type I 19.0B. From 31 calendar days, cut repair shall be completed with a wearing surface course of Type SF9.5A. If an asphalt strip between a cut and the edge of the pavement is 3 feet or less, the strip will be removed and replaced as part of the cut. New asphalt utility cuts within and over half of an existing asphalt utility repair area will require the replacement of the entire existing repair area or at the discretion of the City Engineer or designee.

Trench cuts in asphalt roadways that exceed half of the roadway width in a shoulder section shall require a full width overlay with SF9.5A extending 17.5 feet to each side of the trench. For those trenches that exceed half of the roadway width in a gutter or curb and gutter section, the full width mill and overlay with SF9.5A shall extend 5 feet to each side of the trench.

Trench cuts in asphalt roadways that exceed more than 20 feet parallel to the road will require a minimum half roadway mill and overlay.

Utility cuts in asphalt roadways with an asphalt age of 3 years or less will require a minimum half roadway mill and overlay.

All street markings and traffic control devices shall be replaced to City Standards.

Concrete Utility Cuts. Concrete trench and cut repairs inside a City of Goldsboro maintained right of way shall be completed within 10 calendars days.

For utility cuts in concrete curb, curb and gutter, or sidewalk, the concrete must be removed and replaced from nearest expansion on both sides of the utility cut or have an expansion joint installed at the cut. Any replacement of sidewalk with a decorative stamp pattern must be stamped with the same pattern as the existing sidewalk. Any existing sidewalk ramps removed must be replaced to the current ADA Standards.

When concrete sidewalk utility cuts are required in locations where the sidewalk contains reinforcing steel adjacent to a tree pit, a straight vertical cut shall be made to remove the reinforced concrete. Repair the sidewalk cut by drilling 6 inches into the existing concrete along the vertical face of the cut then dowel in and secure #4 steel rebar with approved epoxy. Replace the sub-grade, then splice steel in the new cut at a minimum of 4 inches and replace remaining steel before replacing the concrete.

Soil Utility Cuts. Soil cut inspection limits within a City of Goldsboro maintained right-of-way is a minimum of 5 feet out from the edge of the pavement, 5 feet out from the back of curb, or the back edge of the sidewalk furthest from the pavement. Soil trench and cut repairs inside a City maintained right-of-way shall be completed within 10 calendar days.

Other Utility Cuts. Brick trench and cut repair inside a City of Goldsboro maintained right-of-way shall be completed within 10 calendar days by replacing existing brick above 6 inch lifts of compacted soil and 8 inches of ABC stone compacted to 100% Standard Proctor.

Excess Spoil Piles. Any excess spoil piles shall be removed and soil disturbances and utility cuts shall be restored to original or better condition.

Crack and Joint Sealing. The repair areas consisting of sealing existing longitudinal and transverse pavement cracks, joints, and traffic signal detector loops with hot-poured rubber asphalt, modified asphalt compound (peel and stick roll) and NCDOT approved Qualified Products List Materials shall be applied as per the following requirements:

- **Hot-Poured Rubber Asphalt.** Hot-poured rubber asphalt must have a 2 inch sealed overband and be applied as per the manufacturer's recommendations.
- **Modified Asphalt Compound Tape.** Modified asphalt compound tape must be 4 inches wide, centered over the crack or joint, and applied as per the manufacturer's recommendations.
- **Traffic Signal Detector Loop.** See NCDOT QPL list and apply as per the manufacturer's recommendations.

City of Goldsboro Right-of-Way Cut Permit

In the event that a resident, contractor, or utility company will be cutting asphalt, concrete, brick, or dirt surfaces within the right-of-way maintained by the City of Goldsboro, then excavating the subsurface for the purpose of installing or repairing public or private utilities as well as above ground infrastructure, all parties are required to obtain a Right-of-Way Cut Permit.

Permit Application. Apply for the Right-of-Way Cut Permit at 200 North Center Street and be able to provide the following information:

- Address nearest to the location of the cut.
- Name of the nearest intersecting street.
- Length and width dimensions
- Type of surface to be cut.

Section 4 – Erosion and Sedimentation Control

General

Temporary and permanent erosion control measures shall be provided for all land disturbing work in accordance with an erosion control plan approved by the City of Goldsboro. A grading permit shall be obtained from the City prior to beginning site work. Temporary measures shall be installed and inspected by the City for compliance prior to any land disturbing activity. All permanent erosion control measures shall be incorporated into the work at the earliest practical time. All temporary measures shall be maintained until the permanent measures have taken effect. Temporary and permanent measures shall be coordinated to provide effective and continuous erosion control throughout the construction and post-construction period to minimize siltation of streams, lakes, reservoirs, and other impoundments, ground surfaces, and other property. These measures shall remain in effect until final approval is given by the City.

Temporary Measures

Temporary Bridges. A temporary bridge is encouraged for higher flow streams. They shall be installed in accordance with an approved engineered design for temporary stream crossings.

Silt Fence. Prior to construction beginning, silt fence must be installed down slope of all disturbed areas and any other necessary locations as directed by the City. Silt fence shall be erected in accordance with the Standard Detail Drawings.

Construction Entrance. A construction entrance shall be installed at all points of access to construction sites. Any access point which does not have a construction entrance shall be barricaded to prevent its use. Construction entrances shall be installed in accordance with the Standard Detail Drawings. The contractor shall be responsible for maintaining the cleanliness of existing sidewalks and streets impacted by construction activities.

Diversion Ditches. Diversion ditches shall be installed in accordance with the Standard Detail Drawings at the top of cut and fill slopes and any other location as directed by the City.

Sediment Basins. A sediment basin is an earthen embankment suitably located to capture sediment. Unless the basin is designed to be converted to a stormwater pond it shall have a lifespan of three years or less. Sediment basins can be used for drainage areas up to 100 acres in size. Dewatering of sediment basins shall be accomplished by either a skimmer, flashboard riser, or other methods approved by the City of Goldsboro or NCDEQ. Perforated

corrugated metal pipe risers shall not be accepted. The volume of a sediment basin shall be determined on the basis of 1,800 cubic feet of basin volume per acre of disturbed area. Do not locate sediment basins in intermittent or perennial streams. Sediment basins shall be installed in accordance with the Standard Detail Drawings.

Sediment Traps. A sediment trap is a small temporary ponding basin formed by an embankment or excavation to capture sediment. A sediment trap shall be used two years or less and can be used for drainage areas up to 5 acres in size. Dewatering of sediment traps shall be accomplished by a stone spillway. The volume of a sediment trap shall be determined on the basis of 3,600 cubic feet of trap volume per acre of disturbed area or in accordance with the most current version of the *Erosion and Sediment Control Manual*. Do not locate sediment basins in intermittent or perennial streams. Sediment traps shall be installed in accordance with the Standard Detail Drawings.

Check Dam and Wattle. Check dams are small stone dams and wattles are tubular shaped straw or coir (coconut fiber) filled fabric dams constructed across a drainage way. Both practices may be used as a temporary measure to limit erosion by reducing velocity in small open channels. When needed, they can be used in channels, roadside ditches and temporary diversions. The drainage area is limited to one half acre. Do not use check dams in intermittent or perennial streams. Check dams and wattles shall be installed in accordance with the Standard Details Drawings.

Inlet Protection. Inlet protection must be placed in accordance with the Standard Detail Drawings at all structures.

Temporary Seeding. Temporary seeding is the use of rapid growing annual grasses, small grains, or legumes to provide initial, temporary ground cover for erosion control on disturbed areas for less than 12 months. Seed bed preparations and soil amendments shall be in accordance with the method described under "Seeding and Mulching".

Seeding and Mulching. Seeding and mulching shall be applied immediately following the completion of any phase of grading. All disturbed areas shall be dressed to a depth of 8 inches. The top 3 inches shall be pulverized to provide a uniform seedbed. Agricultural lime shall be applied at the rate of 95 lb/1000 sq. ft. immediately before plowing. In areas where maintenance will eventually be assumed by the Town under heavy vehicular traffic situations (i.e. right of ways, medians) consultation shall be made with the City Engineer or designee as to the requirements and use of alternate grass.

On projects that will be maintained by the City of Goldsboro, verification of soil amendments and seeding rates may be required, and changes to these rates may be requested by the City

during the plan review process. Reuse of topsoil and/or other measures to assure final soil conditions are conducive to rapid establishment of vegetation cover is required.

10-10-10 (Fall) / 5-10-10 (Spring) fertilizer shall be applied to all disturbed areas at a rate of 2 tons/acre and mulching shall consist of small grain straw applied at a rate of 1-2 tons/acre. Mulched areas shall be tacked with asphalt at a rate of 435 gallons per acre, or other approved method sufficient to hold the straw in place.

If active construction ceases, meaning no substantial or significant progress is made in any area for more than15 days, all disturbed areas must be seeded, mulched, and tacked unless written approval is granted by the City Engineer or designee. Incidental grading shall not constitute substantial or significant progress in construction activity.

Permanent Measures

Permanent Ground Cover. Permanent ground cover is the establishment of perennial vegetation cover for periods longer than 12 months. All disturbed areas shall receive a permanent ground cover. Permanent seeding and temporary seeding differ only in the type of seed to be used (i.e. annual versus perennial). As a part of permanent seeding, maintenance may be required to maintain vegetation for 12 months (including mowing and watering). This maintenance shall be considered a part of establishing permanent ground cover. In areas where maintenance will eventually be assumed by the City of Goldsboro under heavy vehicular traffic situations (i.e. right of ways, medians) consultation shall be made with the City Engineer or designee as to the requirements of acceptable soil conditions and use of alternate grass or ornamental landscaping.

Riprap Dissipation Pads and Riprap Protection. All stormwater release points shall be protected by riprap dissipation pads designed to reduce discharge velocities to non-erosive levels. Dissipation pads shall be designed and constructed with an engineering fabric barrier between the pad and the natural ground. Calculations shall be furnished to indicate the sufficiency of the dissipation pads specified. Riprap pad design shall be in accordance with NRCS or other approved method. Filter fabric shall be used on all sediment basins, riprap dissipaters, and channels.

Computations

All computations and assumptions used to formulate an erosion control plan shall be in compliance with the applicable City Ordinances to verify their sufficiency. Erosion and sedimentation control measures, structures, and devices shall be planned, designed, and constructed to control the calculated peak runoff from a 10-year frequency storm. Runoff rates shall be calculated using the United States Department of Agriculture (USDA) Natural

Resources Conservation Service (NRCS) Method, the Rational Method, or other acceptable calculation procedures. Runoff computations shall be based on rainfall data published by the NCDEQ Erosion and Sedimentation Control Planning and Design Manual for this area. The Rational Method may be used for drainage areas up to 20 acres (for stormwater calculation purposes the NRCS method must be utilized).

Construction Sequence

The construction sequence on projects shall be as follows:

1. Request preconstruction meeting.
2. Obtain grading permit.
3. Install all erosion control measures as shown.
4. Obtain certificate of compliance through on-site inspection by Construction Inspector.
5. Proceed with grading
6. Clean sediment basins when one-half full.
7. Seed and mulch denuded area within 15 calendar days after any phase of grading.
8. Maintain soil erosion control measures until permanent ground cover is established.
9. Request final approval by Construction Inspector.
10. Remove soil erosion control measures and stabilize these areas.

Section 5 – Stormwater

General

Stormwater management and conveyance devices are essential components of development projects. Stormwater management devices are necessary to provide key water quality components. Water quality prevents contamination of local waterways and provides improvements to aquatic life. These devices also reduce the risk of flooding and aid in the replenishment of local groundwater.

Storm Drain Location

- All public storm drains shall be installed in dedicated street right-of-way or dedicated storm drain easements. Minimum widths of storm drain easements shall be 20 feet for pipes up to and including 48 inches in diameter and 30 feet for pipes greater than 48 inches in diameter. Pipes shall be centered in the easement.
- Horizontal and vertical separation requirements between storm drainage pipe, water lines, and sanitary sewer lines shall meet the City's requirements.
- The City of Goldsboro shall maintain only the storm drain systems within City maintained rights-of-way and on City owned property, unless an easement has previously been offered and maintenance responsibility officially accepted by the City. Storm drainage systems located on private property shall be maintained by the property owner(s).
- Discharge points shall be a minimum of 10 feet downhill from the building envelope.
- Structures shall be spaced to intercept flow at the uphill turnout of intersections unless the street design provides a continuous downhill grade around the radius and down the interesting street.
- Pipes, Drains, flumes or other concentrated stormwater devices shall not discharge across a sidewalk, but rather shall be piped or flumed under the sidewalk.

Storm Drain Sizing

- The minimum size of all storm drain pipes in public rights-of-way shall be 18 inches and capable of handling the 25 year storm. The minimum size of all other storm drain pipes shall be 15 inches and capable of handling the 10 year storm.
- Systems shall be designed based on rainfall intensities of 4 inches per hour for street inlet spacing, the 2 year storm for side ditches, the 10 year storm for street drainage pipe sizing, the 25 year storm for cross-street drainage, and the 100 year storm for floodplain areas.

- Curb inlets shall be spaced to provide a maximum spread of 8 feet for the design storm. In areas of heavy pedestrian traffic, the maximum allowable spread may be decreased by the City Engineer.
- Runoff rates shall be calculated by the Rational Method (for drainage areas less than 2 square miles), SCS Method (for drainage areas greater than 2 square miles), or other acceptable procedure. Runoff computations shall be based on rainfall data for the last 30 years published by the National Weather Service for this area.
- Time of concentration (t_c) shall be determined using standard acceptable methods and the storm duration shall equal t_c.
- Pipe shall be sized in accordance with the Manning Equation and applicable nomographs to carry the design flow and to provide a velocity of at least 2 feet per second during the 2 year storm.
- Culverts shall be sized in accordance with the Energy Equation and applicable nomographs to carry the design flow and to provide a velocity between 2-10 fps during the 2 year storm.
- The minimum pipe diameter shall be 12 inches where the inlet is grated and 15 inches where the inlet is not grated.
- Structures shall be installed at each deflection of line and/or grade.
- The maximum length between access points shall be 250 feet for all pipe sizes.
- No inaccessible storm drainage structures shall be allowed.
- Channels and ditches shall be designed to carry the design flow at non-erosive velocities. Calculations indicating design velocities shall be provided along with typical channel cross-sections. The maximum allowable design velocity in grass channels is 4 feet per second.
- A Hydraulic Grade Line (HGL) study shall be performed for all storm drainage systems. The study shall include profiles that show invert slopes, proposed finished grade and hydraulic grade line. Hydraulic grade line shall be required to stay within pipe to ensure no surcharge on system. ASTM Standard C443 (O Ring or Single Groove) water tight sealed pipe shall be used in cases where it is not practicable.
- Stream crossings will necessitate a back water study on the 100 year storm.
- Limit of two pipe or box culverts per crossing. A third pipe or box culvert may be required or approved with proper justification.

Storm Pipe Materials

Reinforced Concrete Pipe shall conform to ASTM C76, Table III or Table IV. Joints shall be sealed with a plastic cement putty meeting ASTM C990 (preformed flexible sealant).

Reinforced Concrete Box Culvert shall conform to ASTM C1422, ASTM C1504, or ASTM C1786. Joints shall be sealed in conformance with ASTM C990 (preformed flexible sealant)

and/or C877 (external sealing bands), based on manufacturer's recommendations for the specific application.

High Density Polyethylene (HDPE) Corrugated Pipe shall be used only in areas outside of public right-of-way and easements. When used in private locations, pipe material shall be rated on approved plans and include the submission of design criteria. Installation of HDPE pipe shall adhere to design criteria standards. Pipe material shall meet the product specifications of ASTM F667 and shall have a smooth interior. Pipe joints shall consist of an integral bell and spigot type joint with "O" ring rubber gasket meeting ASTM F477 placed on the spigot end. Installation shall adhere to the specification of ASTM D2321 and be certified by an engineer. HDPE pipe, 24 inches or under may be used under pavement or curb and gutter in private locations only.

Polyvinyl Chloride (PVC) Pipe shall be used only in areas outside of public right-of-way and easements. When used in private locations, material pipe shall be rated on approved plans and include the submission of design criteria. Installation of PVC pipe shall adhere to design criteria standards. Pipe material shall meet the product specification of ASTM F949-93a and shall have a smooth interior. PVC pipe, 24 inches or under may be used under pavement or curb and gutter in private locations only.

Recycled High Density Polyethylene (HDPE) Corrugated Pipe shall be used only in areas outside of public right-of-way and easements. When used in private locations, pipe material shall be rated on approved plans and include the submission of design criteria. Installation of HDPE pipe shall adhere to design criteria standards. Pipe material shall meet the product specifications of ASTM F2648 and shall have a smooth interior. Pipe joints shall consist of an integral bell and spigot type joint with "O" ring rubber gasket meeting ASTM F477 placed on the spigot end. At least two corrugations of the spigot end must insert in the bell end. Installation shall adhere to the specification of ASTM D2321 and certified by an engineer. HDPE pipe, 24 inches or under may be used under pavement or curb and gutter in private locations only.

Structure Materials

All storm drainage structures such as manholes, inlets, junction boxes, catch basins, endwalls and headwalls shall be constructed of solid brick, solid block, or precast concrete meeting NCDOT standards. Any structure with a depth greater than 4 feet shall have steps installed. All hoods, frames, and grates shall be domestically produced cast iron or steel and approved by NCDOT.

Curb Inlets and Catch Basins. Curb inlets for street drainage shall be in accordance with Standard Detail Drawings. Precast concrete boxes are allowed and precast manholes are will

be considered by the City Engineer on a case-by-case basis. A precondition for the use of round structures is providing adequate access and steps.

Headwalls and Endwalls. Headwall and endwalls may be cast in place per NCDOT Standard Drawings, or precast with wing walls and apron by an approved manufacturer. Installation of precast headwalls and endwalls shall be in accordance with the manufacturer's recommended installation procedures and specifications.

Installation

- All stormwater pipes shall be installed to provide a true line and grade between structures.
- Structures shall be installed at each deflection of line and/or grade.
- The maximum length between access points shall be 250 feet.
- No inaccessible storm drainage structures shall be allowed.
- Pipe may enter through the corner of all structure material types except precast concrete “waffle” boxes.
- A reinforced concrete slab designed by an engineer may be used at oversized structures to adjust an inlet to standard dimensions.
- The minimum cover for pipe shall be 2 feet to finished subgrade under roads and 1 foot to finished grade under non-load bearing areas or as specified by the manufacturer. Trench excavation and backfilling shall be in accordance with the Pipe Trench section of these specifications.
- Pipe shall not project into a drainage structure but shall be finished flush with the inside of the structure.
- Each drainage structure shall have a shaped invert constructed from concrete, and a bench with a maximum 5:1 slope. The bench shall begin at a height of one-half the pipe diameter for 15 to 24 inch pipe, one-third the pipe diameter for 30 to 48 inch pipe, and one-fourth the diameter for pipe greater than 48 inches in diameter.
- Precast concrete structures may be installed only to depths certified as acceptable by the manufacturer. Installation of pipes and structures shall be in accordance with latest OSHA standards. In order to protect City infrastructure during installation, trenches deeper than 4 feet located adjacent to a roadway may require positive shoring.
- Pipe shall be grouted inside and outside of all drainage structures.

Pipe Inlets and Outlets

- Headwalls, endwalls or flared end sections shall be installed at all inlets and discharge points where there is not a structure.

- Flared end sections shall be installed on single pipe culverts up to and including 48 inches in diameter. Multiple pipe culverts up to and including 48 inches must use headwalls and endwalls.
- Precast headwalls shall only be installed at single pipe culverts.
- Approved energy dissipaters shall be installed at all discharge points and shall be properly sized to ensure that stormwater is released at a non-erosive velocity.
- A fabric and washed stone barrier shall be installed between the dissipation pad and the natural ground. The minimum acceptable size stone allowed in this application is #57.
- The system shall include scour protection for drainage ways.
- Details and design of headwalls, endwalls and flared end sections shall be in accordance with NCDOT standard detail requirements. These details shall be shown on plan submissions.
- The City Engineer or designee may require additional information on the impact of stormwater discharge on adjacent properties.

Street Drainage

- Stormwater shall not be allowed to flow across streets at intersections. Drainage structures shall be provided to intercept flow prior to the radius of intersections or the street design shall provide for a continuous grade around the radius to channel flow down the intersecting street.
- Stormwater inlets shall not be placed within travel areas of a public roadway unless design cannot accommodate relocation in which case the City Engineer or designee must approve.
- Curb inlets shall be designed to intercept stormwater before the gutter spread exceeds 6 feet for the 2 year storm. The allowable spread may be decreased by the City Engineer or designee when conditions warrant.

Inspection and Testing

The Contractor shall furnish all materials, labor, and equipment to perform inspections of storm drainage system.

As a final measure required for acceptance, the Contractor shall clean and televise all newly installed storm drain systems prior to acceptance by the City of Goldsboro. The Contractor shall televise all the junction boxes and storm drains 12-inch and larger installed from the upstream to downstream junction box with no reverse setups or cutaways. Throughout shooting, the camera shall be panned and tilted for a complete view of the junction box and storm drain at each joint. Lighting shall be adequate to view the entire storm drain system from beginning to end. The video inspection shall be submitted to the City Engineer or designee on

a CD and formatted with software compatible and readable by the City or another agreed upon format. The City shall not be responsible for purchasing additional software necessary to view the video.

The camera shall be advanced at a uniform rate not to exceed 20 feet per minute that allows a full and thorough inspection of the new storm drain. The camera shall be a color, pan and tilt camera capable of producing a five hundred line resolution picture. Lighting for the camera shall be sufficient to yield a clear picture of the entire periphery of the pipe. The picture quality shall be acceptable and sufficient to allow a complete inspection with no lapses in coverage. The length of the storm drain shall be measured and recorded on the video screen. The distance counter shall be calibrated before shooting the inspection video.

The Contractor shall clean the storm drain system ahead of video inspection with a high-velocity water jet. The video inspection shall take place within 2 hours of cleaning operations as witnessed by a City Construction Inspector. All construction debris shall be collected in the downstream junction box and shall not be released into any stormwater control measure or outfall.

The City Construction Inspector shall be present throughout the cleaning and televising of the storm drain system to verify that the video work complies with the Specifications.

Prior to submitting the videos to the City, the Contractor shall label the videos with the following information:

- Name of the Project.
- Name and contact information of responsible party.
- Date of recording.
- Box identification as shown on the design plans.

Stormwater Management

Statutory Authorization. The Legislature of the State of North Carolina has, in Chapter (T15A), Article (02B), Section (.0235), and entitled Neuse River Basin - Nutrient Sensitive Waters Management Strategy; Basinwide Stormwater Requirements, designated specific local governments for the development of new stormwater management requirements as part of the Neuse River Nutrient Sensitive Waters stormwater management strategy. The requirements of this Chapter shall apply to property located within the Neuse River Basin.

Nutrient Reduction Requirements. For purposes of this section, Development or Land Disturbance shall be defined to include the following:

- Any activity that disturbs greater than one acre of land in order to establish, expand, or modify a single-family or duplex residential development or a recreational facility;
- Any activity that disturbs greater than one-half acre of land in order to establish, expand, or modify a multi-family residential development or a commercial, industrial or institutional facility;
- Any grubbing, stump removal and/or grading activity.
- Exemptions include agriculture, mining or forestry activities and are not subject to the new development requirements of this section.

Vested Rights. Property owners who can demonstrate that they have vested rights as of March 1, 2001 will not be subject to the requirements of this section for new development. Vested rights may be based on at least one of the following:

- Substantial expenditures of resources as determined by the City of Goldsboro's Engineering Department (time, labor, and money) based on a good faith reliance upon having received a valid local government approval to proceed with the project, or
- Having an outstanding valid building permit in compliance with G.S. 153-344.1 or G.S. 160A-385.1, or
- Having an approved site specific or phased development plan in compliance with G.S. 153A-344.1 or G.S. 160A-385.1.

Projects that require state permits, such as landfills, NPDES wastewater discharges, land application of residuals and road construction activities shall be considered to have vested rights if a state permit was issued prior to November 20, 2000.

Calculation of Nitrogen Export. The nitrogen export from each development must be calculated. This export will be calculated in pounds per acre per year (lb/ac/yr). The following methodologies will be used for calculating nitrogen export from new development (refer to the City of Goldsboro Stormwater Management Program for Nitrogen Control in the Neuse River Basin for calculating nitrogen export loading):

- Method 1 is intended for residential developments where lots are shown, but the actual footprints of buildings are not shown on the plans.
- Method 2 is for residential, commercial, and industrial developments when the entire footprint of the roads, parking lots, buildings, and any other built-upon area is shown on the site plans.

- For nonresidential subdivisions where the impervious surfaces are not shown on the plans at the time of submittal, the developer or builder will specify areas of impervious surface, undisturbed open space, and managed open space in their building permit application, assuming the maximum impervious surfaces and minimum open space for the project design. The developer or builder will then use Method 2 for their calculation.
- For redevelopment projects, the procedure as described in the City of Goldsboro Stormwater Management Program for Nitrogen Control in the Neuse River Basin will be used to determine the total change in nitrogen loading.

Nitrogen Export Standards. All new development will be limited to a nitrogen export of 3.6 pounds per acre per year (lbs/ac/yr). Property owners will have the option to partially offset projected nitrogen loads by funding wetland or riparian area restoration through the NC Wetlands Restoration Program. As established by Rule 15A NCAC 2B .0240, the rate shall be $11/lb/yr, at an amount sufficient to fund 30 years of nitrogen reduction. The result is a one-time offset payment of $330/lb/ac, which must be paid prior to approval of the development plan. However, no new residential development will be permitted to exceed a total nitrogen loading rate of 6.0 lbs/ac/yr, and no new nonresidential development will be permitted to exceed 10.0 lbs/ac/yr.

If the development contributes greater than 3.6 lbs/ac/yr of nitrogen, then the table below summarizes the options available, depending upon whether the development is residential or nonresidential. Any changes to the nitrogen export standards approved by the Environmental Management Commission will be adopted by reference.

Nitrogen Export Reduction Options

Residential	***Commercial/Industrial***
If the computed export is less than 6.0 lbs/ac/yr, then the owner may either:	If the computed export is less than 10.0 lbs/ac/yr, then the owner may either:
1) Install BMPs to remove enough nitrogen to bring the development down to 3.6 lbs/ac/yr.	1) Install BMPs to remove enough nitrogen to bring the development down to 3.6 lbs/ac/yr.
2) Pay a one-time offset payment of $330/lb to bring the nitrogen down to the 3.6 lbs/ac/yr.	2) Pay a one-time offset payment of $330/lb to bring the nitrogen down to the 3.6 lbs/ac/yr.
3) Do a combination of BMPs and offset payment to achieve a 3.6 lbs/ac/yr export.	3) Do a combination of BMPs and offset payment to achieve a 3.6 bls/ac/yr export.
If the computed export is greater than 6.0 lbs/ac/yr, the owner must use on-site BMPs to bring the development's export down to 6.0 lbs/ac/yr. Then, the owner may use one of the three options above to achieve the reduction between 6.0 and 3.6 lbs/ac/yr.	If the computed export is greater than 10.0 lbs/ac/yr, the owner must use on-site BMPs to bring the development's export down to 10.0 lbs/ac/yr. Then, the owner may use one of the three options above to achieve reduction between 10.0 and 3.6 lbs/ac/yr.

If an offset payment is being made to the Wetlands Restoration Program, the owner must provide the City of Goldsboro with evidence that the North Carolina Division of Water Quality (NCDWQ) has received payment prior to the City's issuance of a building permit.

Peak Run-Off Control. There shall be no net increase in peak stormwater runoff flow leaving a new development site from the pre-development conditions for the 1-year, 24-hour storm as determined by calculating the pre- and post-development runoff in accordance with the City of Goldsboro Stormwater Management Program for Nitrogen Control in The Neuse River Basin. The Rational Method is the most common method for computing the peak rate of runoff from small drainage basins (up to 150 acres) and will be used to determine the peak flow from both the pre-development (performed prior to issuance of the building permit) and post-development (performed prior to issuance of the certificate of occupancy) conditions. If peak runoff needs to be calculated for a larger drainage area (more than 150 acres), the peak discharge method as described in the USDA Soil Conservation Service's Technical Release Number 55 (TR-55) will be employed for computing the pre- and post-development conditions.

Establishment of Buffer. Riparian areas must be protected on new developments in accordance with the Riparian Buffer Rule (15A NCAC 2B .0233). The rule requires for protecting and maintaining the 50-foot riparian buffers on all sides of intermittent and perennial streams, ponds, lakes, and estuaries in the Neuse River Basin. These waters must be shown on the most recent version of either a Natural Resources Conservation Service (NRCS) soil survey county map or a 1:24,000 scale (7.5 minute quadrangle) topographic map prepared by the U.S. Geological Survey (USGS). The City will refrain from issuing local approvals for any

new development activity that is proposed to take place within the first 50 feet adjacent to an affected water body, unless:

- The person requesting the approval does not propose to impact the riparian buffer of a surface water indicated on the NRCS or USGS maps listed above, or
- The property owner received approval by NCDWQ. NCDWQ approval could be:
    - An on-site determination from NCDWQ that surface waters are not present;
    - An authorization certificate for a use designated as allowable;
    - An authorization certificate and approval on a mitigation plan for a use designated as allowable with mitigation; or
    - A variance.

Description of Buffers on Development Plans. Riparian areas to be protected will be recorded on new or modified plats. If the plat shows an encroachment into a riparian buffer, the appropriate DWQ approval must accompany the preliminary and final plat submissions.

Allowable Best Management Practices. The following best management practices may be utilized for nitrogen reduction:

- Wet detention ponds;
- Constructed wetlands;
- Open channel practices;
- Riparian buffers;
- Bioretention;
- Vegetated filter strips with level spreader;
- Sand filters;
- Proprietary Best Management Practices (BMPs).

The total nitrogen (TN) BMP removal rates to be used in calculating nitrogen reductions are provided in the below. Any state-approved modifications or additions to the list of BMPs available for nitrogen reduction and/or determinations of TN removal rates are adopted by reference.

If more than one BMP is installed in series on a development, then the removal rate shall be determined through serial rather than additive calculations. For example, if a wet detention pond discharges through a riparian buffer, then the removal rate shall be estimated to be 47.5 percent. The pond removes 25 percent of the nitrogen and discharges 75 percent into the buffer. The buffer then removes 30 percent of the nitrogen discharged from the pond, which is 22.5 percent. The sum of 25 and 22.5 is 47.5. The removal rate is not 25 percent plus 30 percent.

BMP Types, TN Removal Rates and Design Standards

BMP Types	***TN Removal Rate Based on Current Literature Studies***	***Design Standards***
Wet Detention Ponds	25%	NC and Maryland Design Manuals
Dry Detention Ponds	10%	NC and Maryland Design Manuals
Constructed Wetlands	40%	NC and Maryland Design Manuals
Open Channel Practices	20%	NC and Maryland Design Manuals
Riparian Buffers	30%	Neuse Riparian Buffer Rule (15A NCAC 2B .0233)
Bioretention	25%	NC and Maryland Design Manuals
Vegetated filter strips with level spreader	20%	NC and Maryland Design Manuals and other literature information
Sand Filters	35%	NC and Maryland Design Manuals
Proprietary BMPs	Varies	Per manufacturer subject to DWQ approval

Maintenance of Best Management Practices. All best management practices that are implemented to achieve nitrogen reduction and flow attenuation will require a maintenance plan.

Building Permit and Building Permit Review Fees. As of March 1, 2001, any builder applying for a building permit must submit calculations for nitrogen loading and peak runoff with both the preliminary and final plats. Application for a building permit constitutes a certification by the developer or builder that all provisions of this section have been fully met and that the calculations for nitrogen loading and peak runoff, as shown on the preliminary and final plats, are correct. Any BMP requiring engineering design will have the engineer's seal and signature affixed to the design drawing and the engineer's seal will attest that the design for the BMP was completed in accordance with good engineering practices. The City Council may set a fee structure for the cost of reviewing all building permit applications for compliance with this section and the fee schedule will be as shown in the City of Goldsboro Stormwater Management Program for Nitrogen Control in the Neuse River Basin.

Permit Required. No property owner or operator shall commence land disturbing activities, as defined in The City of Goldsboro Stormwater Management Program before receiving a stormwater management permit and meeting the requirements of this ordinance. A stormwater management permit will also be required for construction, alteration, operation, maintenance, removal, or abandonment of any stormwater management structure (also known as a Best

Management Practice or BMP) that has been, or is planned to be, put in to operation after July 1, 2007. However, all BMPs that have been reviewed under The City of Goldsboro Stormwater Management Program prior to the enactment of this ordinance shall be deemed permitted from the date the site development plan was approved by the City Engineer or designee.

Application Requirements. Unless specifically excluded by The City of Goldsboro Stormwater Management Program, any property owner or operator desiring a permit for a land disturbance activity shall submit to the City Engineer a permit application for stormwater management on a form provided for that purpose.

Unless otherwise excepted by the City of Goldsboro Stormwater Management Program, a permit application must be accompanied by the following information in order for the permit application to be considered:

1. Stormwater Management Plan
    a. Site plan showing BMP locations, construction details and specifications, drainage areas and directions, outfalls, and related information.
    b. For detention and retention structures, stage routing and storage.
    c. Calculations for reduction of peak runoff for the 1-year, 24-hour storm event and reduction in nitrogen loading.
    d. Operations and maintenance procedures and periodic maintenance schedules.
    e. Responsible parties (owner and operator). If a multimember association such as a Homeowner, Property Owner, Condominium or Master Association is proposed, the owner or developer must submit Articles of Incorporation for the Association, and Declaration of Covenants and Restrictions, or such other organizational and operational documents that affirmatively assign authority and responsibility for the operation and maintenance of the stormwater management system.
2. Deed Restrictions and Protective Covenants
    a. All stormwater management structures shall be located in recorded drainage easements for the purposes of operation and maintenance and shall have recorded access easements to the nearest public right-of-way. These easements shall be granted in favor of the party responsible for operating and maintaining the stormwater management structures and shall include access for City Inspectors and Engineering Department Personnel.
    b. Maintenance of all stormwater management facilities shall be ensured through the creation of a formal maintenance covenant that must be approved by the City Engineer and recorded in the Wayne County Register of Deeds office.
3. Maintenance Agreement
    a. The agreement shall provide for access to the facility at reasonable times for periodic inspection by the City Engineer or designee.

b. The agreement shall provide for regular or special assessments of property owners to ensure that the facility is maintained in proper working condition to meet design standards and any other provisions established by The City of Goldsboro Stormwater Management Program.
c. The agreement shall require that owner/operators keep records of the installation, maintenance, and repair of BMPs, and retain those records for at least three years. These records shall be made available to the City Engineer or designee during inspection of the facility and at other reasonable times upon request.

4. Non-refundable permit review fee

General Engineering Design Criteria shall be in accordance with 15A NCAC 2H.1008(c) as set out below:

General Engineering Design Criteria For All Projects

- The size of the system must take into account the runoff at the ultimate built-out potential from all surfaces draining to the system, including any off-site drainage. The storage volume of the system shall be calculated to provide for the most conservative protection using runoff calculation methods described on pages A.1 and A.2 in "Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs" which is incorporated herein by reference including all amendments thereto. This document is available through the Metropolitan Washington (D.C.) Council of Governments at a cost of forty dollars ($40.00). This method is also described in the North Carolina Division of Water Quality document "An Overview of Wet Detention Basin Design." Other engineering methods may be approved if these methods are shown to provide equivalent protection;
- All side slopes being stabilized with vegetative cover shall be no steeper than 3:1 (horizontal to vertical);
- Vegetative filters are required for the overflow of all infiltration systems and discharge of all stormwater wet detention ponds. These filters shall be at least 30 feet in length, except where a minimum length of 50 feet is required by the North Carolina Division of Water Quality (NCDWQ);
- Stormwater controls shall be designed in accordance with the provisions of this Section. Other designs may be acceptable if these designs are shown by the applicant, to the satisfaction of the City Engineer or designee, to provide equivalent protection;
- In accordance with the Antidegradation Policy as defined in 15A NCAC 2B .0201, additional control measures may be required on a case-by-case basis to maintain and protect, for existing and anticipated uses, waters with quality higher than the standards; and

- Stormwater control measures used for sedimentation and erosion control during the construction phase must be cleaned out and returned to their designed state.

All BMPs will be designed to have an 85% average annual removal for Total Suspended Solids, as well as meet all requirements in The City of Goldsboro Stormwater Management Program. The stormwater management plan and the maintenance agreement shall be prepared to meet all requirements of The City of Goldsboro Stormwater Management Program, and fees shall be established by the City of Goldsboro.

Application Review Fees. The fee for review of any land development application shall be based on the amount of land to be disturbed at the site, and the fee structure shall be established by the City of Goldsboro. All of the monetary contributions shall be credited to a City budgetary fund to support and maintain local plan review, inspection, and program administration; the fee shall be paid prior to the issuance of the stormwater management permit for the development.

Application Procedure.

1. Applications for land disturbance activity permits may be filed with the City Engineer on only a regular business day.
2. Permit applications shall include the following: two copies of the stormwater management concept plan, two copies of the maintenance agreement, and any required review fees.
3. Within 30 calendar days of the receipt of a complete permit application, including all documents as required by this ordinance, the City Engineer or designee shall inform the applicant in writing whether the application, plan and maintenance agreement are approved or disapproved.
4. If the permit application, stormwater management plan, or maintenance agreement are disapproved, the applicant may revise the stormwater management plan or agreement. If additional information is submitted, the City Engineer or designee shall have 15 business days from the date the additional information is received to inform the applicant in writing that the plan and maintenance agreement are either approved or disapproved.
5. If the permit application, final stormwater management plan, and maintenance agreement are approved by the City Engineer or designee, the stormwater management permit shall be issued.

Permit Duration. Permits issued under this section shall be valid from the date of issuance for five (5) years, except that permits issued for removal or abandonment shall be permanent. Permit renewal applications shall be submitted 30 days prior to the expiration date, or upon any change of the owner/operator, which ever first occurs.

Criminal Penalties. Any person who is found in violation of any provision of this Chapter, rule, regulation or order duly adopted or issued pursuant to this Chapter shall be guilty of a misdemeanor, punishable by a fine not to exceed $500. Each violation shall be a separate offense.

Order to Correct Violation. Upon a determination that such a violation exists, the City Engineer or his designee shall notify, in writing, the owner of the premises and shall order the prompt correction thereof. The owner will be allowed 180 days from the receipt of such written notice to comply with the provisions of this Chapter.

Failure to Correct Violation; Correction by City. If any person, having been ordered to correct a known violation of this section, fails, neglects, or refuses to correct the condition(s) within 180 days from receipt of the order, the City Engineer shall cause the condition to be remedied by having employees of the City or other designated persons go upon the premises and perform the necessary corrections under the supervision of an officer or employee designated by the City Manager.

Costs of Correction. The actual cost incurred by the City to bring the development into compliance with the provisions of this section shall be charged to the owner of the development. They will be mailed a statement of charges with instructions that such charges are due and payable within 30 days from the receipt thereof.

Failure to Pay Charges, Lien Created. In the event charges for the correction of the violation are not paid within 30 days after the receipt of a statement of charges as provided above, such charges shall become a lien upon the land or premises where the violation existed, and shall be collected as unpaid ad valorem taxes, as provided in G.S. §160A-193. In the event the person or persons found in violation of this Chapter have divested themselves of the land or premises where the violation existed, the City may pursue the responsible person or persons for payment of the charges through other legal means.

Procedure Deemed Additional to Other Remedies. The procedure set forth in this Chapter shall be in addition to any other remedies that may now or hereafter exist under law for the correction of such violations as outlined in this section, and this section shall not prevent the City from proceeding in a criminal action against any person, firm, or corporation violating the provisions of this section as provided in G.S. § 14-4.

Illegal Discharge Control

Statutory Authorization. The Legislature of the State has, in Chapter T15A, Article 02B, §.0235, entitled Neuse River Basin - Nutrient Sensitive Waters Management Strategy:

Basinwide Stormwater Requirement [hereafter referred to as the Neuse Stormwater Rule], designated specific local governments, including the City of Goldsboro, for stormwater management requirements as part of the Neuse River Nutrient Waters stormwater management strategy.

Definitions. For purposes of this chapter, the following abbreviations and definitions are utilized.

- DENR. North Carolina Department of Environment and Natural Resources.
- Illicit Connection. Any connection which allows the unlawful discharge of non-stormwater to stormwater conveyance system or waters of the state in violation of this section.
- Illicit Discharge. Any unlawful disposal, placement, emptying, dumping, spillage, leakage, pumping, pouring, emission or other discharge of any substance other than stormwater into a stormwater conveyance, the waters of the state, or upon the land in such proximity to the same, such that the substance is likely to reach a stormwater conveyance or the waters of the state.
- Municipal Separate Storm Sewer system (MS). A stormwater conveyance or unified stormwater conveyance system (including without limitation: roads with drainage systems, municipal streets, catch basins, stormwater detention facilities, curbs, gutters, ditches, natural and man-made channels, or storm drains), that:
    - Is located within the jurisdictional limits of the city; and
    - Is owned or operated by the state, county, the city or other public body; and
    - Discharges to waters of the state, excluding publicly owned treatment works, and lawful connections thereto, which in turn discharge into the waters of the state.
- National Pollutant Discharge Elimination System. A permitting system established pursuant to § 402 of the Clean Water Act et seq. *Federal Law Reference: National Pollutant Discharge Elimination System Permits, 33 USC § 1342*
- Pollutant. Anything which causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects, ordinances, and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; hazardous substances and wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; and noxious or offensive matter of any kind.
- Pollution. Man-made or man-induced alteration of the chemical, physical, biological, thermal and/or radiological integrity of water.
- Stormwater. Any flow resulting from, and occurring during or following, any form of natural precipitation.

- Waters of the State. Surface waters within or flowing through the boundaries of the state including the following: any intermittent or perennial stream, river, creek, brook, swamp, lake, sound, tidal estuary, bay, reservoir, wetland, or any other surface water or any portion thereof that is mapped as solid or dashed blue lines on United States Department of the Interior Geological Survey 7.5 minute series topographic maps. Treatment systems, consisting of man-made bodies of water, which were not originally created in waters of the state and which are not the result of impoundment of waters of the state, are not waters of the state.

Findings of Fact.

- Water quality has been an issue in the Neuse River Basin for over a century. Despite a number of initiatives between 1950 and 1995, the Neuse River Basin has continued to have water quality problems. Although environmental conditions in the Neuse River are driven by complex interactions between rainfall, flows, temperatures, biological factors, and chemistry, the long history of problems with nutrient pollution and algal blooms provides evidence that immediate control measures are necessary.
- In August 1998, the final comprehensive Neuse River Nutrient Sensitive Waters Strategy was adopted. The goal of the strategy is to achieve a 30 percent nitrogen reduction from each controllable and quantifiable source of nitrogen in the basin. The City was one of the 15 largest and fastest-growing local governments in the Neuse River basin which was required to comply with the Neuse Stormwater Rule. This rule contains four program elements, one of which pertains to illegal discharges.
- Illegal discharges are substances deposited in storm sewers (which lead directly to streams) that really should be handled as wastewater discharges. Depending on the source, illegal discharges may contain nitrogen. Local governments that must comply with the Neuse Stormwater Rule, including the City, must identify and remove illegal discharges.

Statement of Purpose. The purpose of this section is to:

- Protect the public health, safety and welfare by controlling the discharge of pollutants into the stormwater conveyance system;
- Promote activities directed toward the maintenance and improvement of surface and ground water quality;
- Satisfy the requirements imposed upon the City under its National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS^4) discharge permit issued by the State; and
- Establish administration and enforcement procedures through which these purposes can be fulfilled.

The provisions of this Chapter are supplemental to regulations administered by federal and state governments.

Objectives. The objectives of this section are to:

- Regulate the discharge of substances which may contaminate or cause pollution of stormwater, stormwater conveyances, or waters of the State;
- Regulate connections to the stormwater conveyance system;
- Provide for the proper handling of spills; and
- Provide for the enforcement of same.

Application of Provisions. This section shall apply within the territorial jurisdiction of the City of Goldsboro excluding the Federal, State, and other local governments, including their agencies, unless intergovernmental agreements have been established giving the City enforcement authority.

Basis for Establishing this Legal Authority. *The Neuse River Basin: Model Stormwater Program for Nitrogen Control*, dated August 30, 1999, requires that local governments establish the legal authority to control illegal discharges. By March 2001, each local government is required to show that it has established the legal authority to do the following:

- Control the contribution of pollutants to the stormwater collection system associated with industrial activity;
- Prohibit illegal discharges to the stormwater collection system;
- Prohibit discharge of spills and disposal of materials other than stormwater to the stormwater collection system;
- Determine compliance and non-compliance; and
- Require compliance and undertake enforcement measures in cases of non-compliance.

Abrogation and Greater Restriction. This Chapter is not intended to repeal, abrogate or impair any existing easements, covenants or deed restrictions. However, where this section and another conflict or overlap, whichever imposes the more stringent restrictions shall prevail.

Interpretation. In the interpretation and application of this section, all provisions shall be considered as minimum requirements; liberally construed in favor of the governing body; and, deemed neither to limit not repeal any other powers granted under State statutes.

Illicit Discharges. No person shall cause or allow the discharge, emission, disposal, pouring, or pumping directly or indirectly to any stormwater conveyance, the waters of the State, or upon

the land in such proximity to the same (such that the substance is likely to reach a stormwater conveyance or the waters of the State), any fluid, solid, gas, or other substance, other than stormwater; provided that non-stormwater discharges associated with the following activities are allowed provided that they do not significantly impact water quality:

- Filter backwash and draining associated with swimming pools;
- Filter backwash and draining associated with raw water intake screening and filtering devices;
- Condensate from residential or commercial air conditioning;
- Residential vehicle washing;
- Flushing and hydrostatic testing water associated with utility distribution systems;
- Discharges associated with emergency removal and treatment activities, for hazardous materials, authorized by the federal, state, or local government on-scene coordinator;
- Uncontaminated ground water [including the collection or pumping of springs, wells, or rising ground water and ground water generated by well construction or other construction activities];
- Collected infiltrated stormwater from foundation or footing drains;
- Collected ground water and infiltrated stormwater from basement or crawl space pumps;
- Irrigation water;
- Street wash water;
- Flows from firefighting;
- Discharges from the pumping or draining of natural watercourses or waterbodies;
- Flushing and cleaning the exteriors of buildings, including gutters, provided that the discharge does not pose an environmental or health threat; and
- Other non-stormwater discharges for which a valid NPDES discharge permit has been approved and issued by DENR and provided that any such discharges to the municipal separate storm sewer system shall be authorized by the City.

Prohibited substances include but are not limited to: oil, anti-freeze, chemicals, animal and human waste, paints, garbage, litter, and other pollutants.

Illicit Connections.

1. Connections to a stormwater conveyance or stormwater conveyance system which allow the discharge of non-stormwater, other than the exclusions described in §6.6.9, are unlawful. Prohibited connections include, but are not limited to: floor drains, waste water discharge from washing machines or sanitary sewers, wash water discharge from commercial vehicle washing or steam cleaning, and waste water discharge from septic systems.

2. Where such connections exist in violation of §6.6.9, that were made prior to the adoption of this provision or any other ordinance prohibiting such connections, the property owner or the person using the connection is allowed one year to remove the connection following application of this regulation; provided that, this grace period shall not apply to connections which may result in the discharge of hazardous materials or other discharges which pose an immediate threat to health and safety, or are likely to result in immediate injury and harm to real or personal property, natural resources, wildlife, or habitat.
3. Where it is determined that the connection:
    - May result in the discharge of hazardous materials or may pose an immediate threat to the health and safety, or is likely to result in immediate injury and harm to real or personal property, natural resources, wildlife, or habitat; or
    - Was made in violation of any applicable regulation or ordinance,

    The City Manager or his designee shall designate the time within which the connection shall be removed. In setting the time limit for compliance, the City shall take into consideration:
    - The quantity and complexity of the work;
    - The consequences of delay;
    - The potential harm to the environment, to the public health, and to public and private property; and
    - The cost of remedying the damage.
4. In regard to removing illicit connections, the responsible party must consider that permits are required by the Inspections Department for connections to or modification of storm sewers located in City owned rights-of-way. The costs of such permits will be borne by the responsible party.

Spills. Spills or leaks of polluting substances discharged to, or having the potential to be indirectly transported to the stormwater conveyance system, shall be contained, controlled, collected, and removed promptly. All affected areas shall be restored to their preexisting condition. Persons associated with the spill or leak shall immediately notify the City Fire Chief or his designee of all spills or leaks of polluting substances. Notification shall not relieve any person of any expenses related to the cleanup, restoration, loss, damage, or any other liability which may be incurred as a result of the spill or leak, nor shall such notification relieve any person from other liability which may be imposed by State or other law.

Inspections. The City Engineer (or other authorized agent of the City) has full power and authority to enter upon a premise for the purpose of investigating an illegal discharge. Should the owner or occupant of any property refuse to permit such reasonable access, the City Engineer or designee may obtain an administrative search warrant pursuant to G.S. §15-27.2

or its successor. No person shall obstruct, hamper or interfere with any such representative while carrying out those official duties.

Civil Penalties.

- Illicit discharges. Any person who allows or assists in a violation of this section shall be subject to civil penalties as follows:
    - For first time offenders, if the discharge consists of domestic or household products in quantities considered ordinary for household purposes, the person shall be assessed a civil penalty not to exceed $100 per violation or per day for any continuing violation. If the discharge contains non-domestic substances, including but not limited to process waste water, or if the person cannot provide clear and convincing evidence of the volume and nature of the substance discharged, the person shall be assessed a civil penalty not to exceed $1,000 per violation or per day for any continuing violation.
    - For repeat offenders, the amount of the penalty shall be double the amount assessed for the previous penalty, not to exceed $10,000 per violation or per day for any continuing violation.
- Illicit connections. Any person found with an illicit connection in violation of this section and any other person who assists in the establishment of an illicit connection in violation of this section, shall be subject to civil penalties as follows:
    - First time offenders shall be subject to a civil penalty not to exceed $500 per day of continuing violation.
    - Repeat violators shall be subject to a civil penalty not to exceed $1,000 per day of continuing violation.
- Other violations. Any person found in violation of other provisions of this Chapter, not specifically enumerated elsewhere, shall be subject to a civil penalty not to exceed $100 per violation or per day for any continuing violation.
- Payment/collection procedures. Penalties shall be assessed by the City Manager or designee. No penalty shall be assessed until the person alleged to be in violation is served written notice of the violation by registered mail, certified mail-return receipt requested, or personal service (such as express mail service or courier). Refusal to accept the notice shall not relieve the violator of the obligation to pay the penalty. The City Manager or designee shall make written demand for payment upon the person in violation. If the payment is not received or equitable settlement reached within 30 days after demand for payment is made, the matter shall be referred to the City Attorney for institution of a civil action in the name of the City, in the appropriate division of the general court of justice in the county for recovering the penalty.

Injunctive Relief. The City may petition the General Court of Justice in the county seeking injunctive relief, or other relief as deemed appropriate, to require compliance with this section. Cost of such action shall be assessed against the individual who is failing to comply with this session. The institution of an action for injunctive relief under §6.6.14 shall not relieve any party to such proceeding from any further civil or criminal penalty prescribed for violations of this Ordinance.

Criminal Penalties. Any person who knowingly or willfully violates any provision of this session, rule, regulation, order duly adopted or issued pursuant to this session shall be guilty of a misdemeanor, punishable by a fine not to exceed $500. Each violation shall be a separate offense.

SECTION 6 – WATER DISTRIBUTION PIPE

Design

The following Standard Specifications and associated Detail Drawings shall apply to all water system extensions and development of the City of Goldsboro's municipal water system. The Standard Specifications and Details included herein shall apply to all aspects of the City's water system that may extend into any areas outside the corporate limits in which the water system is otherwise owned, operated and maintained by the City of Goldsboro.

All utility extension permits must be obtained prior to construction.

Location. Water transmission lines shall be located and sized in accordance with the current "Water System Master Plan" or as directed by the City, and shall extend to the adjacent properties to provide an adequate network. All public water mains shall be located under the roadway within dedicated right of way or dedicated easements with a minimum width of 20 feet. Dedicated easements for water mains and appurtenances shall be recorded as "City of Goldsboro Permanent Utility Easement." City of Goldsboro utility and pipeline easements shall contain only City of Goldsboro utilities unless otherwise approved by an approved site plan or encroachment agreement.

No permanent structures, equipment, retaining walls, embankments, impoundments, or other elements that would inhibit maintenance operations shall be constructed within a utility and pipeline easement. Fences may be allowed across easements provided that appropriate access gates have been installed to allow utility maintenance. Fill or cut slopes greater than 5:1 are not allowed to extend into easements.

Sizing. Major transmission lines shall be sized in accordance with the "Water System Master Plan" or as directed by the City. Six (6) inch mains may be used on a case by case basis when the City has determined that a good grid exists and the existing network supports using six (6) inch mains. The total maximum length of 6 inch and 8 inch lines, without connecting to a larger main, is 1200 feet and 2000 feet, respectively. Six (6) inch water mains are permitted on residential cul-de-sacs less than 400 feet long. Where the existing network is lacking connectivity, lines shall be upsized to provide adequate fire flow as directed by the City.

Restraint. All valves and fittings shall be restrained. Pipe joints shall also be restrained an adequate length away from valves and fittings in accordance with AWWA manual M41 (or the latest edition of Thrust Restraint Design for Ductile Iron Pipe as published by the Ductile Iron Pipe Research Association). The standard joint restraint method shall be to use manufacturer

provided restrained joint pipe and fittings. Pipe up to and including 12-inches in diameter may also utilize either mechanical joint pipe with approved wedge action retainer glands (for the specified distance) or reaction blocking at fittings as an alternative.

- **4" to 8" Diameter Pipe.** For pipe 4-inches through 8-inches, the following table may be used to determine the required restrained length of pipe for single occurrences of valves or fittings within the pipe system. The table may not be used for combined bends or offsets where a series of fittings occur. In lieu of using the below table, a pipe restraint plan detailing all assumptions and calculations may be provided by the NC Professional Engineer sealing the plan drawings. In either case, the method of restraint to be used and the length of pipe to be restrained (if applicable) shall be clearly identified on the plans at all necessary locations.

Required Restrained Lengths for Single Fittings and Valves for Pipes 6-inches to 8-inches in Diameter (in Feet, Both Directions unless otherwise noted)

	6"	**8"**
90° Horizontal 90° Vertical Up 90° Vertical Down	84' 84' 130'	108' 108' 168'
45° Horizontal 45° Vertical Up 45° Vertical Down	35' 35' 54'	45' 45' 70'
22-1/2° Horizontal 22-1/2° Vertical Up 22-1/2° Vertical Down	17' 17' 26'	21' 21' 33'
11-1/4° Horizontal 11-1/4° Vertical Up 11-1/4° Vertical Down	8' 8' 13'	11' 11' 17'
	6"	**8"**
Tee (Restrain the Branch)	6" branch - 128'	6" branch 127' 8" branch - 166'
Reducer (Restrain Larger Pipe)	67'	8" x 4" - 121' 8" x 6" - 70'
Dead Ends (Caps and Plugs) & Inline Valves	130'	168'

- **All Pipe and Fittings**. Projects with pipe diameters greater than 8-inches, polywrapped pipe, or combined bends must have a pipe restraint plan with the method of restraint to be used and the length of pipe to be restrained clearly identified on the plans at all necessary locations. The pipe restraint plan must be calculated in accordance with

AWWA manual M41 (or the latest edition of Thrust Restraint Design for Ductile Iron Pipe as published by the Ductile Iron Pipe Research Association). The plan must also account for the actual soil types that exist at the project site.

- **Valves.** Inline valves, which are those valves greater than 10-feet from a waterline intersection, shall be restrained in a manner consistent with operation as a dead end. This includes restraining the valve to the pipe and restraining a sufficient number of pipe joints on both sides of the valve to accommodate dead end restraint. Valves located at waterline intersections (at tees and crosses) however shall only be restrained to the adjacent fitting. (Note that the tee itself must still be restrained.) In these cases, there shall be no joints between the valve and fitting. Restraint at intersections may be achieved by using stainless steel rods (through 16" diameter) or approved wedge action retainer glands (through 48" diameter).
- **Dead Ends.** All MJ cap and plug fittings, including tapped caps, shall be restrained with approved wedge action retainer glands. The adjacent pipe shall be restrained the distances specified above (or on the sealed pipe restraint plan). Reaction blocking shall not be used to restrain caps and plugs.

Restraining systems not included within this Specification shall require written approval prior to utilization. All joint restraint products that include the means of restraint within the joint gasket shall be prohibited in the City of Goldsboro water system.

Depth of Installation. All water mains shall have a minimum cover of 4 feet measured from the top of the pipe to the finished grade. When water lines are installed along a roadway they shall be installed at sufficient depth to maintain four (4) feet of cover to the subgrade of any future road improvements including potential vertical alignment changes.

Separation between Potable Water Mains and Sanitary Sewer Mains or Storm Sewers

- *Parallel Installations*: 10-ft lateral separation (pipe edge to pipe edge) or minimum 3-ft lateral separation and water line at least 18-inches above sanitary sewer line measured vertically from top of sewer pipeline to bottom edge of water main. In unique cases where the sanitary sewer and the water main are installed with at least 3-ft of lateral separation but less than 10-ft of horizontal separation, and less than 18-inches of vertical separation, both the water main and sanitary sewer shall be constructed of ductile iron pipe with joints in full compliance with water main standards.
- *Crossings (Water Main Over Sanitary or Storm Sewer)*: All water main crossings of sanitary sewer lines shall be constructed over the sewer line in conformance with City of Goldsboro Specifications. At a minimum, 18-inches of clearance shall be maintained between the bottom edge of the water main and the top edge of the sanitary sewer main. If 18-inches of clearance is not maintained, the water main and sanitary sewer main

shall both be constructed of ductile iron pipe with joints in conformance with water main construction standards. The sanitary sewer pipe shall be ductile iron the entire run from manhole to manhole. When the separation between pipelines is 18-inches or less, the void space between the pipes shall be filled with minimum 500-psi, quick setting, non-excavatable flowable fill extending 3-ft on both sides of the crossing. Regardless of pipe material, at least 12-inches of vertical separation is required for both sanitary and/or storm sewer crossings of potable water mains.

- *Crossings (Water Main Under Sanitary Sewer Line)*: Allowed only as approved by City of Goldsboro, when it is not possible to cross the water main above the sanitary sewer line. At a minimum, 18-inches of separation shall be maintained, (measured from pipe edge to pipe edge) and both the water main and sanitary sewer shall be constructed of ductile iron in conformance with water main construction standards. The sanitary sewer pipe shall be ductile iron the entire run from manhole to manhole. If local conditions prevent providing 18-inches of clearance, then at least 12-inches of clearance shall be provided and the void space between the pipes shall be filled with minimum 500-psi, quick setting, non-excavatable flowable fill extending at least 3-ft on both sides of the crossing.

Separation between Potable Water Mains and Reclaimed Water Mains.

- *Parallel Installations:* Preferred 10-ft lateral separation (pipe edge to pipe edge) AND water line at least 18-inches above reclaimed waterline measured vertically from top of reclaimed water pipeline to bottom edge of water main. Because all reclaimed water mains in the City of Goldsboro municipal system are required to fully comply with water system testing and integrity standards as described by 15A NCAC 18C, when the 10-ft lateral separation standard cannot be met, a minimum of 3-ft lateral separation, shall be provided.
- *Crossings (Water Main Over Reclaimed Water Pipeline):* All water main crossings of reclaimed water mains shall be constructed over the reclaimed water line in conformance with City of Goldsboro Specifications. At a minimum, 18-inches of clearance shall be maintained between the bottom edge of the water main and the top edge of the reclaimed water main. When the minimum 18-inch clearance cannot be maintained, the reclaimed main shall be constructed of ductile iron pipe in conformance with water main construction standards extending at least 10-ft on both sides of the crossing. The void space between the pipes shall be filled with minimum 500-psi, quick setting, non-excavatable flowable fill extending at least 3-ft on both sides of the crossing. Reclaimed water mains crossing more than 18-inches under potable water service lines may be constructed of either C900 or C905 PVC as typically required for reclaimed water pipeline construction.

- *Crossings (Water Main Under Reclaimed Water Pipeline):* Allowed only on a case by case basis and design shall be approved by City of Goldsboro prior to construction. At a minimum, 18-inches of separation shall be maintained and both potable water and reclaimed mains shall be constructed of ductile iron pipe in conformance with water main construction standards extending at least 10-ft on both sides of the crossing. If local conditions prevent 18-inches of clearance between the pipelines, the void space between the pipes shall be filled with minimum 500-psi, quick setting, non-excavatable flowable fill extending at least 3-ft on both sides of the crossing.

Materials

General. All water main distribution pipe shall be ductile iron or C-900 PVC. The City of Goldsboro Engineering Department maintains a list of approved manufacturers for all water distribution products. New manufacturers must submit requests for approval to the Engineering Department.

Polyvinyl Chloride Pipe. Unless amended on the Construction Drawings or elsewhere in these specifications, all six, eight, and twelve inch water main pipes may be PVC 1120, in accordance with AWWA C-900. All 1.5" and 2" water main pipes shall be PVC 1120 in accordance with ASTM D-2241. The pipe shall be minimum Pressure Class 200 with a SDR of 14 or less for C-900 pipe and a SDR of 21 or less for ASTM 2241 pipe. PVC Pressure Pipe shall be made from white or blue pigmented virgin materials and shall be furnished in lengths of 20 feet. Lesser lengths will be accepted to allow the proper placement of fittings, valves, etc.

Ductile Iron Pipe. Ductile iron pipe shall be designed and manufactured in accordance with AWWA C150 and C151 and provided in nominal 18-ft or 20-ft lengths. The minimum required pressure ratings for ductile iron pipe and required laying conditions are tabulated below. For all other installations other than specified, the laying condition, bedding requirements or the minimum pressure class rating and/or thickness class shall be increased in accordance with AWWA C151.

Pipe joints shall be mechanical joint or push-on type as per AWWA C111. Pipe lining shall be cement mortar with a seal coat of bituminous material in accordance with AWWA C104. All buried ductile iron pipe shall have a bituminous exterior coating in accordance with AWWA C151.

Ductile Iron Fittings. All ductile iron fittings shall be provided in conformance with AWWA C110 for standard ductile iron fittings and AWWA C153 for compact ductile iron fittings. All fittings shall be pressure rated for a minimum 350-psi through 24-inches in diameter and 250-

psi for fittings greater than 24-inches in diameter. In cases where minimum pressure standards are less than the pipe specification, fittings shall always be pressured rated to meet or exceed the pressure ratings for the specified pipe. All fittings for potable water service shall be provided with cement mortar linings and asphaltic seal coats in accordance with AWWA C104. All ductile iron fittings shall have an asphaltic exterior coating in accordance with AWWA C151. All ductile iron fittings shall be provided with mechanical joint end connections or proprietary restrained joints from an approved manufacturer. Gaskets shall be provided in conformance with AWWA C111 with EPDM rubber gaskets preferred over SBR.

Restrained Joint Ductile Iron Pipe. All restrained joint ductile iron pipe unless otherwise specified shall be of the boltless restrained joint type. For installations requiring welded locking rings, the rings shall be factory welded. The restrained joints shall provide a minimum of 4-degrees of deflection for pipe sizes, 4-inches through 12-inches in diameter.

All proprietary pipe restraint systems shall be approved by the City of Goldsboro and provided in compliance with all standards for coatings, linings, pressure classes, etc. as required for ductile iron pipe. All restrained joint pipe shall be installed based on laying conditions, pressure class, etc. as required for typical ductile iron pipe.

Installation

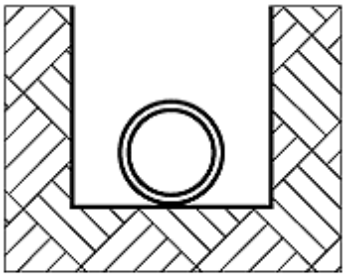
Ductile iron pipe shall be installed in accordance with the requirements of AWWA C600 and the Ductile Iron Pipe Handbook published by the Ductile Iron Pipe Research Association. Materials at all times shall be handled with mechanical equipment or in such a manner to protect them from damage. At no time shall pipe and fittings be dropped or pushed into ditches.

Pipe and fitting interiors shall be protected from foreign matter and shall be inspected for damage and defects prior to installation. In the event foreign matter is present in pipe and fittings, it shall be removed before installation. Open ends of pipe shall be plugged or capped when pipe laying is not in progress.

All pipe shall be constructed with at least 48 inches of cover below the finished surface grade. Pipe shall be laid on true lines as directed by the Engineer. Trenches shall be sufficiently wide to adjust the alignment. Bell holes shall be dug at each joint to permit proper joint assembly. The pipe shall be laid and adjusted so that the alignment with the next succeeding joint will be centered in the joint and the entire pipeline will be in continuous alignment both horizontally and vertically. Pipe joints shall be fitted so that a thoroughly watertight joint will result. All joints will be made in conformance with the manufacturer's recommendations for the type of joint selected. All transition joints between different types of pipe shall be made with transition couplings approved on shop drawings showing the complete assembly to scale.

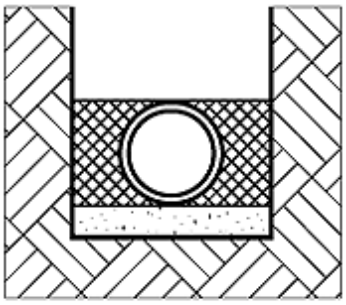
Pipe shall be installed at laying conditions as specified by the plans. Laying conditions for ductile iron pipe shall be as described in AWWA C151 and the Ductile Iron Pipe Research Association. Laying conditions shall be defined as follows:

Type 1: Flat Bottom Trench with Pipe Resting on Stable Undisturbed Earth. Unstable conditions such as wet trench bottoms, intermediate rock layering, partially weathered rock, and other unsuitable soil conditions shall require utilizing more stringent laying conditions. At a minimum, Type 4 laying condition shall be utilized with a minimum of 4- inches of bedding to overcome unstable conditions. For severe unstable soil conditions, undercut excavation and an engineer designed foundation plan shall be provided prior to pipeline installation.



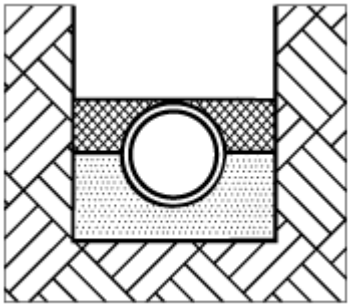
Type 1*

Type 4: Pipe bedded in Class 1 material, No. 67 or No. 78 crushed stone to a depth of 1/8 pipe diameter or a minimum of 4-inches. Embedment material, consisting of Class 1, Class 2 or Class 3 materials, (as defined in Section 7000), shall be compacted greater than 95% Proctor to the top of the pipe. Careful attention must be allocated to compacting embedment material under the bottom edges of the pipe.



Type 4

Type 5: Pipe bedded in Class 1 material, No. 67 or No. 78 crushed stone to the center of the pipe and extending a minimum of 4-inches under the pipe. Granular or select embedment, consisting of Class 1 or Class 2 materials, compacted to greater than 95% Proctor installed to the top of the pipe.



Type 5

For installations below the water table, a single layer of engineering fabric shall be installed between the pipe and trench floor/trench wall. The fabric shall fully encapsulate the waterline, bedding, and embedment material with a minimum of 12-inch overlap at the top of the embedment material.

Prior to beginning construction, the Contractor shall contact local utility companies and verify the location of existing utilities. The Contractor shall be completely and solely responsible for locating all existing buried utilities inside the construction zone before beginning excavation. The Contractor shall be solely responsible for scheduling and coordinating the utility location work. When an existing utility is in conflict with construction, it shall be exposed prior to beginning construction to prevent damage to the existing utility.

All valves that are under the ownership and acceptance of the City of Goldsboro municipal water system shall be operated only by trained personnel of the City of Goldsboro. Existing valves in the City of Goldsboro water system will not be operated without a minimum notice of 48 hours to the Engineering Department and the Public Works Department. Contractor's personnel shall only be responsible for operating valves within new construction areas that are not directly connected with the existing municipal water supply. At such time when the valves in new construction areas are connected with the municipal water supply, the valves shall only be operated by City of Goldsboro personnel or in limited circumstances by Contractor's personnel after receiving authorization from the Operator in Responsible Charge of the water distribution system. For all other cases, the Contractor shall operate valves only in accordance with City of Goldsboro direction.

Pipe Identification and Marking

Pipes shall be identified with either marking tape or tracer wire in such a manner as to allow proper location of pipelines and services without loss or deterioration of signal or without the transmitted signal migrating off the tracer wire.

Marking Tape. Marking tape shall be installed continuously and longitudinally along all water mains and water services for new construction and for any repair or retrofit construction using open trench methods. For service connections, the marking tape shall extend from the main line to the water meter. Marking tape shall be installed directly above the center of the pipe and at least 16-inches deep from final grade to a maximum depth of 24-inches below final grade. The water main marking tape shall be approved by the City of Goldsboro. The marking tape shall be made of polyethylene (or approved equivalent) material, 6-inches wide and a minimum of 6 millimeters thick. The marking tape shall have detectable markers embedded in the tape and spaced adequately to provide continuous detection along the tape from above the buried pipe at final grade. The tape shall be blue in color and shall be marked with words "CAUTION WATER LINE BURIED BELOW" (or an approved equivalent wording). The wording shall be repetitive along the full length of the tape.

Trace Wire. Trace wire shall be installed in the same trench and inside bored holes and casing with pipe during pipe installation. It shall be secured to the pipe as required to insure that the wire remains adjacent to the pipe. The trace wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at all trace wire access points.

Except for approved spliced-in repair or replacement connections, tracer wire shall be continuous and without splices from each trace wire access point. Trace wire access points shall be accessible at all new water valve boxes, water meter boxes, blow-offs, ARVs, fire hydrants, irrigation turnouts and access manholes. Concentrations of multiple proposed valves near pipe intersections, i.e. tees or crosses, may require more than one access point assembly in each concrete valve box collar. Trace wire access points shall be within public right-of-way or public utility easements.

If the spacing of valves and meters is greater than one-half mile, the trace wire shall be looped up in a 2" PVC pipe to be located at a right-of-way fence line or at a cross fence line, as applicable, for protection. A PVC cap shall be placed on the 2" pipe when used, but it shall not be solvent welded onto the pipe.

At the point of connection between ductile iron water mains, with any non-iron water main, the tracer wire shall be properly connected to the iron pipe with a cad weld or approved equivalent. Tracer wire welds shall be completely sealed with the use of an approved mastic type sealer specifically manufactured for underground use. Mastic shall be applied in a thick coat a minimum of one quarter inch thick and shall be protected from contamination by the backfill material with the use of a plastic membrane.

Tracer wire shall be laid flat and securely affixed to the pipe at 10 foot intervals. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer

wire or tracer wire insulation shall be permitted. At water service saddles, the tracer wire shall not be allowed to be placed between the saddle and the water main.

At all water main end caps, a minimum of 6 feet of tracer wire shall be extended beyond the end of the pipe, coiled and secured to the cap for future connections. The end of the tracer wire shall be spliced to the wire of a six pound zinc anode and is to be buried at the same elevations as the water main.

The Contractor shall perform a continuity test on all trace wire in the presence of the City Engineer or the City Engineer's representative. If the trace wire is found to be not continuous after testing, the Contractor shall repair or replace the failed segment of the wire.

Fire Hydrants

Location. All fire hydrants shall be installed on a minimum 6 inch water line. Only one fire hydrant may be installed when the line is served by a 6 inch tap and is not looped to another main. There shall be at least one fire hydrant at each street intersection. The minimum acceptable flow for fire hydrants is 1000-gpm at minimum 20-psi residual in residential areas and 1500-gpm at minimum 20-psi residual in other districts. Valves provided on the fire hydrant branch supply line shall be located within 5-ft of the main line.

In residential districts the maximum distance between hydrants, measured along street centerlines, shall be 500 feet. When residential intersections are less than 700 feet apart, a hydrant is not required between the intersections.

In business, office and institutional, and industrial zoning the maximum distance between hydrants, measured along street centerline, shall be 300 feet. When business, office and institutional, and industrial intersections are less than 450 feet apart, a hydrant is not required between intersections.

On thoroughfares and collector streets with access points only at street intersections, hydrants shall be located at each street intersection and at 1000 foot intervals along the street. Where these intersections are less than 1200 feet apart, no hydrants required between the intersections. Fire hydrants shall be placed in a staggered arrangement on both sides of any roadway classified as a major or minor thoroughfare with the hydrant spacing as referenced above.

Specifications. Hydrants shall be manufactured by American Darling Hydrants or other approved with a minimum valve opening of 4 1/2 inches. Hydrants shall be furnished with a 4 ½ inch steamer and double 2 1/2 inch hose connections with caps and chains, National

Standard Threads, mechanical joint, 1 1/2 inch pentagon operating nut, open left, painted fire hydrant red, bronze to bronze seating, a minimum 4 foot bury depth with a break away ground line flange and break away rod coupling. The hydrant bonnet will be designed with a sealed oil or grease reservoir with O-ring seals and a Teflon thrust bearing. Fire hydrant caps shall be attached to the body of the hydrant with a minimum 2/0 twist link, heavy duty, non-kinking, machine chain. All fire hydrants shall be designed and rated for a working pressure of 250-psi or greater.

Installation. Hydrants shall be set plumb, properly located with the pumper nozzle facing the closest curb of a fire lane or street, but not a parking space. The back of the hydrant opposite the pipe connection shall be firmly blocked against the vertical face of the trench with 1/3 cubic yard of concrete. Double bridle rods and collars shall be connected from the tee to the hydrant. All joints between the tee and the hydrant shall be mechanical joints restrained with wedge action retainer glands. Stainless steel rods not less than 3/4 inch diameter may also be used to restrain the assembly. A minimum of 8 cubic feet of stone shall be placed around the drains. The backfill around the hydrants shall be thoroughly compacted and closely match the elevation on the approved plans. Hydrant extensions will not be allowed on new or retrofit installations. Hydrant installation shall be in accordance with the Details. Hydrant tees may be used upon approval by the City.

Depth of Bury.

- *Typical 90-Degree Hydrant Shoe Installations:* The maximum depth of bury for all new fire hydrants with 90-degree hydrant shoes shall be 5-ft from the breakaway flange connection. The breakaway flange or safety coupling shall be oriented vertically just above finished grading and bolted directly to the fire hydrant in compliance with manufacturer standards. The breakaway flange or safety coupling shall not be buried.
- *Vertical Shoe Hydrant Installations:* For installations requiring depth of bury greater than 5-ft, the fire hydrant shall be equipped with a vertical shoe arrangement that provides for full extension of the lower valve plate against a stopping mechanism located inside the vertical shoe to maximize hydraulic flow conditions through the hydrant. The vertical shoe shall be equipped with flanged connections. The maximum depth of bury for vertical shoe installations shall not exceed 4-ft measured from the breakaway flange to the bottom of the vertical hydrant shoe. The vertical shoe and all piping included in the hydrant supply line shall be restrained with blocking and rodding or blocking with wedge action retainer glands or standard Aqua-grip connections. In all cases where the vertical shoe is utilized, typical washed stone bedding extending at least 12-inches on all sides of the central axis and extending from the top of the vertical shoe downward to at least 12-inches below the vertical shoe shall be provided surrounding the vertical hydrant shoe assembly to assure positive drainage. In cases where Aqua-grip connections are

not utilized, piping below the vertical shoe shall be provided in a flanged by plain end configuration and restrained with wedge action retainer glands to the lower mechanical joint fitting or the lower fitting shall be blocked and rodded to the vertical shoe connection. The entire assembly shall be restrained and support blocking shall be provided under the vertical bend assembly.

Hydrant Relocations. For installations where hydrants will be relocated, all hydrants with greater than 20-years of operational service, as indicated by the date of manufacture provided on the hydrant, shall be replaced with new fire hydrants. The existing fire hydrant shall be turned over to the City of Goldsboro Public Works Department. For installations where the hydrant to be relocated has less than 20-years of operational service, the existing hydrant may be relocated. The existing hydrant shall still be disinfected, flushed and pressure tested.

Valves and Appurtenances

General. Valves shall be installed on all branches from feeder mains and hydrants according to the following schedule: 4 valves at crosses; 2 valves at tees; one valve on each hydrant branch and elsewhere as directed by the City of Goldsboro. When a loop section of water line is connected back into the feeder main within a distance of 200 feet or less, only one valve will be required in the feeder main. In all cases where new water mains are connected to an existing water distribution line, valves shall be located at all end points and at intermediate points throughout the new system extension to assure testing requirements can be met without interfering with the operation of the existing system.

Where no water line intersections are existing, a main line valve shall be installed at every 100 feet per 1 inch diameter main up to a maximum distance of 500 feet between valves. Valves shall be installed at each existing or new intersection.

Valves shall be properly located, operable and at the correct elevation. The maximum depth of the valve nut shall be 6 feet without an extension kit. When valve extension kits are used, they must be manufactured by the same company which manufactured the valve.

Gate Valves, Less than 2-inches for Blowoff Assemblies. Gate valves for blowoff installations sized smaller than 2-inches, shall be resilient seated wedge type with a non-rising stem and a 2 inch operating nut in compliance with AWWA C509. The smaller diameter gate valves shall be provided with triple O-ring seals and threaded end connections in compliance with ANSI B2.1. Gate valves smaller than 2-inches shall be identified “no lead” and consist of brass components designated under UNS C89833 as per ASTM B584. The small diameter gate valves shall be rated for a minimum pressure rating of 200-psi.

Gate Valves, 2-inches to 12-inches. All valves for potable water applications, 12-inches in diameter and smaller shall be resilient seated wedge gate valves in conformance with the requirements of AWWA C509, (grey or ductile iron body) or AWWA C515, (reduced wall ductile iron body). All coating materials used in the construction of gate valves for potable water applications must comply with NSF 61 to assure lead free construction. All gate valves shall be designed for a working pressure of 250-psi with a minimum UL listing and FM approval rating of 200-psi. Gate valves shall be fusion bonded epoxy (FBE) coated both interior and exterior at a minimum of 10-mils and the FBE coating shall be provided in conformance with AWWA C550. All gate valves shall be assembled with stainless steel bolts. All gate valves 12-inches in diameter and smaller shall be installed in the vertical position and shall be provided with mechanical joint fittings. Gate valves shall be restrained by wedge action retainer glands or other approved manufacturer provided restraining systems. All gate valves shall open left with a non-rising stem (NRS) and be provided with a 2-inch square operating nut. All gate valves shall be constructed with triple O-ring seals in which 2 O-rings are located above the thrust collar and 1 O-ring is located below the thrust collar. The two upper O-rings shall be replaceable with the valve fully open and subjected to full rated working pressure. The gate valve wedge shall be fully encapsulated in rubber. All valves shall be rated for bi-directional flow. All sealing gaskets shall be made of EPDM rubber materials.

Gate Valves, 14-inches through 48-inches. Gate valves 14-inches through 48-inches shall be resilient seated wedge gate valves in conformance with the requirements of AWWA C515, (reduced wall ductile iron body) and shall comply with all Specifications outlined for gate valves 4 through 12 inches. Gate valves installed vertically shall be provided with a minimum of 2-ft of overhead clearance between the top of the operator nut and the finished grade. All gate valves 18-inches and greater shall be provided with a geared actuator. Vertical gate valve installations shall have spur gear actuators and horizontal installations shall have bevel gears. Gate valves 18 inches in diameter shall be provided with a gear operator at a minimum 2:1 ratio and larger valves through 24-inches shall be provided with a gear operator at a minimum 3:1 ratio. Gate valves installed in a horizontal position shall only be provided as permitted by the City for special circumstances where vertical alignment is not possible. All horizontal gate valves shall meet or exceed the Specifications outlined herein for vertical gate valves including the 250-psi pressure rating. All horizontal gate valves shall be equipped with bevel gears resulting in a minimum 4:1 turn ratio for valves 30 through 48-inches in diameter.

Butterfly Valves. Butterfly Valves shall not be used in the City of Goldsboro water system unless permitted by the City in unique cases where a gate valve cannot be installed. All butterfly valves shall meet the requirements of AWWA C504 with mechanical joints, 2 inch open left operating nut. Valves greater than 12-inches shall be installed in a manhole with the 2-inch nut accessible from above grade. Valves designated by the City to potentially have a remote actuator shall also be installed in a manhole regardless of size. All butterfly valves shall be rated for a working pressure of 200-psi or greater. Butterfly valves shall be provided with a

fusion bonded epoxy coating on both interior and exterior surfaces at a minimum of 10-mils with an NSF 61 approved epoxy. All rubber seals and gaskets shall be made of EPDM rubber.

Insertion Valves. Insertion valves shall only be used as permitted by the City. Insertion valves shall meet the requirements of AWWA C515, seat on the valve body and be rated for a working pressure of 250-psi or greater. All insertion valves shall be made of ductile iron in conformance with ASTM A-536 Grade 65-45-12 and epoxy coated at a minimum of 10-mils. Insertion valves are available for pipe sizes through 12-inches in diameter. In cases where insertion valves are being installed to shut down water to a work zone area, the insertion valve shall be located a minimum of 100-ft from the work zone or greater as determined by the Engineer of Record to assure the insertion valve can safely operate as a dead end without dislodging from the pipeline or otherwise causing the existing pipeline to shift.

Valve boxes. Valve Boxes shall be cast iron, screw type, with a 5 inch opening and "water" stamped on the cover. The cover shall be 6-inches in depth. All valve box assemblies and covers shall be cast from Class 35 gray iron and domestically made and manufactured in the USA.

Valve box ring adjustments will not be allowed. The valve box shall be centered over the wrench nut and seated on compacted backfill without touching the valve assembly. All valve boxes in pavement shall be flush with the top of the pavement or flush with the finished grade. Outside of paved areas precast concrete valve box encasements or a trowel finished 2' x 2' x 6" pad of 3000-psi concrete may be used for valve box encasement provided the assembly is buried flush with the surface grade and compacted properly to prevent movement of the precast encasement.

Actuators. All valves shall be provided with standard 2-inch operating nuts. Unless otherwise specified, the direction of rotation to open the valves shall be to the left, (counterclockwise), when viewed from the top. Each valve body or actuator shall have cast thereon the word “OPEN” and an arrow indicating the direction to open.

Appurtenances

Blowoffs. Blowoffs shall be a minimum of 2 inches and installed at the end of all dead-end water lines. Where there is not sufficient pressure or fire hydrants to thoroughly flush the system, a larger blowoff shall be required.

Blowoff Assemblies shall be constructed as shown in the Standard Detail Drawings. The valves shall be gate type with a non-rising stem and a 2 inch operating nut, O-ring seals and screwed ends. A full size gate valve is required on water mains that are planned to be extended.

Reaction Blocking. Material for reaction blocking shall be 3000 psi concrete, poured in place. The reaction areas are shown in the Standard Detail Drawings. A minimum 4 mil plastic shall cover the fitting to ensure that no concrete will interfere with removal of the fitting.

Rodding. All rodding shall be constructed with type 304 stainless steel rods at the number and sizing specified in the following table. Rod coupling shall not be allowed. All hardware shall also be stainless steel type 304.

Stainless Steel Rod Requirements are as follows

4-inch branch	2, 3/4 inch stainless steel rods
6-inch branch	2, 3/4 inch stainless steel rods
8-inch branch	4, 3/4 inch stainless steel rods
12-inch branch	6, 3/4 inch stainless steel rods
16-inch branch	8, 3/4 inch stainless steel rods

Wedge Action Retainer Glands. All wedge action retainer glands shall be manufactured as a one piece retainer gland for use with mechanical joints and shall be rated to provide restraint up to 350-psi pressure rating for sizes through 16-inches. For sizing above 16-inches, the wedge action retainer gland shall be rated to provide restraint up to 250-psi. Approved wedge action retainer glands shall be made of ductile iron, coated with a manufacturer applied epoxy coating or polyester powder coating.

In cases where wedge action retainer glands are approved for pipe restraint of fire hydrant supply lines or other applications, the entire hydrant supply line shall be restrained.

Wedge action retainer gland connections to push on pipe are not approved.

Sampling Stations. Sampling Stations shall be provided at all new residential and commercial development areas at the rate of 1 sampling station per development complex consisting of at least 200-homes or 1-per 10 acre or greater commercial complex or 1 per institutional facility with more than 100,000 square feet or as otherwise required by the City. Padlocks for sampling stations shall be provided by the City. The sampling station requirement may be waived in cases where area sampling is already deemed sufficient by the City.

Sampling stations shall be provided as a self-contained manufactured assembly with locking aluminum housing, copper drainage tube and unthreaded spigot.

Water Main Taps and Services

Design. Individual water services shall be provided from the main to each water meter for single family residences in accordance with the Standard Detail Drawings. Multiple branch services are prohibited. All connections shall be made by wet taps. Service connections shall be made perpendicular to the main and shall run straight to the meter.

All water service lines shall be installed with a minimum depth of cover of 24-inches or greater.

All water meter boxes and vaults shall be located at the edge of the serviced lot's right of way or easement. Water meter boxes shall not be placed in streets, sidewalks, parking areas or obstructed by fencing or buildings. A 10-foot clear zone shall be maintained behind meter boxes and vaults.

Provisions for backflow prevention shall be in accordance with existing City policies and the NC Plumbing Code.

The water meter shall be sized based on water demand. All water service lines shall be minimum 1 inch diameter. Multiple branches up to a maximum of 2 potable water services per multiple branch assembly for a single residential use shall be sized by the Engineer of Record in accordance with AWWA M22, but shall not be less than 1.5-inches in diameter.

Service taps 2 inches or less to existing water lines shall be made by the City except if approved on site and subdivision plans. Service taps greater than 2 inches to existing water lines shall be made by a Contractor of the Developer after obtaining applicable permits and paying applicable fees.

Service taps to new water lines shall be made by the Contractor in accordance with the Specifications after obtaining applicable permits and paying applicable fees. No taps shall be made within 3-feet of the bell or spigot end of the pipe.

Materials.

- *Stainless Steel Tapping Sleeves, 6-inch through 12-inch main lines.* Stainless steel tapping sleeves may be used in lieu of mechanical joint tapping sleeves for water mains through 12-inches in diameter with branch sizing as shown in the following table. All stainless steel tapping sleeves shall be manufactured in conformance with AWWA C223. All stainless steel tapping sleeves shall have a stainless steel flange and be provided in a two piece assembly with a full circumferential gasket with tabbed gasket holding assembly and ¾-inch test plug. The back band shall be a minimum 14 gauge

stainless steel and the front band (where the outlet is located) shall be a minimum 12 gauge stainless steel. The bolt bars shall be a minimum 7 gauge stainless steel. All stainless steel tapping sleeves shall be manufacturer rated for a working pressure of 200-psi or greater and air tested to 100-psi for 8 minutes before a tap is made.

Stainless Steel Tapping Sleeve Sizes Allowed

Nominal Main Size (inches)	Nominal Branch Size (inches)
6	4
8	4
10	4
10	6
12	4
12	6
12	8

- *Stainless Steel Tapping Sleeves, 14-inch through 24-inch main lines.* For larger diameter water mains, stainless steel tapping sleeves approved by the City may be used in lieu of a mechanical joint tapping sleeve for cases where the branch line is 50% or less in diameter than the main line diameter. All of the previous Specifications described for tapping sleeves from 6 to 12 inches shall be met for stainless steel tapping sleeves for larger diameter water mains. Additionally, the outlet band for stainless steel tapping sleeves 14-inches through 24-inches shall be a minimum 7 gauge stainless steel. The back half of the sleeve shall be a minimum 12 gauge stainless steel.
- *Tapping Saddles, 14-inch through 24-inch main lines.* Tapping Saddles may be used in lieu of mechanical joint tapping sleeves to tap mains 14-inches through 24-inches when the branch line is 50% or less in diameter than the main line diameter. Saddles shall be made of brass with a working pressure of 250-psi. Saddles shall be equipped with an AWWA C110 flange connection on the branch. Sealing gaskets shall be O-ring type, high quality molded rubber having an approximate 70 durometer hardness, placed into a groove on the curved surface of the saddles. Straps shall be stainless steel. The minimum strap count for branch sizing from 4-12 inches is shown below.

Strap Requirements for Tapping Saddles

Nominal Saddle Outlet (inches)	Number of Straps
4	3
6	3
8	4
12	7

- *Corporation Stops.* Corporation Stops shall be ball type, made of "no lead" brass (meeting UNS C89833 as per ASTM B584). Corp stops shall be complete with a compression coupling and AWWA Standard threads as per AWWA C800. Taps shall be located at 10:00 or 2:00 o'clock on the circumference of the pipe. Service taps shall be staggered alternating from one side of the water main to the other and at least 12 inches apart. The taps must be a minimum of 24 inches apart if they are on the same side of the pipe. All corporation stops shall be rated for a working pressure of 300-psi. No burned taps will be allowed and each corporation stop will be wrapped with Teflon tape for ductile iron pipe water mains. No taps are allowed on a fire hydrant line. No tapping shall be made where rodding is placed.
- *Service Saddles.* Service Saddles shall be used for service taps larger than 1-inch on all water mains 14-inches and greater. Service saddles shall also be used for all taps on existing water mains. Service Saddles shall be provided with brass body and fasteners (85-5-5-5 waterworks brass or "no lead" brass meeting UNS C89833 as per ASTM B584) conforming to AWWA C800 and double straps made of silicon bronze conforming to ASTM A98 and factory installed grade 60 rubber gaskets. Service saddles shall be provided with AWWA standard threads per AWWA C800.
- *Poly Tubing (CTS).* Tubing material shall be high-density polyethylene conforming to the minimum requirements of cell classification 445574E as defined and described in ATSM D3350. The resin shall have a material designation code of PE4710 by the Plastic Pipe Institute.
- *Meter boxes for 1-inch services.* One-inch meter boxes shall be cast iron per ASTM A48 Class 25 or ASTM A126 Class B. Meter boxes for 1-inch water services shall provide a cover opening of 8 X 18 1/8 inches and boxes shall measure at least 12.5 inches in depth. Lids shall also be cast iron and have the words "Water Meter" cast into them. They shall also be lockable. Lids shall be provided with a 2 inch (maximum) diameter hole to accommodate a transmitter. All meter boxes and lids shall be installed as shown in the Standard Detail Drawings and have a black E-coating.

Meter boxes shall have 45 degree compression connections outside the box on the inlet side. There shall be a lockable ball valve inside the box on both the inlet and outlet which shall be permanently affixed to ensure proper spacing and alignment for the meter. Meter boxes shall also be provided with an ASSE 1024 approved inline, dual check valve located behind the meter. For boxes not utilizing a 1 inch meter, adapters shall be provided to accommodate a 5/8 x 3/4 inch meter. All fittings and connections shall be "no lead" brass conforming to UNS C89833 as per ASTM B584.

A "no lead" brass curb stop with compression connections shall be installed within 2 feet of the inlet connection. The curb stop may be buried without a box above it.

One 2 inch or 6 inch grade adjuster may be used when needed to meet final grade, however, no grade adjusters are permitted on new construction projects. Grade adjusters shall be cast iron. Grade adjuster and box shall be by the same manufacturer.

In isolated cases and when approved by the City, meter boxes may be located in driveways, alleys and/or parking areas. In these cases, a street rated box capable of withstanding a 40,000-lbs proof load shall be specified.

- *2 inch Water Services.* 2" meter boxes shall be cast iron MBX-5 as indicated in the Standard Detail Drawings. Meter boxes for water services shall provide a cover opening of 18 X 30 inches and boxes shall measure at least 18-inches in depth and provided in straight wall arrangement. To ensure positive discharge, the box should be tied into the existing storm drain system, or shall have an open bottom to allow drainage through a 12-inch stone base.

  Custom setter piping and fittings for 2 inch water meters shall be constructed from "no lead" brass (meeting UNS C89833 as per ASTM B584) and copper tubing and shall be equipped with a lockable by-pass flanged ball valve and flanged angle meter ball valves. All applications shall have a separate above ground backflow preventer.
- *Water services greater than 2-inches.* Water services greater than 2-inches shall have the meter and bypass line located within a precast concrete vault. All piping and valves shall have flanged connections. There shall be isolation gate valves on both sides of the meter as well as one on the bypass line. Gate valves within the vault shall meet the above requirements of AWWA C509 for non-rising stem gate valves, but shall be provided with hand wheel operators. A standard buried gate valve with 2-inch nut shall be provided between the main and the vault. Link seals shall be used where the pipe enters and exits the vault.
- *Meter Vaults.* Meter vaults and access doors shall meet HS-20 loading requirements and shall be located outside of travel areas. Pedestrian rated covers shall not be used regardless of where they are located. The access double doors shall be aluminum with

a flush drop lift handle, stainless steel hinges and bolts, a stainless steel slam lock, an automatic hold open arm, and compression springs to allow for easy opening. Vaults for 3 and 4 inch meters shall be approximately 8-feet by 10-feet in size. Six inch meter vaults shall be approximately 9-feet by 12-feet. To ensure positive drainage, the vault shall be tied into the existing storm drainage system. If positive drainage is unobtainable, a sump pump shall be located and operated in the vault.

Irrigation System

All irrigation systems shall be provided with privately maintained reduced pressure principle backflow prevention installed in accordance with the NC Plumbing Code and the Foundation for Cross Connection Control and Hydraulic Research. Reduced pressure zone backflow preventers shall be installed above ground in an insulated box as shown by the details.

All irrigation systems within public street right of way require an encroachment agreement from the City and/or NCDOT prior to installation. Plans designating the location, size, material, and depth shall be submitted with the agreement application. If there is an approved site plan, it shall be referenced with the encroachment submittal to the City.

Pipe material for the mainline proposed to be used within the public right of way shall be Schedule 40 PVC or greater. A distance of at least 3-feet shall be provided from the back of curb or edge of asphalt in a ditch section. A minimum depth of 2-feet of cover shall be provided and all heads shall spray away from the street.

All street crossings of irrigation systems shall be encased in ductile iron or steel conduit. Irrigation systems installed in the medians of City maintained roadways must also have French drains installed behind the curb and gutter which are piped to a storm system.

Testing and Inspections

Hydrostatic Testing. A section of line that is to be hydrostatically tested, shall be slowly filled with water at a rate which will allow complete evacuation of air from the line. Hand pumps shall not be used for the pressure testing of water mains. Taps used for testing purposes shall be removed after testing and repaired using a “no lead” brass plug.

When filling the pipeline, it is very important to fill the line slowly to avoid undue impacts associated with surge and to allow air to evacuate the pipeline. After all air has been expelled from the water main, the line shall be tested to a pressure of 150 psi as measured at the lowest elevation of the line for a duration of 2 hours. The testing period shall not commence until all air has been evacuated and the pressure has stabilized. The pressure gauge used in the hydrostatic test shall be calibrated in increments of 10-psi or less. The pressure gauge shall

be liquid-filled and indexed for an operating range of 300-psi or less with a minimum dial size of 4 inches. At the end of the test period, the leakage shall be measured with an accurate water meter.

Any measured leakage not within the allowable limits as specified in the following table shall require repair of the water main and additional testing until the standards are met. For pipe sizes other than those shown, the Contractor shall test within the allowable leakage amounts as specified by AWWA C600-99. All visible leaks shall be repaired regardless of the amount of leakage.

Maximum Leakage Allowed with Hydrostatic Testing

Pipe Size (inches)	Allowable Leakage at 200-psi (Gal/Hr per 1000 feet of pipe)
4	0.38
6	0.57
8	0.76
10	0.96
12	1.15
16	1.53
20	1.91
24	2.29
30	2.87
36	3.44
42	4.01

Disinfection. All additions or replacements to the water system shall be disinfected with chlorine in conformance with AWWA C651 before being placed in service under the supervision of the City's designated inspector in the following manner:

Taps shall be made at the control valve at the upstream end of the line and at all extremities of the line including valves.

A solution of water containing 70% High Test Hypochlorite (HTH) available chlorine shall be introduced into the line by regulated pumping at the control-valve tap. The solution shall be of such a concentration that the line shall have a uniform concentration of not less than 50-ppm and not more than 100-ppm total chlorine immediately after chlorination. The chart below shows the required quantity of 70% HTH compound to be contained in solution in each 1000 feet section of line to produce the desired concentration from 50-ppm to100 ppm.

Required Hypochlorite Concentration

Pipe Size (inches)	Pounds of High Test Hypochlorite (70%) to reach 50-ppm (per 1,000 feet of line)	Pounds of High Test Hypochlorite (70%) to reach 100-ppm (per 1,000 feet of line)
6	0.88	1.76
8	1.56	3.12
10	2.42	4.84
12	3.50	7.00
14	4.76	9.52
16	6.22	12.44
20	9.76	19.52
24	14.00	28.00
30	21.86	43.72
36	31.47	62.94
42	42.85	85.70

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

HTH solution shall remain in lines for no less than 24 hours or as directed by the City's designated inspector.

Extreme care shall be exercised at all times to prevent the HTH solution from entering existing mains.

Free residual chlorine after 24 hours shall be at least 10 ppm or City will require that the lines be re-chlorinated.

Flushing. Flushing of lines may only proceed after 24 hours of disinfection contact time and as directed by City staff, provided the free residual chlorine analysis is satisfactory. At the completion of disinfection, chlorinated water flushed from the water main shall be disposed of in conformance with all Federal, State and local regulations. In accordance with all applicable regulations, a neutralizing chemical shall be applied to minimize chlorine residual in the flushing water before discharging from the water main, unless an alternate plan is submitted in writing and approved by the City. Water used for disinfection shall be flushed from the water main until the chlorine residual concentration is below 5-ppm before initiating sampling.

Bacteriological and Turbidity Sampling. The City of Goldsboro Public Water Treatment Plant will provide testing.

Tracer Wire and Marker Tape Testing. Testing of the tracer wire and tape shall be performed by the Contractor at the completion of the project to assure they are all working properly. It is the Contractor's responsibility to provide the necessary equipment to test the markers. Any defective, missing, or otherwise non-locatable units shall be replaced.

Repair and Rehabilitation

- Joint leaks of Ductile Iron Pipe shall be repaired by using a bell joint leak repair clamp approved by the City or otherwise replacing the damaged pipe and reconnecting with a mechanical joint sleeve connection.

- Line Breaks or Punctures shall be repaired by a full circle repair clamp as approved by the City or otherwise replacing the damaged pipe and reconnecting with a mechanical joint sleeve connection.

- Line Splits or Blow Outs shall be repaired by replacing the damaged section with C-900 PVC with a restrained sleeve connection at each end.

- Asbestos Cement Pipe to PVC or Ductile Iron Pipe transitions shall use a Krausz Hymax or Romac Macro HP coupling with different end diameters sized specifically for the pipe materials and pipe outside diameter at each end.

- All water main point repairs shall be replaced with C-900 in accordance with these Specifications and backfilled with crush and run stone compacted to 95% maximum dry density as specified elsewhere in this manual.

- Water Service Line Repairs

    - A water service line severed between the water main and the water meter shall be repaired using polyethylene tubing and "no lead" brass 3 piece compression unions.
    - Galvanized service lines shall require saddle installation with new polyethylene tubing and "no lead" brass 3 piece compression unions to the meter.
    - New installations on galvanized service lines shall be plugged at the tap.
    - A corporation stop pulled out of a PVC pipe water main shall have a new service saddle and a new "no lead" brass corporation stop installed on the water main.

- A corporation stop pulled out of a ductile iron pipe shall have a full circle repair clamp placed over the old tap hole. A new tap shall be made and a new “no lead” brass corporation stop installed on the water main.

SECTION 7 – CROSS CONNECTION CONTROL

Approved Backflow Prevention Assemblies

The following are the approved types of "backflow prevention assemblies" for use within the town to prevent backflow into the City of Goldsboro's public potable water system. All backflow prevention devices shall have received approval of their design and construction from the American Society of Sanitary Engineers (ASSE), or the American Water Works Association (AWWA), or USC, or the Foundation for Cross Connection Control and Hydraulic Research, whichever is most restrictive. All backflow prevention assemblies with brass components shall meet the requirements of the 2011 Reduction of Lead in Drinking Water Act. All brass parts shall be 'no lead' brass and meet UNS C89833 as per ASTM B584.

- Air gap. An "air gap" is a physical separation between the free-flowing discharge end of a potable water supply pipeline and an open or non-pressure receiving vessel. An "approved air gap" shall be at least double the diameter of the supply pipe measured vertically above the overflow rim of the vessel - in no case less than 1 inch (2.54 cm).
- Atmospheric Type Vacuum Breaker (AVB). An "atmospheric type vacuum breaker" (also known as the "non-pressure type vacuum breaker") is a device containing a float-check, a check seat, and an air inlet port. The flow of water into the body causes the float to close the air inlet port. When the flow of water stops, the float falls and forms a check valve against back siphonage and at the same time opens the air inlet port to allow air to enter and satisfy the vacuum. A shutoff valve immediately upstream may be an integral part of the device. An atmospheric vacuum breaker is designed to protect against a non-health hazard (isolation protection only) under a back siphonage condition only.
- Double-Check Valve Assembly [DCVA]. A "double-check valve assembly" is an assembly composed of two independently acting, approved check valves, including tightly closing shut-off valves attached at each end of the assembly and fitted with properly located test cocks. This assembly shall only be used to protect against a non-health hazard (i.e., pollutant).
- Double-Check-Detector Assembly [DCDA]. A "double-check-detector assembly" is a specially designed assembly composed of a line-size approved double-check valve assembly with a specific bypass water meter and a meter-sized approved double-check valve assembly. The meter shall register (in U.S. gallons) accurately for only very low rates of flow and shall show a registration for all rates of flow. This assembly shall only be used to protect against a non-health hazard (i.e., pollutant).
- Reduced Pressure Principle Backflow Prevention Assembly [RP]. A "reduced pressure principle backflow prevention assembly" is an assembly containing within its structure a minimum of two (2) independently acting, approved check valves, together with a

hydraulically operating, mechanically independent, pressure differential relief valve located between the check valves and at the same time below the first check valve. The first check valve reduces the supply pressure to a predetermined amount so that during normal flow and at cessation of normal flow, the pressure between the checks shall be less than the supply pressure. In case of leakage of either check valve, the pressure differential relief valve, by discharge to atmosphere, shall operate to maintain the pressure between the checks less than the supply pressure. The unit shall include tightly closing shutoff valves located at each end of the assembly and each assembly shall be fitted with properly located test cocks. The assembly is designed to protect against a health hazard (i.e., contaminant). The Reduced Pressure Principle Backflow Prevention Assembly shall not be installed in a vertical configuration.

- Reduced Pressure Principle-Detector Assembly [RPDA]. A "reduced pressure principle-detector assembly" is a specially designed assembly composed of a line-size approved reduced pressure principle backflow prevention assembly with a specific bypass water meter and a meter-sized approved reduced pressure principle backflow prevention assembly. The meter shall register (in U.S. gallons) accurately for only very low rates of flow and shall show a registration for all rates of flow. This assembly shall be used to protect against health hazard (i.e., contaminant). The Reduced Pressure Principle Detector Assembly shall not be installed in a vertical configuration.
- Pressure Type Vacuum Breaker [PVB]. A "pressure type vacuum breaker" is an assembly containing an independently operating internally loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve. The assembly is to be equipped with properly located test cocks and tightly closing shutoff valves attached at each end of the assembly. This assembly is designed to protect against a health hazard (i.e., contaminant) under a back siphonage condition only.
- Residential Dual Check (RDC). A "residential dual check valve" is an assembly, without test cocks or ports, containing two independently operating spring loaded, poppet type check valves, in series, which can be easily removed and replaced. This assembly is suitable for installation in a water meter vault or pit, below ground.

Installation of Assemblies

All new construction plans and specifications, when required by these Specifications, or by the North Carolina Building Code, to have cross connection control devices, shall be made available to the City of Goldsboro for review and approval and to determine the degree of hazard. All backflow prevention assemblies shall be installed in accordance with these Specifications and/or in the latest edition of the North Carolina Building Code, whichever is most restrictive. All backflow prevention assemblies shall be installed in accordance with the manufacturer's instructions. All backflow prevention assemblies connected to piping 2 ½

inches in diameter or larger shall be provided with gate valves on each side of the backflow prevention assembly. Each of these gate valves shall be operated by an outside screw and yoke assembly with a hand wheel. Non rising stem gate valves will not be acceptable.

In the event of a conflict between a manufacturer's instructions for installation and the North Carolina Building Code, the North Carolina Building Code shall prevail. In the event of a conflict between these Specification and a manufacturer's instructions for installation, these Specifications shall prevail, unless judged otherwise by the City. All double-check valve assemblies must be installed in a location in which no portion of the assembly can become submerged in any substance under any circumstance. Pit and/or below grade installations are prohibited. Double-check valve assemblies may be installed in a vertical position with prior approval from the City of Goldsboro, provided the flow of water is in an upward direction and the double check assembly is approved for vertical installation by the manufacturer. Reduced pressure principle backflow prevention assemblies must be installed in a horizontal position and in a location in which no portion of the assembly can become submerged in any substance under any circumstance. Pit and/or below grade installations are prohibited. All backflow prevention assemblies installed outdoors shall be provided with a weatherproof enclosure, which is capable of preventing freezing of these backflow prevention assemblies and any related valves and piping. Assemblies 2.5-inches and greater shall be installed in heated enclosures. The customer is responsible to make sure a backflow prevention assembly is working properly upon installation.

The consumer shall, at his own expense, conduct testing of a backflow prevention assembly. Tests shall be conducted within ten (10) days of installation, and annually thereafter, with a record of all testing and repairs retained by the consumer. Each consumer shall send a copy of the test report, certified by the Certified Backflow Prevention Assembly Technician, for each test to the City within thirty (30) days after the completion of each test. The consumer is required to furnish the following information to the City of Goldsboro on each test report for the following types of backflow prevention assemblies:

- Types of assemblies requiring test reports:
    - Double-check-detector assembly (DCDA)
    - Double-check valve assembly (DCVA)
    - Pressure vacuum breaker (PVB)
    - Reduced pressure principle detector assembly (RPDA)
    - Reduced pressure principle backflow preventer assembly (RP)
- Information required in a test report:
    - Service address where assembly is located.
    - Owner (and address, if different from service address).
    - Description of assembly's location.

- Date of installation.
- Installer (include name, plumbing company represented, plumber's license number).
- Type of assembly and size of assembly.
- Manufacturer, model number, serial number.
- Test results/report.
-

When it is not possible to interrupt water service, provisions shall be made for a "parallel installation" of backflow prevention assemblies. The City of Goldsboro will not accept an unprotected bypass around a backflow preventer. Any and all water meter bypasses shall be locked, tagged and the tag dated with the last date that it was secured.

Testing and Test Equipment

Backflow prevention assembly tests shall be conducted upon installation and annually thereafter or at a frequency established by the City of Goldsboro. Following installation, all RP, DCVA, PVB, DCDA, and RPDA are required to be tested by a town certified back-flow prevention assembly technician within 10 day.

All certified backflow prevention assembly technicians must obtain and employ backflow prevention assembly test equipment, which has been evaluated and/or approved by the City of Goldsboro. All test equipment shall be registered with the City of Goldsboro and shall be checked for accuracy annually (at a minimum), calibrated if necessary, and certified to the City of Goldsboro as to such accuracy/calibration, employing a calibration method acceptable to the City of Goldsboro.

SECTION 8 – WASTEWATER

Wastewater Collection Systems

Design

All public sanitary sewer mains shall be installed in dedicated street right of way or in dedicated utility easements. Mains installed in City right of way shall be located in the center of pavement or as otherwise approved. Mains within easements shall be centered within the easement. Mains located within NCDOT right of way shall be placed in accordance with NCDOT standards.

In preparing engineering design plans for sanitary sewer mains, all elevations shall be tied to NC grid system and the benchmark shall be described on the plans.

All private sewer collection mains inside the City of Goldsboro service area that will connect or are planning to discharge into the City sewer system shall comply with all City of Goldsboro design, siting and installation criteria outlined herein. The Owner of the private sewer collection system shall meet all State design requirements and obtain a State permit to operate the private system.

Gravity mains shall be installed in dedicated public right of way or in dedicated utility easements as follows:

Standard Easement Width for Sanitary Sewer Mains

Pipe Size (diameter)	Pipe Depth (feet)	Easement Width (feet)
8-inch to ≤ 12-inch	10-ft or less	20-ft
8-inch to ≤ 12-inch	10-ft - 12.5-ft	25-ft
8-inch to ≤ 12-inch	12.5 - 15-ft	30-ft
8-inch to ≤ 12-inch	15-ft - 17.5-ft	35-ft
8-inch to ≤ 12-inch	17.5-ft - 20-ft	40-ft
> 12-inch to ≤ 24-inch	15-ft or less	30-ft
> 12-inch to ≤ 24-inch	15-ft - 17.5-ft	35-ft
> 12-inch to ≤ 24-inch	17.5-ft - 20-ft	40-ft
Greater than 24-inch	Any Depth	As Determined by the City
Any Size	Deeper than 20-ft	

Dedicated easements for sewer mains and appurtenances shall be recorded as “City of Goldsboro Permanent Utility Easement”. City of Goldsboro sewer easements shall contain

only City of Goldsboro utilities unless otherwise approved by the site plan or an encroachment agreement.

No permanent structures, equipment, retaining walls, embankments, impoundments, or other elements that would inhibit maintenance operations shall be constructed within a sewer main easement. Fences may be allowed across easements provided that appropriate access gates have been installed to allow utility maintenance. In all cases, the City of Goldsboro shall have access to secured access gates. Fill or cut slopes are not allowed to extend into easements without full development plan approval or an approved encroachment agreement from the City. All such pre-existing or planned conditions as noted herein that would impact operations and maintenance within the noted sewer main easement shall be noted and disclosed during the site plan approval process. Pre-existing conditions that are not disclosed during the site plan review may nullify the approval and require relocating the sewer easement where there are no existing conflicts.

Sewer line easements shall be graded smooth, free from rocks, boulders, roots, stumps, and other debris, and seeded and mulched upon the completion of construction. Easements across sloped areas shall be graded uniformly across the slope to no steeper than a 5 to 1 ratio.

Mains paralleling a creek shall be of sufficient depth to allow lateral connections below the stream bed elevation. The top of the sewer main and laterals shall be at least one foot below the stream bed. Concrete encasement and ductile iron pipe shall be required when the cover between the top of the pipe and the stream bed is less than 3 feet.

Mains shall not be installed under any part of water impoundments. The following minimum horizontal separations shall be maintained:

- 100 feet from any private or public water supply source, including wells, WS-1 waters or Class I or Class II impounded reservoirs used as a source of drinking water (except as noted below)
- 50 feet from wetlands and any waters (from normal high water) classified WS-II, WS-III, B, SA, ORW, HQW or SB (except as noted below)
- 10 feet from any other stream, lake, or impoundment (except as noted below)
- With approval directly from PERCS, the following separations may be acceptable when water main standards are implemented:
    - All appurtenances shall be outside the 100 foot radius of wells.
- 25 feet from private wells (with no exceptions)
- 50 feet from public water wells (with no exceptions)

Where the required minimum separations cannot be obtained sewer pipe, ductile iron pipe shall be used with joints equivalent to water main standards.

Sewer mains shall always be extended along natural drainage courses to all adjacent upstream property lines.

Gravity sewer mains shall be deep enough to serve the adjoining property and allow for sufficient slope in lateral lines. Gravity sewer pipe shall have the following minimum covers:

- 4 feet from the top of pipe to finished subgrade in roadways.
- 3 feet from the top of pipe to finished grade outside roadways.

Sewer mains over 20 feet deep require ductile iron for the entire run between manholes. Sewer mains 14 feet to 18 feet along or in roadways shall also require ductile iron pipe for the entire run between manholes. The maximum depth of sewer along or in roadways shall be 18 feet.

In all cases where fill material is added above existing sewer mains, the Engineer of Record shall prepare a structural analysis of the existing pipeline and determine if it is capable of supporting additional loading. If the additional fill material exceeds AWWA, DIPRA, UNIBELL and/or manufacturer standards for loading, the pipeline shall either be reinforced to adequately support the additional loading or replaced with a ductile iron pipe rated to support the added loading.

Separation Between Sanitary Sewer and Storm Water Pipes. Sewer mains shall have a minimum vertical separation of 24 inches between storm pipes when the horizontal separation is 3 feet or less. Where sanitary and storm sewers cross with a vertical separation of less than 24 inches, the entire leg of sanitary sewer shall be made of standard ductile iron pipe with joints rated for water main service and the void space between the pipe crossing shall be backfilled with 3000-psi concrete or quick setting, minimum 500-psi, non-excavatable flowable fill that meets or exceeds NCDOT Specifications.

Separation Between Sanitary Sewer and Sewer Force Main. There shall be a minimum 7 foot horizontal separation between parallel gravity and/or force mains when the depth of installation is 8-ft or less. Otherwise, the minimum horizontal separation between pipelines shall be 10-ft up to 10-ft depth of installation. Otherwise, a project specific design shall be implemented.

Separation Between Sanitary Sewer and Water Main.

- Parallel Installations: 10-ft lateral separation (pipe edge to pipe edge) or minimum 3-ft lateral separation, and water line at least 18-inches above sanitary sewer line measured vertically from top of sewer pipeline to bottom edge of water main. In unique cases where the sanitary sewer and the water main are installed with at least 3-ft of lateral separation but less than 10-ft of horizontal separation, and less than 18-inches of vertical

separation, both the water main and sanitary sewer shall be constructed of ductile iron pipe with joints in full compliance with water main standards.

- Crossings (Water Main Over Sewer): All water main crossings of sewer lines shall be constructed over the sewer line in conformance with City of Goldsboro Specifications. At a minimum, 18-inches of clearance shall be maintained between the bottom edge of the water main and the top edge of the sewer main. If 18-inches of clearance is not maintained, the water main and sanitary sewer main shall:

    - Both lines shall be constructed of ductile iron pipe with joints in conformance with water main construction standards.
    - The sanitary sewer pipe shall be ductile iron the entire run from manhole to manhole.
    - The void space between the pipes shall be filled with minimum 500-psi, quick setting non-excavatable flowable fill extending 3-ft on both sides of the crossing. Regardless of pipe material, at least 12-inches of vertical separation is required for sanitary sewer crossings of potable water mains.

- Crossings (Water Main Under Sewer Line): Allowed only as approved by City of Goldsboro, when it is not possible to cross the water main above the sewer line. At a minimum, 18-inches of separation shall be maintained, (measured from pipe edge to pipe edge) and the sanitary sewer shall be constructed of ductile iron in conformance with water main construction standards the entire run from manhole to manhole. If local conditions prevent providing 18-inches of clearance, then at least 12-inches of clearance shall be provided and the void space between the pipes shall be filled with minimum 500-psi, quick setting, non-excavatable flowable fill extending at least 3-ft on both sides of the crossing.

Main Size, Slope and Design Criteria

Public gravity mains shall be a minimum of 8 inches in diameter. Major interceptors shall be sized appropriately using the following flow factors. At a minimum, all gravity sewer mains shall be designed and sized to serve the ultimate tributary buildout of the drainage basin.

Residential flow rates

Land Use	**Flow Factor**
Single Family Residential	280 gpd per dwelling unit
Multi-Family Residential	100 gpd per bedroom

For non-residential flow rates, use the current flow factors as required by the North Carolina Department of Environmental Quality.

The ratio of peak to average daily flow shall be 3.3.

Sanitary sewers shall be designed to carry the projected peak flow at no more than 2/3 full. The minimum velocity for sanitary sewer lines shall be 3-fps. Sanitary sewers shall be sized based on Manning's Equation with Manning's roughness coefficient "n" = 0.013 or greater. Pipe diameter sizes used in the calculation of Manning's Equation shall be nominal pipe sizes.

The minimum grades for public sanitary sewers shall be as follows:

Minimum Slopes for Gravity Sewer Mains

Main Size (diameter in inches)	**Minimum Slope (feet per 100 feet) V=3fps; 2/3 Depth**
8	0.61
10	0.46
12	0.36
14	0.29
15	0.27
16	0.25
18	0.21
21	0.17
24	0.14
27	0.13
30	0.11
36	0.09

The minimum grade for the uppermost reach of a sanitary sewer line shall be 1% regardless of sewer line size.

The maximum grade for sanitary sewers is 10%. The maximum velocity in sanitary sewers is 15 ft/sec. These limits may only be exceeded with the approval of the City and the incorporation of the following provisions, which apply to all sewers either designed or installed at grades equal to or exceeding 10%:

- All sewers with a grade of 10% or higher must have the downstream run of pipe installed with ductile iron pipe.

- High velocity manholes shall be used on all sewers with a grade of 10% or higher. High velocity lines cannot tie directly to an existing line and must proceed 180° through the invert into the downstream line.
- Concrete thrust collars shall be installed on all sewers designed at grades of 10% or higher. The anchors shall be installed at the following spacing:
    - Not over 36' center to center on grades from 10% to 25%
    - Not over 24' center to center on grades from 25% to 40%
    - Not over 16' center to center on grades exceeding 40%

- The Town reserves the right to require all high velocity requirements outlined herein for sewer lines either designed or installed at grades of 10% or greater, regardless of the flow velocity. In cases where the design grade established on the sewer design plan is exceeded during construction and the10% threshold is exceeded, all high velocity requirements shall apply without waiver.

Sewer extensions shall be designed for projected flows, even when the diameter of the receiving sewer is less than the diameter of the proposed extension. All pipe diameter changes shall occur only in manholes, with the invert of the larger pipe lowered sufficiently to maintain the same energy gradient. An approximate method of obtaining this result is to place the 0.8 depth point of both sewers at the same elevation. As an alternative, the crown of the incoming pipes may be designed for an elevation at or above the crown of the outgoing pipe. All transitions of pipe material, pipe separations, grade changes and all angular deflection changes shall occur only at manholes. Pipe trench excavation and backfilling shall be performed in accordance with these Specifications.

Materials

Ductile Iron Pipe. Ductile Iron Pipe shall be designed and manufactured in accordance with AWWA C150 and C151 and provided in nominal 20-ft lengths. The minimum requirements for ductile iron pipe and required laying conditions are tabulated below. For all other installations other than specified, the laying condition, bedding requirements or the minimum pressure class rating and/or thickness class shall be increased in accordance with AWWAC151. A pipe thickness design shall be submitted for external loading in all cases where the pipe depth exceeds the specified range of depths outlined in the following table.

Pressure Class, Max. Depth and Laying Condition for DI Sewer Mains

Pipe Diameter	AWWA C-150, Laying Condition	Pressure Class (psi)	Max Depth of Cover
8 inch	type 1	350	3-16 feet
8 inch	type 4	350	16-34 feet
10-12 inch	type 1	350	3-10 feet
10-12 inch	type 4	350	10-28 feet
10-12 inch	type 5	350	28-44 feet
14-20 inch	type 4	250	3-22 feet
14-20 inch	type 5	250	22-30 feet
14-20 inch	type 5	350	30-38 feet
24-30 inch	type 4	250	3-19 feet
24-30 inch	type 5	300	19-29 feet
24-30 inch	type 5	350	29-33 feet
36-42 inch	type 4	300	3-20 feet
36-42 inch	type 5	350	20-32 feet

For cases not specified, a ductile iron pipe and bedding design certified by a Professional Engineer licensed in the State of North Carolina shall be required in compliance with AWWA C150 and the Ductile Iron Pipe Research Association.

In cases where thickness class designation of ductile iron pipe is specified, the corresponding thickness class designations are as outlined in the table below.

Ductile Iron Pipe Thickness Class

Pipe Diameter	Pressure Class (psi)	Nominal Thickness (inches)	Minimum Corresponding Thickness Class
4	350	0.25	51
6	350	0.25	50
8	350	0.25	50
10	350	0.26	50
12	350	0.28	50
14	250	0.28	50
16	250	0.30	50
18	250	0.31	50
20	250	0.33	50
24	250	0.37	50
24	300	0.40	51
30	250	0.42	51
30	300	0.45	52
36	300	0.51	52
36	350	0.56	53
42	300	0.57	52
42	350	0.63	53

Pipe joints shall be of the push-on type as per AWWA C111.

For 10-inch diameter and smaller gravity sewer mains, pipe lining shall be cement mortar with a seal coat of bituminous material, all in accordance with AWWA C104.

For 12-inch diameter and larger gravity sewer mains, all ductile iron pipe and fittings for sewer construction shall receive an interior ceramic epoxy coating, consisting of an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment, as manufactured by Protecto 401. The interior coating shall be applied at a nominal dry film interior thickness of 40-mils. All DIP bells and spigots shall be lined with 8-mils of joint compound by Protecto 401 or approved equal applied by brush to ensure full coverage. All pipe supplied with Protecto 401 interior lining shall be provided free of holidays. Pipe installed with defects in the lining will be rejected and required to be replaced. Patching of Protecto 401 coating defects after installation shall not be approved. Protecto 401 lined pipe must be installed within one year of the application date on the pipe.

All buried DIP and fittings shall have bituminous coating on the exterior surface in accordance with AWWA C151. Pipe shall be supplied in minimum 20-ft lengths.

All ductile iron pipes shall be marked in conformance with ASTM A-746.

Solid Wall PVC Pipe. PVC Pipe shall be solid wall and made of PVC plastic having a cell classification of 12454 or 12364 (with minimum tensile modulus of 400,000 psi) as defined in Specification D1784. PVC pipe shall have integral wall bell and spigot joints for the conveyance of domestic sewage and shall be supplied in minimum14 or 20 foot lengths. Fittings shall be made of PVC plastic having a cell classification of 12454-B, as defined in ASTM D1784.

All PVC gravity sewer pipe and PVC fittings up to 15-inches in diameter shall be manufactured in accordance with the latest version of ASTM D3034. All solid wall PVC pipe installed at diameters from 18-inches to 27-inches in diameter shall be manufactured in conformance with ASTM F679 and provided at minimum pipe stiffness of 115-psi. Fittings must be manufactured by pipe supplier or approved equal, and have bell and/or spigot configurations compatible with that of the pipe. PVC pipe shall be installed in accordance with the requirements of this Specifications manual and ASTM D2321.

All PVC pipe up to and including 15 inches in diameter shall have a maximum Standard Dimension Ratio (SDR) of 35 for depth of installation no shallower than 4-ft of cover from the pipe crown and no deeper than 14-ft measured from the bottom of the pipe. All solid wall PVC pipe for depth of installation greater than 14-ft shall have a maximum Standard Dimension Ratio (SDR) of 26. Solid wall PVC pipe shall not be approved for depths of installation greater than 20-ft. All solid wall PVC pipe shall be marked and certified in conformance with ASTM D3034 or ASTM F679.

PVC Pipe Sizing and Minimum Wall Thickness

Nominal Pipe Diameter (inches)	Outside Diameter (inches)	Minimum Wall Thickness SDR 35 (inches)	Minimum Wall Thickness SDR 26 (inches)
8	8.400	0.240	0.323
10	10.500	0.300	0.404
12	12.500	0.360	0.481
15	15.300	0.437	0.588
18	18.701		0.720
21	22.047		0.849
24	24.803		0.956
27	27.953		1.077

Note: SDR 35 not approved for pipe diameters greater than 15-inches and for depths greater than 14-ft.

Sewer Main Installation. Pipe trench excavation and backfilling shall be performed in accordance with these Specifications. Transitions of pipe material, pipe separations, grade changes and all angular deflection changes shall occur only at manholes. All sewer mains installed with less than 4-ft of cover or deeper than 20-ft shall be ductile iron pipe.

Pipe and fitting interiors shall be protected from foreign matter and shall be inspected for damage and defects prior to installation. In the event foreign matter is present in pipe and fittings, it shall be removed before installation. Open ends of pipe shall be covered and protected when pipe laying is not in progress to prevent debris from entering the pipe.

All pipes shall be constructed with at least 48 inches of cover below the finished grade. Pipe shall be laid on true lines as directed by the Engineer. Trenches shall be sufficiently wide to adjust the alignment. Bell holes shall be dug at each joint to permit proper joint assembly. The pipe shall be laid and adjusted so that the alignment with the next succeeding joint will be centered in the joint and the entire pipeline will be in continuous alignment both horizontally and vertically. Pipe joints shall be fitted so that a thoroughly watertight joint will result. All joints will be made in conformance with the manufacturer's recommendations for the type of joint selected.

Prior to beginning construction, the Contractor shall contact local utility companies and verify the location of existing utilities. The Contractor shall be completely and solely responsible for locating all existing buried utilities inside the construction zone before beginning excavation. The Contractor shall be solely responsible for scheduling and coordinating the utility location work. When an existing utility is in conflict with construction, it shall be exposed prior to beginning construction to prevent damage to the existing utility.

Embedment Material. Bedding and embedment material classifications shall be defined as follows:

- CLASS I - Angular, (1/4 to 1-1/2 inch) graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, crushed gravel, and crushed shells.
- CLASS II - Coarse sands and gravels with maximum particle size of 1-1/2 inch, including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW and SP are included in this class.
- CLASS III - Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures, Soil Types GM, GC, SM, and SC are included in this class.

- CLASS IV - Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH and CL are included in this class. These materials shall not be used for embedment.

Class I foundation material consisting of ¼-inch to 1½ -inch graded stone shall be required in addition to standard bedding and embedment for all sewer installations, regardless of pipe material, when the trench bottom is unstable due to water, rock, infiltration or soil type.

All bedding, embedment and backfill materials shall be compacted to a minimum of 95% Standard Proctor density regardless of material. In instances where compliance with compaction requirements is questionable as determined by the City, testing shall be provided by the Contractor and a reputable licensed Geotechnical Engineer to verify compliance.

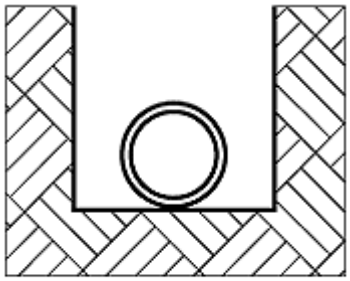
In any area where the pipe will be installed below existing or future ground water levels or where the trench could be subject to inundation, additional Class I material shall be used for bedding.

If hydraulic jack shoring is utilized for trench walls, it shall be restricted to the area just above the top of the pipe. This will ensure the embedment materials and pipe will not be disturbed when the shoring is removed.

DIP Specific Installation Requirements. Ductile iron pipe shall be installed in accordance with the requirements of AWWA C600 and the Ductile Iron Pipe Handbook published by the Ductile Iron Pipe Research Association. Materials at all times shall be handled with mechanical equipment or in such a manner to protect them from damage. At no time shall pipe and fittings be dropped or pushed into ditches.

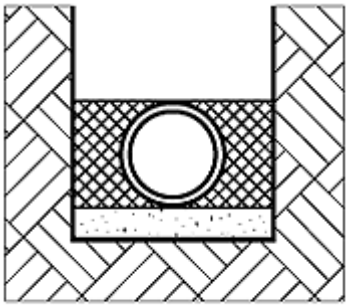
Pipe shall be installed at laying conditions as specified herein and identified by the plan drawings. Laying conditions for ductile iron pipe shall be as described in AWWA C151 and the Ductile Iron Pipe Research Association. Laying conditions shall be defined as follows:

Type 1: Flat Bottom Trench with Pipe Resting on Stable Undisturbed Earth. Unstable conditions such as wet trench bottoms, intermediate rock layering, partially weathered rock, and other unsuitable soil conditions shall require utilizing more stringent laying conditions. At a minimum, Type 4 laying condition shall be utilized with a minimum of 4- inches of bedding to overcome unstable conditions. For severe unstable soil conditions, undercut excavation and an engineer designed foundation plan shall be provided prior to pipeline installation.



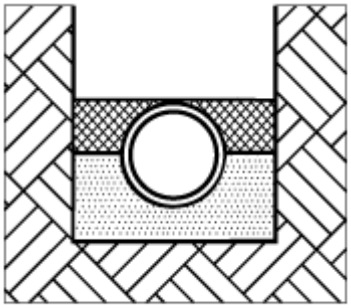
Type 1*

Type 4: Pipe bedded in Class 1 material, No. 67 or No. 78 crushed stone to a depth of 1/8 pipe diameter or a minimum of 4-inches. Embedment material consisting of Class 1, Class 2 or Class 3 materials shall be compacted to the top of the pipe greater than 95% Proctor. Careful attention must be allocated to compacting embedment material under the bottom edges of the pipe.



Type 4

Type 5: Pipe bedded in Class 1 material, No. 67 or No. 78 crushed stone to the center of the pipe and extending a minimum of 4-inches under the pipe. Granular or select embedment, consisting of Class 1 or Class 2 materials, compacted to greater than 95% Proctor installed to the top of the pipe.



Type 5

PVC Specific Installation Requirements. The installation of PVC Pipe shall satisfy the requirements of the manufacturer, and/or the following, whichever is more stringent. For PVC pipe, the pipe shall be produced with bell and spigot end construction. Joining shall be accomplished by rubber gasket in accordance with manufacturer's recommendation. Flexible watertight elastomeric seals in accordance with ASTM D3212-1 may also be used. Each pipe length shall be clearly marked with information including pipe size, profile number and class number.

Installation of PVC pipe shall follow the recommendations of ASTM D-2321 "Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications". For PVC pipe installation, bedding and embedment material shall be Class I, typically No. 67 or No. 78 washed stone. Bedding and embedment materials for PVC gravity sewers other than No. 67 or No. 78 washed stone shall be approved by the City of Goldsboro prior to use.

Typical bedding and embedment for SDR35 PVC Gravity Sewers, 4-ft to 14-ft in depth shall consist of minimum 4-inches of No. 67 or No. 78 stone installed under the pipe. Embedment shall extend to the top of the pipe. Bedding and embedment shall be compacted to 95% standard proctor density. Careful attention shall be placed on compacting embedment under the haunches of the pipe to prevent any potential voids.

Typical bedding and embedment for SDR26 PVC Gravity Sewers, 14-ft to 20-ft in depth shall consist of minimum 6-inches of No. 67 or No. 78 stone installed under the pipe. The embedment, consisting of the same material, shall extend 6-inches above the crown of the pipe. Bedding and embedment shall be compacted to 95% standard proctor density. Careful attention shall be placed on compacting embedment under the haunches to prevent any potential voids.

The bedding and embedment materials shall be in accordance with ASTM D-2321. The embedment materials shall be installed from trench wall to trench wall. The maximum allowable deflection after installation shall BE LESS THAN 5% for PVC pipe. All PVC pipe shall be stored properly to prevent UV damage prior to installation. Any PVC pipe with visible fading caused by UV radiation from sunlight shall be rejected. All PVC pipe shall be free from nicks, scratches and gouges at the time of installation. Such defects can impact the strength of PVC pipe and all pipes with visible gouges shall be rejected.

Pipe Identification and Marking. Marking tape shall be installed continuously and longitudinally along all sanitary sewer mains for new construction and for any repair or retrofit construction using open trench methods. For service connections, the marking tape shall extend from the main line to the cleanout at the right-of-way/easement. Marking tape shall be installed directly above the center of the pipe and at least 16-inches deep from final grade to a maximum depth of 24-inches below final grade.

The marking tape shall be made of polyethylene (or approved equivalent) material, 6-inches wide and a minimum of 6 millimeters thick. The marking tape shall have detectable markers embedded in the tape and spaced adequately to provide continuous detection along the tape from above the buried pipe at final grade. The tape shall be green in color and shall be marked with words “CAUTION SEWER LINE BURIED BELOW” (or an approved equivalent wording). The wording shall be repetitive along the full length of the tape.

Manholes

Location Sizing and Design. Manholes shall be spaced at a maximum distance of 400 feet for lines 12 inches in diameter or less, and 500 feet for lines greater than 12 inches in diameter. Manholes shall be installed at each deflection of line and/or grade. The flow channel through manholes shall have a uniform and smooth finish free of irregularities or obstructions. The invert channel shall conform to the shape and slope of the entering/exiting sewer line. Either pre-cast or brick and mortar inverts may be used. When sewers of uniform slope pass through a manhole, the slope shall be maintained and the invert at the center of the manhole shall be provided. When sewers change slope at a manhole, the incoming and outgoing invert elevations will be given on the plan drawings.

The maximum flow deflection angle in a manhole shall be dependent upon pipe size as shown in the following table. Sufficient drop shall be provided in the manhole to compensate for energy loss caused by the change of alignment. A minimum drop of 0.1-ft is required for a change of alignment greater than 30-degrees.

Maximum Allowable Flow Deflection

Pipe Size (largest pipe controls)	Maximum Deflection Angle per Manhole
8-10 inch diameter	90 degrees
12-20 inch diameter	75 degrees
>20-inch diameter	60 degrees

Free falls of wastewater flow into the manhole invert from incoming sewer mains shall not be allowed, except under limited circumstances.

In certain isolated circumstances standard free drops may be allowed, not exceeding 20-inches, when pipe diameter changes occur at a manhole. In these cases, the smaller diameter pipe crown shall be positioned no higher than the larger diameter pipe crown to limit the drop. When free drops are necessary due to pipe size changes, the Contractor shall take preventive measures to prevent free drops into the manhole invert, such as building a flume or trough up to the incoming invert, or piping the flow to the primary invert flow channel.

Drop manholes are not allowed without the written approval of the City of Goldsboro. While certain physical constraints may dictate the need for drop manholes, they may not be used merely to decrease trenching depth. Upstream slope changes shall be used to avoid the need for drop manholes. In the event that drop manholes are required, they shall be constructed with an outside drop connection. The entire incoming sewer main leading to the drop shall be made of ductile iron pipe. Drops shall be concrete encased and constructed in accordance with the Standard Details. Inside drop manholes shall only be allowed in unique circumstances on a limited basis and can only be approved by the City of Goldsboro.

Manholes shall not be obstructed from view or access. It is illegal to bury or obstruct access to manholes.

Manhole covers shall be elevated as follows:

- Roadways: Manholes installed in roadways and road shoulders shall be installed with the cover flush with the top of pavement.
- Outside of Roadways: Manholes installed outside of roadways shall be elevated at least 1-ft above the surface grade unless otherwise noted.
- Wooded Outfalls: All manholes installed in wooded, forested or brushy areas shall be elevated at least 2-ft above the surface elevation.
- 100-Year Flood Zone: All manholes located within the 100-year flood elevation shall be elevated at least 24 inches above the 100-year flood elevation or specify watertight covers and vents that extend at least 24 inches above the 100-year flood elevation.
- Well Maintained Areas: All manholes installed in well maintained areas, such as yards, sidewalks or otherwise inside an improved right-of-way shall be installed flush with the finished surface.

Manholes higher than 30 inches above finished grade shall be constructed with a flat top and outside steps. Manholes shall be provided without interior steps. When connecting a new sewer main to an existing main, the connection shall be established with a “Doghouse” type of manhole inserted over the existing main.

Manhole Sizing. Manholes shall be sized as shown in the following table. The next larger size shall be required if the pipe size, depth, drop connection or number of main line connections warrants a larger size. In consideration of main line connections, all will be considered regardless of type, whether inside drop, outside drop, force main or standard connection.

Manhole Sizing Guide

Manhole Size (diameter)	**Maximum Allowable Pipe Size** (diameter)	**Maximum Depth of Cover** (invert to surface)	**Maximum Depth with Extended Base** (invert to surface)	**Frame and Cover Size (outside of paved areas)** (diameter)	**Maximum Sewer Main Connections** (quantity)
4-ft	8-12 inches	12-ft	25-ft[a]	24-inches	3[b]
5-ft[d]	14-24 inches	12-ft	35-ft	24-inches	2[c]
6-ft[d]	27-42 inches	12-ft	35-ft	36-inches	2[c]
8-ft[d]	48 inches	12-ft	35-ft	36-inches	2[c]
10-ft[d]	54 inches	12-ft	35-ft	35-inches	2[c]

[a]Depths beyond 14-ft in roadways shall require a 5-ft diameter manhole with extended base.

[b]Four connections may be permitted in a 4-ft diameter manhole when the separation between each incoming connection is at least 85°

[c]Additional smaller diameter connections that meet the spacing requirements listed in the *Installation* section may be approved by the City.

[d]Due to the limited manhole wall area that could exist between the invert in and out, some manholes may require upsizing as directed by the City.

All manholes 5-ft in diameter shall be extended to surface elevation with no further reduction in diameter until the eccentric cone section. Manhole transitions for 6-ft and larger diameter manholes are only allowed in the top 5-ft of the manhole. In no case shall the smallest barrel size be less than 5-ft diameter. At least 5-ft of vertical clearance shall be maintained above the pipe crown before transitioning to a smaller diameter riser, or transition shall not be utilized. An eccentric flat slab reducer from 6-ft diameter or larger manhole base sections to 5-ft diameter risers (non-paved areas) or eccentric cones (paved areas) shall be used to make any transition.

Manholes outside of paved areas that are 6-ft in diameter and greater and are too shallow to maintain 5-ft of vertical clearance above the crown of the pipe shall maintain the full manhole diameter up to the design surface elevation and be provided with a flat top slab cover with eccentric hole.

Manholes inside of paved areas that are 6-ft in diameter and greater shall be constructed with an eccentric, flat top reducer to 5-ft diameter and provided with a 5-ft diameter eccentric,

tapered cone at the finished grade. When the depth of the manhole is too shallow to maintain 5-ft of vertical clearance above the crown of the pipe a 3-ft tall eccentric, tapered cone shall be used without any additional 5-ft diameter risers.

Materials

Concrete Manholes. Manholes shall be precast concrete with a minimum compressive strength of 4000-psi and utilize minimum grade 60 rebar in compliance with ASTM C478. All 4-ft and 5-ft diameter manholes and all 6-ft diameter manholes in paved areas shall be provided with eccentric cone sections. Flat top manholes are required in outfall areas for 6-ft and larger diameter manholes.

Precast concrete manholes shall meet all design and manufacturing requirements of ASTM C478 and all H-20 loading requirements. Minimum wall thickness shall be 5-inches and shall increase with depth and diameter in accordance with ASTM standards. The standard joint shall be sealed with a plastic cement putty meeting Federal Specification SS-S-00210, such as Ram-Nek or a butyl rubber sealant. All lift holes must be plugged with non-shrinking grout after installation.

All manholes greater than 5-ft diameter shall have minimum 8-inch (6-inch for 4-ft diameter manholes), 4,000-psi concrete bottoms resting on a minimum of 12 inches of #57 stone. Sewer mains shall enter and exit radially through the manhole. Inverts shall be constructed with a width equal to the effluent pipe and a height equal to 1/2 that of the effluent pipe. Inverts shall be so finished with sufficient drop across the manhole to compensate for all resulting energy loss across the invert. Flat invert channels shall not be allowed. At each inlet and outlet of 8 inches or greater, resilient connectors or manhole boots shall be provided in conformance with ASTM C923. Rings and clamps are to meet standards of ASTM A167 and/or ASTM C923.

Precast manhole components shall not be installed, transported, or removed from the casting yard prior to reaching the minimum compressive strength of 4,000-psi and at least 7 days have elapsed since casting.

Manhole flat slab, eccentric reducers provided for 6-ft diameter and larger manholes shall be provided with minimum slab thickness of 12-inches. Flat slab, eccentric reducers shall not be allowed for manhole diameters less than 6-ft.

Manhole flat top slab covers for outfall manholes 6-ft diameter and greater shall be designed and manufactured for H-20 loading and provided in minimum slab thickness of 8-inches. Manhole flat top covers shall be provided with a minimum clear opening of 36-inches when utilized with a 36-inch clear span manhole frame and cover.

Manhole benches shall slope upwards from the spring line of the pipe to the projected level of the pipe crown at the manhole wall, or 8-inches above the spring line, whichever is less. Bowl type inverts recessed inside of precast benches shall not be accepted.

Manhole Frame and Cover Materials. Manhole Frames and Covers shall be Class 35 gray iron with "Sanitary Sewer" forged into the cover. Ring and cover shall be stamped with make and model. All manhole frames and covers shall be domestically made and manufactured in the USA from domestic iron.

Types:

- Manhole Frames and Covers in Paved Areas and some Unpaved Areas: For all installations in roadways or within the right of way, use Type 1 ring and cover, and place sufficient depth of concrete below the pavement around the ring to ensure contact with manhole. Type 1 covers shall be provided with 1 vent hole. Type 1 covers shall be designed for a proof load of 40,000 lbs. and be provided in Class 35B gray iron in conformance with ASTM A48. At a minimum, Type 1 manhole rings shall weigh 190 lbs. and the cover shall weigh 120 lbs.
- Manhole Frames and Covers for Outfalls: For installation in outfall areas, with 4-ft and 5-ft diameter manholes use Type 2 ring and covers. Type 2 covers shall not be installed in areas subject to traffic loading. Type 2 covers shall be provided with an integrated frame and cover assembly in which the cover rotates away from the frame for access. The rotating assembly shall be provided with a cast in stainless steel rod assembly. Type 2 covers shall be provided with a minimum 24-inch clear span opening along the axis with the stainless steel rod assembly. Security shall be provided by 3 exterior cast lugs at ¾-inch thickness that allow padlock installation or bolting with 3 stainless steel bolts with stainless steel zinc plated nuts. Type 2 covers shall be made of Class 35B iron in conformance with ASTM A48 and designed for a proof load of 12,000 lbs. The frame and cover weight shall not be less than 60-lbs for the cover and 80-lbs for the ring. The Type 2A frame and cover assembly shall be provided with a gasket that makes the cover assembly watertight when bolted at all three lugs. Type 2A covers shall be provided inside the 100-year flood elevation or other areas subject to flooding. Type 2B covers are not watertight and are not required to have a gasket.
- Manhole Frames and Covers for Large Diameter Outfall Manholes: Type 3 ring and cover assemblies shall be provided with a minimum 36-inch clear span opening and utilized for 6-ft diameter or larger manhole installations with eccentric flat top manholes outside of paved areas. (Within paved areas, use standard Type 1 cover on a 5-ft diameter eccentric cone.) The type 3 frame and cover shall be provided with a 36-inch cover with an inset cover of 26-inches in diameter. The frame and cover assembly shall

be provided in the watertight configuration in areas within the 100-year flood elevation or other areas subject to flooding.

All castings shall be machined to give even and continuous bearing on the full length of the frame. Castings shall be free of porosity and blow holes. All manhole frames shall be bolted to the manhole, except in paved streets.

Installation

General. The upstream side of the last manhole(s) of a sanitary sewer line extension under construction shall be plugged by constructing a brick/block wall to prevent the passage of groundwater, runoff and sediment into the sanitary sewer system. All water upstream of the wall shall be pumped out of the sanitary sewer line and all sediment and solids shall be removed and properly disposed of by the Contractor. The wall shall not be removed until the line has been inspected by the City to ensure that all possible points of inflow or infiltration have been eliminated.

Manholes shall not be buried or hidden.

All manhole penetrations, whether sewer main or service lateral, shall be cored with a concrete coring machine. All pipe connections must be made with flexible watertight couplings or boots. For new manholes, there shall be a minimum of 9-inches or ½ the pipe outside diameter (OD), whichever is greater, between the pipe hole openings. (Pipe hole opening is typically 4" greater than the pipe OD.) When the adjacent pipes are different sizes, the OD of the smaller pipe shall be used to determine the spacing requirement, but shall never be less than 9-inches.

For connections to existing manholes, there shall be a minimum of 9-inches or 3.5-inches plus ½ the OD of the existing pipe, whichever is greater, between the pipe hole openings.

All external manhole joints shall be wrapped with an approved joint seal material.

Manholes Subject to Inundation. Manholes subject to flooding shall be watertight and vented 24 inches above the 100-YR flood elevation. In flood prone areas, the manholes shall be vented at least every 1000-ft or every other manhole, whichever is greater.

The exterior of all manholes within the 100-year flood elevation and in wetland areas shall receive an exterior coating of an approved bitumastic coal tar epoxy or an approved epoxy coating at 40-mils to prevent weepage or attack by acidic soils.

Anti-flotation design measures shall be implemented as required in flood prone areas.

Manholes Located on Large Collection Mains. The City reserves the right to require all manholes located on interceptor or outfall mains 24-inches in diameter and larger to have the manhole interior and bench coated with an approved epoxy coating at 80-mils thickness. The epoxy coating shall be field applied and tested as described herein.

Force Main Discharge Manholes. All manholes located on gravity mains that serve or will serve as discharge points for sanitary sewer force mains shall receive an interior epoxy coating at 80-mils thickness. In addition to the receiver manhole, the City reserves the right to require epoxy coating of the next two consecutive manholes downstream of the receiver manhole or all downstream manholes within 1500-lf of the receiver manhole.

Epoxy Coating. Concrete manholes must be well cured prior to application of the protective epoxy coating. Generally, 28 days is adequate cure time for standard Portland cement. If earlier application is desired, compressive or tensile strength of the concrete can be tested to determine if acceptable cure has occurred. (Note: Bond strength of the coating to the concrete surface is generally limited to the tensile strength of the concrete itself. An Elcometer pull test to determine suitability of concrete for coating may be required).

Surface preparation shall be based on the requirements of the manufacturer of the epoxy coating and applicable NACE International standards.

A minimum 80-mils thickness shall be field applied to new manholes (120-mils for existing manholes). During application a wet film thickness gage, meeting ASTM D4414 -Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used to ensure a monolithic coating and uniform thickness during application.

Temperature of the surface to be coated should be maintained between 40°F and 120°F during application. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated. Where varying surface temperatures do exist, care should be taken to apply the coating when the temperature is falling versus rising or in the early morning. The humidity should also be observed to ensure compliance with the epoxy manufacturers' recommendations.

Manufacturer approved heated plural component spray equipment shall be used in the application of the specified protective epoxy coating. The spray equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order. If necessary, subsequent top coating or additional coats of the protective coating should occur as soon as the basecoat becomes tack free, ideally within 12 hours but no later than the recoat window for the specified products. Additional surface preparation procedures will be required if this recoat window is exceeded.

Service Connections

Design. Direct sewer service taps shall not be allowed on sewer interceptor or outfall mains 15-inches in diameter or larger, except by manhole connection. All residential subdivision lots shall be served by gravity unless otherwise approved. If a pump is approved, it shall be privately maintained and must pump into either a service connection placed on the lot or through a private force main to a manhole. The pump and force main (if needed) must have a note on the recorded plat indicating the following: "Privately maintained sewer pump and force main is required to serve this lot".

Service connections to the main lines shall be perpendicular to the main line and shall extend to the edge of the right of way or easement line. Cleanouts are required on all services with a maximum spacing of 75 feet on 4 inch services and 100 feet on 6 inch services, and at the right of way line or edge of easement. All cleanouts shall extend a minimum of 6 inches above finished grade with brass caps or meet the optional cleanout method requirements in accordance with the Standard Details. Sewer cleanouts located in paved areas, which bear vehicle loading, must have ductile iron risers, ductile iron fittings and a traffic rated cast iron cover assembly.

All 6 inch service connections shall be into a manhole. Service lines connected to manholes shall not be through the cone section or manhole joints. Service lines shall be installed 6" above, but no more than 30 inches above the invert or shall be installed with a standard drop. Multiple service connections shall not be maintained by the City. For 6-ft diameter and larger manholes no service is allowed in the reduced diameter riser sections of the manhole.

The use of in-line wyes for service connections shall be required for all new construction. When connecting to existing sewer mains, service saddle taps will be allowable. Taps shall be at the 10 or 2 o'clock position, and shall not be top taps.

Service connections to mains at depths of 14-ft and greater shall utilize ductile iron pipe between the main and the cleanout, including a ductile iron wye for the cleanout stack. Location and angle of fittings shall be as shown in the standard detail drawings. Where the flood level rims of plumbing fixtures are below the elevation of the manhole cover of the next upstream manhole in the public sewer, such fixtures shall be protected by a backwater valve installed in the building drain, branch of the building drain or horizontal branch serving such fixtures. Plumbing fixtures having flood level rims above the elevation of the manhole cover of the next upstream manhole in the public sewer shall not discharge through a backwater valve.

Pipe Materials

PVC pipe shall be schedule 40 or greater supplied in minimum 18-ft lengths. Schedule 40 PVC pipe shall be manufactured with a cell classification of 12454 in conformance with ASTM D1784. Schedule 40 pipes shall be manufactured to dimensional tolerances as specified in ASTM D1785 and rated for service conditions up to temperatures of 140-degrees Fahrenheit. The pipe may be joined by solvent weld in conformance with ASTM D2564.

Schedule 40 PVC Service Pipe Sizing

Nominal Pipe Diameter (inches)	Outside Diameter (inches)	Inside Diameter (inches)	Thickness (inches)
4	4.50	4.02	0.24
6	6.62	6.03	0.28

PVC pipe for sewer services shall require bedding based upon depth as follows:

- 3 to 14-ft Depth – 4-inches of stone bedding extended to springline
- 8 to 20-ft Depth – 6-inches of stone bedding extended 6-inches above pipe crown

Ductile Iron Pipe shall be sued for sanitary sewer services with less than 4 fee of cover or in excess of 20 feet of cover. Ductile iron services shall also be used in all cases where a well is located within 100-ft of the sewer service line. Ductile iron service piping shall be provided in conformance with the ductile iron piping standards outlined herein including cement mortar lining.

DIP Service Pipe Sizing

Nominal Pipe Diameter (inches)	Outside Diameter (inches)	Inside Diameter (inches)	Thickness (inches)
4	4.80	4.30	0.25
6	6.90	6.40	0.25

Sewer Service Fittings, New Construction

All sewer service connections for new construction shall be provided with in-line wye fittings.

DIP Main with DIP Service. In-line wye fittings for ductile iron main lines joined with ductile iron service lines shall be typical ductile iron mechanical joint fittings as specified herein. In this

case all fitting sizes shall conform to AWWA C153. Wye fittings through 10-inches in diameter shall be provided with cement mortar lining in accordance with AWWA C104 and provided with exterior asphaltic coating per AWWA C151. Wye fittings for lines larger than 10-inches in diameter shall be provided with Protecto 401 lining as specified herein for ductile iron pipe of the same sizing.

DIP Main with PVC Service. For ductile iron sewer mains to be joined with PVC service lines, the in-line wye fittings shall be slip joint ductile iron with an IPS sized branch for PVC schedule 40 service lines. Ductile iron fittings for connecting PVC service lines shall be deep bell, gasketed joint and air test rated. Gasket grooves shall be machined. Bell depths shall meet the minimum socket depth requirements of ASTM D3034 and ASTM F1336. Wall thickness shall meet the requirements of AWWA C153. Ductile iron wye fittings through 10-inches in diameter with IPS connections shall be provided with cement mortar lining in accordance with AWWA C104 and provided with exterior asphaltic coating per AWWA C151. Ductile iron wye fittings for PVC lines larger than 10-inches in diameter shall be provided with Protecto 401 lining as specified herein.

PVC Main with PVC Service. For PVC sewer mains to be joined with PVC service lines, PVC in-line wye fittings shall be provided. Typical Schedule 40 PVC fittings shall be provided at the cleanout wye and stack.

PVC Main with DIP Service. A ductile iron tee/wye shall be provided when the service line is required to be ductile iron due to a crossing or other obstruction. The fitting shall be specifically manufactured for ASTM 3034 PVC pipe such that a smooth flow way exists on the main line through the fitting. The branch shall be gasketed to receive the 4-inch DIP service line without additional fittings. The ductile iron tee/wye fitting shall be Protecto 401 lined.

Service Saddle Connections, Existing Sewer Mains

PVC service saddles shall be of the same material as the main, and shall be solvent welded and fastened with double stainless steel bands.

For existing DIP main lines, ductile iron service saddles shall be used. The saddle assembly shall consist of a virgin SBR or NBR gasket compounded for sewer service, a ductile iron saddle casting, a 304 stainless steel adjustable strap for fastening the gasket and the saddle casting to the sewer main and a 304 stainless steel adjustable circle clamp for securing the service line into the rubber gasket.

Installation

Sewer laterals shall not be located in easements when gravity service can be provided to the property frontage at the street. Each separately owned structure requires a separate tap to a public sewer. All service lines with less than 3-ft of cover or deeper than 20-ft shall be made of ductile iron pipe. Four inch lines shall have a minimum slope of 1.0-ft/100 feet and 6 inch lines shall have a minimum slope of 0.60-ft/100 feet.

All service connections to existing sanitary sewer mains shall be made by the City. Service connections to new mains may be made by the Contractor, but shall include the use of wye (not tee) connections. Saddle taps on to new lines shall not be allowed. Saddle taps into existing PVC mains shall be made at the 10 o'clock or 2 o'clock position of the main with the wye saddle angled 45-degrees towards the direction of flow in the main. Taps shall only be made by a mechanical circular cutting saw providing a smooth and uniform cut for the saddle installation.

Service connections shall be made using an approved sewer saddle when the existing sewer line is 8", 10", or 12" in diameter. This service connection shall not be used when the sewer main material is truss sewer pipe. The opening in the sewer main for the sewer saddle shall be cut with a hydraulically or pneumatically driven circular tapping saw of the same nominal diameter as the sewer service line.

Testing and Inspections

The Contractor shall furnish all materials, labor, and equipment to perform all testing. The Contractor may arrange to obtain water for testing purposes from the City. The Contractor shall reimburse the City for all water used for construction at current inside utility rates.

Visual Testing and Observation. All materials used must be approved by the City of Goldsboro prior to installation. Rejected materials shall be immediately removed from the job.

Gravity sanitary sewer lines shall be clean and free from obstructions, and shall be visually inspected from every manhole. Lines which do not exhibit a true line and grade or which have structural defects shall be corrected. Sanitary sewer service connections shall be visually inspected prior to backfilling.

Air Testing. Low-pressure air testing in accordance with ASTM F1417 shall be performed on all sewer mains before the laterals or stubs are installed on the line, and after the trench has been backfilled to finished grade. Plugs shall be installed at each manhole to seal off the test section. The line will be pressurized with a single hose and monitored by a separate hose connection from the plug. Air then shall be slowly introduced into the sealed line until the

internal air pressure reaches 4.0 psig. The air pressure shall then be allowed to stabilize for a minimum of 2 minutes at no less than 3.5 psig (plus groundwater pressure, if any). When the pressure reaches 3.5, the time required for the pressure to drop 1.0 psi will be observed and recorded. The line shall be "acceptable" if the pressure does not drop more than 1.0 psi in the time prescribed for the test in the Sanitary Sewer Air Test table found in the Standard Detail Drawings. An abbreviated version of the air test table is shown below.

Specification Time (min:sec) Required for Pressure Drop From 3-1/2 to 2-1/2 PSIG

		Nominal Pipe Diameter (inches)										
		8	12	15	16	18	21	24	27	30	36	42
Length of Test Section	50	7:33	11:20	14:10	15:11	17:00	19:48	22:40	25:30	28:19	34:00	39:40
	100	7:33	11:20	14:10	15:11	17:00	19:48	22:47	28:51	35:37	51:17	69:48
	150	7:33	11:20	14:10	15:12	19:14	26:10	34:11	43:16	53:25	76:55	104:42
	200	7:33	11:24	17:48	20:16	25:39	34:54	45:35	57:42	71:13	102:36	139:36
	250	7:33	14:15	22:16	25:20	32:03	43:37	56:58	72:07	89:02	128:12	174:30
	300	7:35	17:06	26:43	30:23	38:28	52:21	68:22	86:32	106:48	153:54	209:25
	350	8:52	19:57	31:10	35:27	44:52	61:05	79:46	101:00	124:42	179:30	244:19
	400	10:07	22:48	35:37	40:31	51:17	69:48	91:10	115:24	142:30	205:06	279:13
	450	11:23	25:39	40:04	45:35	57:42	78:31	102:36	129:48	160:18	230:48	314:07
	500	12:39	28:30	44:31	50:39	64:06	87:15	114:00	144:12	178:06	256:24	349:02

If the section fails to meet these requirements, the source of leakage shall be repaired and the pipe section re-inspected.

The City may require that an infiltration test be performed that shall not exceed 100 GPD/inch/mile.

Deflection Testing for Flexible Pipe. The mandrel (go/no-go) deflection test shall be performed on each line prior to acceptance and no sooner than 30 days after installation. The pipeline shall be thoroughly clean and free of debris and/or sediment prior to testing. The Contractor shall supply the mandrel used for this performance test. The mandrel device shall be cylindrical in shape having 9 possible contact points with the pipe. The mandrel's length and diameter (ID of proving ring) shall be in accordance with the following tables, and shall be subject to the City's approval.

For flexible pipes such as PVC, the following shall apply:

Nominal Diameter (inches)	Pipe Class	Average Inside Pipe Diameter (inches)	5% Deflection Mandrel Diameter (inches)	Length of Mandrel (inches)	Minimum Fins Included with Mandrel
8	SDR 26	7.715	7.329	10	9
8	SDR 35	7.891	7.496	10	9
10	SDR 26	9.644	9.162	10	9
10	SDR 35	9.864	9.371	10	9
12	SDR 26	11.480	10.906	10	9
12	SDR 35	11.737	11.150	10	9
15	SDR 26	14.053	13.350	10	9
15	SDR 35	14.374	13.655	10	9
18	SDR 26	17.261	16.398	24	9
21	SDR 26	20.349	19.332	24	9
24	SDR 26	22.891	21.746	24	9
27	SDR 26	25.799	24.509	24	9

Note: Calculated 5% deflection allowance does not include additional manufacturing tolerances provided by pipe manufacturers. For purposes of testing, 5% deflection shall be calculated from standard pipe inside diameter as published in ASTM D3034 and ASTM F679.

The mandrel shall be advanced through the pipeline to determine if bedding and embedment has been provided in compliance with ASTM D2321 to assure joint deflection of less than 5%. If the mandrel becomes obstructed for any reason while being pulled through the line with less than 100-lbs of force, the location of the defect shall be noted and the mandrel shall be removed from the pipeline. Under no circumstances shall heavy equipment be utilized to force the mandrel through the pipeline. Deflection testing may be done concurrently with sewer televising inspections, provided the mandrel is kept within visible range of the camera.

Video Assessment and Cleaning. As a final measure required for acceptance, the Contractor shall clean and televise all newly installed sewer mains prior to acceptance by the City. The Contractor shall televise the sewer main and all lateral connections installed from the upstream to downstream manhole with no reverse setups or cutaways. Throughout shooting, the camera shall be panned and tilted for a complete view of the main. Lighting shall be adequate to view the entire sewer main and service connections from beginning to end. The video inspection shall be submitted to the Inspector on a CD and formatted with software compatible and readable by the City. The City shall not be responsible for purchasing additional software necessary to view the CD's.

The camera shall be advanced at a uniform rate not to exceed 20 feet per minute that allows a full and thorough inspection of the new sewer main. The camera shall be a color, pan and tilt camera capable of producing a five hundred line resolution picture. Lighting for the camera shall be sufficient to yield a clear picture of the entire periphery of the pipe. The picture quality shall be acceptable and sufficient to allow a complete inspection with no lapses in coverage. The length of the sewer main shall be measured and recorded on the video screen. The distance counter shall be calibrated before shooting the inspection video.

The Contractor shall clean the sewer mains ahead of video inspection with a high-velocity water jet. The video inspection shall take place within 2-hours of cleaning operations as witnessed by the Inspector. All construction debris shall be collected in the downstream manhole and shall not be released into the sewer system.

The Inspector shall be present throughout the cleaning and televising of the sewer mains to verify that the video work complies with the Specifications.

Prior to submitting the CD's to the Inspector, the Contractor shall label the CD's with the following information:

- Name of the Project/Development.
- Name and contact information of responsible party.
- Date of televising.
- Manhole identification as shown on the design plans.

Testing of the marker tape shall be performed by the Contractor at the completion of the project to assure it is working properly and completely detectable. It is the Contractor's responsibility to provide the necessary equipment to test the markers. Any defective, missing, or otherwise non-locatable segments shall be replaced.

Manhole Testing

Vacuum Testing. All newly installed manholes shall pass a vacuum test in accordance with ASTM C 1244. The Contractor shall supply all equipment and materials necessary to vacuum test the manholes. Vacuum Testing shall be completed prior to any specified coating and lining materials being installed. The Inspector shall be present and witness all vacuum testing. The following vacuum testing criteria shall apply for compliance with the testing procedure:

- A vacuum of 10-inches of mercury shall be drawn with an approved vacuum testing unit.
- The testing time shall not be measured until after the vacuum pump has been shut off.
- The time required for the vacuum to drop from 10-inches to 9-inches of mercury shall meet or exceed the values listed in the following table.

Manhole Vacuum Testing Time (seconds)

Depth (feet)	Manhole Diameter (inches)		
	48	60	72
8	20	26	33
10	25	33	41
12	30	39	49
14	35	48	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

Repairs and Modifications

Vitrified Clay Pipe. Replace damaged section with SDR-35 PVC and Shearguard coupling at each end.

PVC Pipe. Replace damaged section with PVC Pipe and install a Shearguard coupling at each end.

ABS/PVC Truss Pipe. Replace damaged section with SDR-35 PVC and install a Shearguard coupling at each end.

Asbestos Cement Pipe. Replace damaged section with SDR-35 PVC and couplings.

All repairs to damaged sanitary sewer lines in paved areas shall be backfilled with ABC stone (crusher run) to a density of 95 percent Standard Proctor. All repairs to damaged sanitary sewer lines shall be bedded with 6-inches of washed stone and compacted to a minimum of 95% Standard Proctor density before installing the new joint of ductile iron or PVC pipe.

A detailed pumping and emergency plan shall be required for any sewer line draining event.

All sanitary sewer mains and sewer force mains 20-inches and larger, active, inactive, or abandoned shall begin to be drained by tapping the bottom half of the pipe. A corporation stop

or other valve shall be provided to control flow. All effluent shall be pumped to a downstream manhole (when available) or other containment tank utilizing continuous piping. The use of a sump pit on lines 20-inches and larger is not allowed.

In sensitive environmental areas and in other various scenarios the City may require lines less than 20-inches also be tapped in order to be drained.

SECTION 9 – WASTEWATER FORCE MAINS

General

These Specifications apply to all force mains that are to be owned, operated, and maintained by the City of Goldsboro. Design of private pump stations and force mains and associated facilities is not covered by these Specifications or otherwise herein, and the applicant should look for guidance from other appropriate agencies (NCDENR, NC Plumbing Code, etc.).

All aspects of the design of wastewater force mains, and associated facilities shall, at a minimum, meet the requirements of the latest version of the NCDENR "Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains". Requirements presented in the City of Goldsboro Standard Specifications hereunder that are more restrictive or go above and beyond the requirements of the Minimum Design Criteria are required by the City of Goldsboro.

All aspects of the design of pump stations, force mains, and associated facilities shall be submitted for review and approval by the City of Goldsboro.

Wastewater force main interconnections shall be prohibited. All wastewater force mains shall extend to the nearest gravity sewer or pump station wet well that has sufficient long term capacity.

Design

Force mains shall be installed with a minimum cover of 4 feet measured from the top of the pipe to the finished grade.

Force mains shall be installed in dedicated public right of way or in dedicated utility easements as follows. When wastewater force mains are constructed adjacent to gravity sewer mains or for construction of parallel wastewater force mains, the minimum horizontal clearance shall be at minimum 7-ft from pipe edge to pipe edge when the depth of installation is 8-ft or less. Otherwise, the minimum horizontal separation between pipelines shall be 10-ft up to installation depth of 10-ft. Clearances for pipelines greater than 10-ft depth shall be designed by Engineer of Record and approved by the City of Goldsboro. Easement widths outlined below shall be widened by at least the clearance between the pipelines when constructing a shared gravity sewer and wastewater force main corridor.

Standard Easement Width for Sewer Force Mains

Pipe Size (diameter)	Pipe Depth (feet)	Easement Width (feet)
8-inch to 12-inch	10-ft or less	20-ft
8-inch to 12-inch	10-ft to 12.5-ft	25-ft
8-inch to 12-inch	12.5-ft to 15-ft	30-ft
8-inch to 12-inch	15-ft to 17.5-ft	35-ft
8-inch to 12-inch	17.5-ft to 20-ft	40-ft
12-inch to 24-inch	15-ft or less	30-ft
12-inch to 24-inch	15-ft to 17.5-ft	35-ft
12-inch to 24-inch	17.5-ft to 20-ft	40-ft
Greater than 24-inch	Any Depth	Specified by the City
Any Size	Deeper than 20-ft	

Dedicated easements for force mains and appurtenances shall be recorded as “City of Goldsboro Utility Easement”. City of Goldsboro force main easements shall contain only City of Goldsboro utilities unless otherwise approved by an encroachment agreement.

Wastewater force main discharge manholes and intermediate air release locations that require odor control shall be provided with sufficient easement area to accommodate the odor control systems as designed by the Engineer of Record, whether utilizing passive, forced-air or chemical treatment for odor control. The maintenance easement for odor control systems shall be sized based on site specific conditions and shall provide sufficient area for routine maintenance operations, such as refilling media, chemicals, replacing equipment, etc.

Force mains shall discharge at the invert of the receiving manhole and shall be as close as possible to 180 degrees from the outlet pipe.

Force main design shall facilitate cleaning and inspection. The use of 90 degree bends is prohibited.

Force mains shall be constructed with a pigging/bypass connection located within 50-ft of the pump station valve vault.

Force main minimum design velocity shall not be less than 2-ft per second throughout the length of the force main. As a design preference, force main systems when operating at higher flows shall reach velocities of 3 to 5 ft/s to re-suspend any settled solids.

Force main systems shall be of adequate sizing and design to effectively convey the ultimate peak flows as applied by the connected pump station to the discharge point.

The force main route shall be such that the number of high points requiring combination air valves is minimized to the extent possible. Combination Air Valves rated for use with raw wastewater shall be installed at all the high points or runs exceeding 3000-ft on all force mains in accordance with the Standard Details. A high point shall be determined as any location where the vertical separation between the adjacent low point and high point in the force main is greater than or equal to 10 vertical feet.

All valves and fittings shall be restrained. Pipe joints shall also be restrained an adequate length away from valves and fittings in accordance with AWWA manual M41 (or the latest edition of Thrust Restraint Design for Ductile Iron Pipe as published by the Ductile Iron Pipe Research Association). In all cases, there must be a pipe restraint plan with the method of restraint to be used and the length of pipe to be restrained clearly identified on the plans at all necessary locations. The pipe restraint plan shall be included under the design responsibility of the NC Professional Engineer sealing the plan drawings.

- Pipe Joints: The standard joint restraint method shall be to use manufacturer provided restrained joint pipe. Pipe up to and including 12-inches in diameter may also utilize either mechanical joint pipe with approved wedge action retainer glands (for the specified distance) or reaction blocking at fittings as an alternative. All joint restraint products that include the means of restraint within the joint gasket shall be prohibited.
- Valves: Valves shall be restrained in a manner consistent with operation as a dead end. This includes restraining the valve to the pipe and restraining a sufficient number of pipe joints on both sides of the valve to accommodate dead end restraint.

A plug valve shall be installed at least every 3000 feet of force main length.

All air release valves, plug valves greater than 12-inches, or other appurtenances that have moving or operating parts and require maintenance and routine access shall have a manhole placed over them or over the operating portion of the device.

Separation between Sewer Force Main and Storm Water Pipes: Sewer force mains shall have a minimum vertical separation of 24 inches between storm pipes when the horizontal separation is 3 feet or less. Where sanitary and storm sewers cross with a vertical separation of less than 24 inches, the entire leg of sanitary sewer shall be made of standard ductile iron pipe with joints rated for water main service and the void space between the pipe crossing shall be backfilled with 3000-psi concrete or minimum 500-psi, quick setting, non-excavatable flowable fill that meets or exceeds NCDOT Specifications.

Separation between Sanitary Sewer and Sewer Force Main: There shall be a minimum 7 foot horizontal separation between parallel gravity and/or force mains in outfall locations when the

depth of installation is 8-ft or less. Otherwise, the minimum horizontal separation between pipelines shall be 10-ft in outfalls.

Separation between Sewer Force Main and Water Main: Parallel Installations: 10-ft lateral separation (pipe edge to pipe edge) or minimum 3-ft lateral separation, and water line at least 18-inches above sewer force main measured vertically from top of sewer pipeline to bottom edge of water main. In unique cases where the sewer force main and the water main are installed with at least 3-ft of lateral separation but less than 10-ft of horizontal separation, and less than 18-inches of vertical separation, both the water main and sewer force main shall be constructed of ductile iron pipe with joints in full compliance with water main standards.

Crossings (Water Main over Sewer Force Main): All water main crossings of sewer force mains shall be constructed in conformance with City of Goldsboro Specifications. At a minimum, 18-inches of clearance shall be maintained between the bottom edge of the water main and the top edge of the sewer force main. If 18-inches of clearance is not maintained, the water main and sewer force main shall both be constructed of ductile iron pipe with joints in conformance with water main construction standards. The ductile iron sewer force main shall extend 10-ft on both sides of the crossing. When the separation between pipelines is 18-inches or less, the void space between the pipes shall be filled with minimum 500-psi, quick setting, and non-excavatable flowable fill extending 3-ft on both sides of the crossing. Regardless of pipe material, at least 12-inches of vertical separation is required for sewer force main crossings of potable water mains.

Crossings (Water Main under Sewer Force Main): Allowed only as approved by City of Goldsboro, when it is not possible to cross the water main above the sewer force main. At a minimum, 18-inches of separation shall be maintained, (measured from pipe edge to pipe edge) and both the water main and sewer force main shall be constructed of ductile iron in conformance with water main construction standards to a minimum of 10-ft on both sides of the crossing. If local conditions prevent providing 18-inches of clearance, then at least 12-inches of clearance shall be provided and the void space between the pipes shall be filled with minimum 500-psi, quick setting, and non-excavatable flowable fill extending at least 3-ft on both sides of the crossing. In all cases the water main pipe shall be centered at the point of crossing with joints equally spaced from the point of crossing.

Sanitary Sewer Force Main and Stream Crossings: The top of the sewer force main shall be at least one foot below the stream bed. Concrete encasement and ductile iron pipe shall be required when the cover between the top of the pipe and the stream bed is less than 3 feet. Sewer force mains shall not be installed under any part of water impoundments.

The following minimum horizontal separations shall be maintained:

- 100 feet from any private or public water supply source, including wells, WS-1 waters or Class I or Class II impounded reservoirs used as a source of drinking water (except as noted below)
- 50 feet from any waters (from normal high water) classified WS-II, WS-III, B, SA, ORW, HQW or SB (except as noted below)
- 10 feet from any other stream, lake, or impoundment (except as noted below)
- 25 feet from private wells (with no exceptions)
- 50 feet from sources of public water supply (with no exceptions)

Where the required minimum separations cannot be obtained, ductile iron sewer force main pipe with joints equivalent to water main standards shall be used.

Materials

Pipe Materials: The minimum wastewater force main size shall be 4-inches in diameter. SDR-35 PVC or ductile iron pipe shall be required for all wastewater force mains. SDR-35 PVC or ductile iron pipe shall be designed and manufactured in accordance with AWWA C150 and C151 and provided in nominal 20-ft lengths. The minimum requirements for ductile iron pipe and required laying conditions are tabulated below. For all other installations other than specified, the laying condition, bedding requirements or the minimum pressure class rating and/or thickness class shall be increased in accordance with AWWA C151. A pipe thickness design shall be submitted for external loading in all cases where the pipe depth exceeds the specified range of depths outlined in the following table.

Pressure Class, Max. Depth and Laying Condition for DI Wastewater Force Mains

Pipe Diameter	AWWA C-150, Laying Condition	Pressure Class	Maximum Depth of Cover
4 to 8 inch	type 1	350 psi	3-16 feet
4 to 8 inch	type 4	350 psi	16-20 feet
10 to 12 inch	type 1	350 psi	3-10 feet
10 to 12 inch	type 4	350 psi	10-20 feet
14 to 20 inch	type 4	350 psi	3-28 feet
24 inch	type 4	350 psi	3-25 feet

Note: For cases not specified, a ductile iron pipe and bedding design certified by a Professional Engineer licensed in the State of North Carolina shall be required in compliance with AWWA C150 and the Ductile Iron Pipe Research Association.

All pipe shall be marked in conformance with ASTM A-746.

All ductile iron wastewater force mains and fittings for sewer construction shall receive an interior ceramic epoxy coating, consisting of an amine cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment, as manufactured by Protecto 401. The interior coating shall be applied at a nominal dry film interior thickness of 40-mils. All DIP bells and spigots shall be lined with 8-mils of Protecto 401 joint compound applied by brush to ensure full coverage. All pipe supplied with Protecto 401 interior lining shall be provided free of holidays. Pipe installed with defects in the lining will be rejected. Patching of Protecto 401 coating defects after installation shall not be approved. Protecto 401 lined pipe must be installed within one year of the application date on the pipe.

Pipe fittings shall be made of ductile iron designed and manufactured per AWWA C110 or C153. All fittings up to and including 24 inches in diameter shall be designed for a minimum internal pressure of 350 psi, unless otherwise approved by the City of Goldsboro. Fittings shall be mechanical joint or proprietary manufacturer provided restrained joint. Gaskets shall be in accordance with AWWA C111. All fittings shall be interior coated with Protecto 401 as specified herein for ductile iron pipe.

Restrained Joint Ductile Iron Pipe shall be the boltless type unless otherwise approved. For installations requiring welded locking rings, the rings shall be factory welded. The restrained joints shall provide a minimum of 4-degrees of deflection for pipe sizes, 4-inches through 12-inches in diameter. All proprietary pipe restraint systems shall be approved by the City of Goldsboro and provided in compliance with all standards for coatings, linings, pressure classes, etc. as required for ductile iron pipe. All restrained joint pipe shall be installed based on laying conditions, pressure class, etc. as required for typical ductile iron pipe.

Manhole Materials: All sewer force main manholes shall be installed according to the City of Goldsboro Standard Specifications when design and installation criteria are not otherwise covered herein.

All force main discharge locations and other manholes for wastewater force mains (excluding those housing large diameter plug valves) shall be epoxy coated at minimum 80-mils thickness.

Sewer force main receiver manholes, sewer force main combination air valve manholes and other concrete structures subject to high levels of hydrogen sulfide gas shall be provided with an approved monolithic epoxy coating system consisting of a 100% solids, solvent-free, two-component epoxy resin that meets the following Specifications for up to 100 mils of coating with a manufacturer approved set time of 6-hours or less.

Force Main Receiver Manholes: Sewer force mains shall not discharge directly into existing gravity sewer lines. Sewer force mains shall typically discharge into a receiver manhole that

has been epoxy coated as specified herein. The receiver manhole shall be provided in the typical eccentric tapered design at minimum 5-ft diameter. The bench shall be sloped up to 8-inches from the invert channel to the manhole wall. The invert shall be provided with a gradual up sloping alignment from the force main entry to the gravity transition point. Sufficient grade shall be placed on the invert such that wastewater falls back into the force main when the pumps are not in operation creating a vapor lock between the force main and the manhole. Drop connections into force main receiver manholes shall be prohibited.

Combination Air Valve Manholes: Manholes for combination air valve installation shall be provided in flat top configuration to accommodate the excess length of wastewater combination air valves. In cases where the combination air valve assembly shall be located in a paved area, provide typical eccentric, tapered manhole design with typical manhole frame and cover for paved areas. The minimum manhole diameter for combination air valve assemblies shall be 5-ft. Minimum 6-ft diameter manholes shall be used with force mains 20-inches and larger and when an odor control system is required. Any manholes located in NCDOT or street right-of-way shall be provided flush with finished grade.

Installation

General. Ductile iron pipe shall be installed in accordance with the requirements of AWWA C600 and the Ductile Iron Pipe Handbook published by the Ductile Iron Pipe Research Association. Materials at all times shall be handled with mechanical equipment or in such a manner to protect them from damage. At no time shall pipe and fittings be dropped or pushed into ditches.

Pipe trench excavation and backfilling shall be performed in accordance with these Specifications.

Pipe and fitting interiors shall be protected from foreign matter and shall be inspected for damage and defects prior to installation. In the event foreign matter is present in pipe and fittings, it shall be removed before installation. Open ends of pipe shall be plugged or capped when pipe laying is not in progress.

All pipe shall be constructed with at least 48 inches of cover below the finished surface grade. Pipe shall be laid on true lines as directed by the Engineer. The wastewater force main shall be installed at a grade which will allow air to migrate to a high point where the air can be released through an air valve. A minimum pipe slope of 1 foot in 500 feet should be maintained and there shall be no intermediate high points in the line.

Trenches shall be sufficiently wide to adjust the alignment. Bell holes shall be dug at each joint to permit proper joint assembly. The pipe shall be laid and adjusted so that the alignment with

the next succeeding joint will be centered in the joint and the entire pipeline will be in continuous alignment both horizontally and vertically. Pipe joints shall be fitted so that a thoroughly watertight joint will result. All joints will be made in conformance with the manufacturer's recommendations for the type of joint selected. All transition joints between different types of pipe shall be made with transition couplings approved on shop drawings showing the complete assembly to scale.

Embedment Material. Bedding and embedment material classifications shall be defined as follows:

- CLASS I - Angular, (1/4 to 1-1/2 inch) graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, crushed gravel, and crushed shells.
- CLASS II - Coarse sands and gravels with maximum particle size of 1-1/2 inch, including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW and SP are included in this class.
- CLASS III - Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures, Soil Types GM, GC, SM, and SC are included in this class.
- CLASS IV - Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH and CL are included in this class. These materials shall not be used for embedment.

Class I foundation material consisting of ¼-inch to 1½-inch graded stone shall be required in addition to standard bedding and embedment for all sewer installations, regardless of pipe material, when the trench bottom is unstable due to water, rock, infiltration or soil type.

All bedding, embedment and backfill materials shall be compacted to a minimum of 95% Standard Proctor density regardless of material. In instances where compliance with compaction requirements is questionable as determined by the Inspector, testing shall be provided by the Contractor and a reputable licensed Geotechnical Engineer to verify compliance.

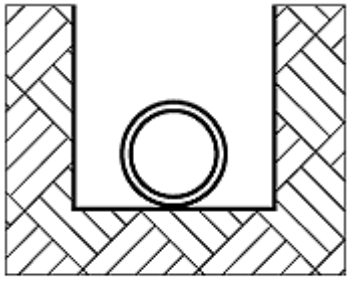
The minimum trench width shall be one pipe diameter plus 9 inches on each side of the pipe as described in these Specifications.

In any area where the pipe will be installed below existing or future ground water levels or where the trench could be subject to inundation, additional Class I material shall be used for bedding.

If hydraulic jack shoring is utilized for trench walls, it shall be restricted to the area just above the top of the pipe. This will ensure the embedment materials and pipe will not be disturbed when the shoring is removed.

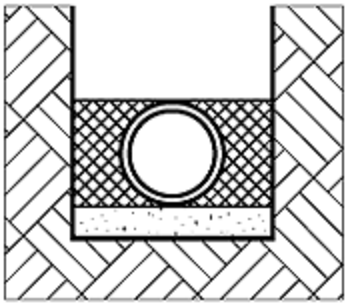
Laying Conditions. Pipe shall be installed at laying conditions as specified by the plans. Laying conditions for ductile iron pipe shall be as described in AWWA C151 and the Ductile Iron Pipe Research Association. Laying conditions shall be defined as follows:

Type 1: Flat Bottom Trench with Pipe Resting on Stable Undisturbed Earth. Unstable conditions such as wet trench bottoms, intermediate rock layering, partially weathered rock, and other unsuitable soil conditions shall require utilizing more stringent laying conditions. At a minimum, Type 4 laying condition shall be utilized with a minimum of 4-inches of bedding to overcome unstable conditions. For severe unstable soil conditions, undercut excavation and an engineer designed foundation plan shall be provided prior to pipeline installation



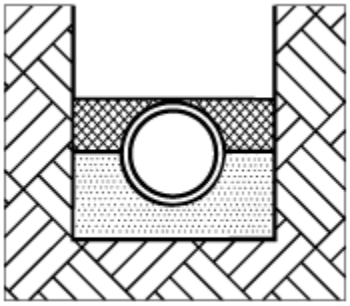
Type 1*

Type 4: Pipe bedded in Class 1 material, No. 67 or No. 78 crushed stone to a depth of 1/8 pipe diameter or a minimum of 4-inches. Embedment material, consisting of Class 1, Class 2 or Class 3 materials, shall be compacted greater than 95% Proctor to the top of the pipe. Careful attention must be allocated to compacting embedment material under the bottom edges of the pipe.



Type 4

Type 5: Pipe bedded in Class 1 material, No. 67 or No. 78 crushed stone to the center of the pipe and extending a minimum of 4-inches under the pipe. Granular or select embedment, consisting of Class 1 or Class 2 materials, compacted to greater than 95% Proctor installed to the top of the pipe.



Type 5

Installation Below the Water Table. For installations below the water table, a single layer of engineering fabric shall be installed between the pipe and trench floor/trench wall. The fabric shall fully encapsulate the force main, bedding, and embedment material with a minimum of 12-inch overlap at the top of the embedment material.

Utility Coordination. Prior to beginning construction, the Contractor shall contact local utility companies and verify the location of existing utilities. The Contractor shall be completely and solely responsible for locating all existing buried utilities inside the construction zone before beginning excavation. The Contractor shall be solely responsible for scheduling and coordinating the utility location work. When an existing utility is in conflict with construction, it shall be exposed prior to beginning construction to prevent damage to the existing utility.

Marking Tape. Marking tape shall be installed continuously and longitudinally along all sewer force mains for new construction and for any repair or retrofit construction using open trench methods. Marking tape shall be installed directly above the center of the pipe and at least 16-inches deep from final grade to a maximum depth of 24-inches below final grade.

The marking tape shall be made of polyethylene (or approved equivalent) material, 6-inches wide and a minimum of 6 millimeters thick. The marking tape shall have detectable markers embedded in the tape and spaced adequately to provide continuous detection along the tape from above the buried pipe at final grade. The tape shall be green in color and shall be marked with words that read “CAUTION SEWER LINE BURIED BELOW” (or an approved equivalent wording). The wording shall be repetitive along the full length of the tape.

Valves and Appurtenances

The rated working pressure of all valves and appurtenances shall meet the maximum design pressure of the pump station and pipeline.

Check Valve: Check valves shall be iron bodied, fully bronze mounted with bronze clapper disc and bronze seat ring, and shall have a spring loaded lever arm capable of being mounted on either side of the valve.

Plug Valve: Plug valves shall be non-lubricating, eccentric action and resilient plug facing with heavy duty Type 316 stainless steel bearings. Plug valves shall be designed for a minimum working pressure of 175 psi for valves 12 inches and smaller, 150 psi for valves 14 inches and larger. Valves shall be bi-directional and meet the pressure rating in both directions of flow. The plug valve body shall be cast iron ASTM A126 Class B with welded-in overlay of 90% nickel alloy content on all surfaces contacting the face of the plug. Sprayed, plated, nickel welded rings or seats screwed into the body are not acceptable.

All plug valves 12 inches and smaller shall have round port design that provides a minimum 80% port area. The valve plug shall be ductile iron ASTM A536 Grade 65-45-12 up to 20-inches in diameter, with EPDM, Buna N, or Neoprene resilient seating surface to mate with the body seat. Valves 24-inches and larger may have plugs made of cast iron in accordance with ASTM A126 class B. Large plug valves with rectangular plugs shall provide clean passage for a solid sphere of at least 67% of the adjoining pipe diameter to facilitate pigging of the force main. Force main plug valves with rectangular port shall be "full-port" cross-sectional area perpendicular to the flow of at least 100% of the adjoining pipe.

All buried plug valves shall be provided with worm gear actuators. All plug valves shall be buried and provided with a 2-inch operator nut and valve box as shown in the details. Plug valves greater than 12-inches shall be installed such that the actuator and gearing is accessible in a manhole as shown in the details. All plug valves shall be provided with typical mechanical joint end connections and restrained with wedge action retainer glands on both ends of the valve assembly as described herein.

Valves shall be installed according to the manufacturer's recommendations. Typically for wastewater this means installing the seat side toward the pump station so that the flow is against the face of the plug in the closed position. In the open position, the plug should rotate up to the top of the pipeline which may require installing the valve on its side.

Rubber Seated Ball Valve: For larger diameter force mains where plug valves are not available, rubber seated ball valves shall be of the tight-closing, shaft-mounted type that fully comply with AWWA Standard C507 to provide a full port unobstructed waterway with no additional pressure

drop. Design pressure ratings shall be 150 psi or greater and provide tight shutoff against flow. With the valve in the closed position, the rubber seated valve shall be bubble tight at rated pressure. All ball valves shall be provided in an epoxy coated manhole with worm gear actuators and a handwheel.

Valve Box Covers: Force main plug valves or ball valves shall have valve box covers and/or manhole lids with the word "Sewer" cast into them.

Combination Air Valves: Combination Air Valves shall be provided to purge air from the system at startup, vent small pockets of air while the system is being pressurized and running, and prevent critical vacuum conditions during draining. Combination air valves approved for use in wastewater force main installations shall be installed at all high points of wastewater force mains 6 inches in diameter or larger and at other locations, such as major changes in slope, as directed by the City. A high point shall be determined as any high location where the difference between the high elevation and adjacent low elevation exceeds 10-ft unless otherwise determined by the City based on special circumstances. The combination air valve shall automatically exhaust large volumes of air from the system when it is being filled and allow air to re-enter the pipe when the system is being drained. The wastewater force main shall be installed at a continuous grade between low and high points without intermediate high points unless an air release valve is being installed. A minimum pipe slope of 1 foot in 500 feet should be maintained. Combination air valves shall be sized by the Engineer and approved by the City.

- Combination air valves shall be of the single housing style with Type 304 or 316 stainless steel body that combines the operation of both an air/vacuum and air release valve. The valve must meet the requirements of AWWA C512 and be installed in accordance with the Details. The valve shall have a minimum 145-psi working pressure unless the pipeline design requires a higher pressure rating.
- The valve shall have a minimum 2-inch male NPT inlet for a 2-inch valve assembly. Combination air valves sized from 3-inches to 8-inches shall be provided with studded inlet connectors or flanged connections. The combination air valve shall be provided with cylindrical shaped floats and anti-shock orifice made of high density polyethylene. Combination air valves with spherical floats shall not be accepted. All combination air valves shall be installed in accordance with the Details.
- Installation of Combination Air Valve Assembly:
    - The Engineer of Record shall provide ample depth of installation to accommodate the extended height of combination air valves for wastewater force mains. All combination air valves shall be connected to the main by an MJ x FLG tee with the branch diameter equal to at least half of the main diameter.

- The 2-inch combination air valve shall be provided with male NPT threads and isolated with a 2-inch gate valve. The isolation valve shall be provided with NPT threads and connected with brass or bronze piping.
- Combination air valves 3-inches and greater shall be connected by flange or studs. If needed due to a larger diameter tee, a flanged reducer shall be provided between the tee and the isolation valve. Gate valves shall be used for 3-inch assemblies. Combination air valves 4-inches and larger shall be isolated with a plug valve. In all cases the isolation valve shall be sized equal to the combination air valve.

Pigging Station: Force mains shall be constructed with a pigging/bypass connection located within 50-ft of the pump station valve vault. This pigging leg shall consist entirely of Protecto 401 coated ductile iron pipe of the same diameter as the main. A restrained MJ wye shall be provided in the main line and valved on each branch. The pigging leg shall extend out of the ground and be closed with a blind flange. The protruding pipe shall be protected by concrete bollards spaced 6-ft apart.

Bypass Connection Assembly: On some wastewater force mains, an additional bypass connection assembly may be required. The size, criticality and proximity to a downstream manhole will be important factors in the need for this connection. The bypass assembly shall include either a ball valve or plug valve assembly for isolation from the primary wastewater force main. Additionally, the primary force main shall be provided with a main line plug valve or ball valve on the upstream side of the bypass assembly to prevent bypass flow from draining back to the pump station. The bypass assembly shall be brought to the final graded surface with a visible blind flange assembly for connection by an outside pumping contractor.

Force Main Odor Control Systems: Force main odor control shall be included in the design plans for any proposed force main at discharge locations, intermediate air release locations and otherwise as directed by the City. In limited cases, air release valves located in isolated areas may be approved without odor control systems. The suggested odor control technology shall be designed by the Engineer of Record to achieve 95% or greater hydrogen sulfide removal. All systems, including those utilizing activated carbon, shall be manufactured specifically for addressing hydrogen sulfide gas. Forced air systems should be avoided due to the need to include provisions for electrical power to the odor control system. For all odor control systems, the Engineer of Record shall provide sufficient easement area for long term maintenance of the system.

Inspections

All materials and equipment used in the construction of the wastewater pumping system must be verified for compliance with the Specifications (or other approval granted by the City) by the

Inspector prior to installation. Non-conforming materials or equipment shall be immediately removed from the job site. Compliance with plans and Specifications shall be verified on a regular basis by the Inspector.

Testing

The Contractor shall furnish all materials, labor, and equipment to perform all testing. Water for testing purposes may be obtained from the City. The Contractor shall reimburse the City for all water used at Inside Utility Rates.

All water or wastewater used during testing of the pump station, force main, or any of the systems described in this section, must be returned to the City of Goldsboro sanitary sewer system after proper coordination with the City.

All on-site testing and/or installation verification shall be performed in the presence of the Inspector or other representative authorized by the City.

The force main shall be completely filled with water, all air shall be expelled from the pipe, and the discharge end of the pipeline shall be plugged and adequately blocked before the hydrostatic test begins.

The force main shall be tested to a pressure of 100 psi or three times the rated Total Dynamic Head of the pumps in psi, whichever is larger, as measured at the lowest elevation of the pipeline, for a duration of 2 hours. The pressure gauge used in the hydrostatic test shall be calibrated in increments of 5 psi or less. At the end of the test period, the leakage shall be measured with an accurate water meter.

All leaks shall be located and repaired regardless of the amount of leakage. If the force main does not pass the leakage test requirements, the cause of the failure shall be identified and repaired. Testing shall be repeated until the force main passes.

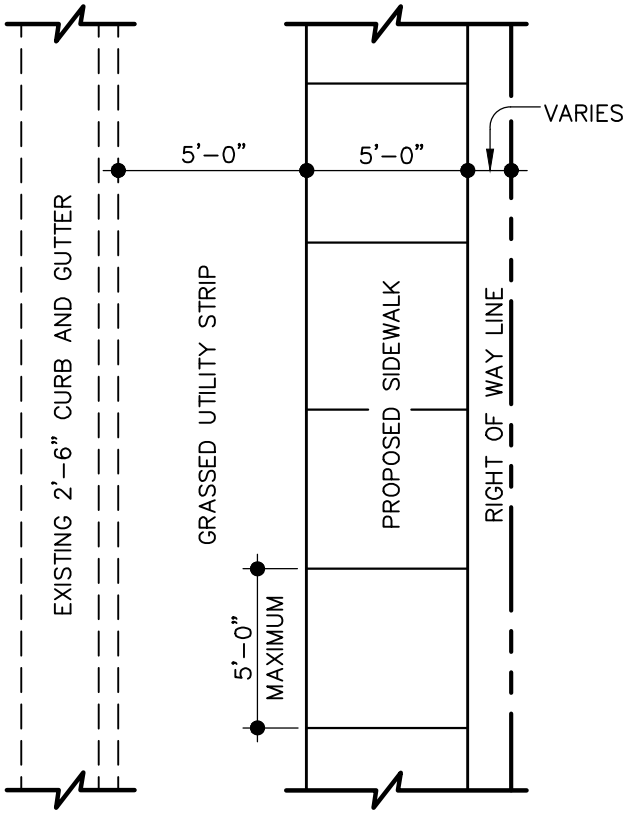
$$\text{Allowable Leakage, } L = \frac{S \times D \times \sqrt{(P)}}{133{,}200}$$

Where: L = leakage (gph)
S = length of pipe (feet)
D = nominal diameter of pipe segment tested (inches)
P = test pressure (pounds per square inch)

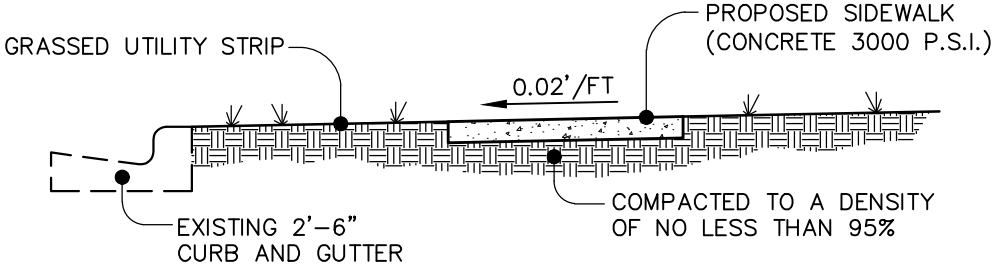
Testing of the tracer wire and marker tape shall be performed by the Contractor at the completion of the project to assure they are all working properly. It is the Contractor's responsibility to provide the necessary equipment to test. Any defective, missing, or otherwise non-locatable units shall be replaced.

APPENDIX

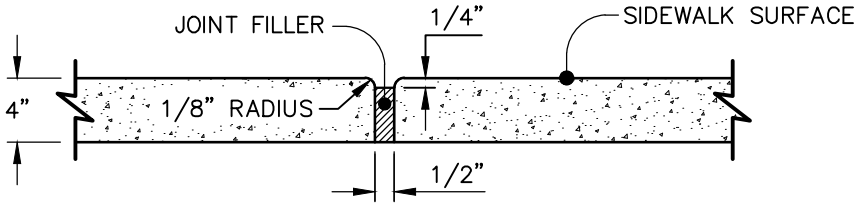
STANDARD DRAWINGS



PLAN VIEW



TYPICAL SECTION



TRANSVERSE EXPANSION JOINT

NOTES:

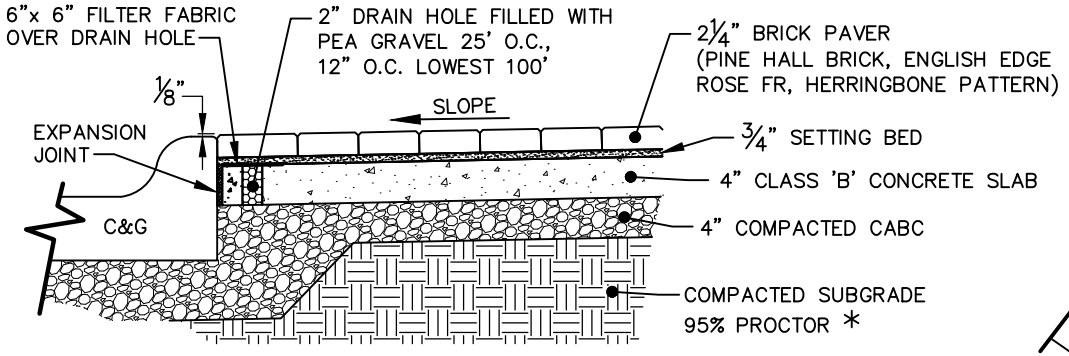
1. TRANSVERSE EXPANSION JOINTS TO BE A MAXIMUM OF 50 FEET.
2. ALL CONCRETE TO BE FINISHED WITH CURING COMPOUND.
3. A 6 INCH DEPTH IS REQUIRED AT LOCATIONS OF DRIVEWAY CROSSINGS, AT STREET INTERSECTIONS (ALONG THE LENGTH OF RADIUS CURB RETURNS), AND IN THE HANDICAP RAMPS.

CITY OF GOLDSBORO NORTH CAROLINA

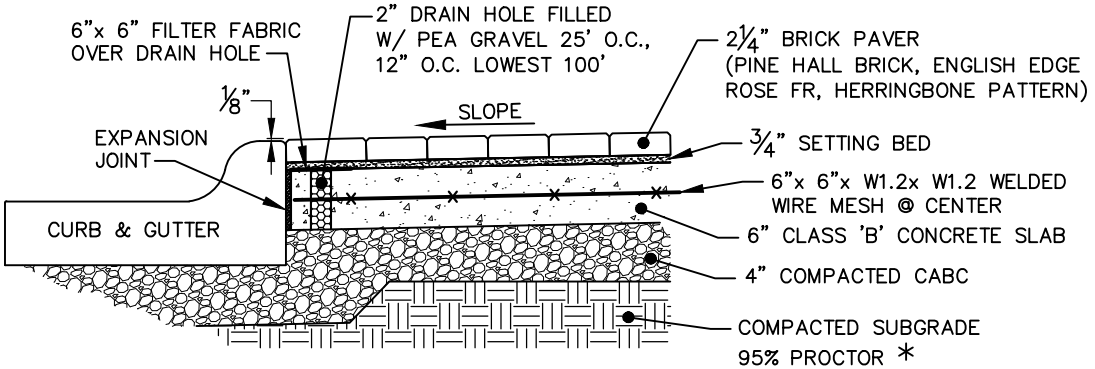
EFFECTIVE: 12/01/18

STANDARD CONCRETE SIDEWALK

DETAIL No.
02000.01
SHEET 1 OF 2

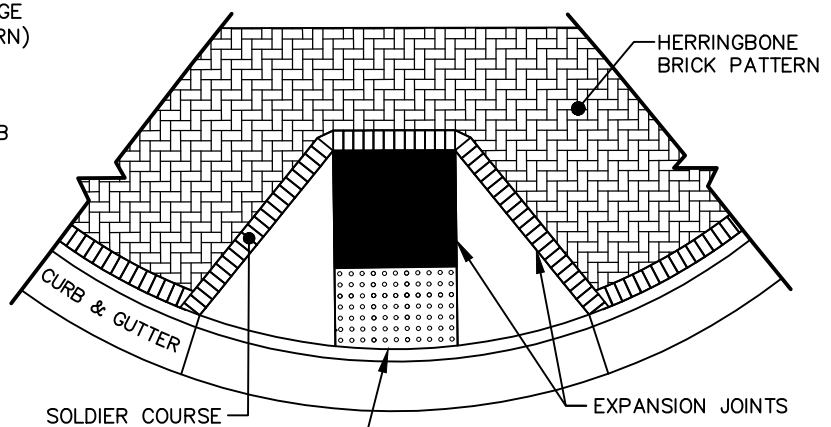


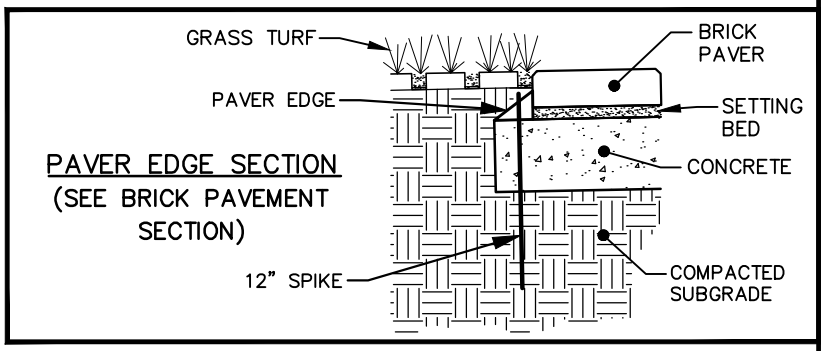
BRICK SIDEWALK SECTION
LIGHT DUTY

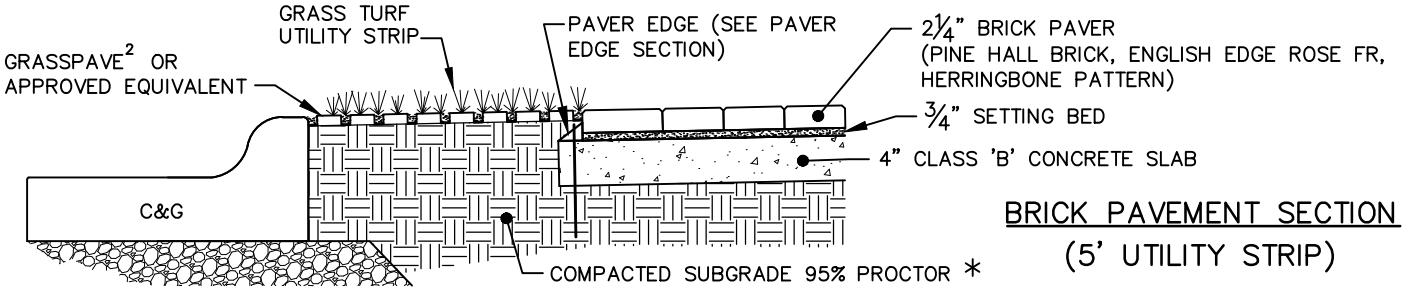


BRICK SIDEWALK SECTION
HEAVY DUTY

WHEELCHAIR RAMP – PLAN VIEW







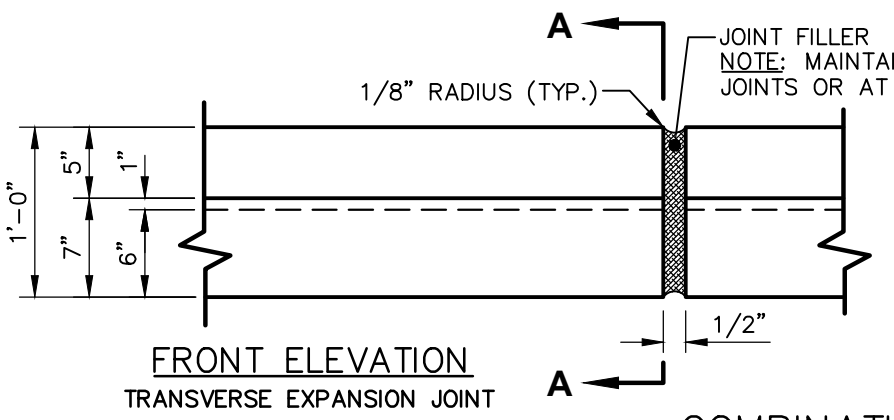
BRICK PAVEMENT SECTION
(5' UTILITY STRIP)

CITY OF GOLDSBORO NORTH CAROLINA

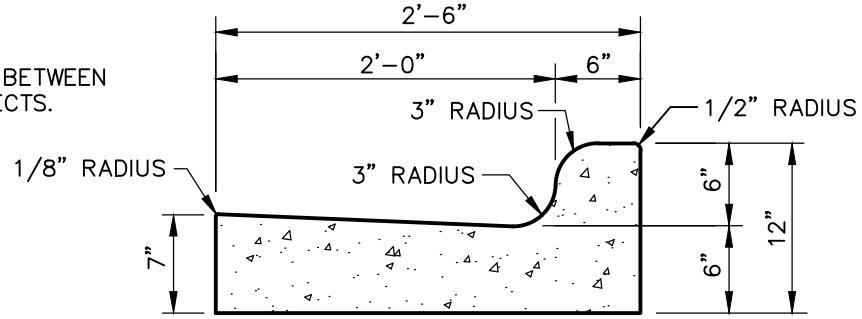
EFFECTIVE: 12/01/18

STANDARD BRICK OR CONCRETE PAVERS SIDEWALK

DETAIL No.
02000.01
SHEET 2 OF 2

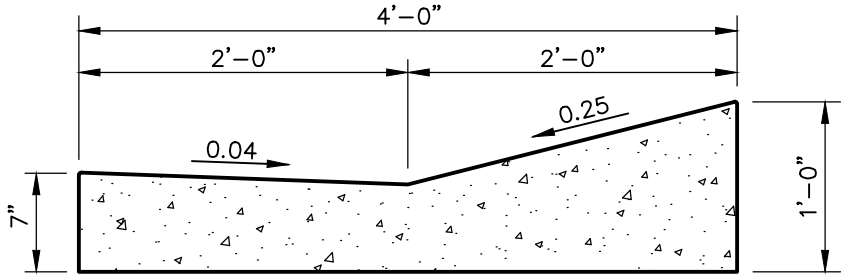


FRONT ELEVATION
TRANSVERSE EXPANSION JOINT

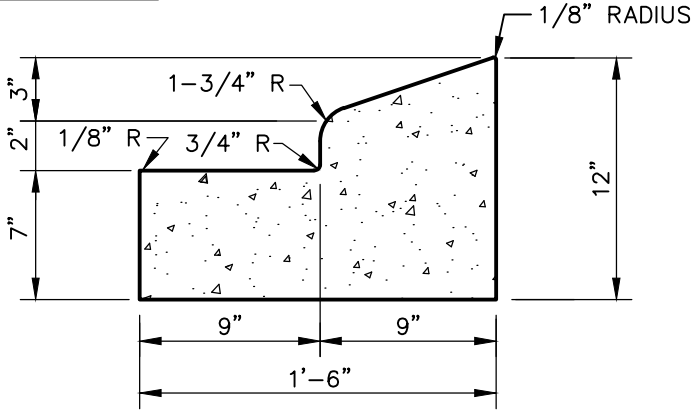


SECTION A-A
SIDE ELEVATION

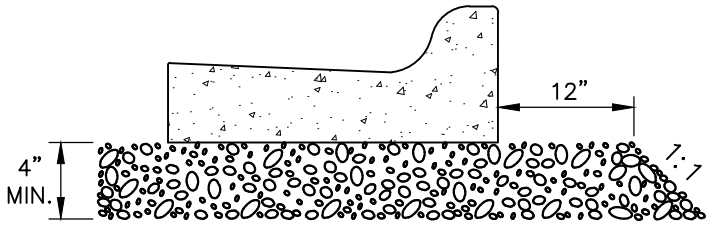
COMBINATION CURB AND GUTTER



EXPRESSWAY GUTTER
(FOR USE ON ALLEYS ONLY)



MEDIAN CURB AND GUTTER
SIDE ELEVATION



A.B.C. UNDER STANDARD
CURB & GUTTER

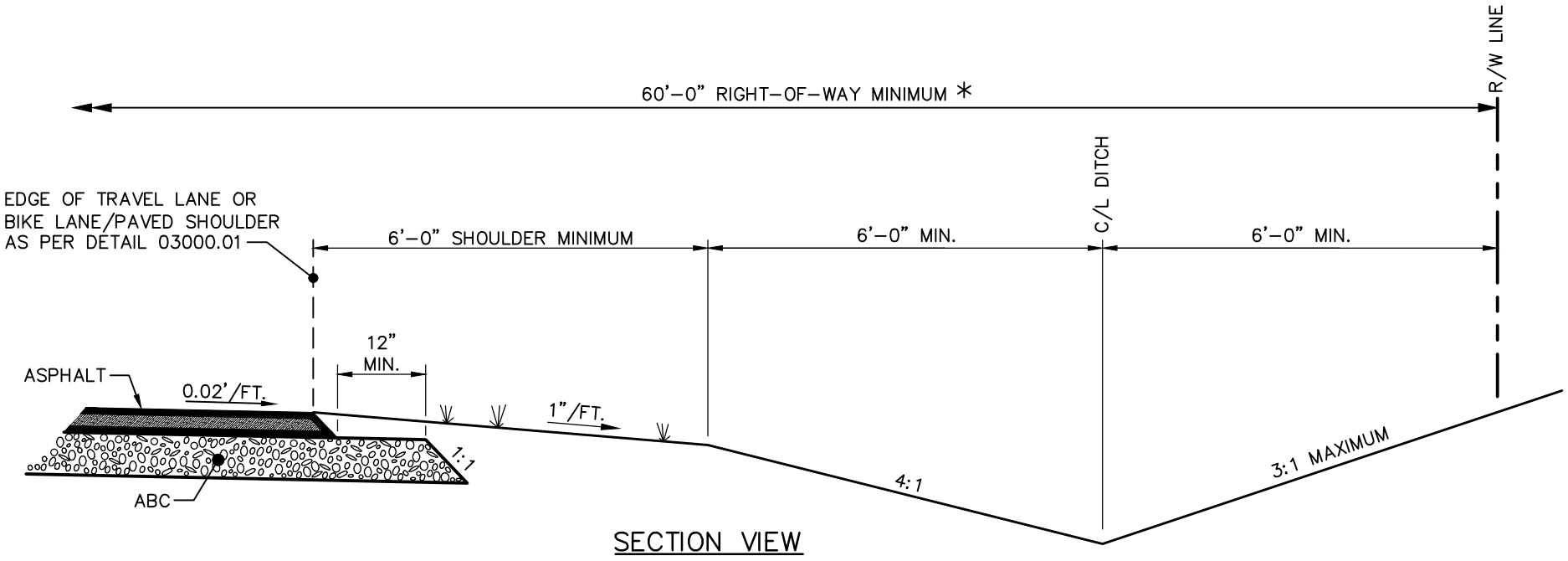
NOTES:
1. CONCRETE SHALL BE 3,000 P.S.I.
2. CONTRACTION JOINTS SHALL BE SPACED AT 10 FOOT INTERVALS. (A 15 FOOT SPACING WILL BE ALLOWED WHEN A MACHINE IS USED)
3. FINISH ALL CONCRETE WITH CURING COMPOUND.
4. REFER TO **NCDOT** DETAIL 846.01 FOR CURB AND GUTTER SUPERELEVATION RATES.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD CONCRETE CURB AND GUTTER

DETAIL No.
02000.02
SHEET 1 OF 1



SECTION VIEW

* RIGHT–OF–WAY WIDTH TO BE PROVIDED AS NEEDED TO LOCATE ENTIRE DITCH WITHIN RIGHT–OF–WAY

NOTES:

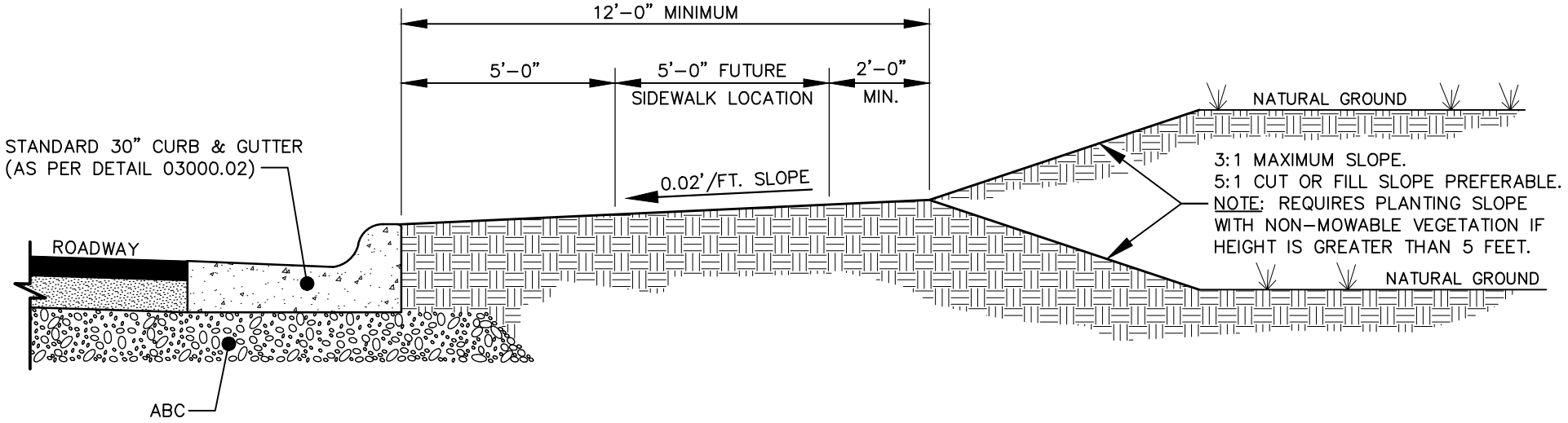
1. THIS SECTION MAY ONLY BE USED WHEN:
   - STREET IS WITHIN A RESERVOIR WATERSHED PROTECTION DISTRICT.
   - LOCAL OR COLLECTOR STREET. SEE SECTION 03030 B5 FOR DESIGN SPECIFICATIONS.
2. FOR THOROUGHFARE STREETS, SEE **NCDOT** DESIGN MANUAL.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD DITCH SECTION WITHOUT CURB AND GUTTER

DETAIL No.
02000.03
SHEET 1 OF 1



CITY OF GOLDSBORO NORTH CAROLINA

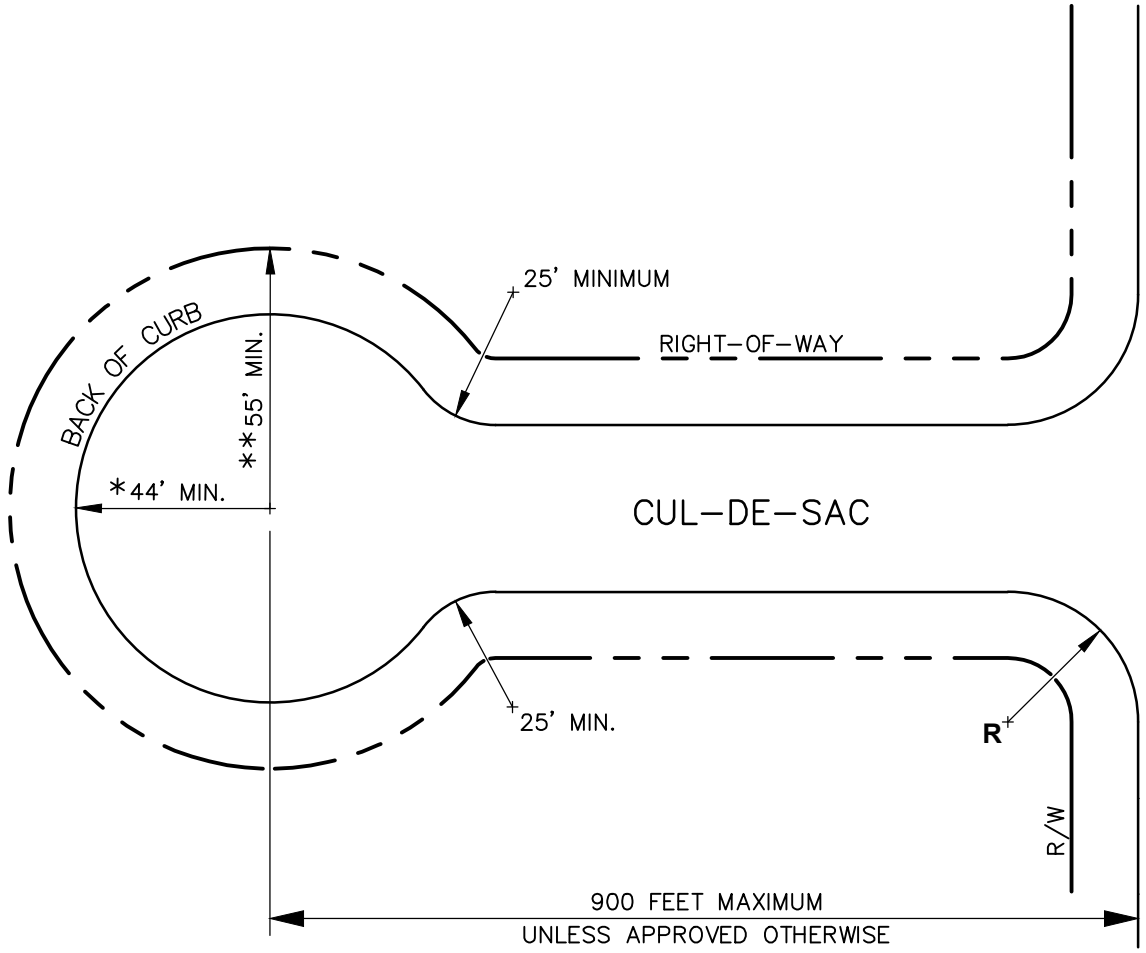
EFFECTIVE: 12/01/18

STANDARD CURB AND GUTTER SECTION WITHOUT SIDEWALK

DETAIL No.

02000.04

SHEET 1 OF 1



* DIMENSION REMAINS THE SAME IF CURB & GUTTER IS NOT USED.

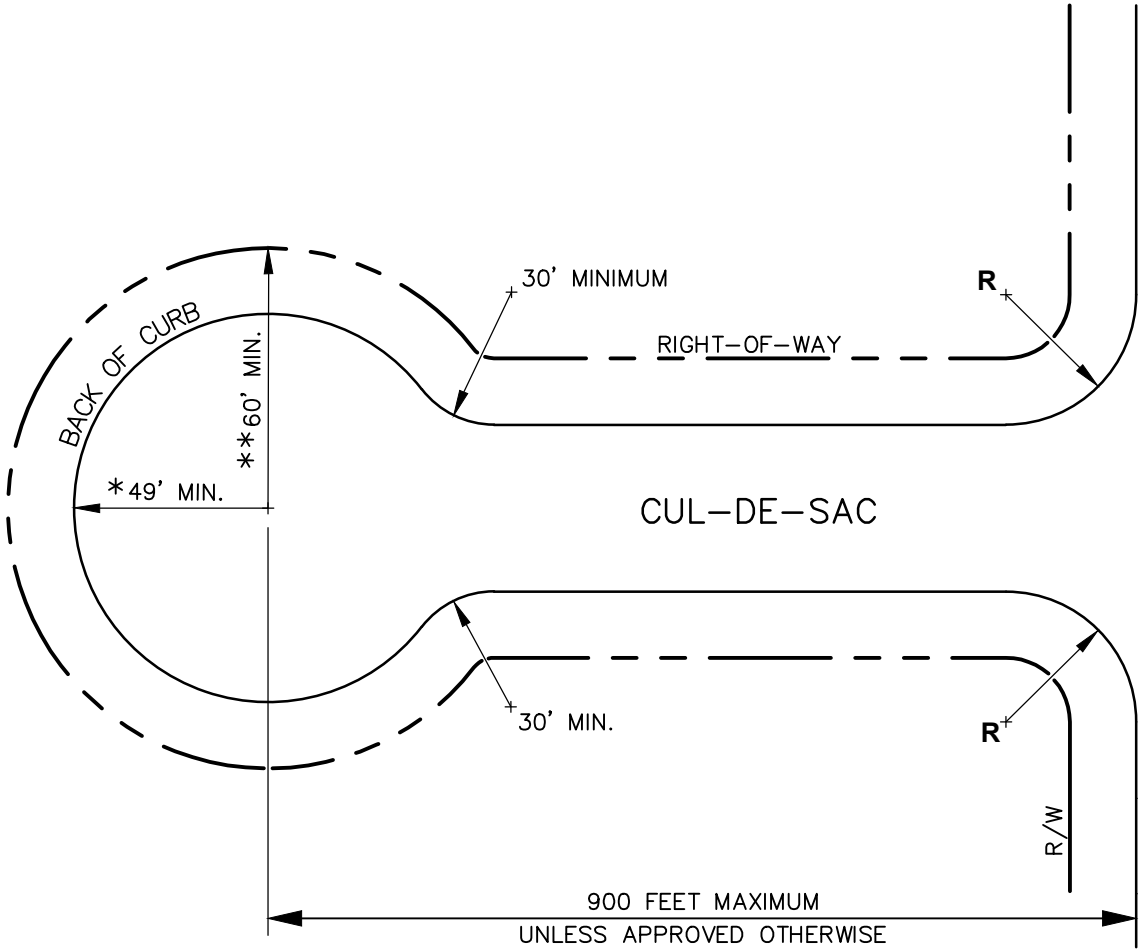
** INCREASE TO 60' IF CURB & GUTTER IS NOT USED.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

RESIDENTIAL CUL-DE-SAC

DETAIL No.
02000.05
SHEET 1 OF 3



* DIMENSION REMAINS THE SAME IF CURB & GUTTER IS NOT USED.

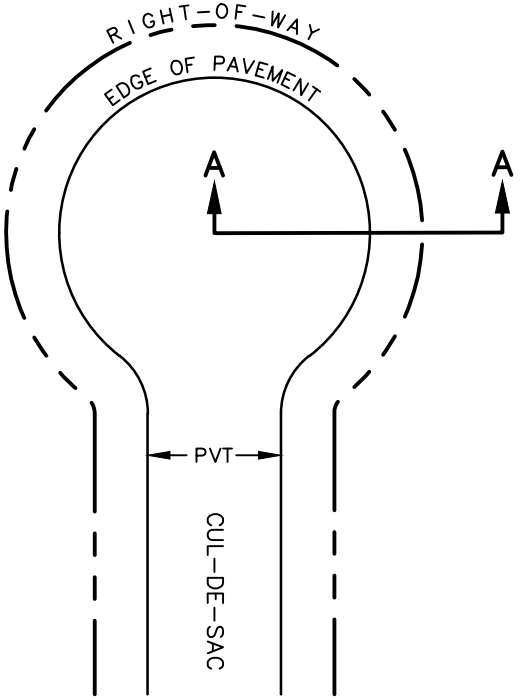
** INCREASE TO 65' IF CURB & GUTTER IS NOT USED.

CITY OF GOLDSBORO NORTH CAROLINA

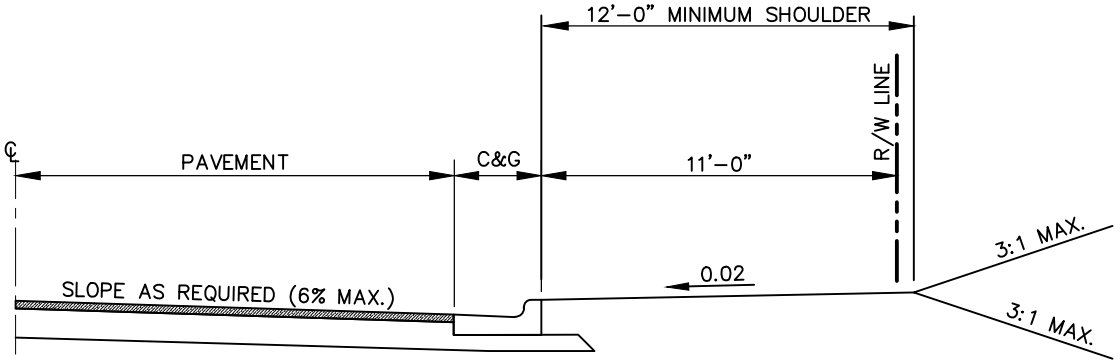
EFFECTIVE: 12/01/18

NON-RESIDENTIAL CUL-DE-SAC

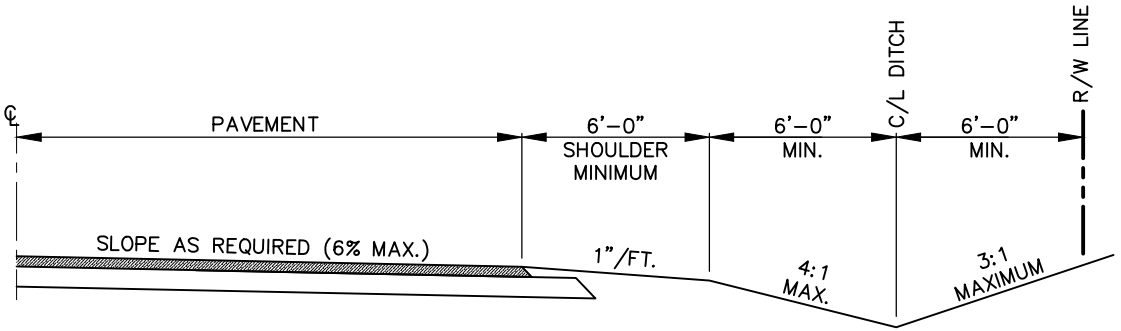
DETAIL No.
02000.05
SHEET 2 OF 3



PLAN VIEW



SECTION 'A-A'
WITH CURB & GUTTER



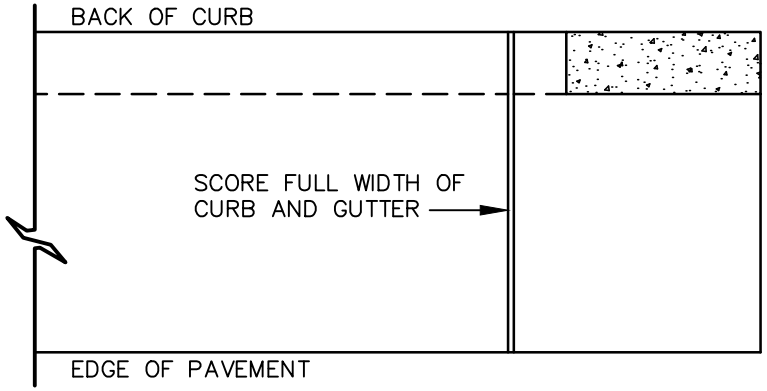
SECTION 'A-A'
WITHOUT CURB & GUTTER

CITY OF GOLDSBORO
NORTH CAROLINA

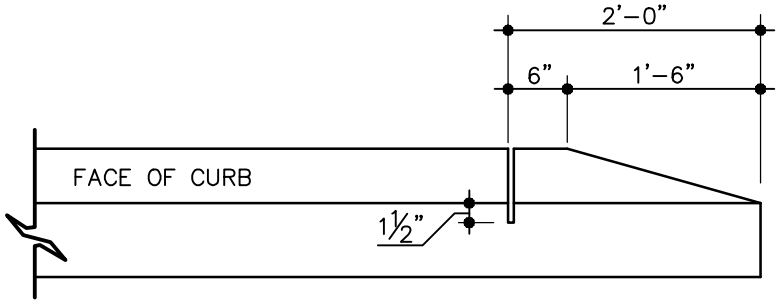
EFFECTIVE: 12/01/18

CUL-DE-SAC SECTION

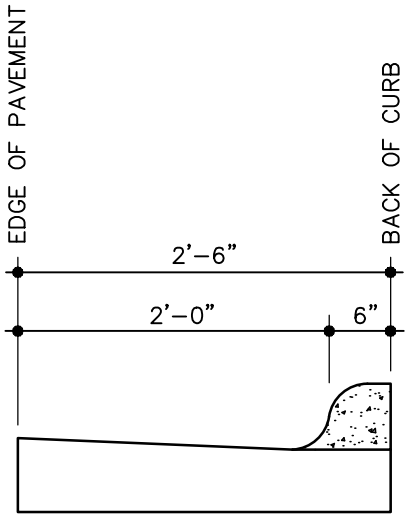
DETAIL No.
02000.05
SHEET 3 OF 3



PLAN



FRONT



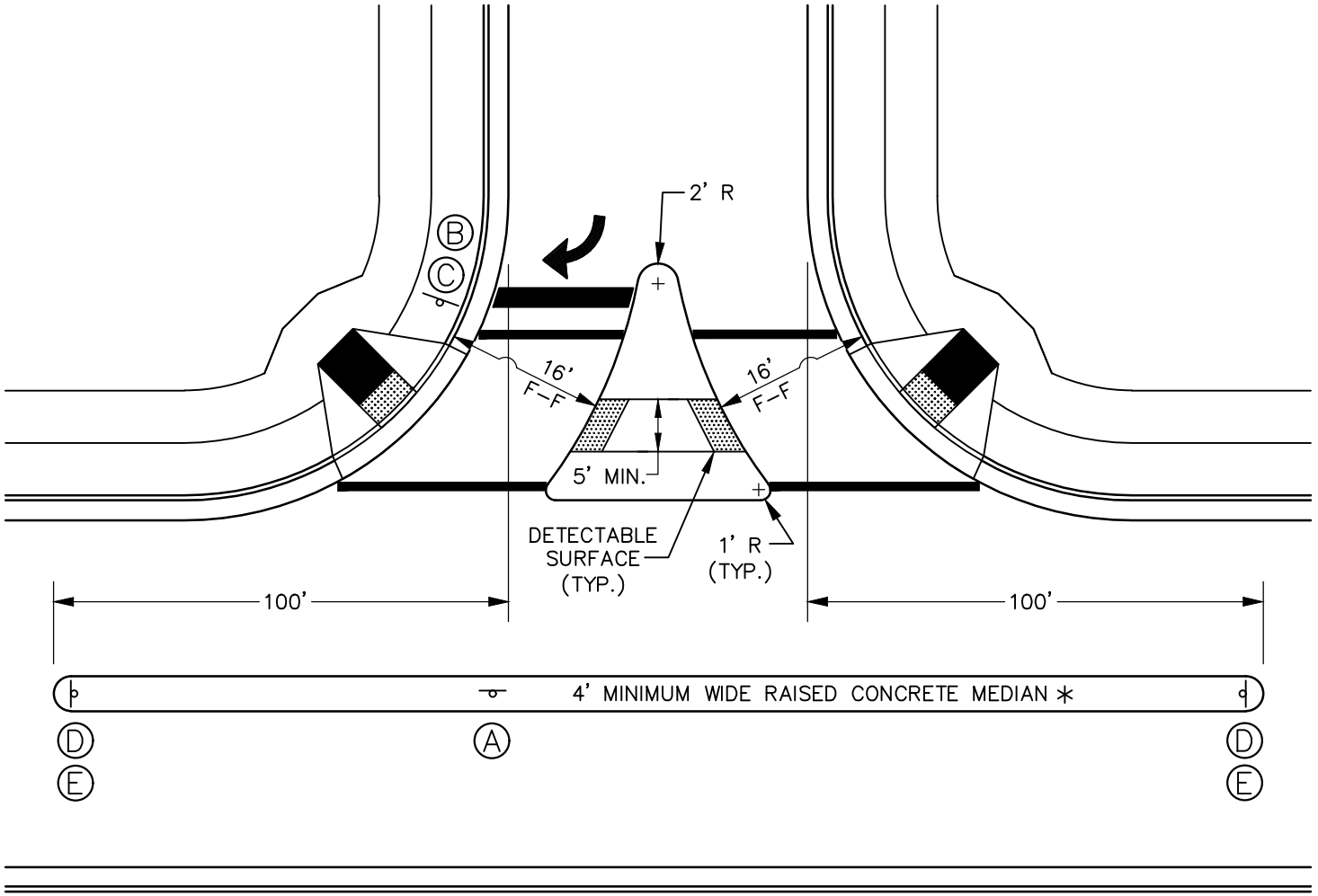
END

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD METHOD OF ENDING CURB AND GUTTER

DETAIL No.
02000.06
SHEET 1 OF 1



SIGN LEGEND

Ⓐ 

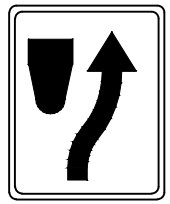
R6-1R
36"X12"

Ⓑ 

R1-1
30"X30"

Ⓒ 

R3-5R
30"X36"

Ⓓ 

R4-7 or R4-7A
24"X30"

Ⓔ 

OM-3L
12"X36"

* MEDIAN USED ON UNDIVIDED ROADWAYS ONLY

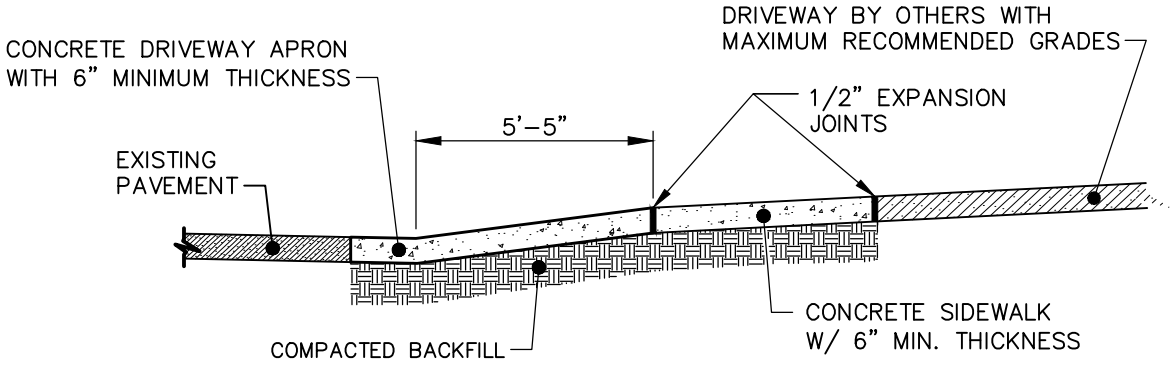
NOTES:
1. MOUNT SIGN B & C ON SAME POST WITH STOP SIGN ON TOP.
2. F-F = FACE OF CURB TO FACE OF CURB.

CITY OF GOLDSBORO NORTH CAROLINA

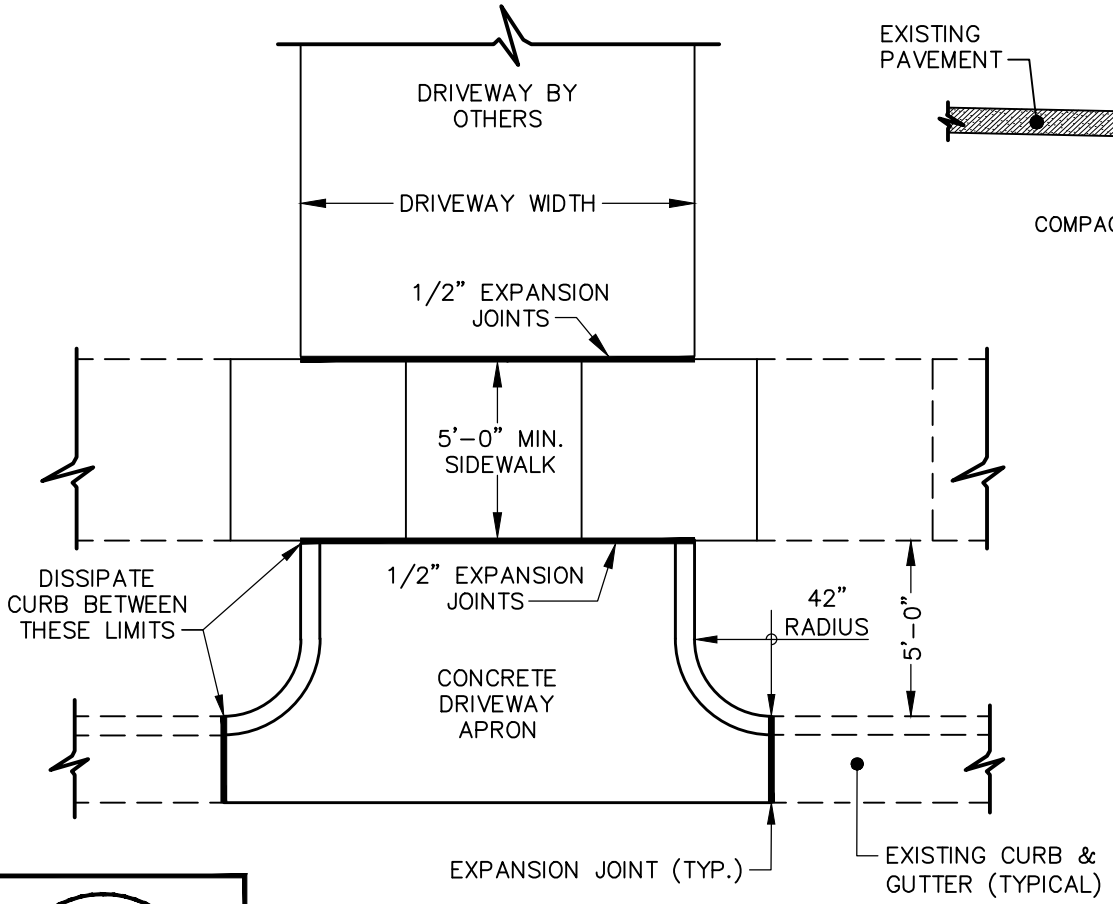
EFFECTIVE: 12/01/18

STANDARD RIGHT-IN/RIGHT-OUT CHANNELIZATION

DETAIL No.
02000.07
SHEET 1 OF 1



TYPICAL SECTION



PLAN VIEW

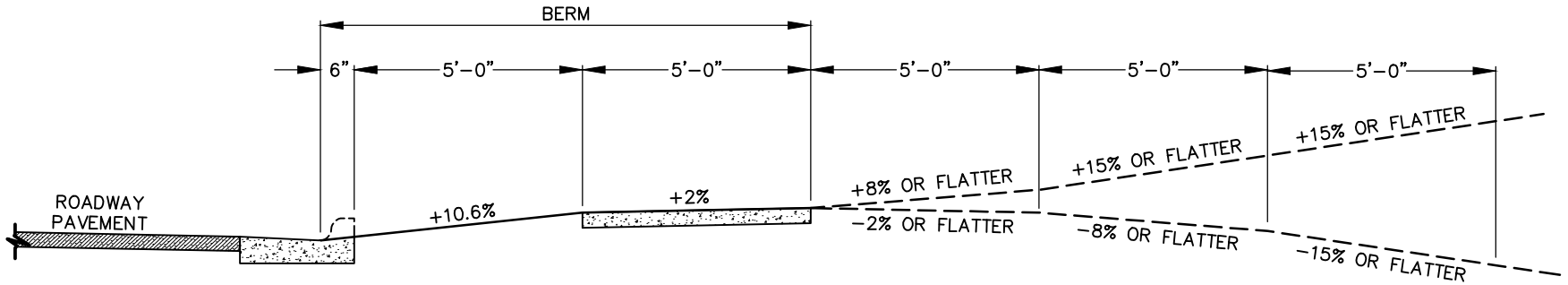
NOTES:
1. CURB SHALL BE TAPERED TO FINISH FLUSH WITH SIDEWALK.
2. BEGINNING RADIUS SHALL NOT ENCROACH ON ADJACENT PROPERTIES BASED ON A PROJECTION OF THE PROPERTY LINE FROM THE RIGHT OF WAY TO THE CURB LINE.
3. THE TOWN IS NOT RESPONSIBLE FOR VEHICLES THAT DRAG DUE TO GRADE OF DRIVEWAY. THE DRIVEWAY IS PRIVATELY MAINTAINED.
4. ALL CONCRETE SHALL BE 3,000 PSI.

CITY OF GOLDSBORO NORTH CAROLINA

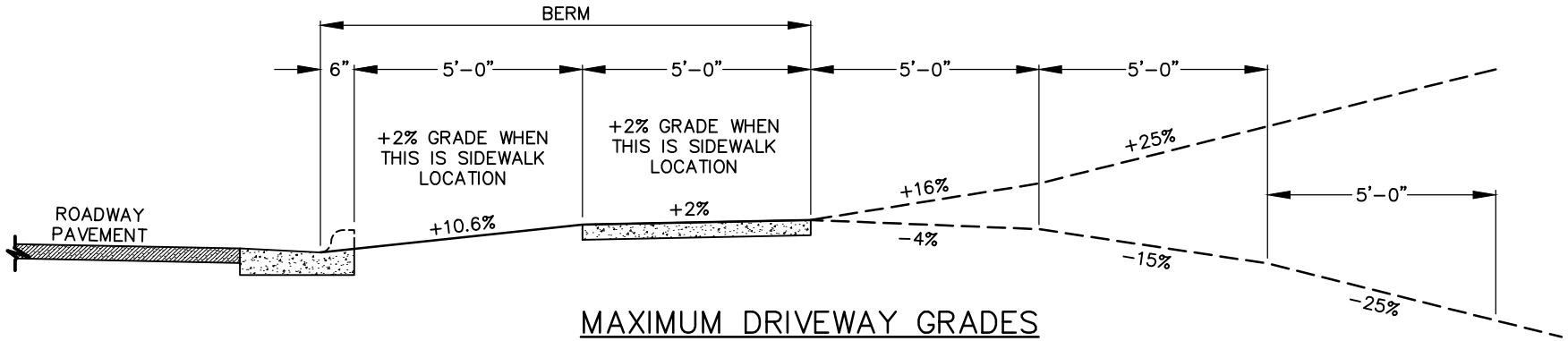
EFFECTIVE: 12/01/18

STANDARD DRIVEWAY APRON

DETAIL No.
02000.08
SHEET 1 OF 4



DESIRABLE DRIVEWAY GRADES



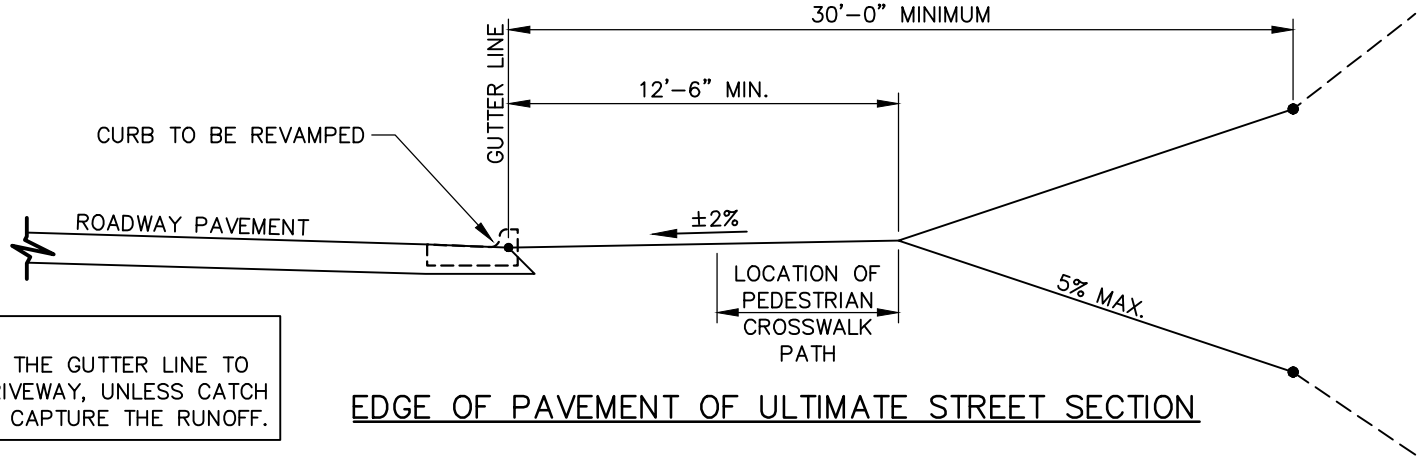
MAXIMUM DRIVEWAY GRADES

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD DRIVEWAY GRADES

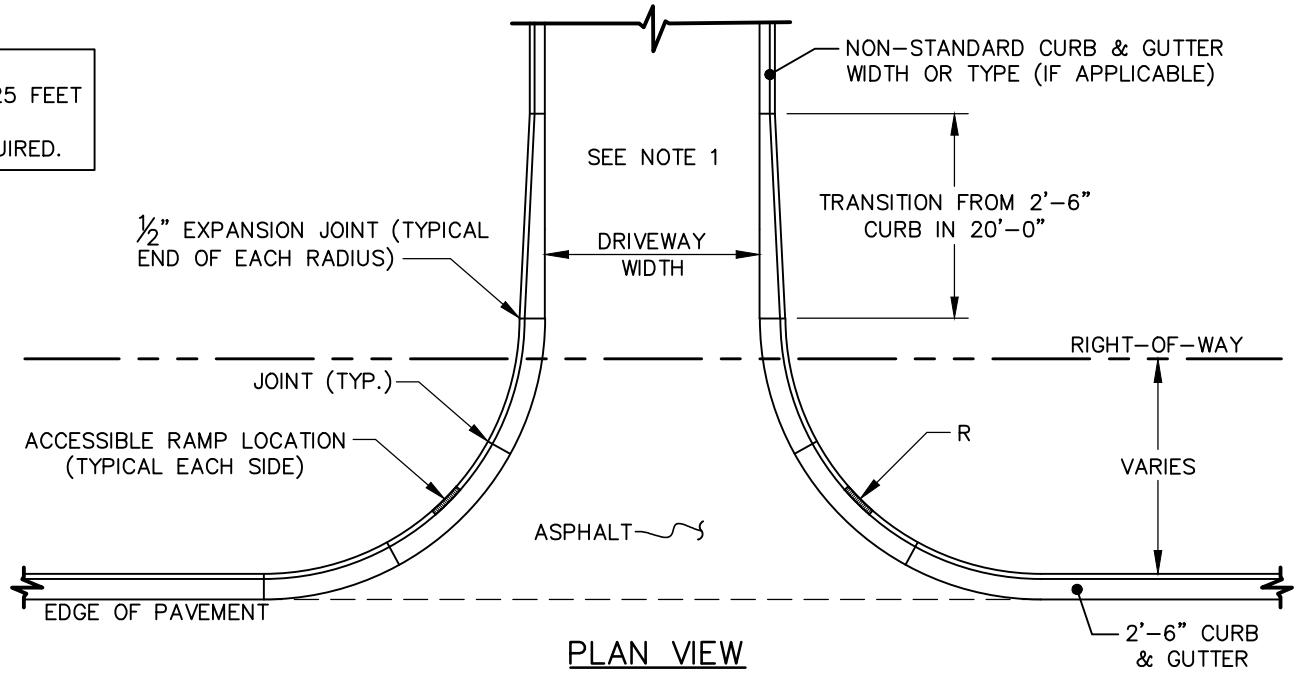
DETAIL No.
02000.08
SHEET 2 OF 4



NOTE:
DRIVEWAY GRADE SHOULD RISE FROM THE GUTTER LINE TO PREVENT RUNOFF FROM ENTERING DRIVEWAY, UNLESS CATCH BASINS IN STREET ARE PROVIDED TO CAPTURE THE RUNOFF.

EDGE OF PAVEMENT OF ULTIMATE STREET SECTION

NOTES:
1. PAVING MUST EXTEND INTO SITE AT LEAST 25 FEET FROM EDGE OF PAVEMENT.
2. ACCESSIBLE RAMPS PER CURB RETURN REQUIRED.



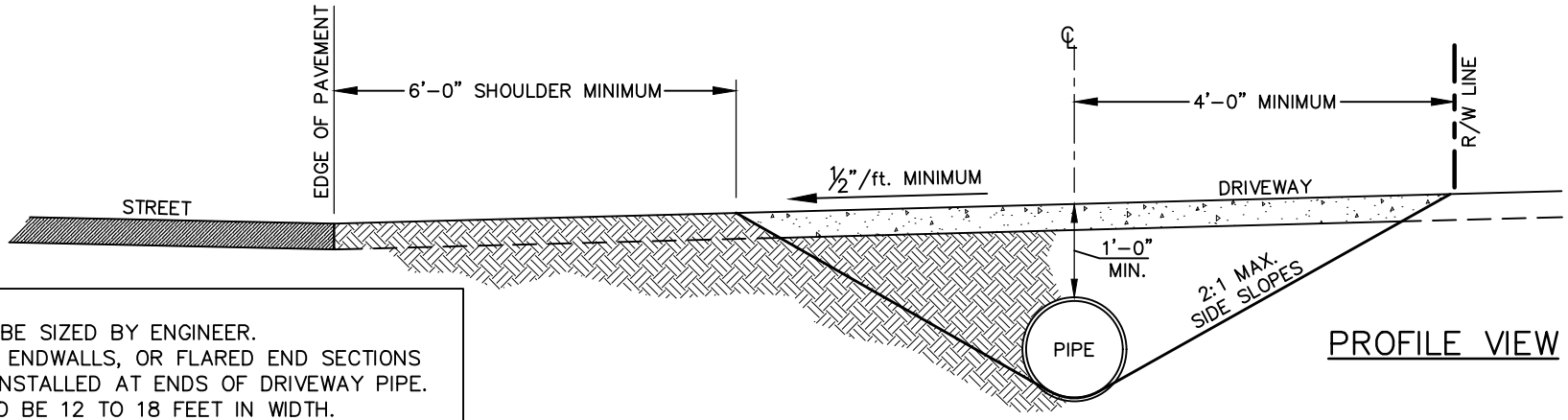
PLAN VIEW

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

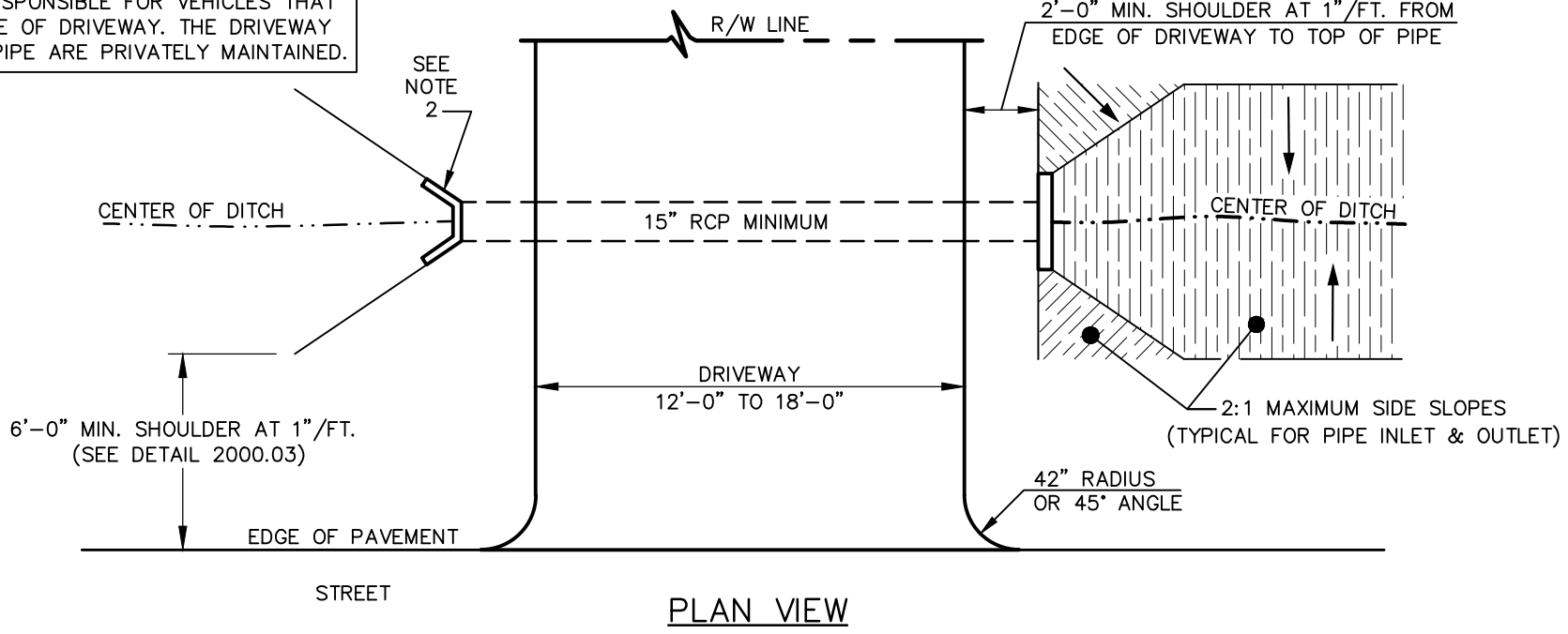
STANDARD DRIVEWAY ENTRANCE AND GRADES

DETAIL No.
02000.08
SHEET 3 OF 4



PROFILE VIEW

NOTES:
1. PIPE SHALL BE SIZED BY ENGINEER.
2. HEADWALLS, ENDWALLS, OR FLARED END SECTIONS SHALL BE INSTALLED AT ENDS OF DRIVEWAY PIPE.
3. DRIVEWAY TO BE 12 TO 18 FEET IN WIDTH.
4. BACKFILL PIPE TRENCH TO 95% COMPACTION PER **AASHTO** METHOD T99 AND **TOC** STANDARD 5020.
5. THE TOWN IS NOT RESPONSIBLE FOR VEHICLES THAT DRAG DUE TO GRADE OF DRIVEWAY. THE DRIVEWAY AND STORM DRAIN PIPE ARE PRIVATELY MAINTAINED.



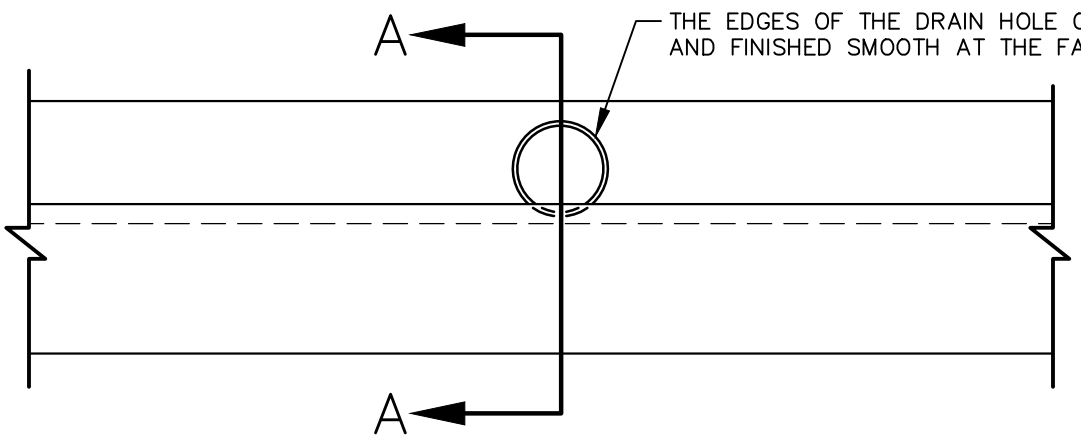
PLAN VIEW

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

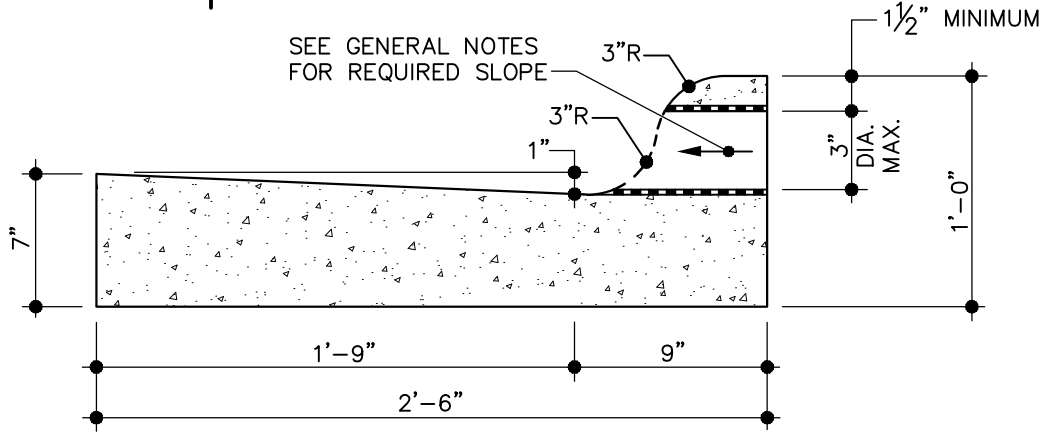
RESIDENTIAL DRIVEWAY APRON WITHOUT CURB AND GUTTER

DETAIL No.
02000.08
SHEET 4 OF 4



FRONT VIEW

SECTION A–A



GENERAL NOTES:

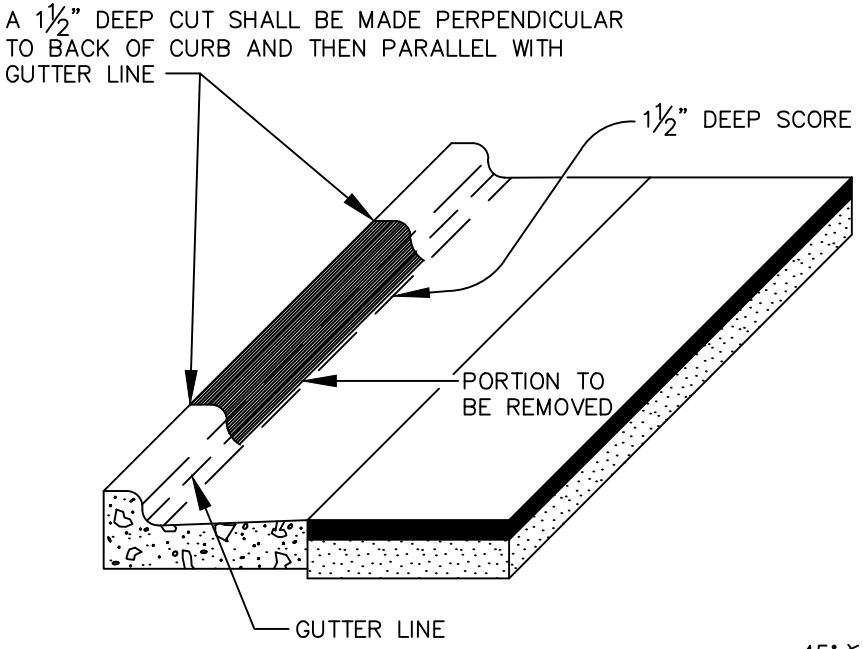
1. CURB DRAINS SHALL NOT BE CONSTRUCTED WITHIN 18 INCHES OF CONTRACTION OR EXPANSION JOINTS.
2. OPENING GRADE MAY VARY BETWEEN A MAXIMUM SLOPE OF 1/2" PER FT. AND A MINIMUM OF 1/4" PER FT.
3. MORE THAN ONE HOLE MAY BE INSTALLED PROVIDED THE HOLES ARE LOCATED WITH 18 INCHES MINIMUM SPACING.
4. IN LIEU OF CUTTING THE CURB TO INSTALL A 3 INCH PIPE, A 4 INCH CONCRETE BORE MAY BE USED.
   A) BORE OR REMOVE & REPOUR 5 FOOT SECTION OF CURB, NO CUTTING OUT TOP OF CURB.
   B) MAY NEED PERMIT AND/OR ENCROACHMENT AGREEMENT FROM THE ENGINEERING DEPARTMENT.

CITY OF GOLDSBORO NORTH CAROLINA

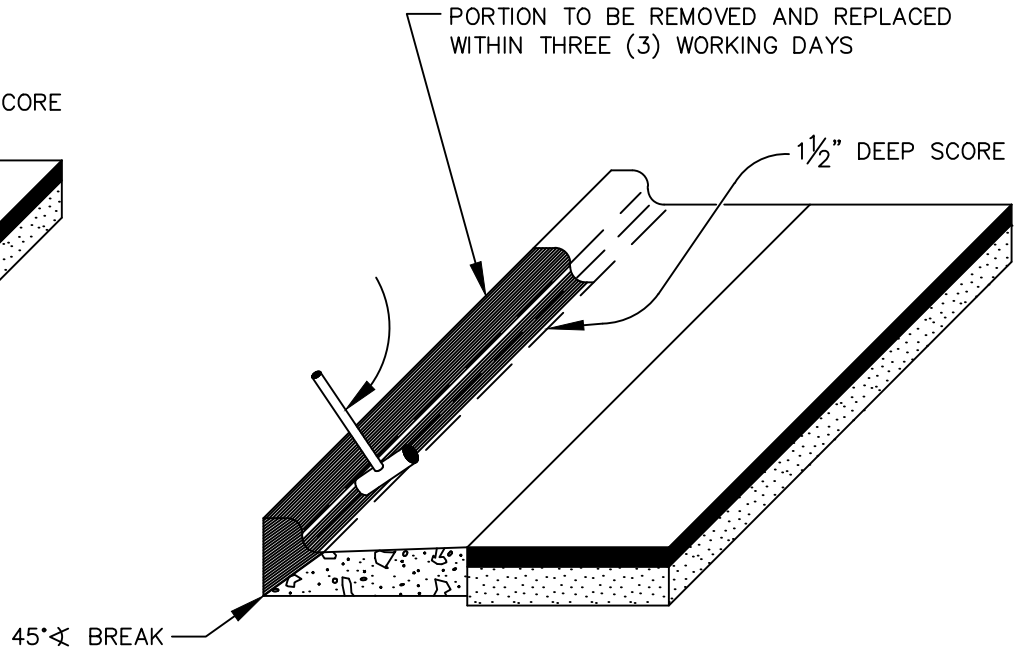
EFFECTIVE: 12/01/18

STANDARD CURB DRAIN

DETAIL No.
02000.09
SHEET 1 OF 1



STEP ONE



STEP TWO

NOTES:

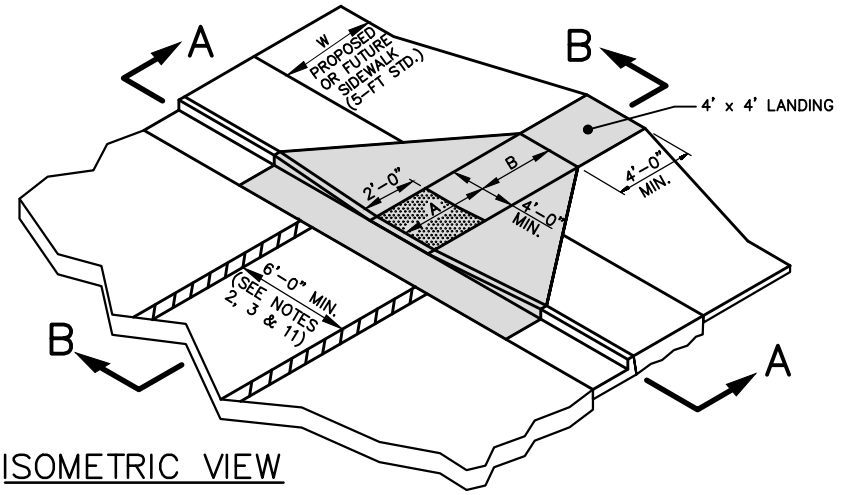
1. CURB AND GUTTER SECTION SHALL BE REMOVED IN ACCORDANCE WITH DRIVEWAY WIDTH APPROVED BY THE CITY.
2. IF PERPENDICULAR CUT IS WITHIN 12 INCHES FROM A JOINT, THEN THE PARALLEL CUT SHALL BE MADE TO THAT JOINT.
3. THIS METHOD IS NOT ALLOWED IN NEW SUBDIVISION CONSTRUCTION.

CITY OF GOLDSBORO NORTH CAROLINA

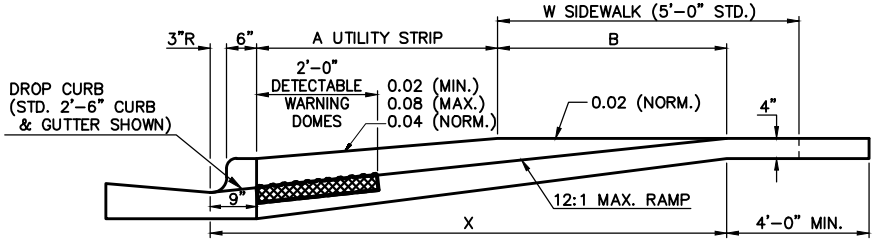
EFFECTIVE: 12/01/18

STANDARD METHOD OF REMOVING EXISTING CURB FOR DRIVEWAY

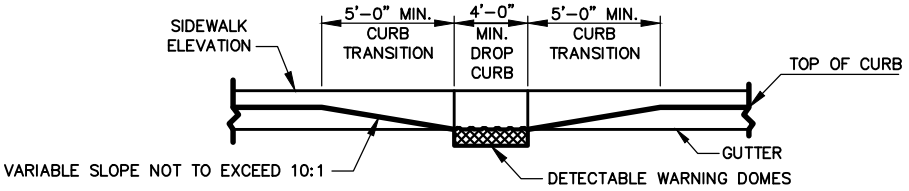
DETAIL No.
02000.10
SHEET 1 OF 1



ISOMETRIC VIEW



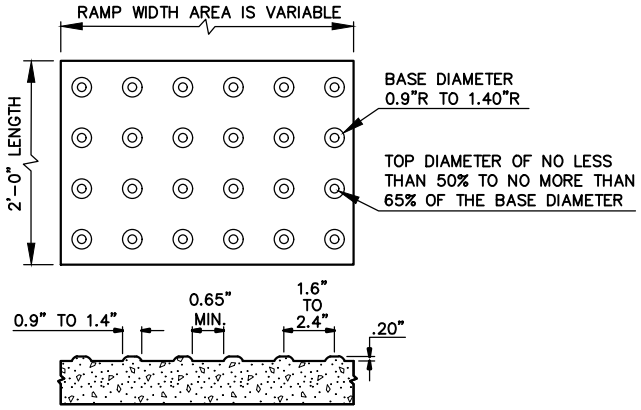
SECTION B–B



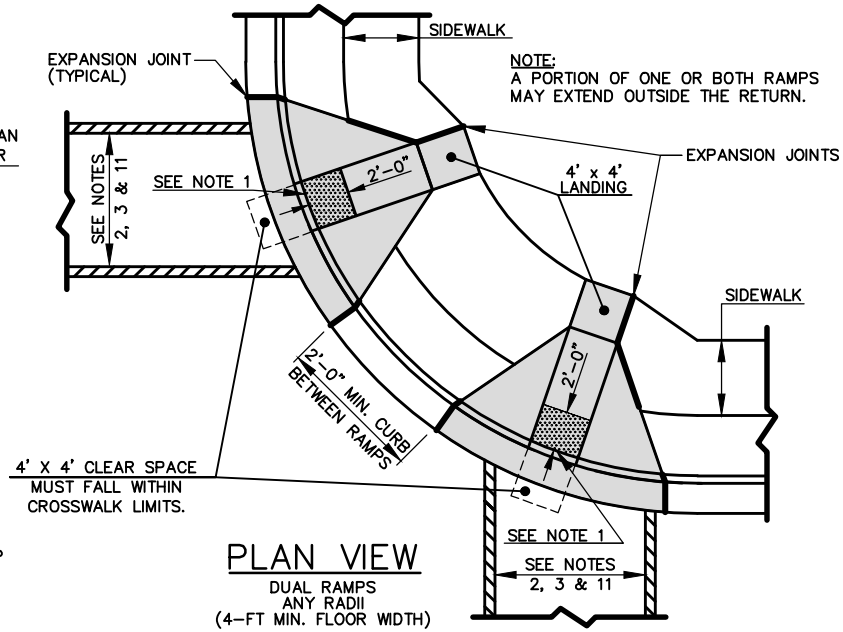
SECTION A–A

W	A	W+A+9"	X	B
5'	0.0'	5.8'	5.8'	5.0'*
6'	0.0'	6.8'	6.8'	6.0'**
7'	0.0'	7.8'	7.3'	6.5'**
8'	0.0'	8.8'	7.3'	6.5'**
5'	2.0'	7.8'	7.8'	5.0'
5'	2.5'	8.3'	8.1'	4.8'
5'	3.0'	8.8'	8.3'	4.4'
5'	3.5'	9.3'	8.4'	4.1'
5'	4.0'	9.8'	8.6'	3.8'
5'	4.5'	10.3'	8.7'	3.4'
5'	5.0'	10.8'	8.9'	3.1'

B = X–(A+9")
B = DISTANCE FROM FRONT EDGE OF SIDEWALK TO BACK POINT OF 12:1 (8.33%) SLOPE.
* BACK OF SIDEWALK DROP REQUIRED FOR ALL SIDEWALK SLOPES.
** BACK OF SIDEWALK DROP REQUIRED FOR SIDEWALK SLOPES 0.04.



DETECTABLE WARNING DOMES



PLAN VIEW
DUAL RAMPS
ANY RADII
(4–FT MIN. FLOOR WIDTH)

PAY LIMITS FOR CURB RAMP

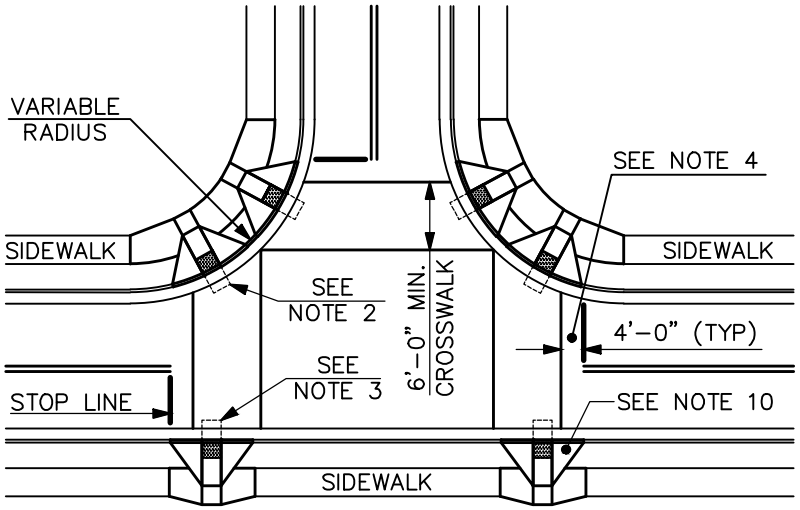
NOTES:
1. DETECTABLE WARNING DOMES WILL COVER 2'–0" LENGTH AND FULL WIDTH OF THE RAMP FLOOR AS SHOWN ON THE DETAILS.
2. DETECTABLE WARNING DOMES WILL CONTRAST VISIBILITY WITH ADJOINING SURFACE, EITHER LIGHT–ON–DARK, OR DARK–ON–LIGHT SEQUENCE COVERING THE ENTIRE RAMP.

CITY OF GOLDSBORO NORTH CAROLINA

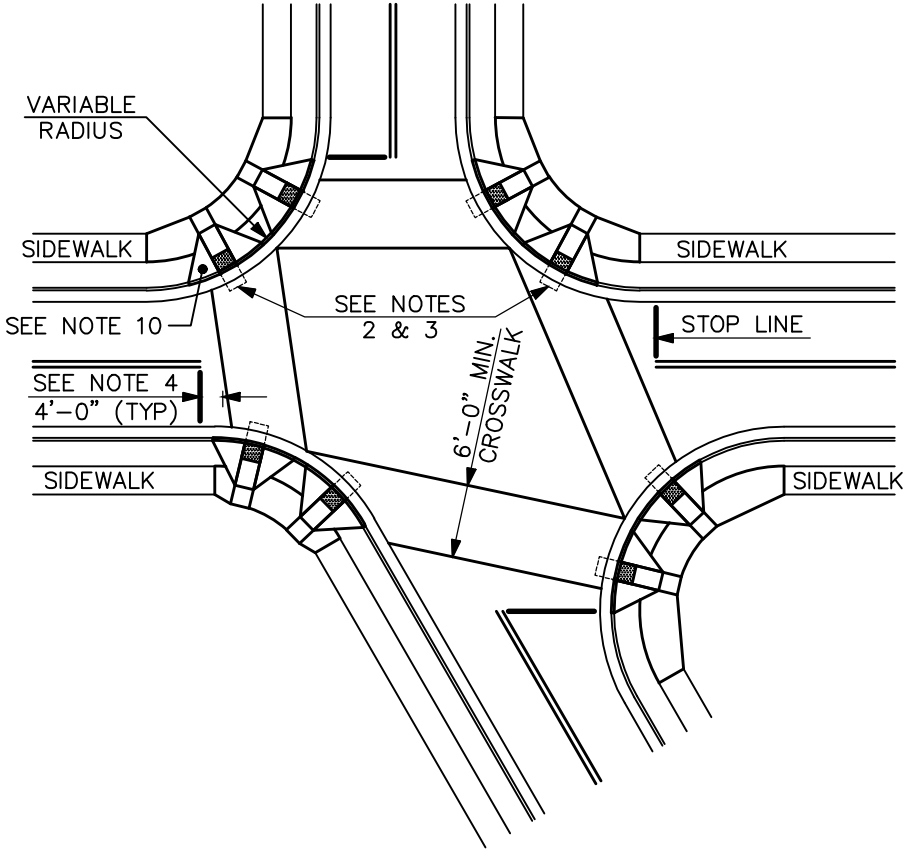
EFFECTIVE: 12/01/18

STANDARD CURB RAMPS

DETAIL No.
02000.11
SHEET 1 OF 3



DETAIL SHOWING TYPICAL LOCATION OF CURB RAMPS, PEDESTRIAN CROSSWALKS AND STOP LINES FOR TEE INTERSECTIONS



DETAIL SHOWING TYPICAL LOCATION OF CURB RAMPS, PEDESTRIAN CROSSWALKS AND STOP LINES

ROADWAY
PLAN SYMBOL
CR
FOR PROPOSED
CURB RAMP

PROPOSED CURB RAMP W/ LANDING

PROPOSED OR FUTURE SIDEWALK

ALLOWABLE LOCATIONS

DUAL RAMP RADII.....ANY

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD CURB RAMPS

DETAIL No.
02000.11
SHEET 2 OF 3

NOTES:

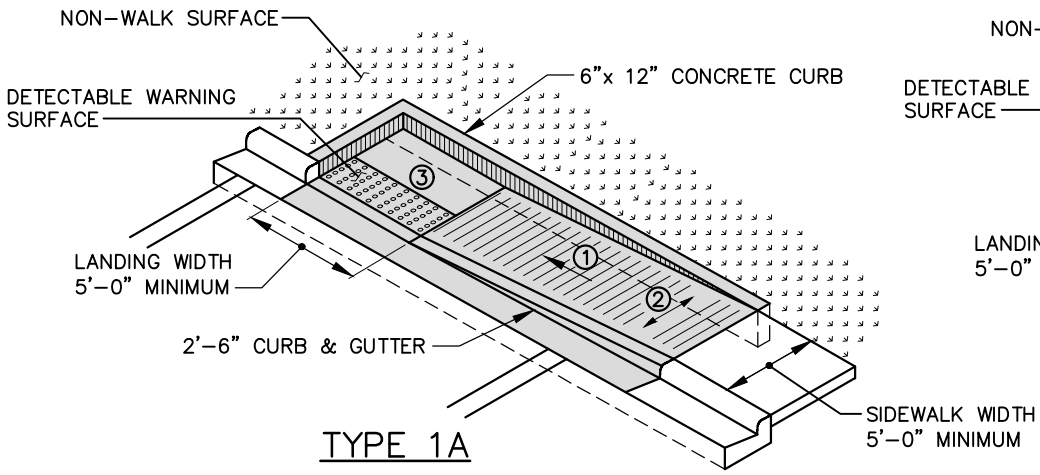
1. CONSTRUCT THE RAMP SURFACE TO BE STABLE, FIRM, AND SLIP RESISTANT. CONSTRUCT THE CURB RAMP TYPE AS SHOWN IN THE PAVEMENT MARKING PLANS OR AS DIRECTED BY THE ENGINEER.
2. LOCATE CURB RAMPS AND PLACE PEDESTRIAN CROSSWALK MARKINGS AS SHOWN IN THE PAVEMENT MARKING PLANS. WHEN FIELD ADJUSTMENTS REQUIRE MOVING CURB RAMPS OR MARKINGS AS SHOWN, CONTACT THE CITY ENGINEER.
3. COORDINATE THE CURB RAMP AND THE PEDESTRIAN CROSSWALK MARKINGS SO A 4'x4' CLEAR SPACE AT THE BASE OF THE CURB RAMP WILL FALL WITHIN THE PEDESTRIAN CROSSWALK LINES.
4. SET BACK DISTANCE FROM INSIDE CROSSWALK MARKING TO NEAREST EDGE OF TRAVEL LANE IS 4–FT MINIMUM.
5. REFER TO THE PAVEMENT MARKING PLANS FOR STOP BAR LOCATIONS AT SIGNALIZED INTERSECTIONS. IF A PAVEMENT MARKING PLAN IS NOT PROVIDED, CONTACT THE CITY ENGINEER.
6. TERMINATE PARKING A MINIMUM OF 20–FT BACK OF A PEDESTRIAN CROSSWALK.
7. CONSTRUCT CURB RAMPS A MINIMUM OF 4–FT WIDE.
8. CONSTRUCT THE RUNNING SLOPE OF THE RAMP 8.33% MAXIMUM.
9. ALLOWABLE CROSS SLOPE ON SIDEWALKS AND CURB RAMPS WILL BE 2% MAXIMUM.
10. CONSTRUCT THE SIDE FLARE SLOPE A MAXIMUM OF 10% MEASURED ALONG THE CURB LINE.
11. CONSTRUCT THE COUNTER SLOPE OF THE GUTTER OR STREET AT THE BASE OF THE CURB RAMP A MAXIMUM OF 5% AND MAINTAIN A SMOOTH TRANSITION.
12. CONSTRUCT LANDINGS FOR SIDEWALK A MINIMUM OF 4'x4' WITH A MAXIMUM SLOPE OF 2% IN ANY DIRECTION. CONSTRUCT LANDINGS FOR MEDIAN ISLANDS A MINIMUM OF 5'x5' WITH A MAXIMUM SLOPE OF 2% IN ANY DIRECTION.
13. TO USE A MEDIAN ISLAND AS A PEDESTRIAN REFUGE AREA, MEDIAN ISLANDS WILL BE A MINIMUM OF 6–FT WIDE. CONSTRUCT MEDIAN ISLANDS TO PROVIDE PASSAGE OVER OR THROUGH THE ISLAND.
14. SMALL CHANNELIZATION ISLANDS THAT CAN NOT PROVIDE A 5'X5' LANDING AT THE TOP OF A RAMPS, WILL BE CUT THROUGH LEVEL WITH THE SURFACE STREET.
15. CURB RAMPS WITH RETURNED CURBS MAY BE USED ONLY WHERE PEDESTRIANS WOULD NOT NORMALLY WALK ACROSS THE RAMP. THE ADJACENT SURFACE IS PLANTING OR OTHER NON–WALKING SURFACE OR THE SIDE APPROACH IS SUBSTANTIALLY OBSTRUCTED.
16. PLACE A 1/2" EXPANSION JOINT WHERE THE CONCRETE CURB RAMP JOINS THE CURB.
17. PLACE ALL PEDESTRIAN PUSH BUTTON ACTUATORS AND CROSSING SIGNALS AS SHOWN IN THE PLANS OR AS SHOWN IN THE **MUTCD**.
18. CURB RAMPS THROUGH MEDIAN ISLANDS, SINGLE RAMPS AT DUAL CROSSWALKS OR LIMITED RIGHT–OF–WAY SITUATIONS, WILL BE HANDLED BY SPECIAL DETAILS.

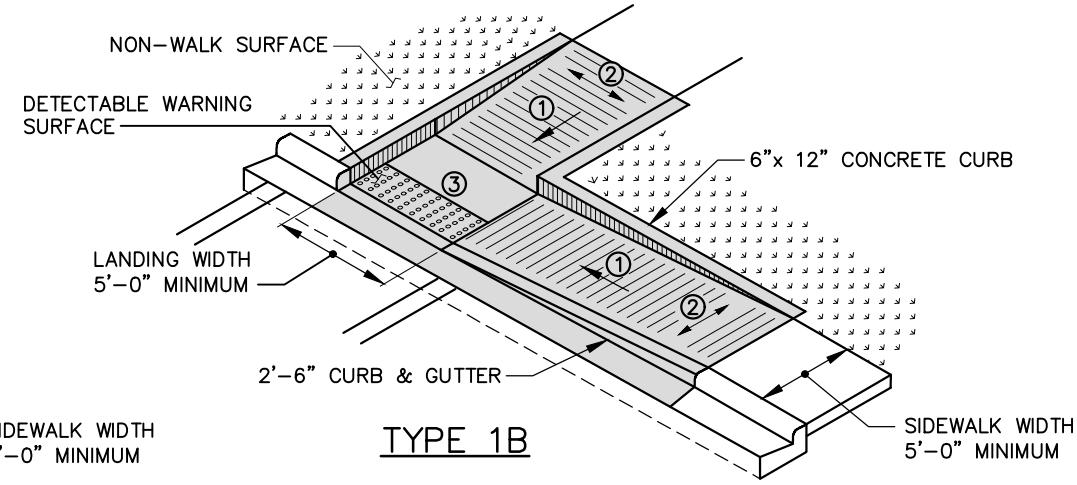
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD CURB RAMPS

DETAIL No.
02000.11





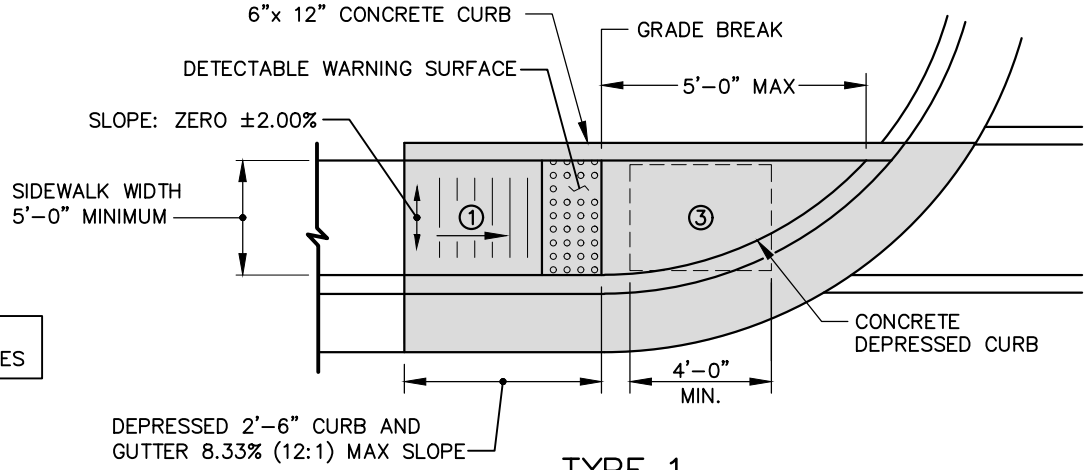
PAY LIMITS FOR 1 CURB RAMP

① 8.33% (12:1) MAX RAMP SLOPE

② CROSS SLOPE: 2.00%

③ CURB RAMPS REQUIRE A 4 FOOT MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.

NOTE:
REFER TO STANDARD DETAIL 02000.11, SHEET 3 of 3 FOR ALL RAMP NOTES



TYPE 1 NOTES:

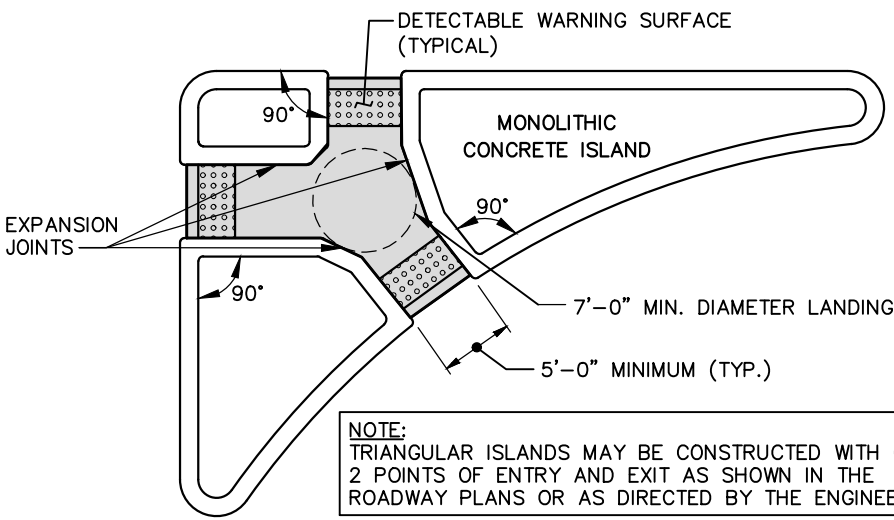
1. ON LANDINGS AND FLUSH TRANSITIONS AT RADIUS RETURNS: ROWS OF DOMES ARE NOT REQUIRED TO BE ALIGNED WITH THE CENTERLINE OF THE RAMP.
2. DETECTABLE WARNINGS MAY BE PLACED PERPENDICULAR ACROSS THE BOTTOM OF THE CURB RAMP, BUT ONLY IF THE BOTTOM OF THE CURB RAMP IS NO MORE THAN 5 FEET FROM THE BACK OF CURB.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

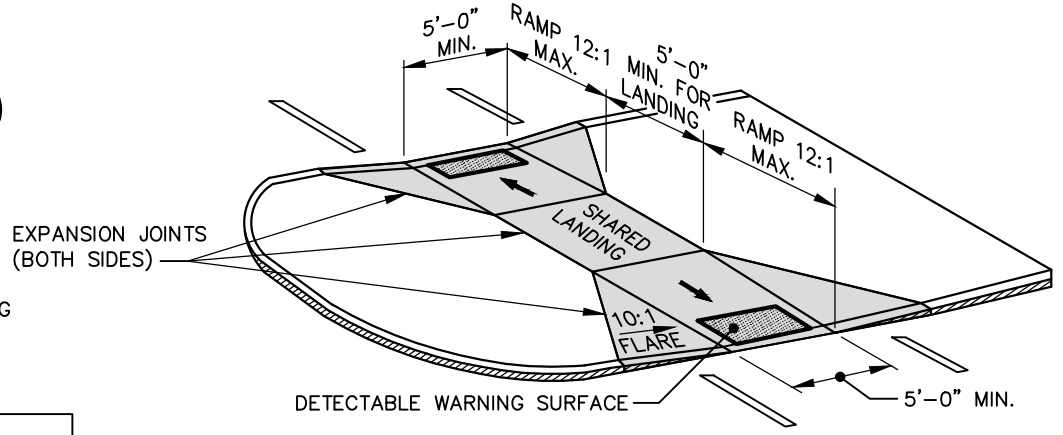
ALTERNATIVE CURB RAMPS - DIRECTIONAL RAMPS

DETAIL No.
02000.12
SHEET 1 OF 4



NOTE:
TRIANGULAR ISLANDS MAY BE CONSTRUCTED WITH ONLY 2 POINTS OF ENTRY AND EXIT AS SHOWN IN THE ROADWAY PLANS OR AS DIRECTED BY THE ENGINEER.

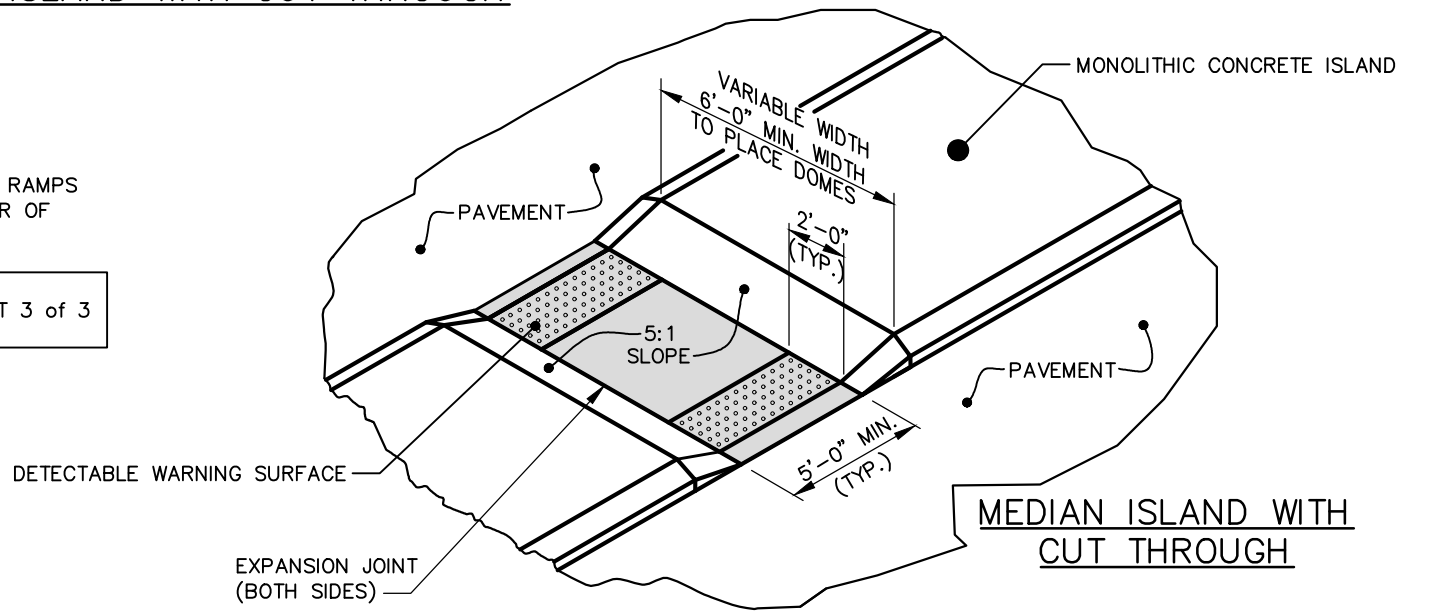
TRIANGULAR ISLAND WITH CUT THROUGH



MEDIAN ISLAND CURB RAMPS

PAY LIMITS FOR 2 OR 3 CURB RAMPS (CALCULATE BASED ON NUMBER OF SETS OF TRUNCATED DOMES)

NOTE:
REFER TO STANDARD DETAIL 02000.11, SHEET 3 of 3 ALL RAMP NOTES



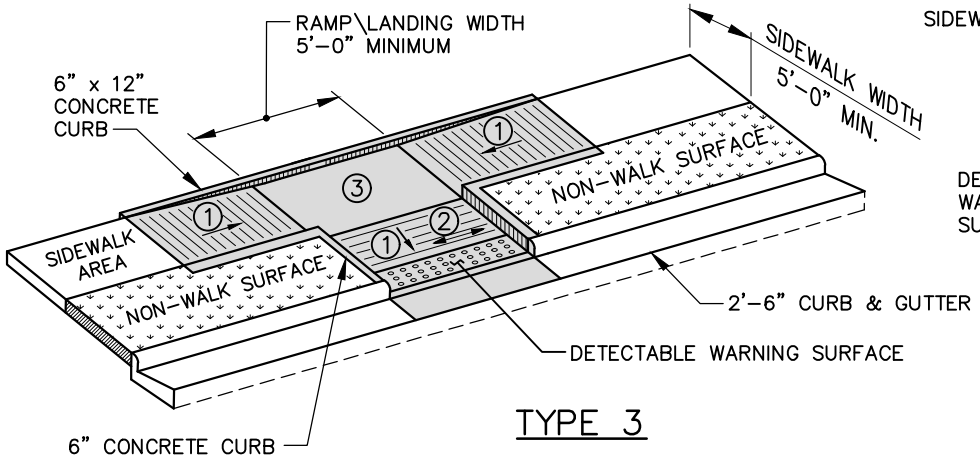
MEDIAN ISLAND WITH CUT THROUGH

CITY OF GOLDSBORO NORTH CAROLINA

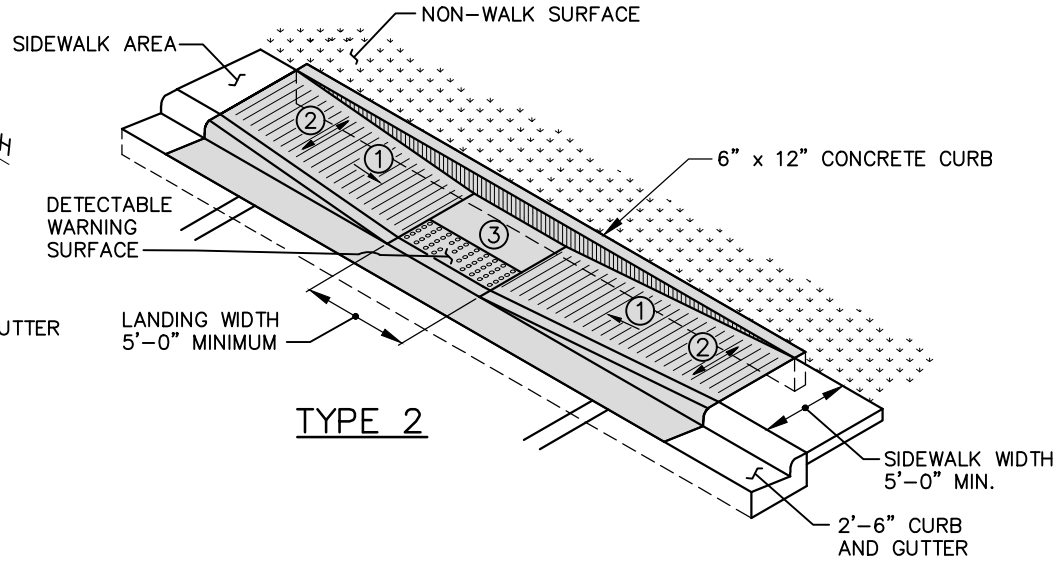
EFFECTIVE: 12/01/18

ALTERNATIVE CURB RAMPS - MEDIAN OR TURN LANE ISLANDS

DETAIL No.
02000.12
SHEET 2 OF 4



TYPE 3



TYPE 2

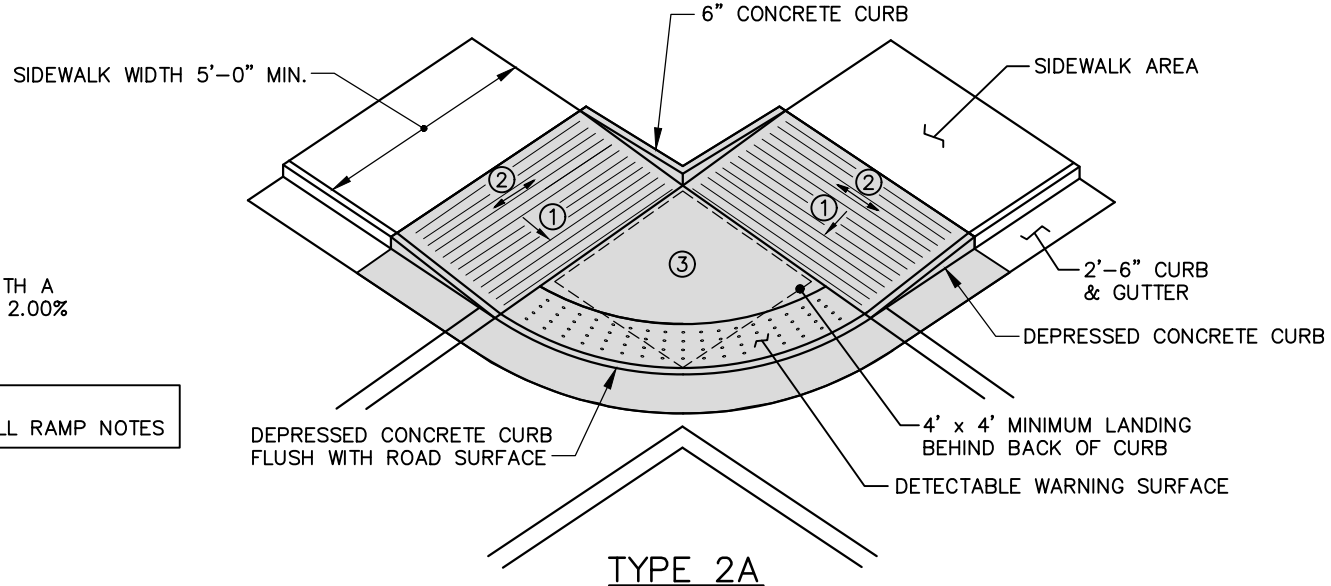
PAY LIMITS FOR 1 CURB RAMP

(1) 8.33% (12:1) MAX RAMP SLOPE

(2) CROSS SLOPE: 2.00%

(3) CURB RAMPS REQUIRE A 4 FOOT MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.

NOTE:
REFER TO STANDARD DETAIL 02000.11, SHEET 3 of 3 ALL RAMP NOTES



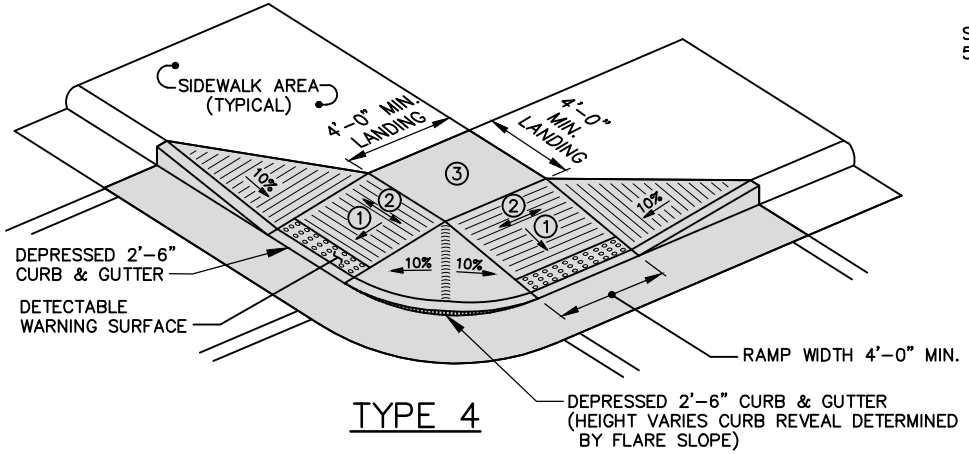
TYPE 2A

CITY OF GOLDSBORO NORTH CAROLINA

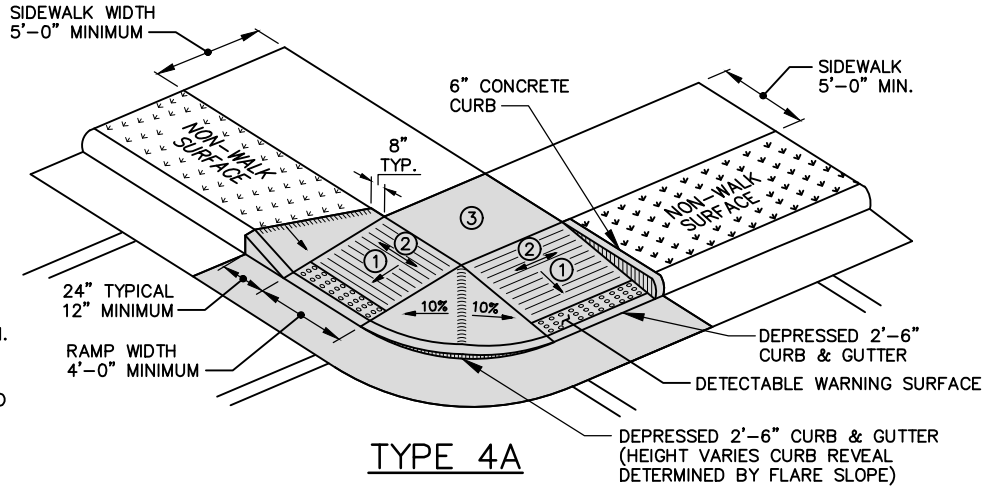
EFFECTIVE: 12/01/18

ALTERNATIVE CURB RAMPS - PARALLEL RAMPS

DETAIL No.
02000.12
SHEET 3 OF 4



TYPE 4



TYPE 4A

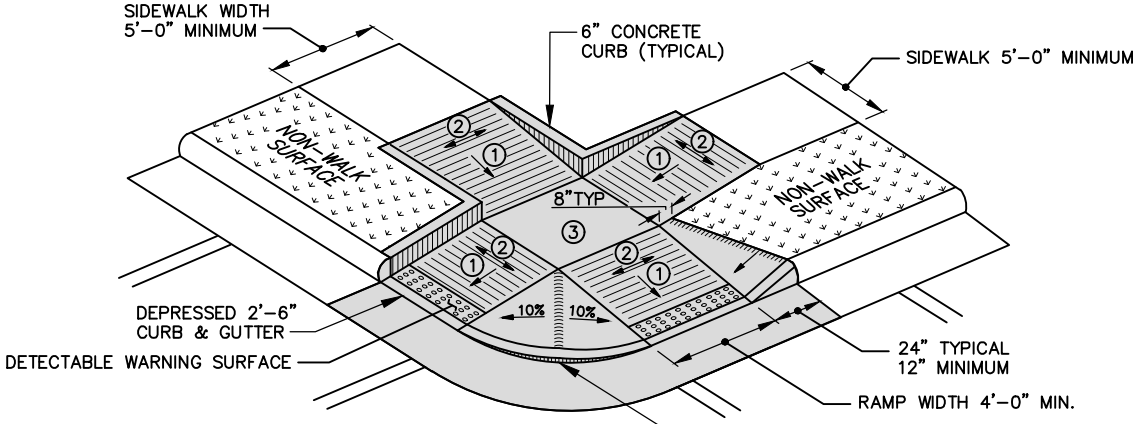
PAY LIMITS FOR 1 CURB RAMP

① 8.33% (12:1) MAX RAMP SLOPE

② CROSS SLOPE: 2.00%

③ CURB RAMPS REQUIRE A 4 FOOT MINIMUM LANDING WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SLOPE TO DRAIN TO CURB.

NOTE:
REFER TO STANDARD DETAIL 02000.11, SHEET 3 of 3 ALL RAMP NOTES.



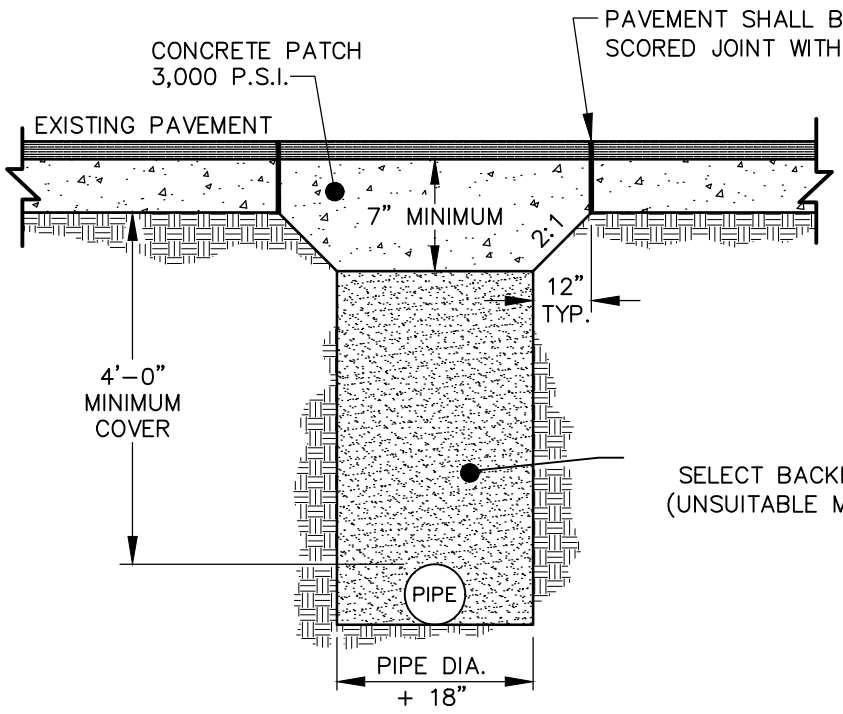
TYPE 5

CITY OF GOLDSBORO
NORTH CAROLINA

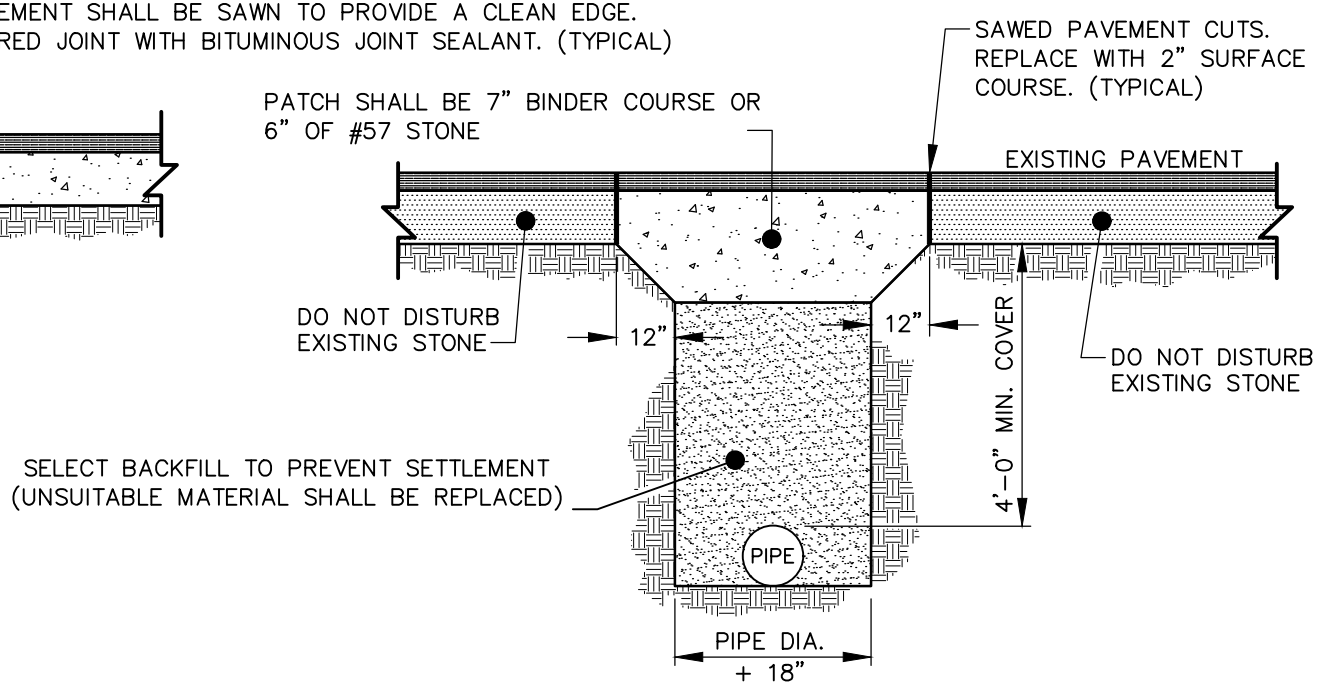
EFFECTIVE: 12/01/18

ALTERNATIVE CURB RAMPS - SHARED LANDING

DETAIL No.
02000.12
SHEET 4 OF 4



CONCRETE PAVEMENT



ASPHALT PAVEMENT

NOTES:

1. ALL PAVEMENT CUTS SHALL BE REPAIRED WITHIN A MAXIMUM OF THREE (3) DAYS FROM THE DATE THE CUT IS MADE.
2. CONCRETE TRENCH CAP ON ASPHALT STREETS SHALL BE USED ONLY DURING INCLEMENT WEATHER WHEN ASPHALT PLANTS ARE NOT OPERATING.
3. IN ALL OPEN TRENCHES, BACKFILL SHALL BE COMPACTED TO 95% MAXIMUM DRY DENSITY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING COMPACTION REQUIREMENTS BY SOILS TESTING CERTIFIED BY A LICENSED PROFESSIONAL GEOTECHNICAL ENGINEER.
4. BACKFILL WITH A HIGH CLAY CONTENT, HIGH SHRINK-SWELL POTENTIAL, OR HIGH MOISTURE CONTENT THAT CANNOT MEET COMPACTION REQUIREMENTS SHALL BE DEEMED UNSUITABLE AND SHALL BE REPLACED WITH SUITABLE BACKFILL MATERIAL.
5. ALL PAVEMENT PATCHES SHALL PROVIDE A UNIFORM AND SMOOTH DRIVING SURFACE.

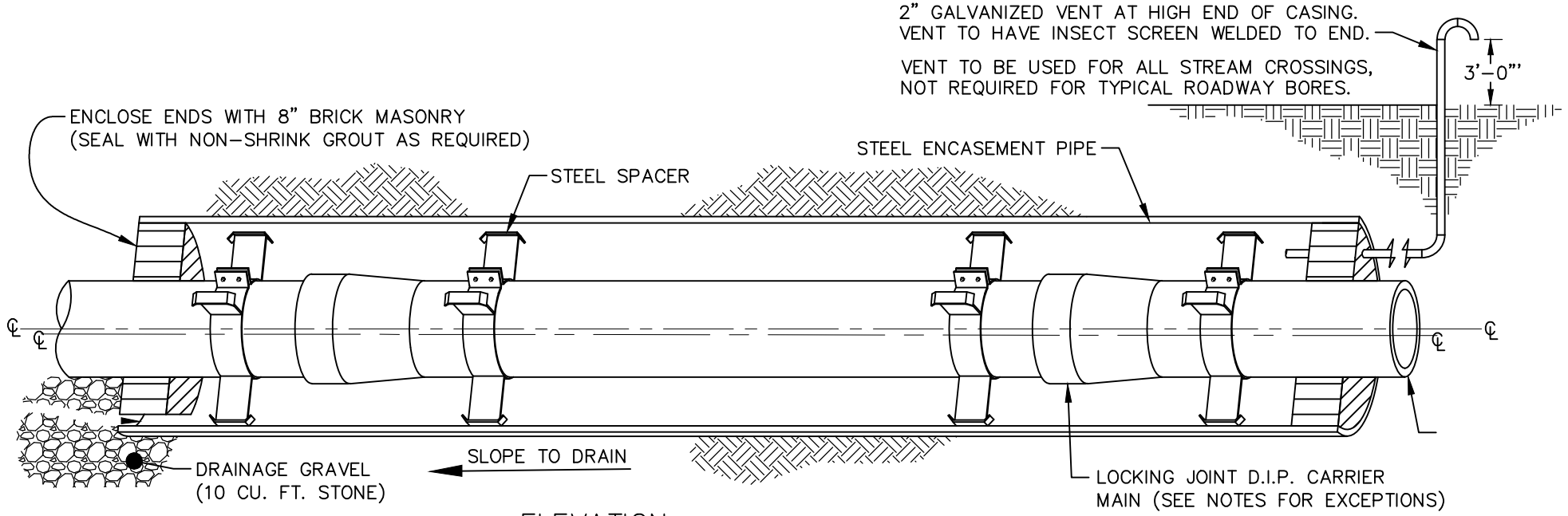
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD TRENCH AND PAVEMENT REPAIR

DETAIL No.

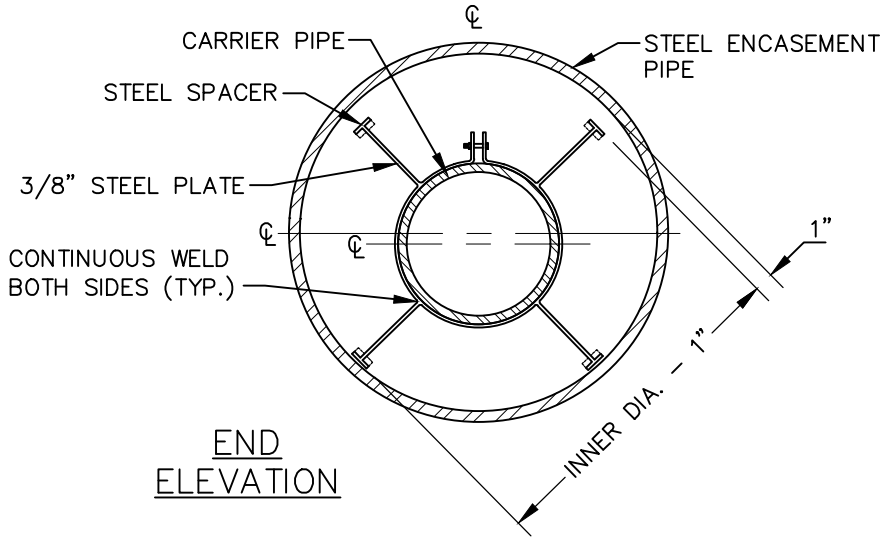
03000.01



ELEVATION

¾" WEEPHOLE AT LOW POINT OF CASING

NOTES:
1. STEEL SPACERS SHALL BE USED FOR SUPPORT OF THE CARRIER PIPE WITHIN THE CASING PIPE.
2. A MINIMUM SPACING OF 2 SPACERS PER JOINT OF CARRIER PIPE SHALL BE REQUIRED. 3 SPACERS ARE REQUIRED FOR CARRIER PIPE ? 36 INCHES.
3. THE SPACERS SHALL BE LOCATED EVENLY ALONG THE CARRIER PIPE SUCH THAT EACH SPACER SUPPORTS THE SAME UNIT WEIGHT OF THE CARRIER MAIN.
4. FOR CASING SIZE SEE STANDARD SPECIFICATIONS.
5. RECLAIMED WATER LINE SHALL BE PVC WITH RESTRAINED JOINTS.



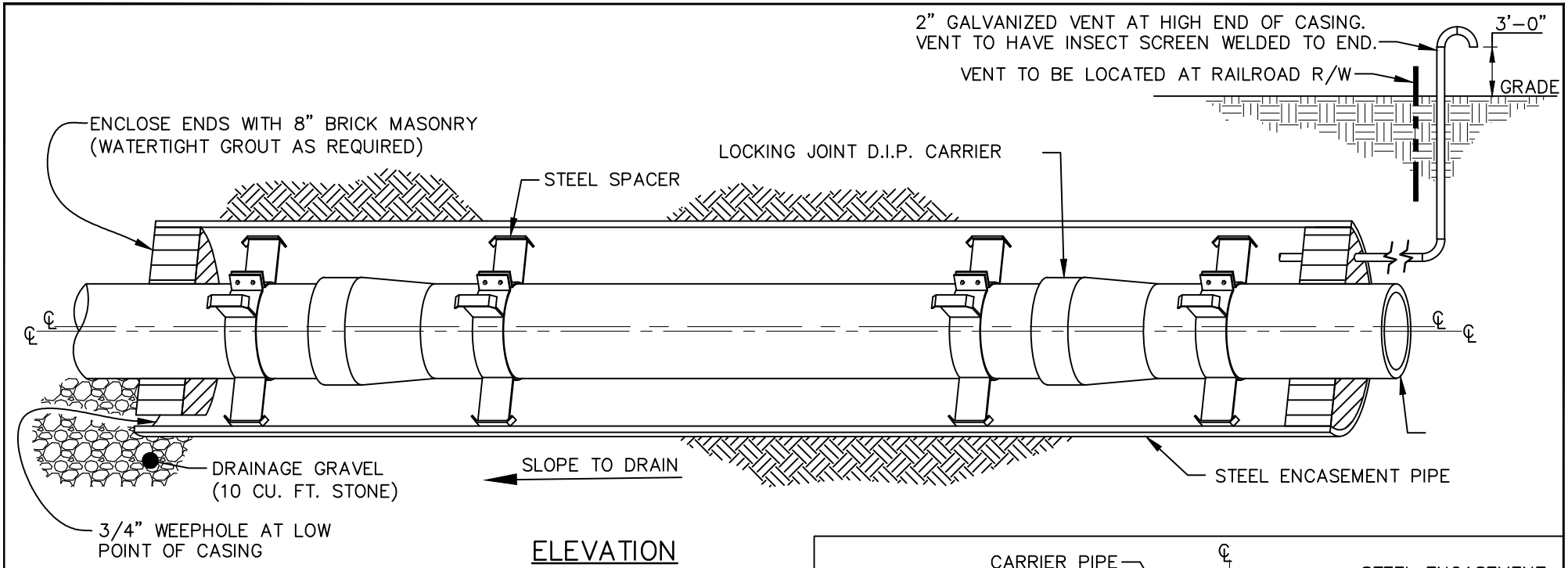
END ELEVATION

CITY OF GOLDSBORO NORTH CAROLINA

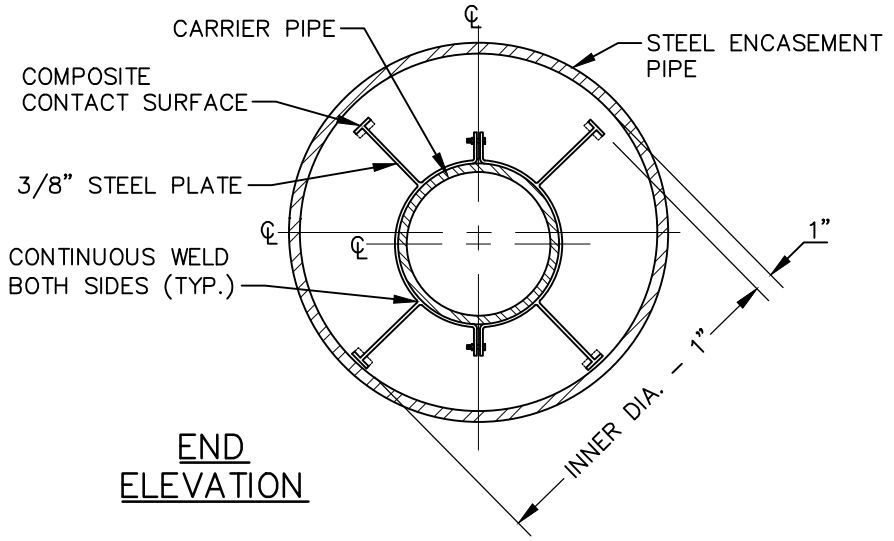
EFFECTIVE: 12/01/18

STANDARD STEEL ENCASEMENT AND CARRIER PIPE

DETAIL No.
03000.02
SHEET 1 OF 2



ELEVATION



END
ELEVATION

NOTES:

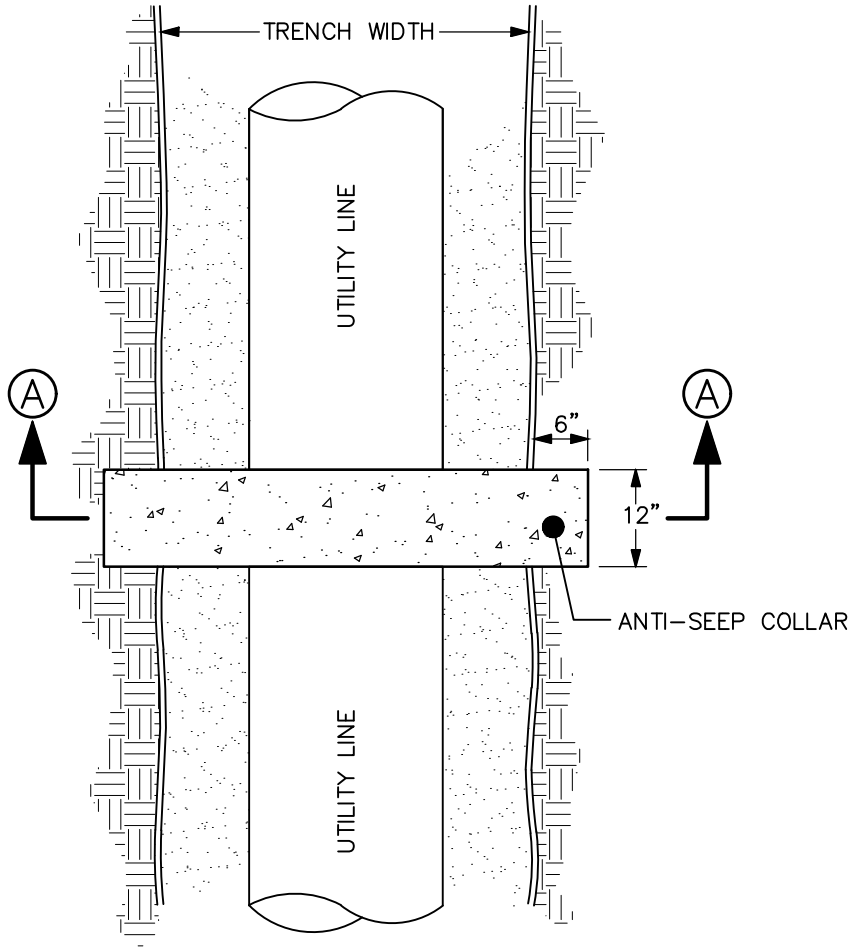
1. STEEL SPACERS SHALL BE USED FOR SUPPORT OF THE CARRIER PIPE WITHIN THE CASING PIPE. FOR RAILROAD CROSSINGS WITH IMPRESSED CURRENT OR WITH ENCASEMENT PIPES REQUIRING CATHODIC PROTECTION, STEEL SPACERS WITH **EPDM** OR COMPOSITE CONTACT SURFACES SHALL BE USED.
2. A MINIMUM SPACING OF 2 SPACERS PER JOINT OF CARRIER PIPE SHALL BE REQUIRED. 3 SPACERS ARE REQUIRED FOR CARRIER PIPE ≥ 36 INCHES.
3. THE SPACERS SHALL BE LOCATED EVENLY ALONG THE CARRIER PIPE SUCH THAT EACH SPACER SUPPORTS THE SAME UNIT WEIGHT OF THE CARRIER MAIN.
4. THE PROPOSED ENCASEMENT PIPE & CARRIER PIPE SHALL COMPLY WITH ALL APPLICABLE CITY OF GOLDSBORO AND OTHER JURISDICTIONAL REQUIREMENTS, WHICHEVER IS MORE STRINGENT.
5. NO BLASTING ALLOWED IN RAILROAD RIGHT-OF-WAY.

CITY OF GOLDSBORO NORTH CAROLINA

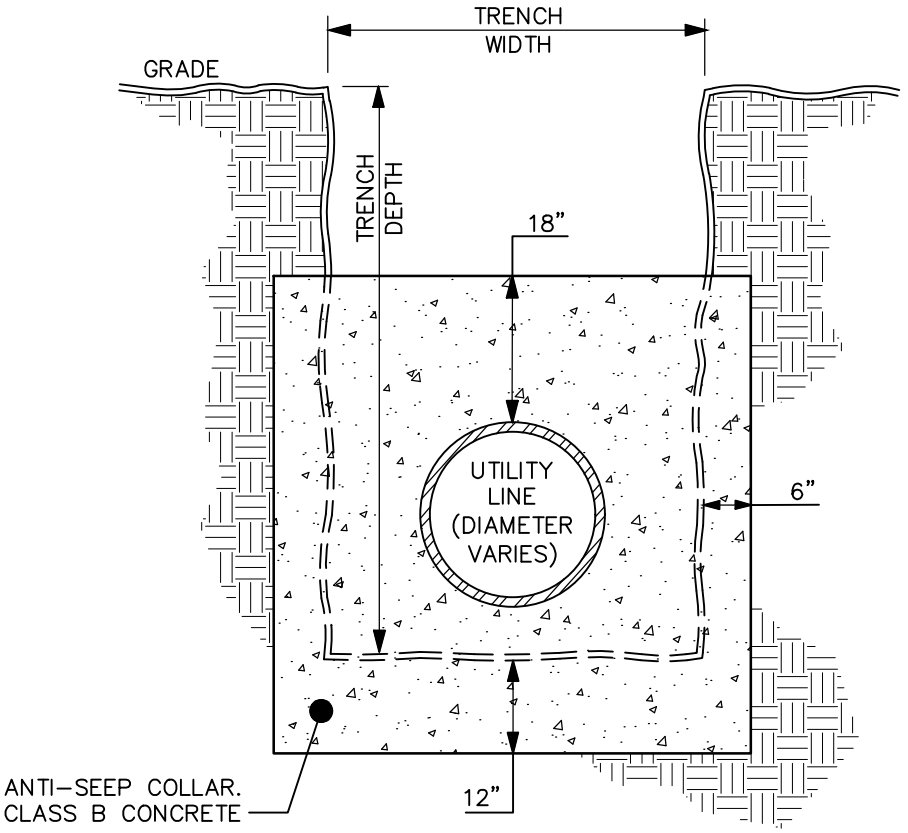
EFFECTIVE: 12/01/18

STANDARD STEEL ENCASEMENT AND CARRIER PIPE - UNDER RAILROAD

DETAIL No.
03000.02
SHEET 2 OF 2



PLAN VIEW



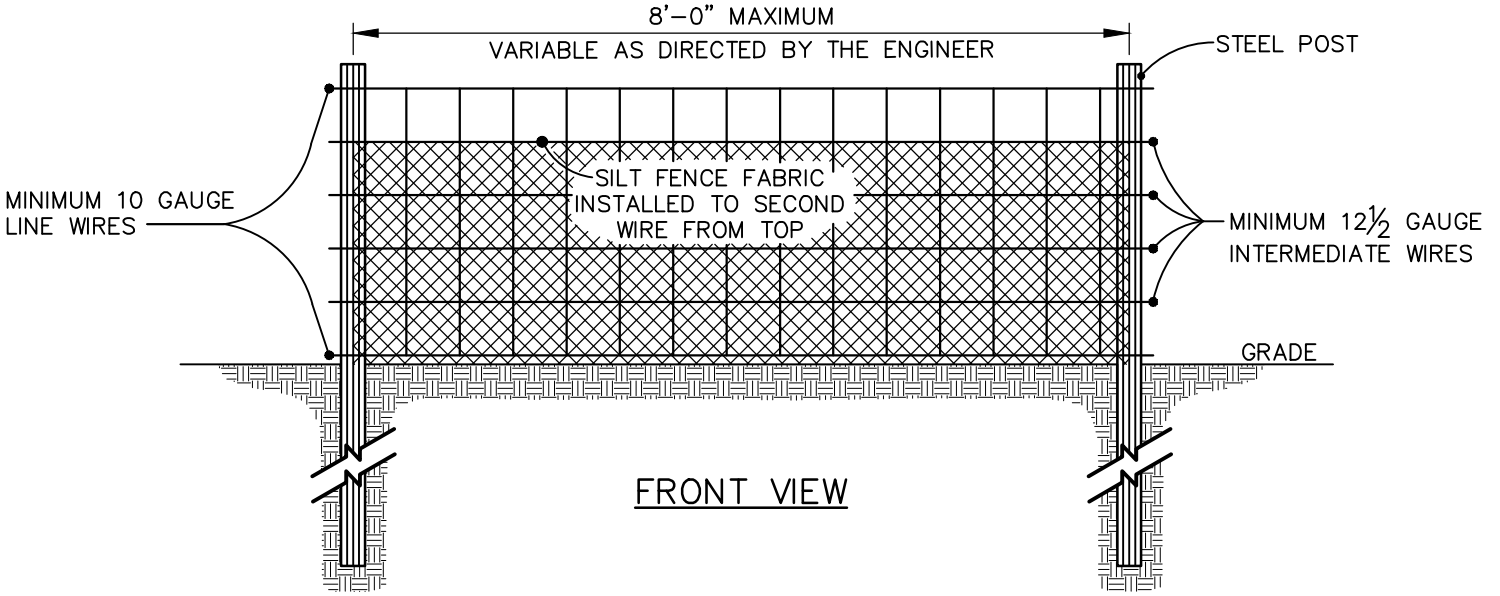
SECTION A–A

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

ANTI-SEEP COLLAR

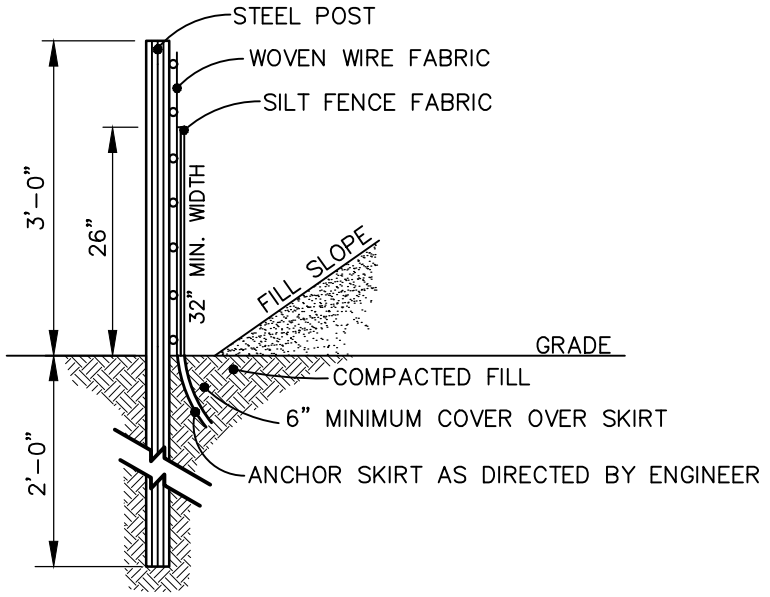
DETAIL No.
03000.03
SHEET 1 OF 1



FRONT VIEW

NOTES:

1) USE SILT FENCE ONLY WHEN DRAINAGE AREA DOES NOT EXCEED 1/4 ACRE PER 100 ft. OF FENCE AND NEVER IN AREAS OF CONCENTRATED FLOW.
2) OVERLAP 12 INCHES WHEN SPLICING FABRIC.
3) FOR REPAIR OF SILT FENCE FAILURES USE DETAIL 04000.23.



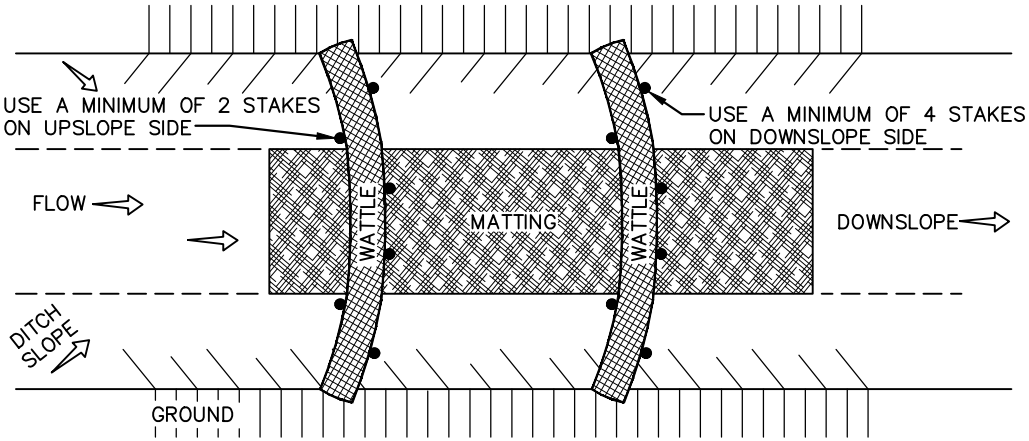
SIDE VIEW

CITY OF GOLDSBORO NORTH CAROLINA

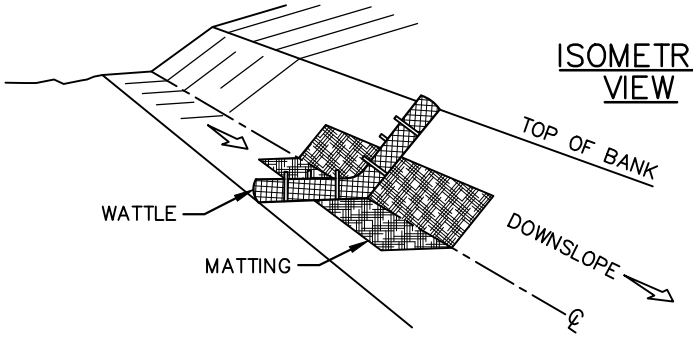
EFFECTIVE: 12/01/18

TEMPORARY SILT FENCE

DETAIL No.
04000.01
SHEET 1 OF 1

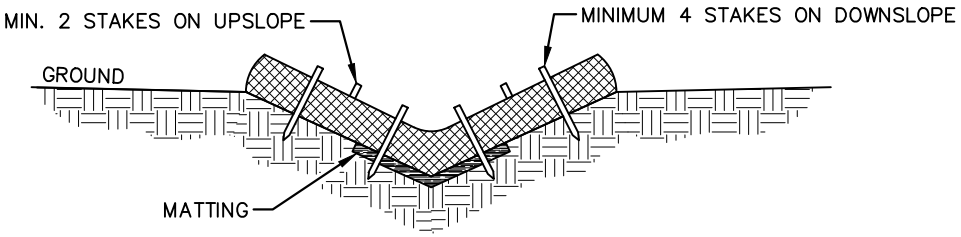


PLAN VIEW

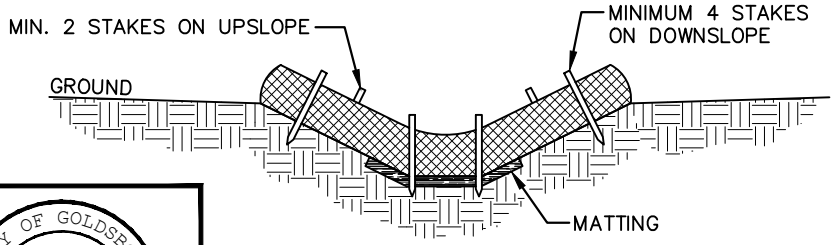


NOTES:

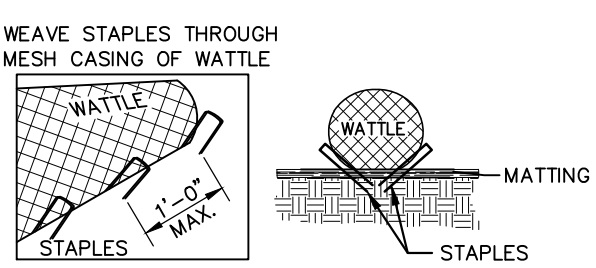
1) USE A MINIMUM 12 INCH DIAMETER EXCELSIOR WATTLE.
2) USE 24 INCH LONG WOODEN STAKES WITH A 2"x2" NOMINAL CROSS SECTION.
4) INSTALL WATTLE(S) TO A HEIGHT ON SLOPE SO FLOW WILL NOT WASH AROUND WATTLE AND SCOUR SLOPES, OR AS DIRECTED.
5) INSTALL A MINIMUM OF TWO UPSLOPE STAKES AND FOUR DOWNSLOPE STAKES AT AN ANGLE TO WEDGE WATTLE TO GROUND AT BOTTOM.
6) PROVIDE STAPLES MADE OF 0.125 INCH DIAMETER STEEL WIRE FORMED INTO A U-SHAPE NOT LESS THAN 12 INCHES IN LENGTH.
7) INSTALL STAPLES APPROXIMATELY EVERY 1 LINEAR FOOT ON BOTH SIDES OF WATTLE AND AT EACH END TO SECURE IT TO THE SOIL.
8) AFTER INSTALLATION OF STAPLES, CHINK ANY GAPS BETWEEN WATTLE AND GROUND WITH MATTING.



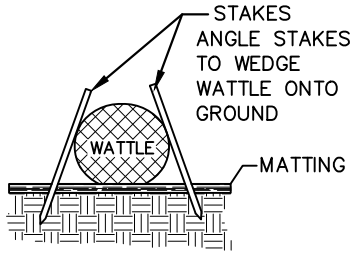
V-DITCH SECTION VIEW



TRAPEZOIDAL DITCH SECTION VIEW



STAPLE INSTALLMENT SECTIONS



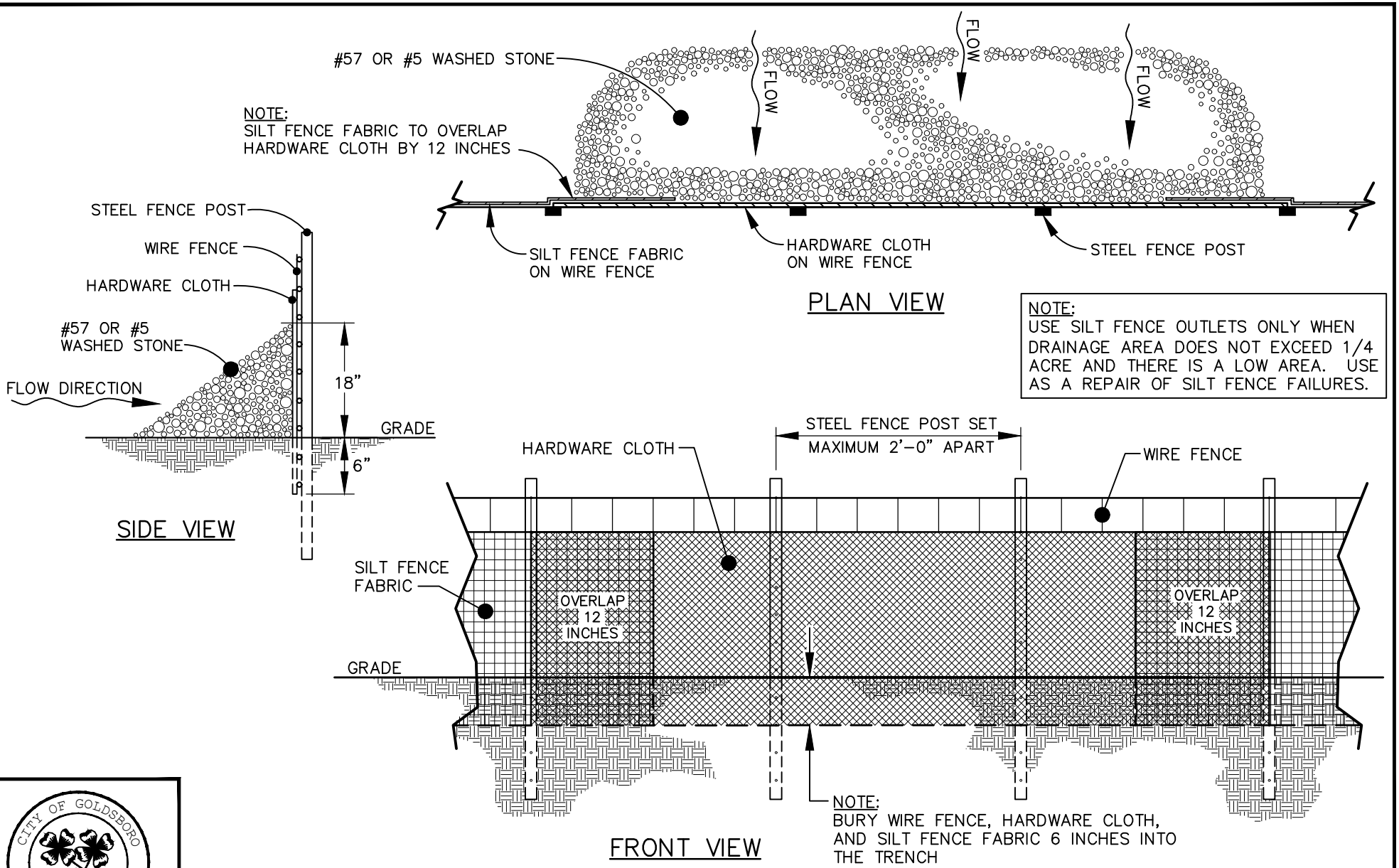
STAKE INSTALLMENT CROSS SECTION

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

WATTLES

DETAIL No.
04000.02
SHEET 1 OF 1

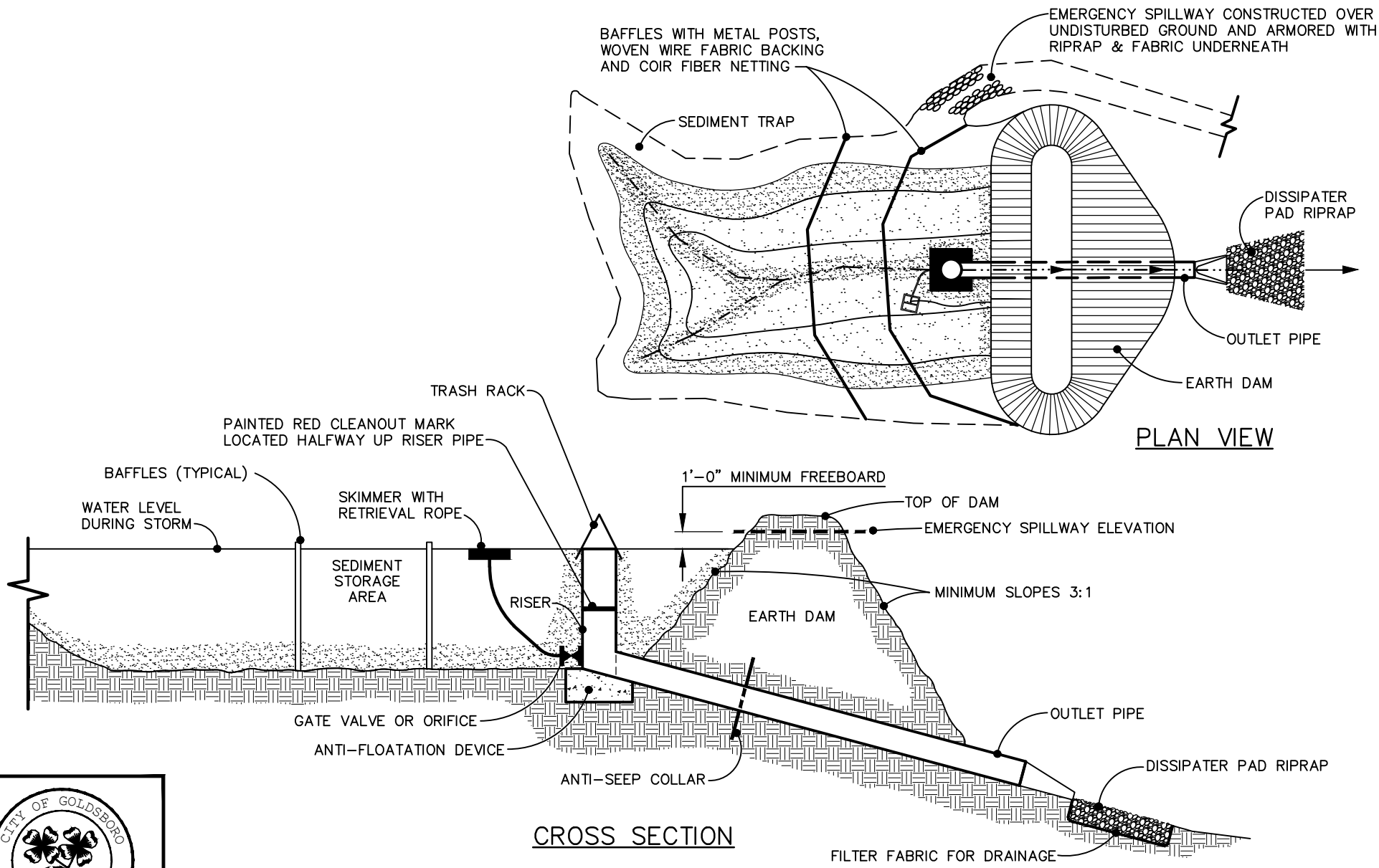


CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD SILT FENCE OUTLET

DETAIL No.
04000.03
SHEET 1 OF 1



CITY OF GOLDSBORO NORTH CAROLINA

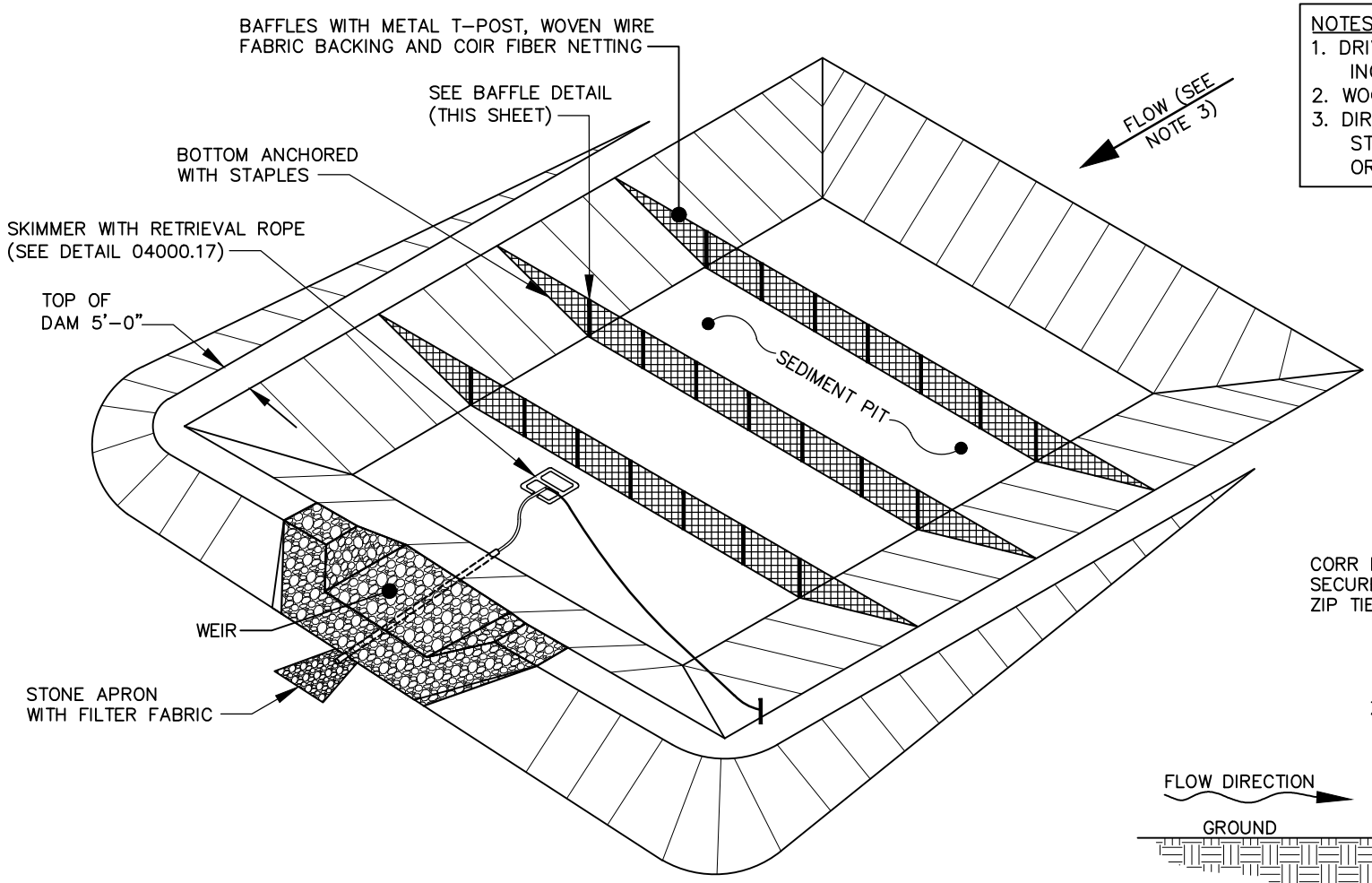
EFFECTIVE: 12/01/18

STANDARD RISER - BARREL SEDIMENT BASIN WITH SKIMMER

DETAIL No.

04000.04

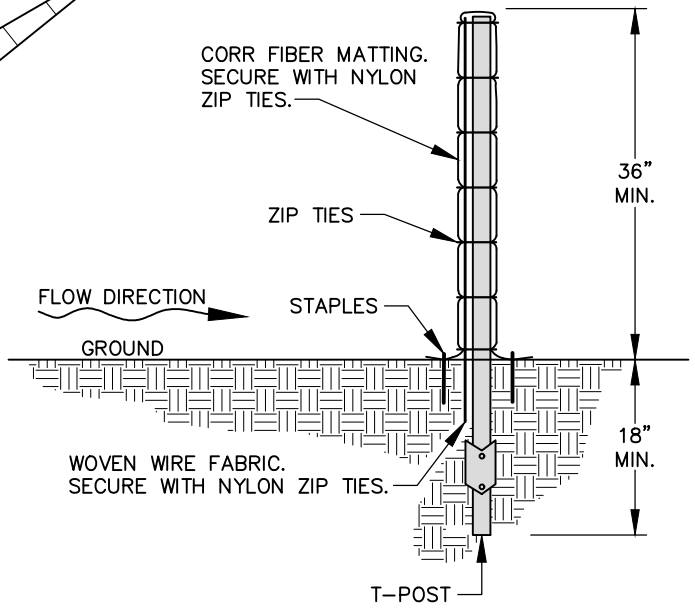
SHEET 1 OF 1



PERSPECTIVE VIEW

NOTES:
1. DRIVE STEEL FENCE POST AT LEAST 18 INCHES INTO SOLID GROUND.
2. WOOD POST ARE NOT ACCEPTABLE.
3. DIRECT WATER TO TOP OF BASIN USING STABILIZED DITCH, SLOPE DRAIN PIPE OR OTHER APPROVED METHOD.

BAFFLE DETAIL

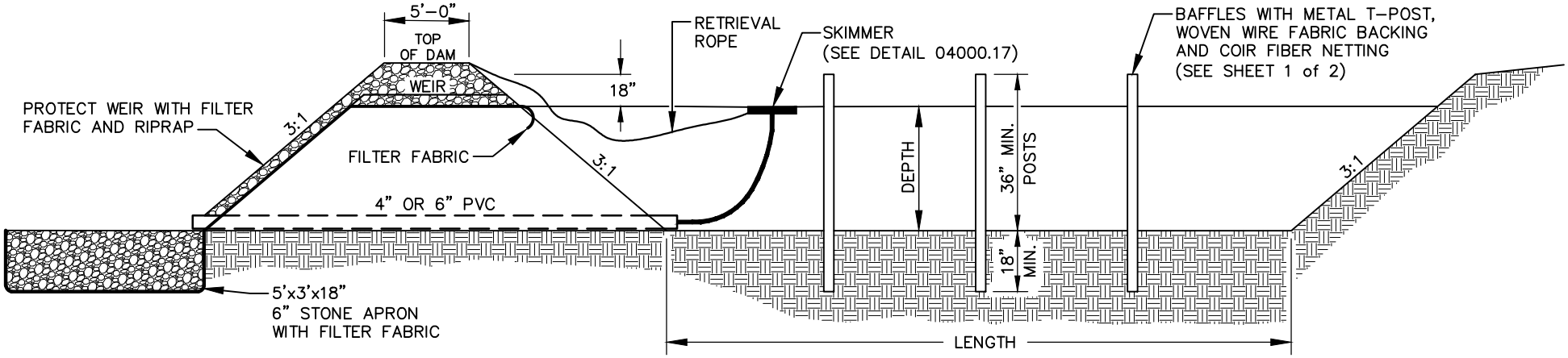


CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD TEMPORARY SKIMMER BASIN

DETAIL No.
04000.05
SHEET 1 OF 2



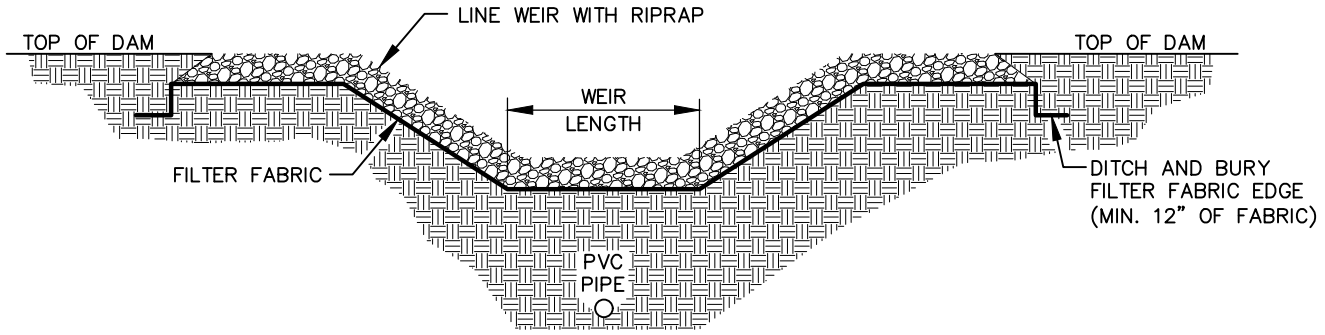
SKIMMER BASIN CROSS SECTION

NOTES:
1. USE FOR DRAINAGE AREAS NOT EXCEEDING FIVE ACRES.
2. EARTH BERM SHALL BE STABILIZED w/SEEDING ACCORDING TO CITY SPECIFICATIONS.

DESIGN OF SPILLWAYS

DRAINAGE AREA (ACRES)	WEIR LENGTH [1] (FT)
1	4.0
2	6.0
3	8.0
4	10.0
5	12.0

[1] DIMENSIONS SHOWN ARE MINIMUM



WEIR CROSS SECTION

MAINTENANCE

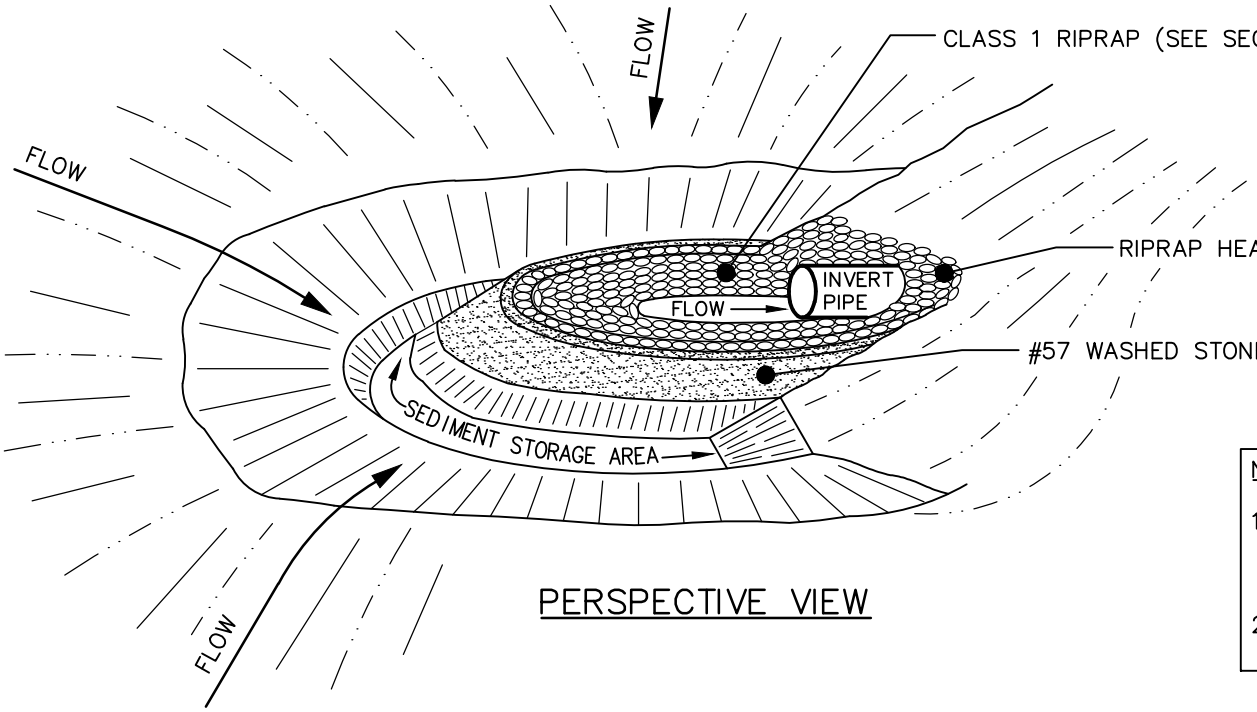
- INSPECT TEMPORARY SKIMMER BASIN AND EMPTY SKIMMER OF ALL DEBRIS AFTER EACH PERIOD OF SIGNIFICANT RAINFALL. REMOVE SEDIMENT AND RESTORE BASIN TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE-HALF THE DESIGN DEPTH OF THE BASIN. PLACE THE SEDIMENT THAT IS REMOVED IN A DESIGNATED DISPOSAL AREA. REPAIR BAFFLES.
- CHECK THE STRUCTURE FOR DAMAGE FROM EROSION OR PIPING. PERIODICALLY CHECK THE DEPTH OF THE SPILLWAY TO ENSURE IT IS A MINIMUM OF 1.5 FEET BELOW THE LOW POINT OF THE EMBANKMENT. IMMEDIATELY FILL ANY SETTLEMENT OF THE EMBANKMENT TO SLIGHTLY ABOVE DESIGN GRADE. ANY RIPRAP DISPLACED FROM THE SPILLWAY MUST BE REPLACED IMMEDIATELY.
- STABILIZE THE EMBANKMENT AND ALL DISTURBED AREAS ABOVE THE SEDIMENT POOL AND DOWNSTREAM FROM THE BASIN IMMEDIATELY AFTER CONSTRUCTION WITH SEEDING AND MATTING, AS NEEDED.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD TEMPORARY SKIMMER BASIN

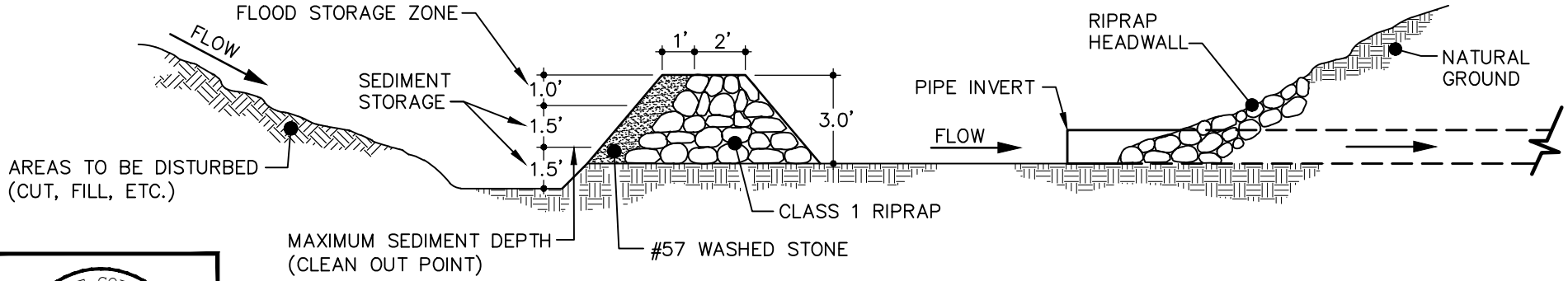
DETAIL No.
04000.05
SHEET 2 OF 2



PERSPECTIVE VIEW

NOTES:

1. GRAVEL & RIPRAP FILTER BERM BASIN DETAIL IS DESIGNED TO PROTECT EXISTING PIPE INVERTS THAT DRAIN FIVE ACRES OR LESS.
2. DIMENSIONS ARE MINIMUM ACCEPTABLE UNLESS OTHERWISE NOTED.



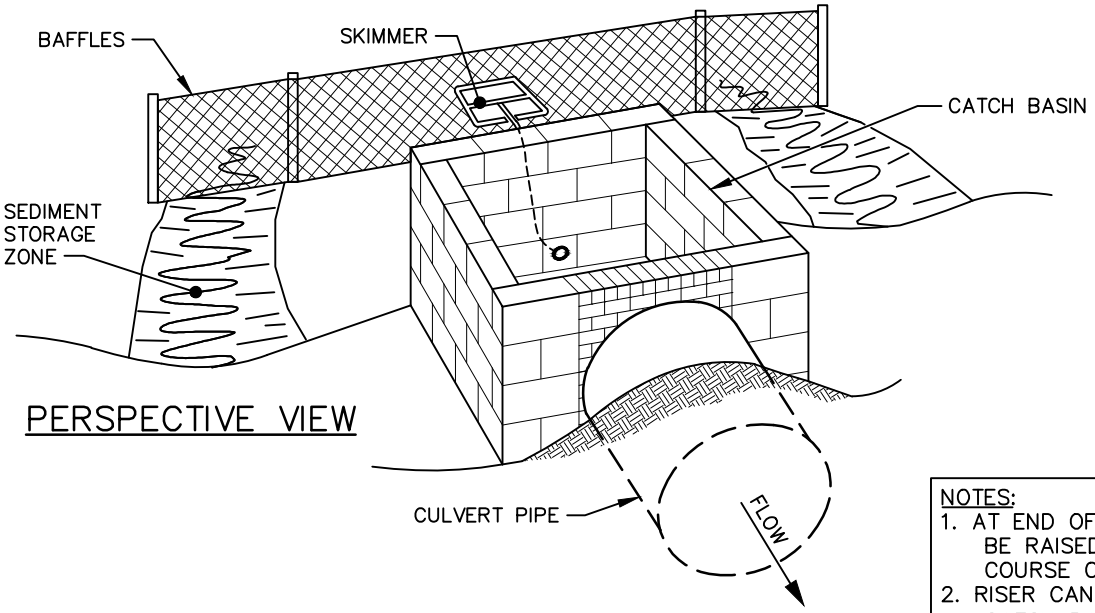
SECTION THRU BASIN, FILTER AND CULVERT PIPE

CITY OF GOLDSBORO NORTH CAROLINA

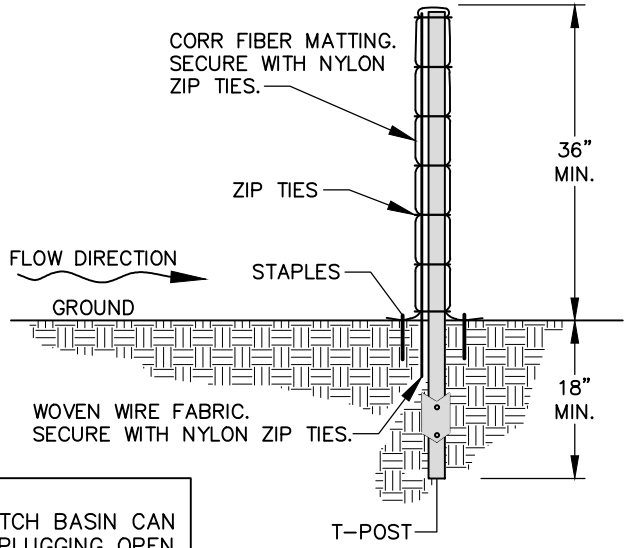
EFFECTIVE: 12/01/18

(EXISTING PIPE INVERTS) GRAVEL AND RIPRAP FILTER BERM BASIN

DETAIL No.
04000.06
SHEET 1 OF 1

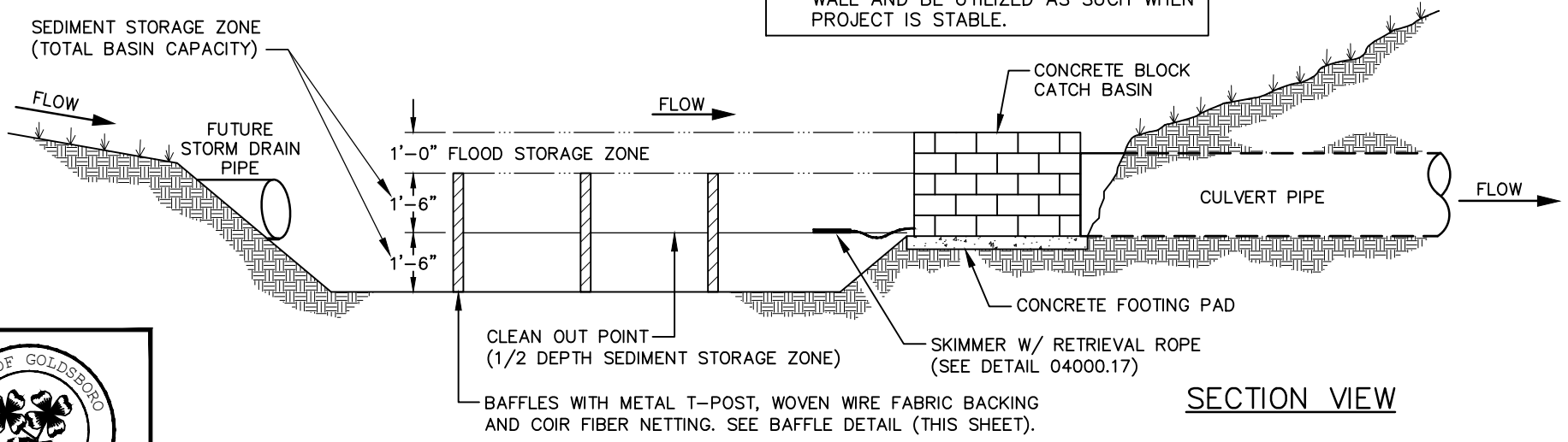


PERSPECTIVE VIEW



BAFFLE DETAIL

NOTES:
1. AT END OF PROJECT, CATCH BASIN CAN BE RAISED AS NEEDED PLUGGING OPEN COURSE OF BLOCK WITH MORTAR.
2. RISER CAN BE BUILT AS A STANDARD CATCH BASIN/JUNCTION BOX (WITH SKIMMER ATTACHMENT) IN RECEIVING WALL AND BE UTILIZED AS SUCH WHEN PROJECT IS STABLE.



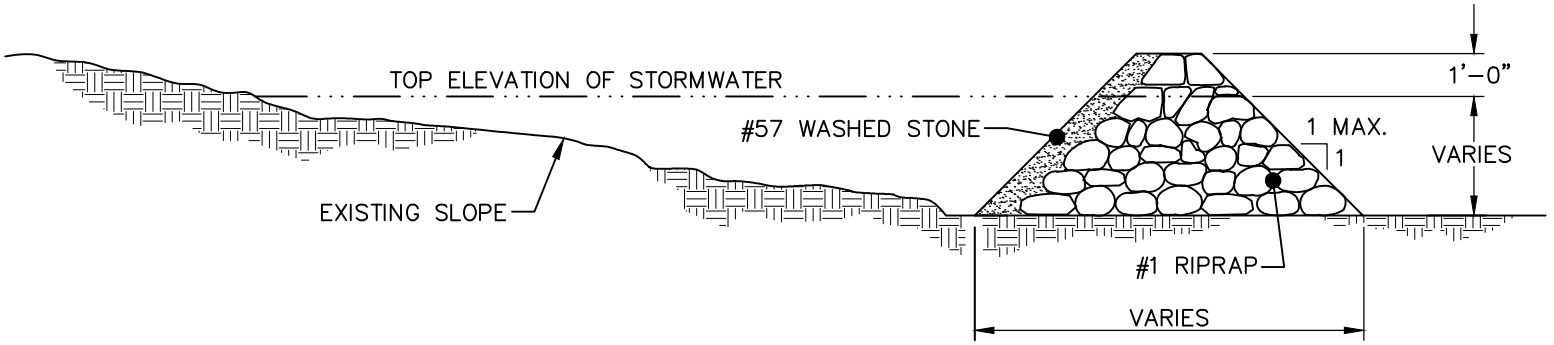
SECTION VIEW

CITY OF GOLDSBORO NORTH CAROLINA

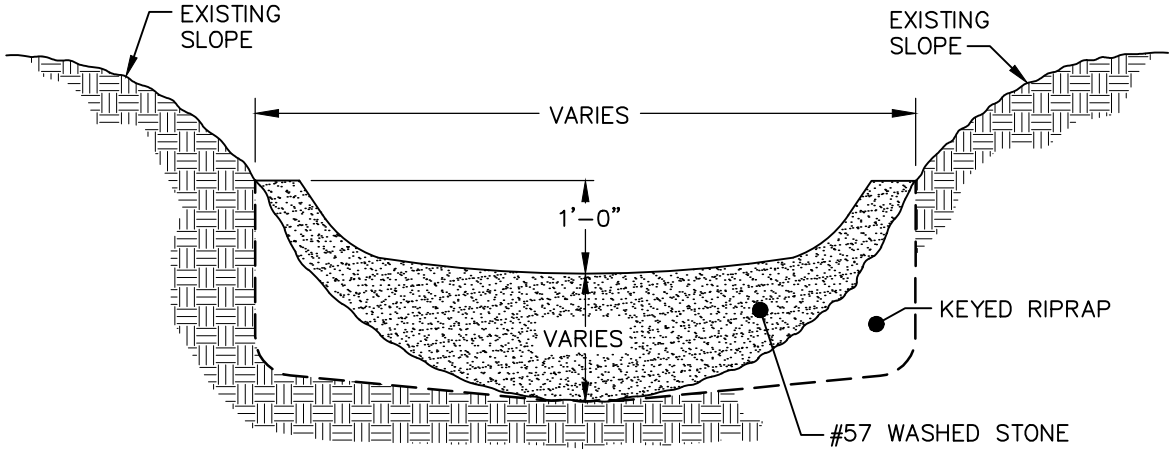
EFFECTIVE: 12/01/18

CATCH BASIN RISER/FILTER

DETAIL No.
04000.07
SHEET 1 OF 1



SIDE VIEW



DESIGN OF SPILLWAYS

DRAINAGE AREA (ACRES)	WEIR LENGTH [1] (FT)
1	4.0
2	6.0
3	8.0
4	10.0
5	12.0

[1] DIMENSIONS SHOWN ARE MINIMUM

NOTES:
1) HEIGHT & WIDTH DETERMINED BY EXISTING TOPOGRAPHY AND SEDIMENT STORAGE REQUIRED.

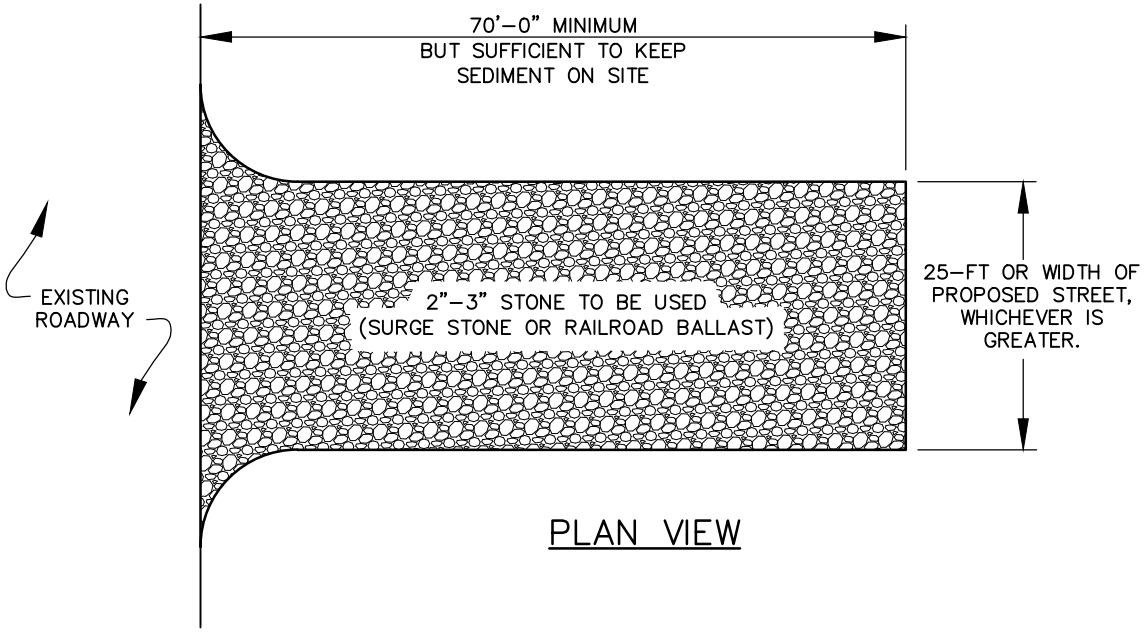
2) KEY RIPRAP INTO THE DAM FOR STABILIZATION.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD CHECK DAM

DETAIL No.
04000.08
SHEET 1 OF 1



PLAN VIEW

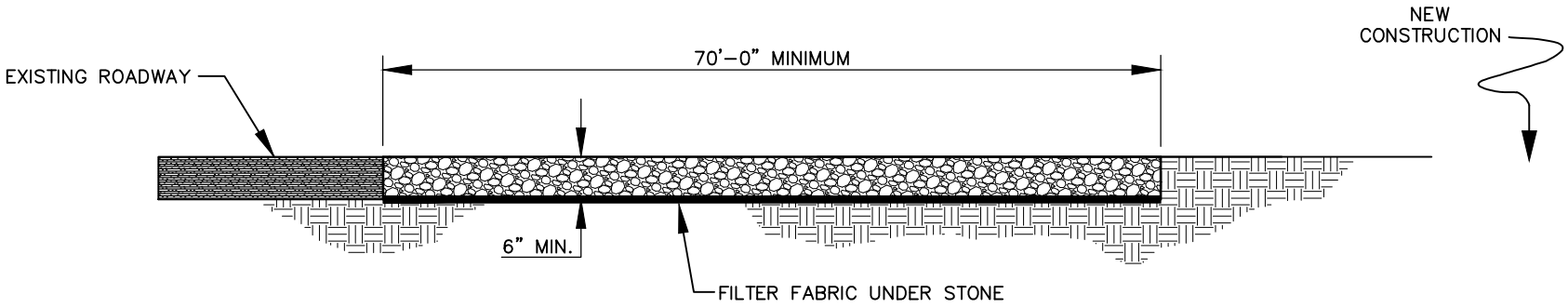
NOTES:

1) PUT SILT FENCE OR TREE PROTECTION FENCE UP TO ENSURE CONSTRUCTION ENTRANCE IS USED.

2) IF CONSTRUCTION ON THE SITES ARE SUCH THAT THE MUD IS NOT REMOVED BY THE VEHICLE TRAVELING OVER THE STONE, THEN THE TIRES OF THE VEHICLES MUST BE WASHED BEFORE ENTERING THE PUBLIC ROAD.

3) IF A PROJECT CONTINUES TO PULL MUD AND DEBRIS ON TO THE PUBLIC ROAD, THE CITY WILL CLEAN THE AREA AND INVOICE THE FINANCIALLY RESPONSIBLE PERSON AS INDICATED ON THE FINANCIAL RESPONSIBILITY FORM. THE MINIMUM FEE THE CITY OF GOLDSBORO WILL CHARGE TO CLEAN THE STREETS WILL BE $300 FOR THE FIRST HOUR AND $200 FOR EACH HOUR THEREAFTER.

4) WHEN CONSTRUCTION ENTRANCE CROSSES A SIDEWALK **ADA** REQUIREMENTS REMAIN INTACT.



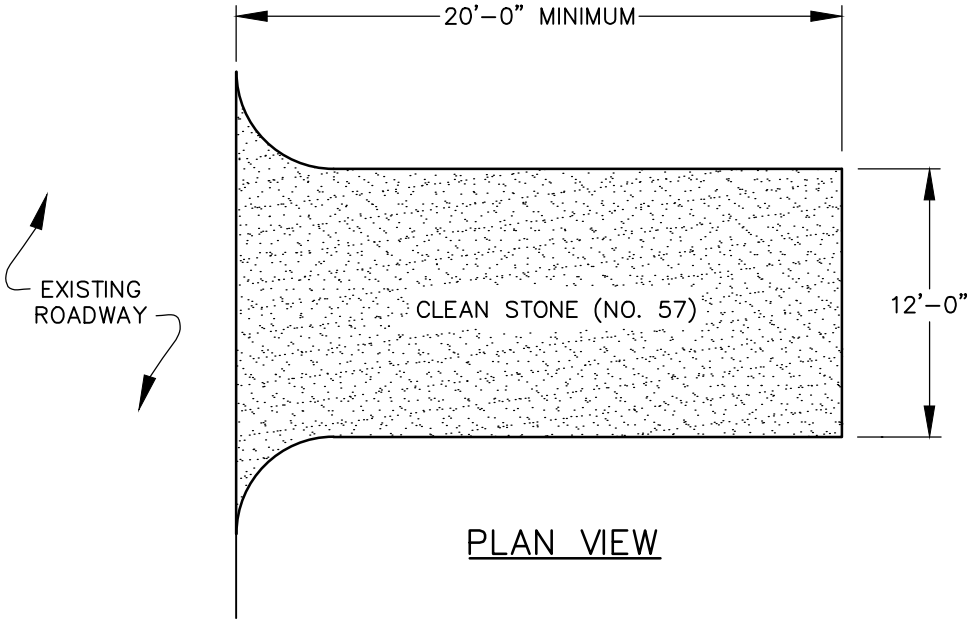
CROSS SECTION

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD CONSTRUCTION ENTRANCE

DETAIL No.
04000.09
SHEET 1 OF 1



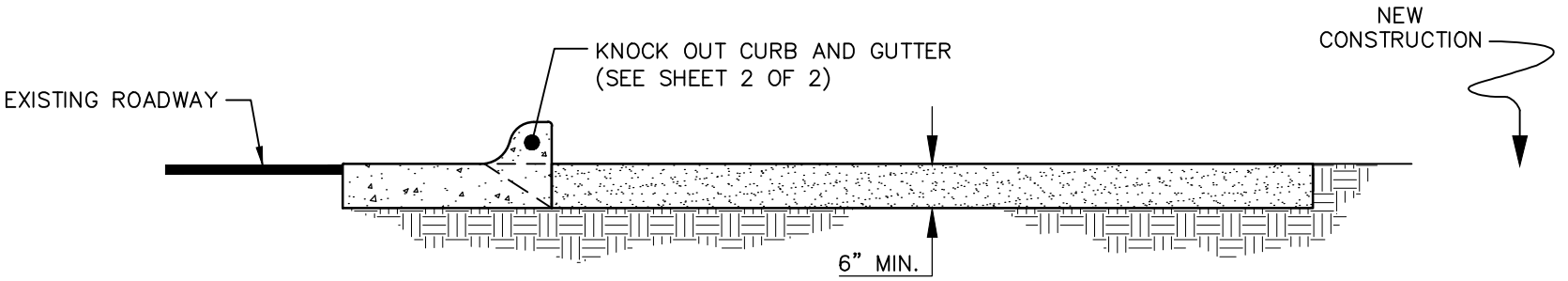
PLAN VIEW

NOTES:

1) FILTER FABRIC MAY BE ADDED UNDER THE STONE WHICH WOULD ADD TOTAL LIFE TO THE CONSTRUCTION ENTRANCE.

2) WHEN CONSTRUCTION ENTRANCE CROSSES A SIDEWALK **ADA** REQUIREMENTS REMAIN INTACT.

NOTE:
THIS ENTRANCE APPLIES ONLY TO ENTRANCES OF INDIVIDUAL SINGLE FAMILY RESIDENTIAL UNITS.



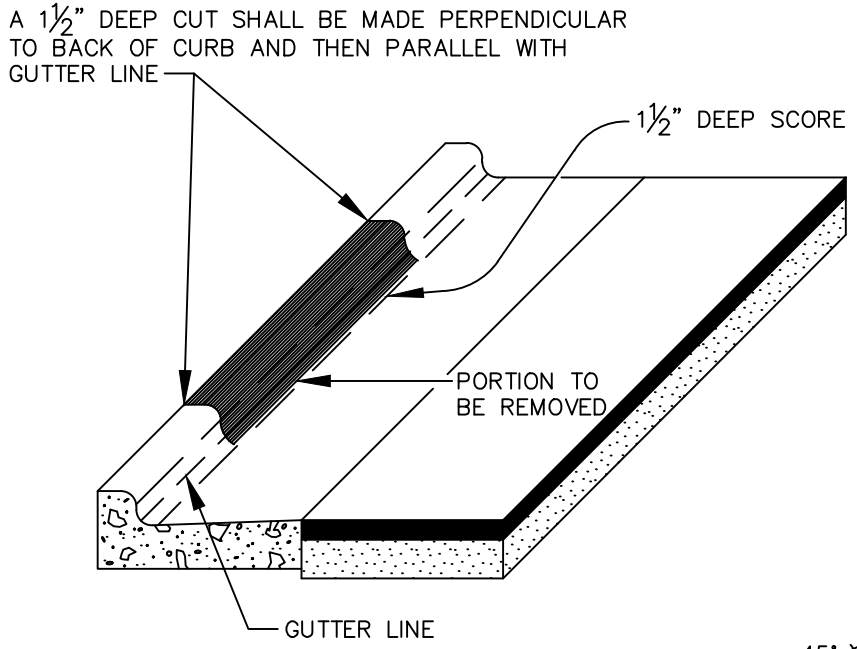
CROSS SECTION

CITY OF GOLDSBORO NORTH CAROLINA

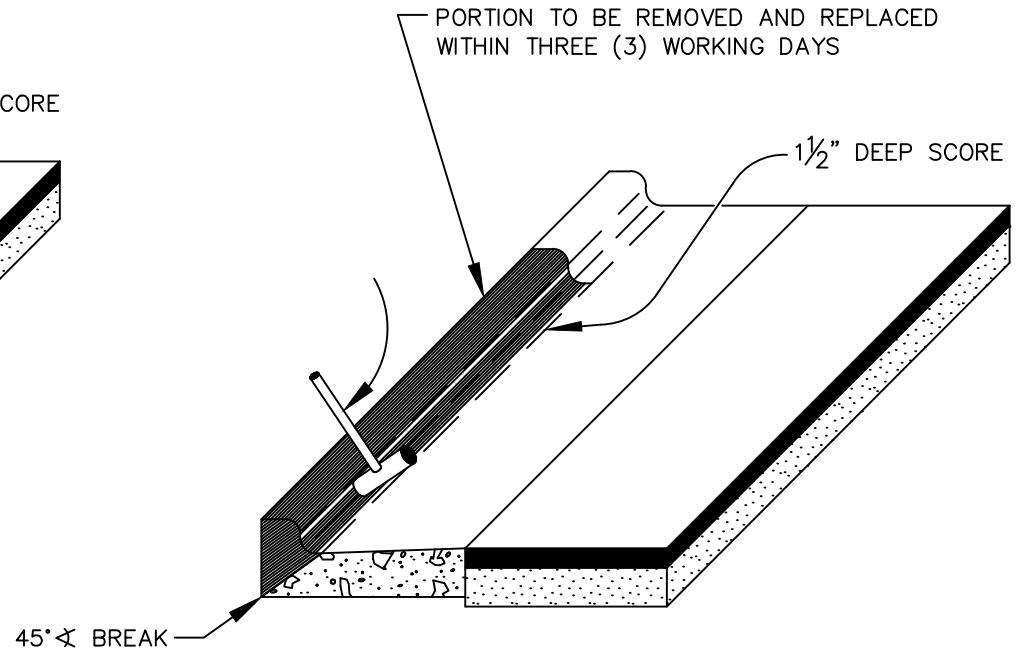
EFFECTIVE: 12/01/18

STANDARD RESIDENTIAL CONSTRUCTION ENTRANCE

DETAIL No.
04000.10
SHEET 1 OF 2



STEP ONE



STEP TWO

NOTES:

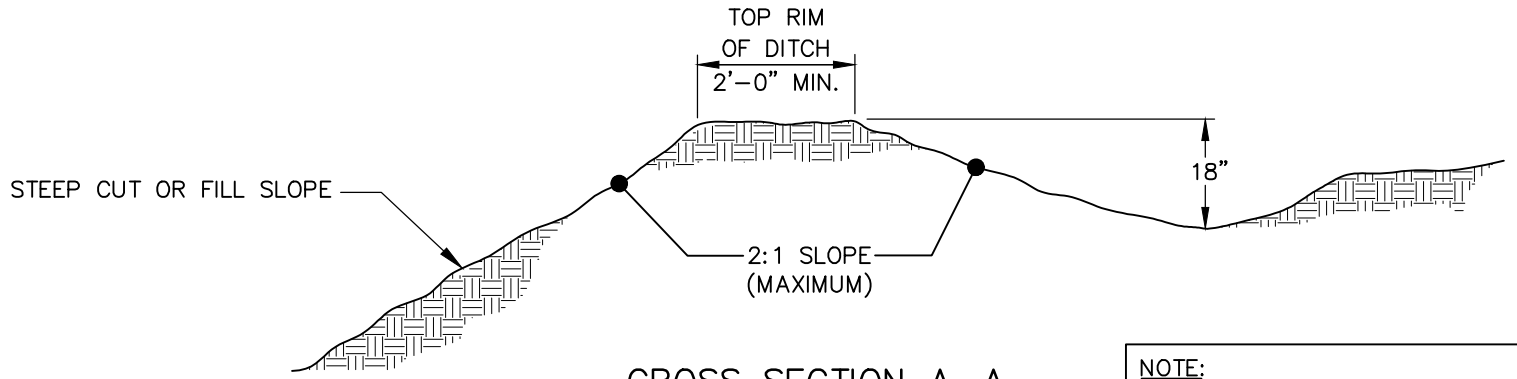
1. CURB AND GUTTER SECTION SHALL BE REMOVED IN ACCORDANCE WITH DRIVEWAY WIDTH APPROVED BY THE CITY.
2. IF PERPENDICULAR CUT IS WITHIN 12 INCHES FROM A JOINT, THEN THE PARALLEL CUT SHALL BE MADE TO THAT JOINT.
3. THIS METHOD IS NOT ALLOWED IN NEW SUBDIVISION CONSTRUCTION.
4. REFER TO STANDARD DETAIL 02000.08 FOR NEW DRIVEWAY APRON.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

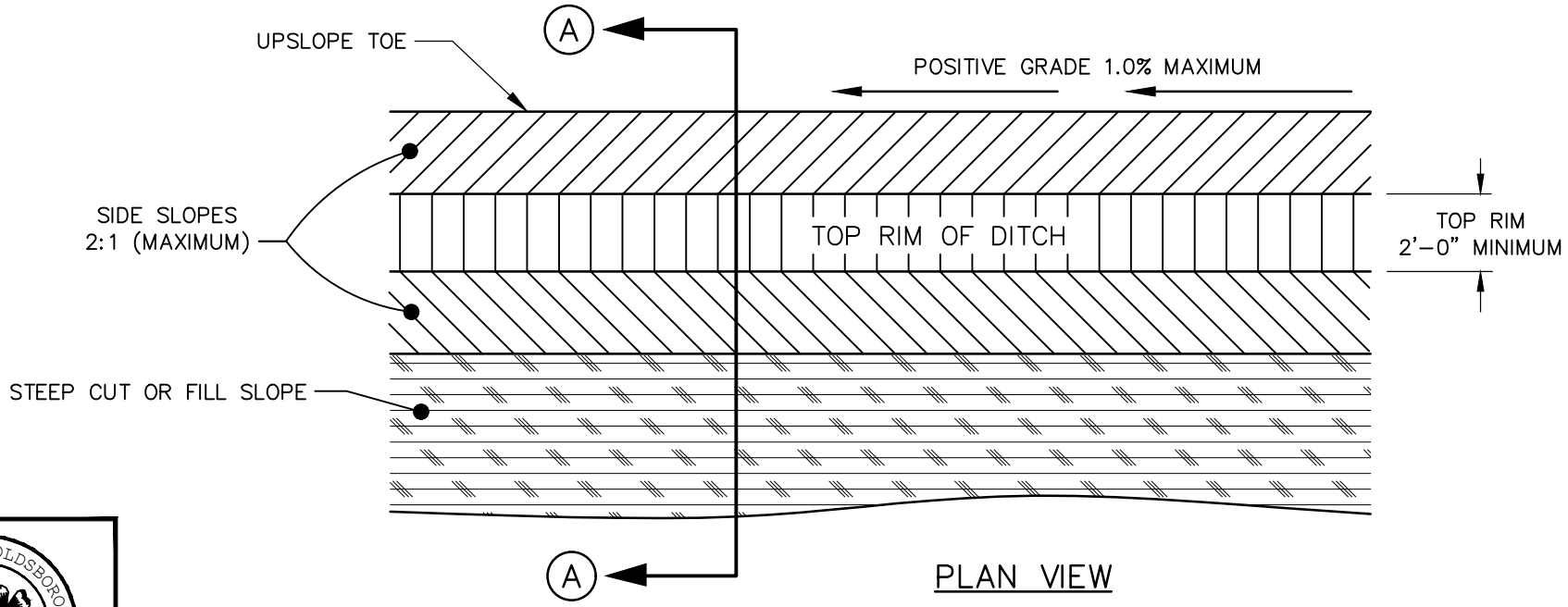
REMOVING EXISTING CURB FOR TEMPORARY CONSTRUCTION ENTANCE

DETAIL No.
04000.10



CROSS SECTION A–A

NOTE:
STABILIZE DIVERSION DITCH WITH TEMPORARY SEEDING AND EROSION CONTROL MATTING.



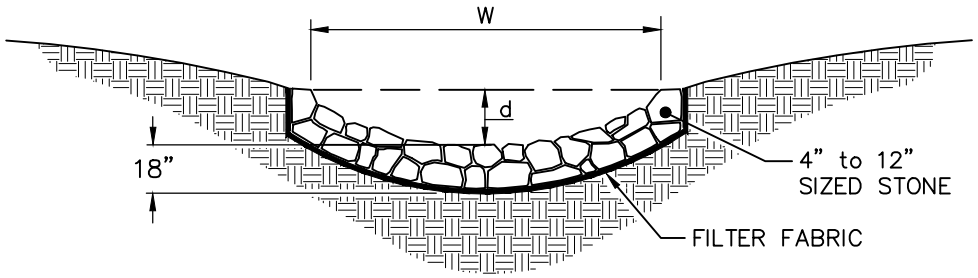
PLAN VIEW

CITY OF GOLDSBORO NORTH CAROLINA

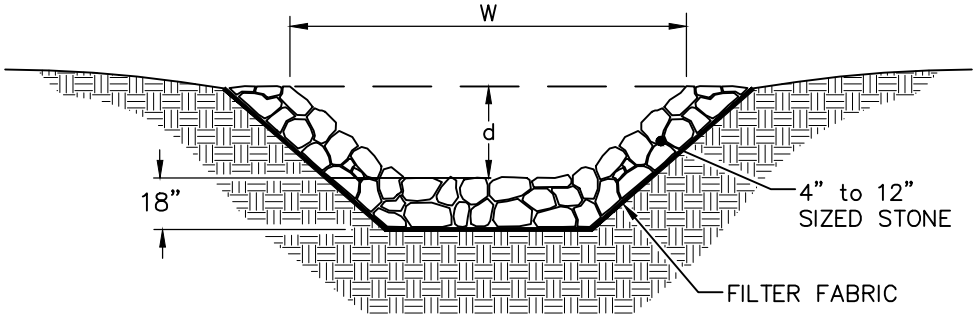
EFFECTIVE: 12/01/18

STANDARD TEMPORARY DIVERSION DITCH

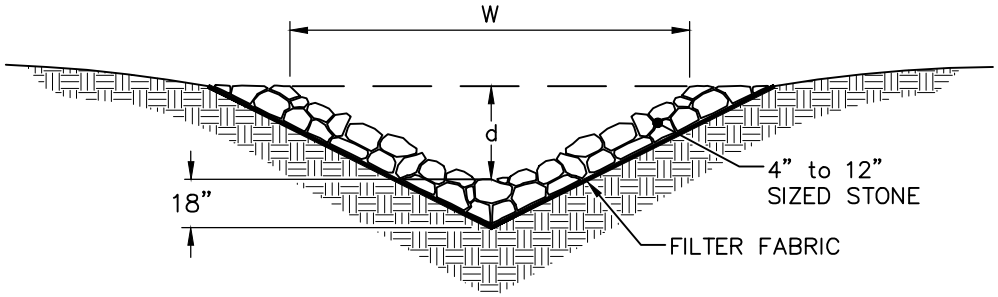
DETAIL No.
04000.11
SHEET 1 OF 1



PARABOLIC–SHAPED



TRAPEZOIDAL
(TYPICAL RIPRAP CHANNEL)



V–SHAPED

NOTES:

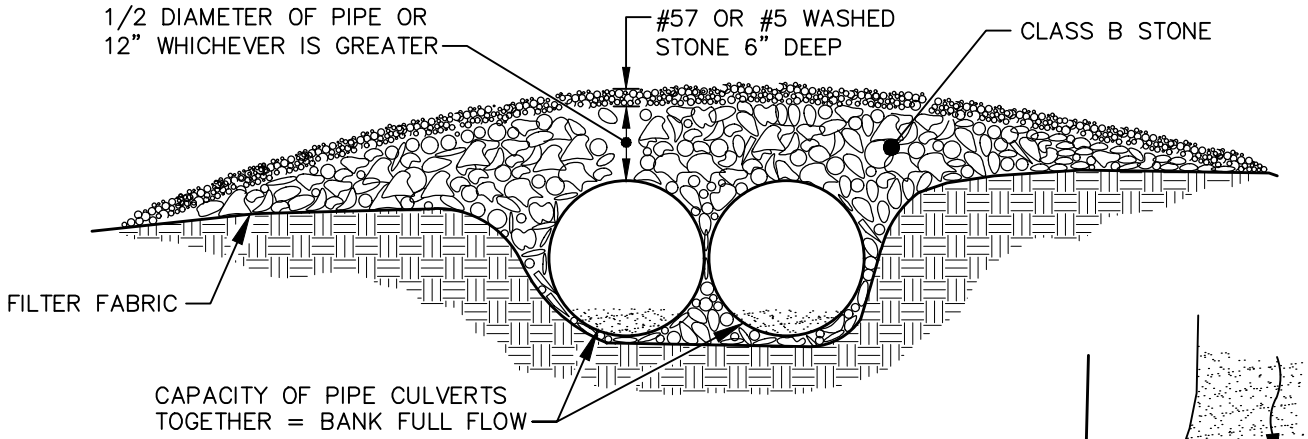
1. TO BE USED WHERE EXCESSIVE STORMWATER VELOCITIES PROHIBIT VEGETATIVE LININGS.
2. SIZE OF STONE MUST BE DETERMINED BY APPROPRIATE DESIGN PROCEDURE.
3. DIMENSIONS FOR d & W VARIES ACCORDING TO DESIGN.

CITY OF GOLDSBORO NORTH CAROLINA

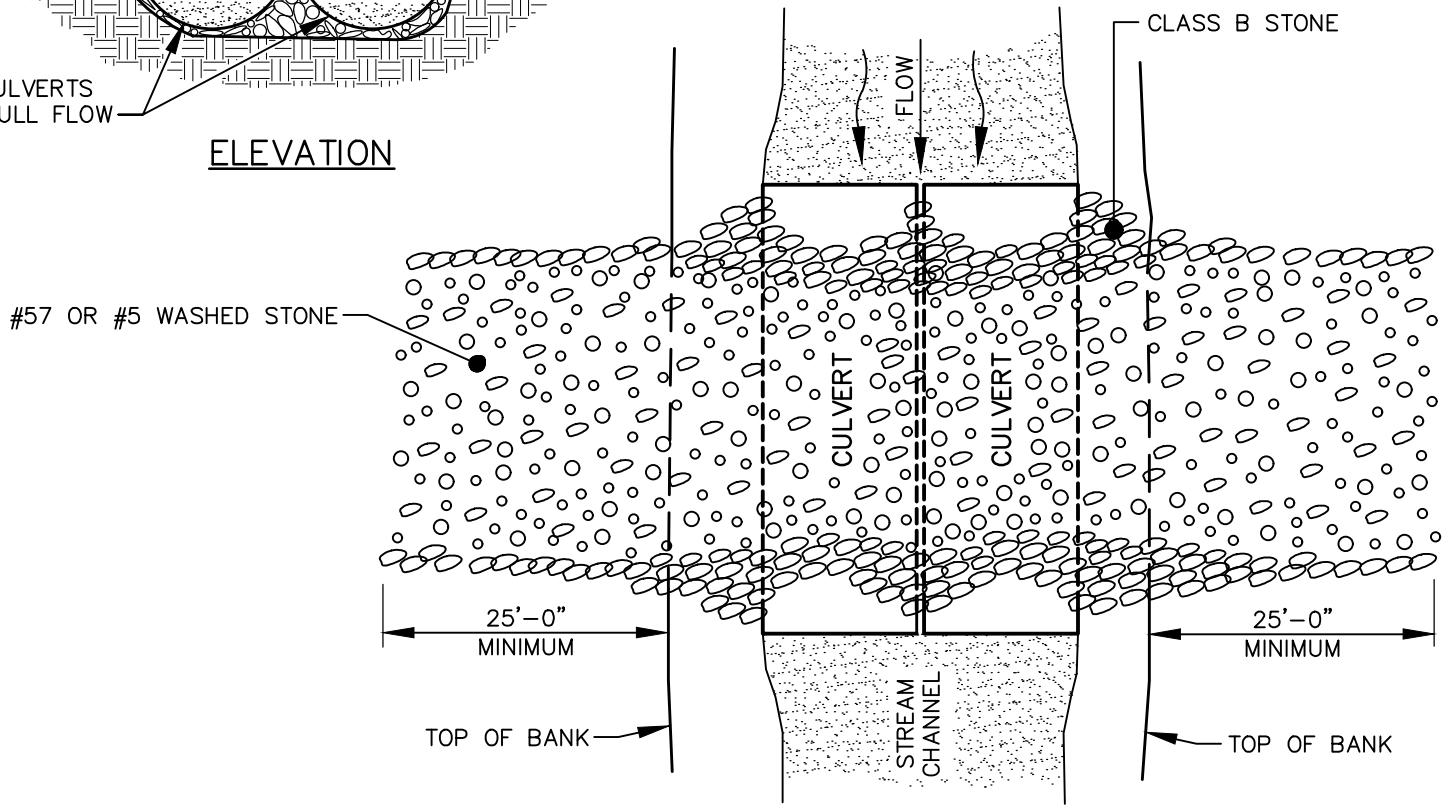
EFFECTIVE: 12/01/18

STANDARD RIPRAP LINED CHANNELS

DETAIL No.
04000.12
SHEET 1 OF 1



ELEVATION



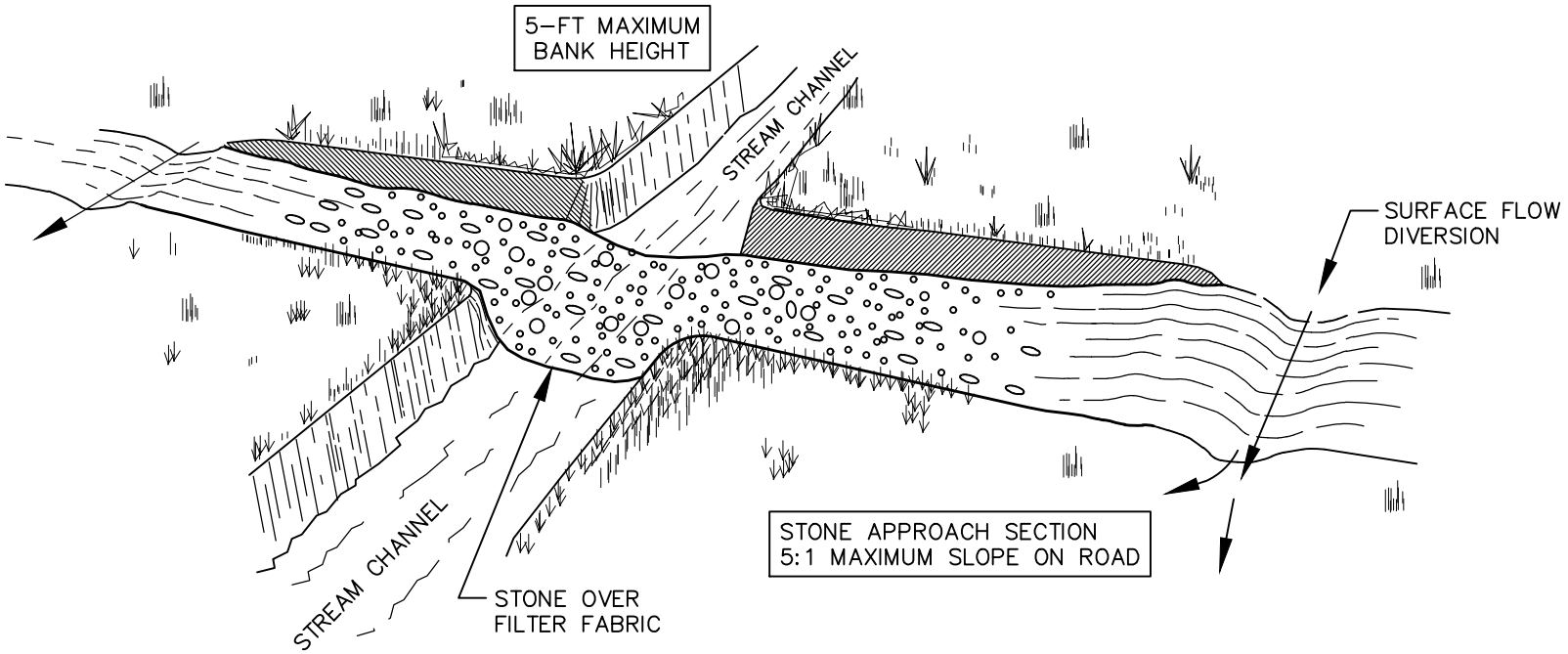
PLAN VIEW

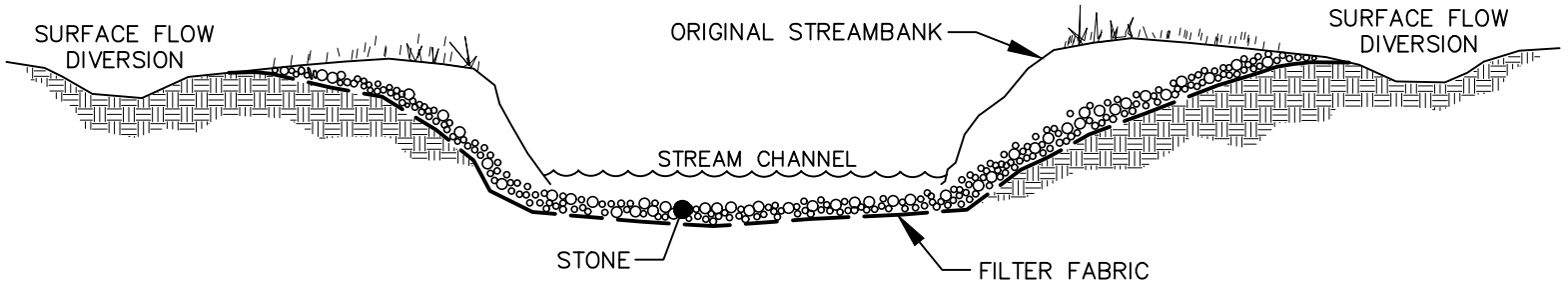
CITY OF GOLDSBORO
NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD TEMPORARY STREAM CROSSING

DETAIL No.
04000.13
SHEET 1 OF 3



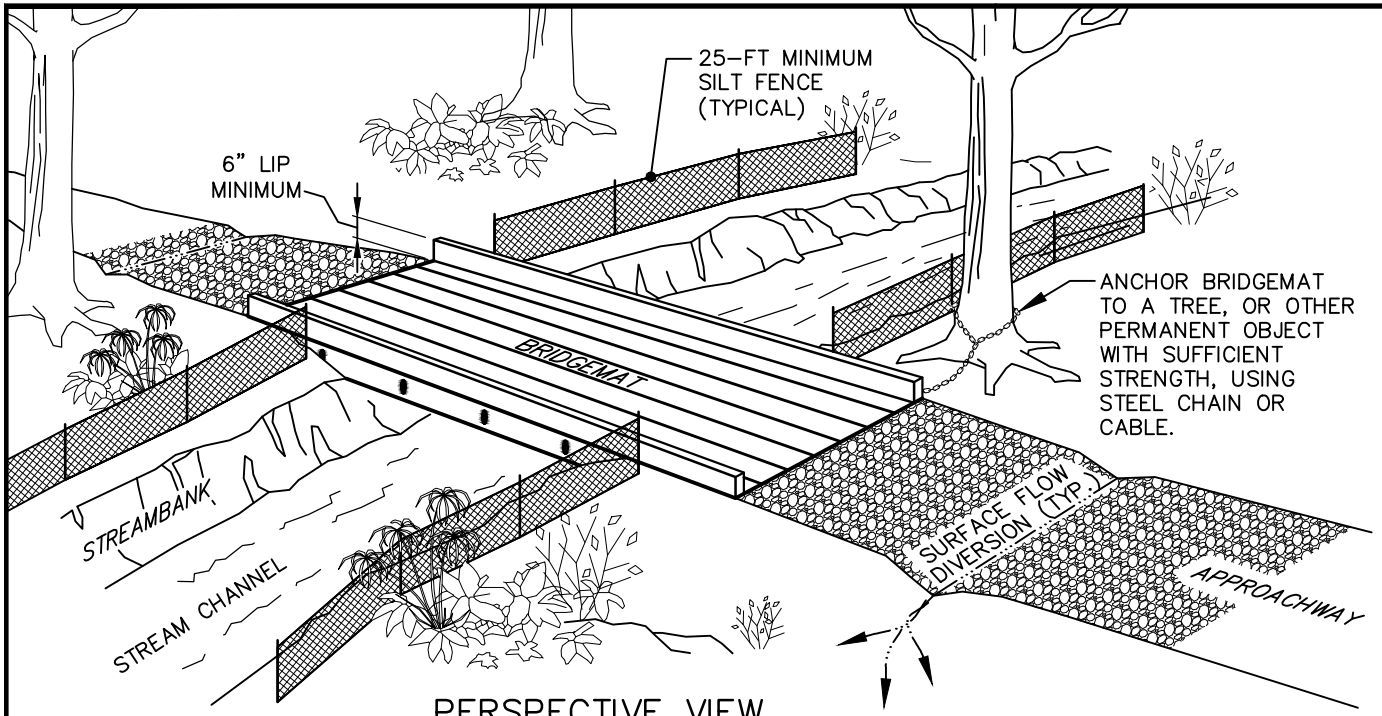


CITY OF GOLDSBORO
NORTH CAROLINA

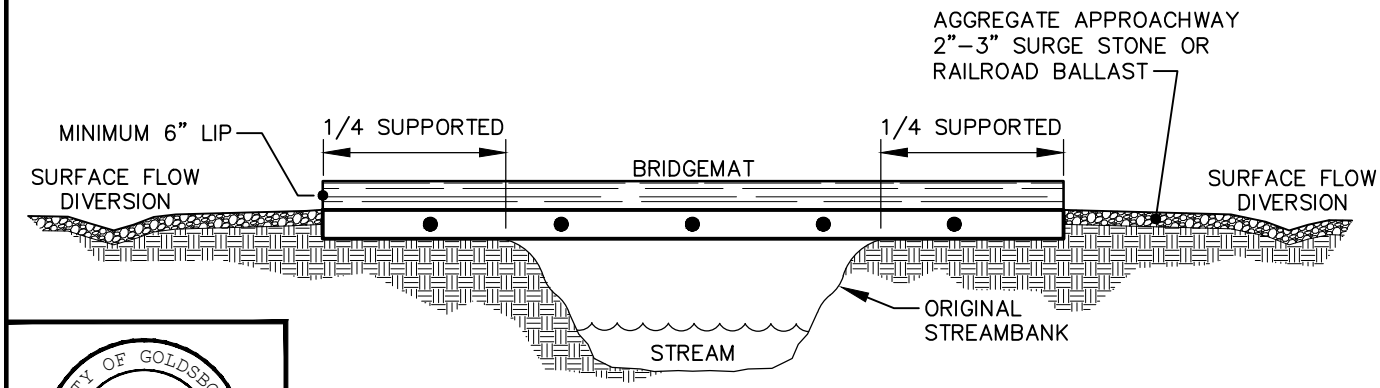
EFFECTIVE: 12/01/18

STANDARD TEMPORARY STREAM CROSSING OPTION

DETAIL No.
04000.13
SHEET 2 OF 3



PERSPECTIVE VIEW



SIDE VIEW

INSTALLATION NOTES:

1. REFER TO "NORTH CAROLINA DIVISION OF FOREST RESOURCES" LITERATURE, INSTALLATION MAINTENANCE GUIDELINES, & "NORTH CAROLINA FORESTRY BMP MANUAL–2006".
2. INSTALL WATER DIVERSION DEVICES (WATER BARS, TURNOUTS, BROAD–BASED DIPS, ETC.) ON BOTH SIDES OF THE MATS.
3. STABILIZE EXPOSED MINERAL SOIL WITH TREE TOPS OR BRUSH DURING MAT INSTALLATION, AND SEEDING/MULCH AFTER MAT REMOVAL.
4. INSTALL MATS TO CREATE A MINIMUM TEN FOOT BRIDGE WIDTH.
5. INCLUDE COARSE AGGREGATE ON THE APPROACHWAY FOR A MINIMUM OF 25 FEET AND SILT FENCE ALONG STREAMBANKS ADJACENT TO CROSSING FOR A MINIMUM OF 25 FEET.

MAINTENANCE NOTES:

1. KEEP MATS' SURFACE FREE OF MINERAL SOIL AND DEBRIS THAT COULD ENTER STREAM.
2. PERIODICALLY CHECK MAT HARDWARE; RETIGHTEN NUTS & CABLE CLAMPS AS NECESSARY TO MAINTAIN BRIDGE STRENGTH AND INTEGRITY.
3. IMMEDIATELY REMOVE ANY DEBRIS WHICH ENTERS THE STREAM AT THE CROSSING LOCATION.

REMOVAL NOTES:

1. CLEAN OFF BRIDGE SURFACE.
2. REMOVE MATS BY USING MAT CABLE LOOP OR SKIDDER GRAPPLE.
3. PERMANENTLY STABILIZE DISTURBED PORTIONS OF STREAMBANK AND APPROACH ROADS WITH PERENNIAL GRASSES/MULCH (OR WETLAND MIX WHEN APPLICABLE).
4. LEAVE APPROPRIATE WATER DIVERSION STRUCTURES IN PLACE ON BOTH SIDES OF STREAM.
5. RESTORE THE STREAM CHANNEL TO ITS ORIGINAL CROSS–SECTION, AND SMOOTH AND APPROPRIATELY STABILIZE ALL DISTURBED AREAS.

CITY OF GOLDSBORO NORTH CAROLINA

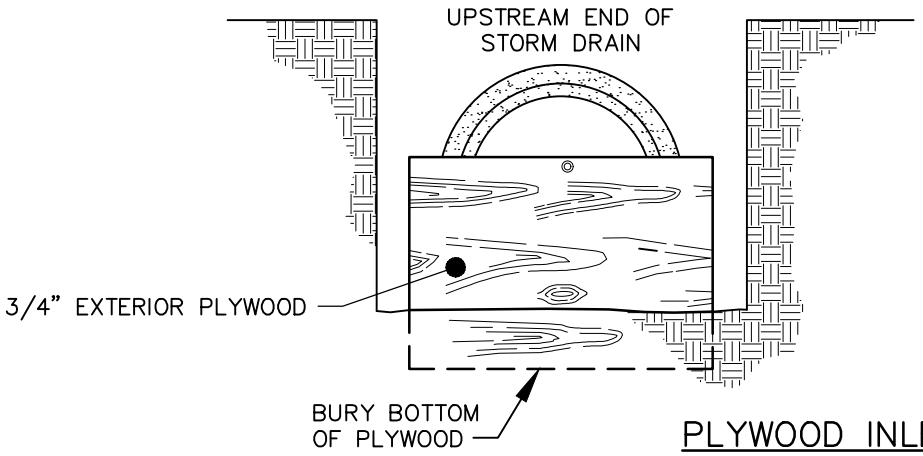
EFFECTIVE: 12/01/18

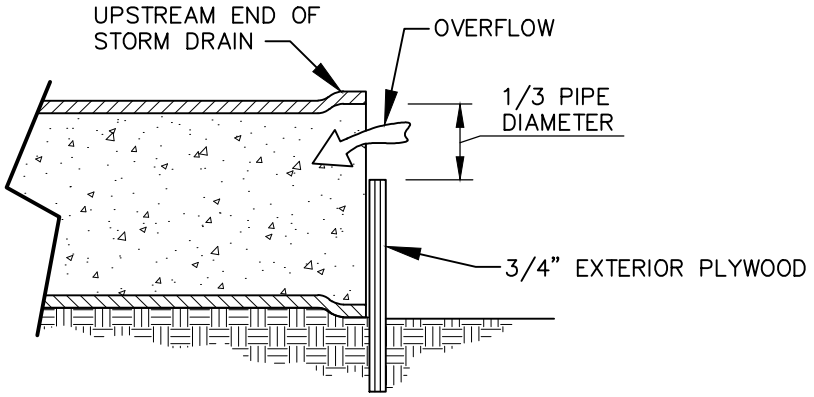
STANDARD TEMPORARY STREAM CROSSING OPTION

DETAIL No.

04000.13

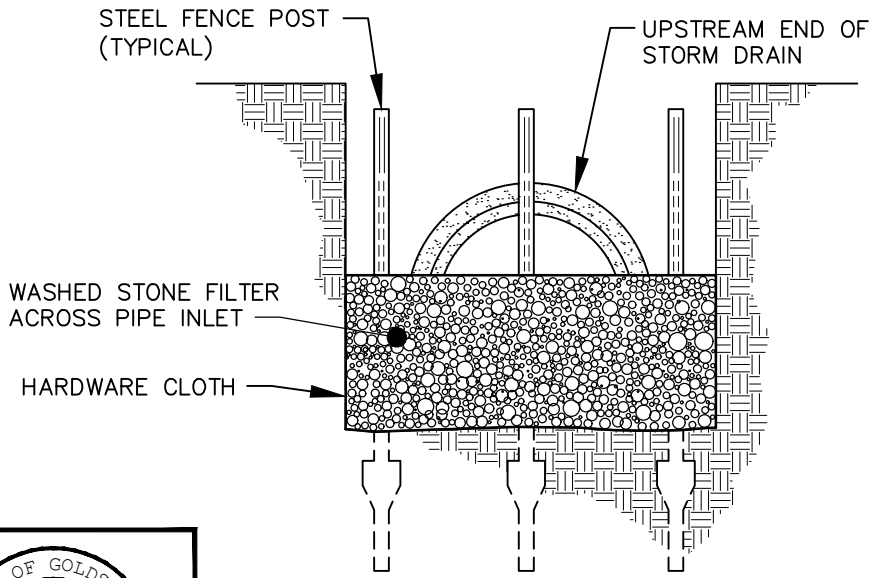
SHEET 3 OF 3

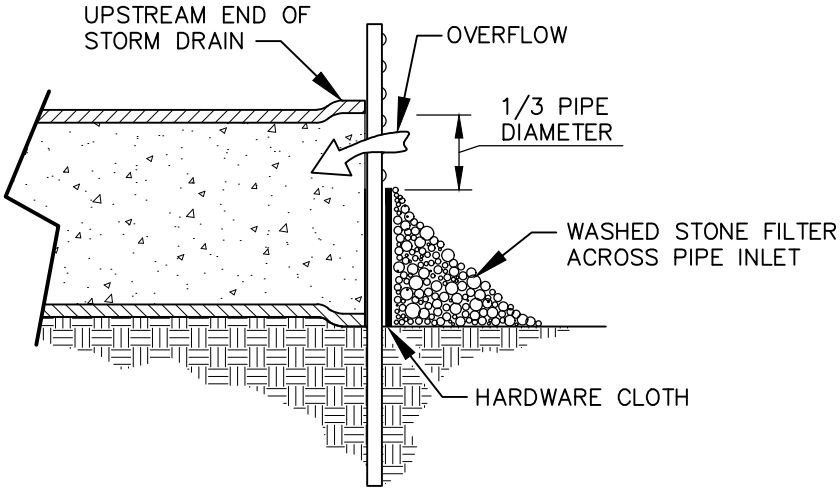




PLYWOOD INLET PROTECTION

NOTE:
ALL PARTIALLY COMPLETED STORM DRAINS, UP TO 24 INCH PIPE SIZE, SHALL BE PROTECTED AT THE END OF EACH DAY IN ACCORDANCE WITH THESE DETAILS.





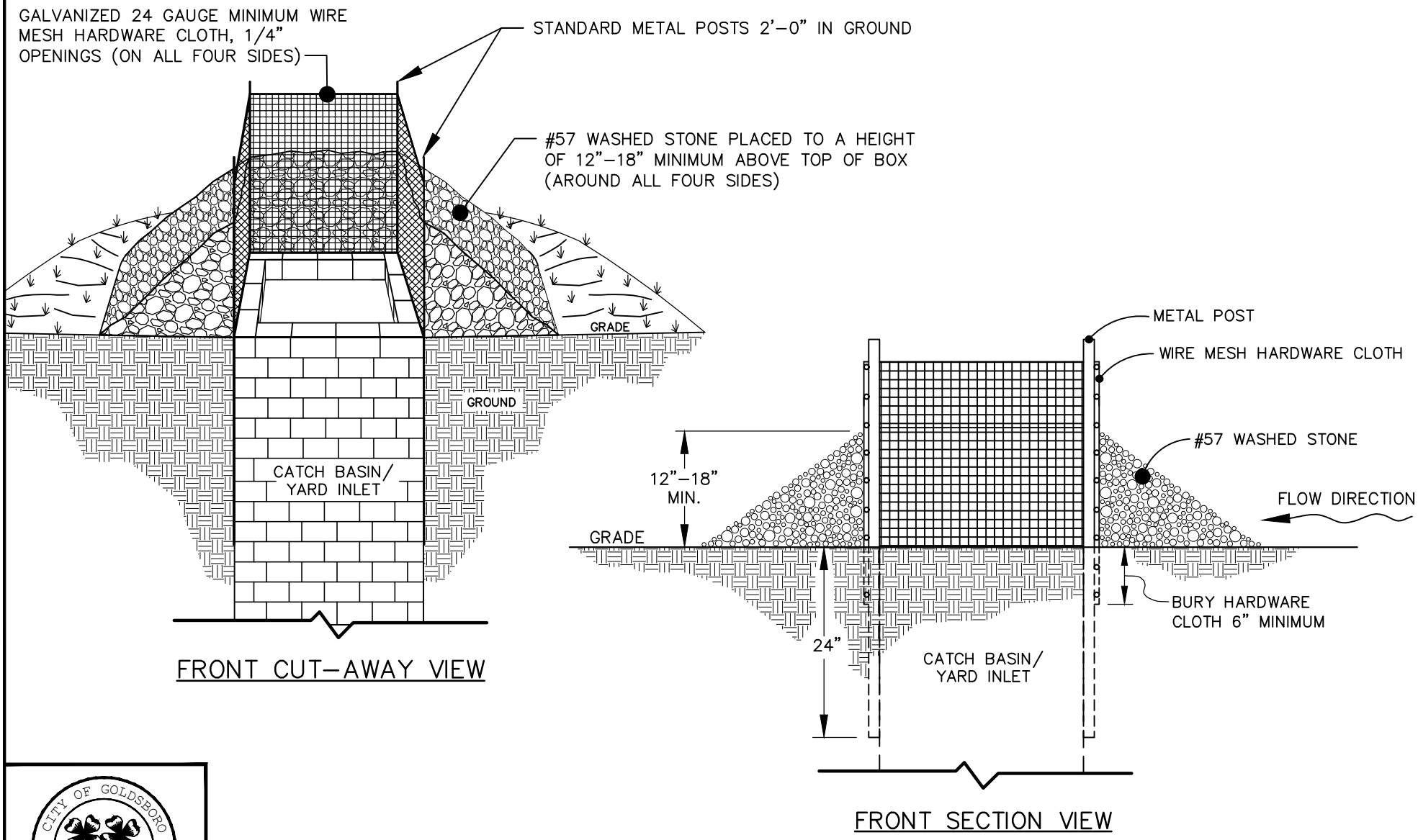
STONE FILTER INLET PROTECTION

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD PIPE INLET PROTECTION

DETAIL No.
04000.14
SHEET 1 OF 1



CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD CATCH BASIN/YARD INLET PROTECTION

DETAIL No.

04000.15

SHEET 1 OF 1

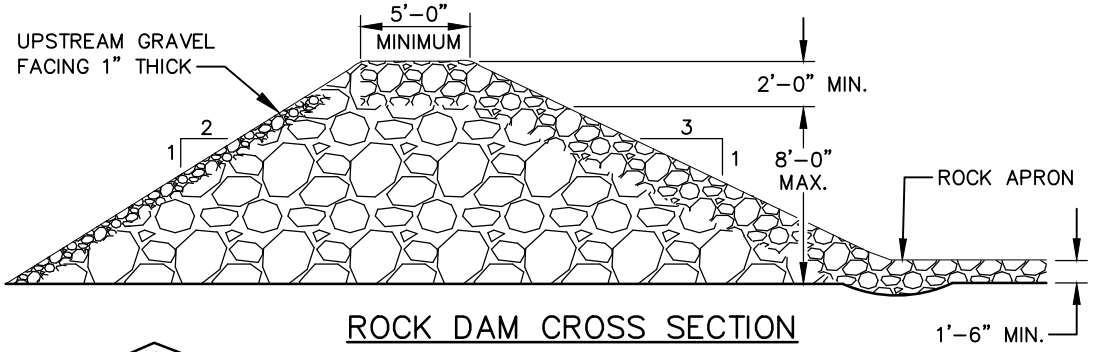
NOTES:

INSTALLATION:
- –DIVERT RUNOFF FROM UNDISTURBED AREAS AWAY FROM THE BASIN DELAY CLEANING POND AREA UNTIL DAM IS IN PLACE.
- –EXCAVATE FOUNDATION FOR APRON AND USE IT AS A TEMPORARY SEDIMENT BASIN DURING CONSTRUCTION OF DAM.
- –CLEAR AND GRUB AREA UNDER DAM, REMOVING ALL ROOT MATTER AND OTHER OBJECTIONABLE MATERIAL.
- –GRADE EARTH ABUTMENTS NO STEEPER THAN 2:1.
- –DISPOSE OF MATERIAL IN APPROVED LOCATION.
- –IF CUTOFF TRENCH IS REQUIRED, EXCAVATE AT CENTER LINE OF DAM EXTENDING ALL THE WAY UP EARTH ABUTMENTS.
- –STONE SIZE TO BE DETERMINED BY ENGINEER.

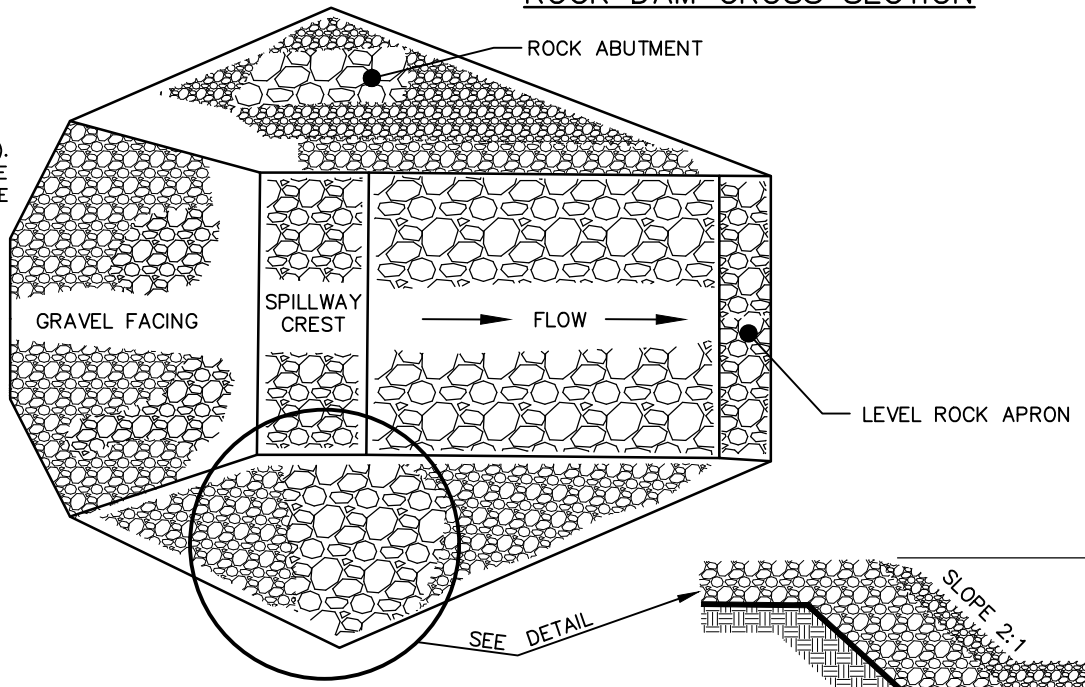
PROTECTION FROM PIPING:
- –THE ENTIRE FOUNDATION INCLUDING BOTH EARTH ABUTMENTS MUST BE COVERED BY FILTER FABRIC, OVERLAP 1 FOOT AT ALL JOINTS, UPSTREAM STRIPS OVER DOWNSTREAM STRIP (SEE CROSS SECTION).
- –SMOOTH THE FOUNDATION AREA BEFORE PLACING FILTER FABRIC. BE CAREFUL PLACING ROCK ON FABRIC, IT MAY BE HELPFUL TO PLACE A 4 INCH LAYER OF SAND OVER FABRIC BEFORE PLACING ROCK.

EMBANKMENT AND POOL:
- –CONSTRUCT EMBANKMENT TO DIMENSIONS SHOWN ON PLANS, USE WELL GRADED HARD, ANGULAR, WEATHER–RESISTANT ROCK. ABUTMENTS MUST BE AT LEAST 2 FEET HIGHER THAN THE SPILLWAY CREST AND AT LEAST 1 FOOT HIGHER THAN THE DOWNSTREAM FACE OF DAM AT ALL POINTS. (SEE PLAN)
- –DIVERT SEDIMENT–LADEN FLOW TO UPPER END OF BASIN.
- –SET MARKER STAKE TO INDICATE CLEAN OUT ELEVATION WHERE SEDIMENT POOL IS 50% FULL.
- –STABILIZE ALL DISTURBED AREAS EXCEPT THE LOWER ONE–HALF OF SEDIMENT POOL AS SHOWN IN THE VEGETATION PLAN.

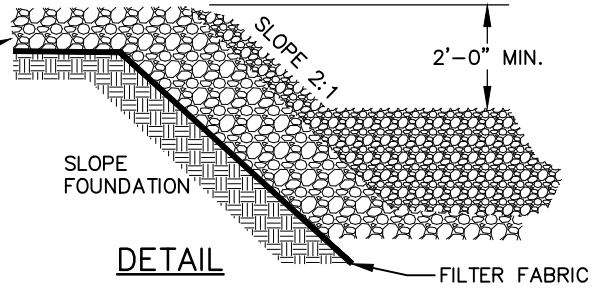
SAFETY:
SEDIMENT BASINS THAT IMPOUND WATER ARE HAZARDOUS. BASINS SHOULD BE DEWATERED BETWEEN STORMS. AVOID STEEP SLOPES. FENCES WITH WARNING SIGNS MAY BE NECESSARY IF TRESPASSING IS LIKELY. STATE AND LOCAL REQUIREMENTS MUST BE FOLLOWED.



ROCK DAM CROSS SECTION



PLAN WITH SPILLWAY DETAIL



DETAIL

CITY OF GOLDSBORO NORTH CAROLINA

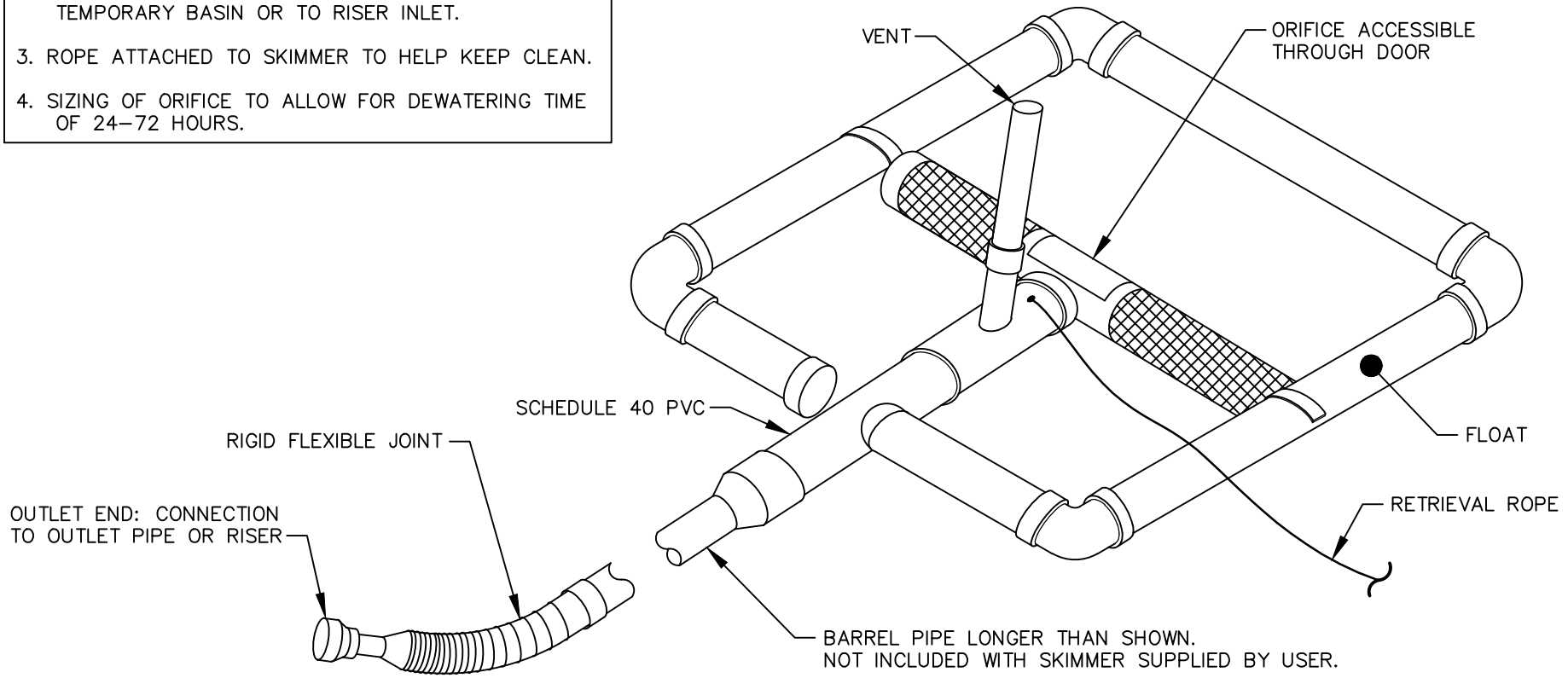
EFFECTIVE: 12/01/18

STANDARD ROCK DAM DETAIL

DETAIL No.
04000.16
SHEET 1 OF 1

NOTES:

1. SKIMMER IS TO BE A SURFACE DEWATERING DEVICE SUCH AS BMP SKIMMER OR APPROVED DEVICE.
2. SKIMMER SHOULD RISE TO LEVEL OF WEIR HEIGHT IN TEMPORARY BASIN OR TO RISER INLET.
3. ROPE ATTACHED TO SKIMMER TO HELP KEEP CLEAN.
4. SIZING OF ORIFICE TO ALLOW FOR DEWATERING TIME OF 24–72 HOURS.

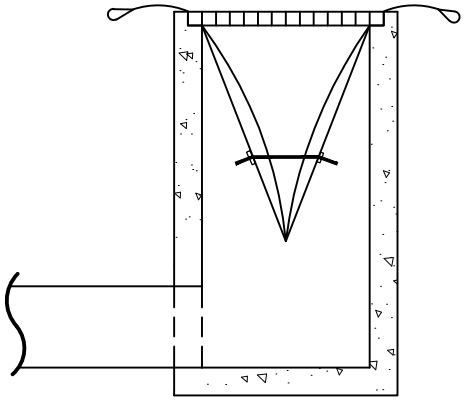


CITY OF GOLDSBORO NORTH CAROLINA

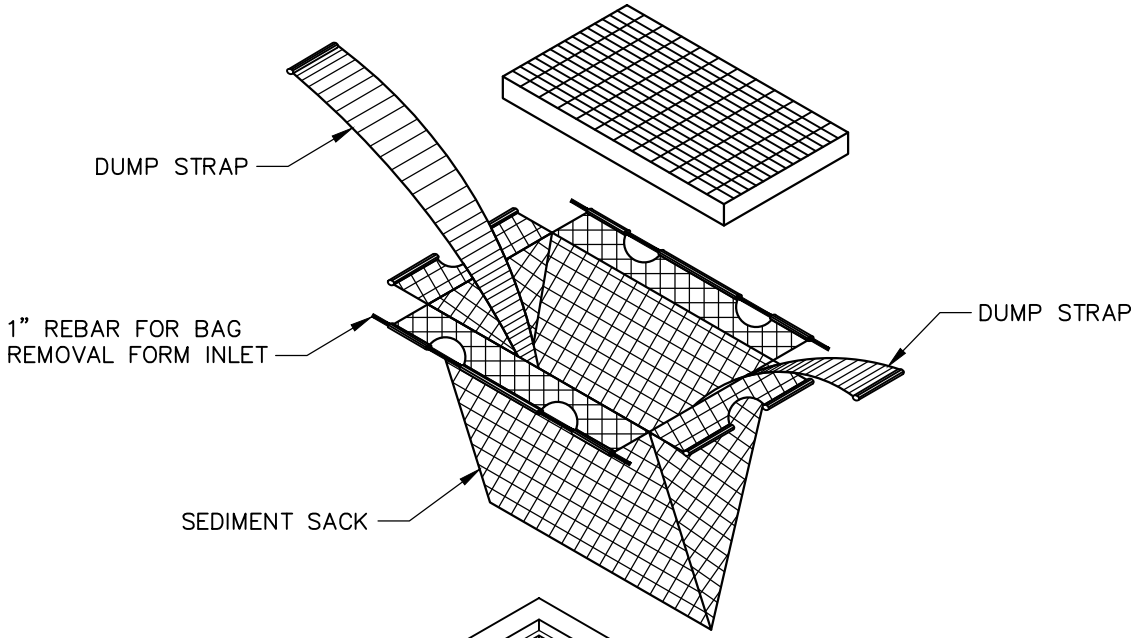
EFFECTIVE: 12/01/18

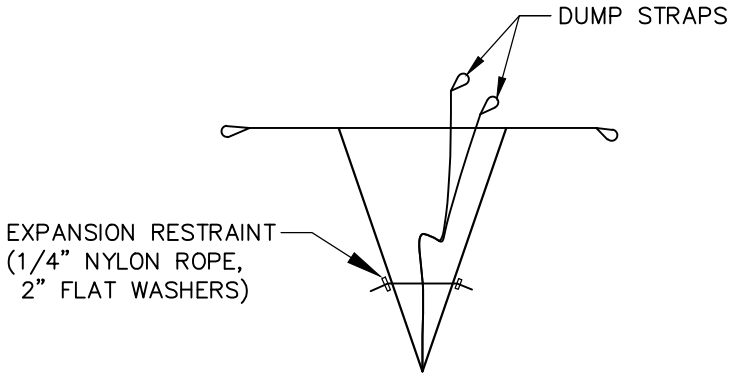
STANDARD SKIMMER DETAIL

DETAIL No.
04000.17
SHEET 1 OF 1

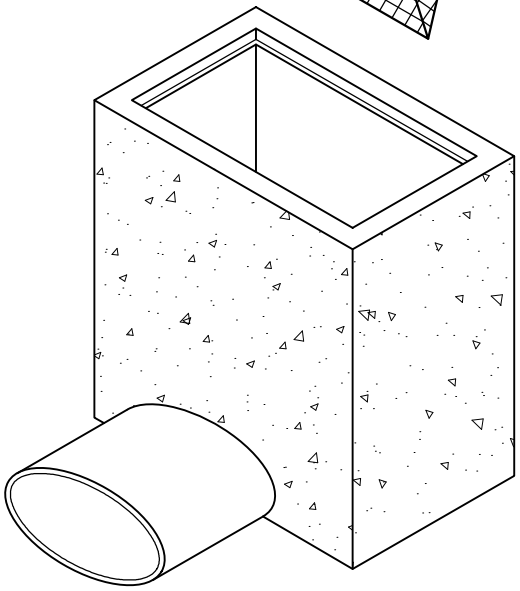


INSTALLATION DETAIL





BAG DETAIL



CITY OF GOLDSBORO NORTH CAROLINA

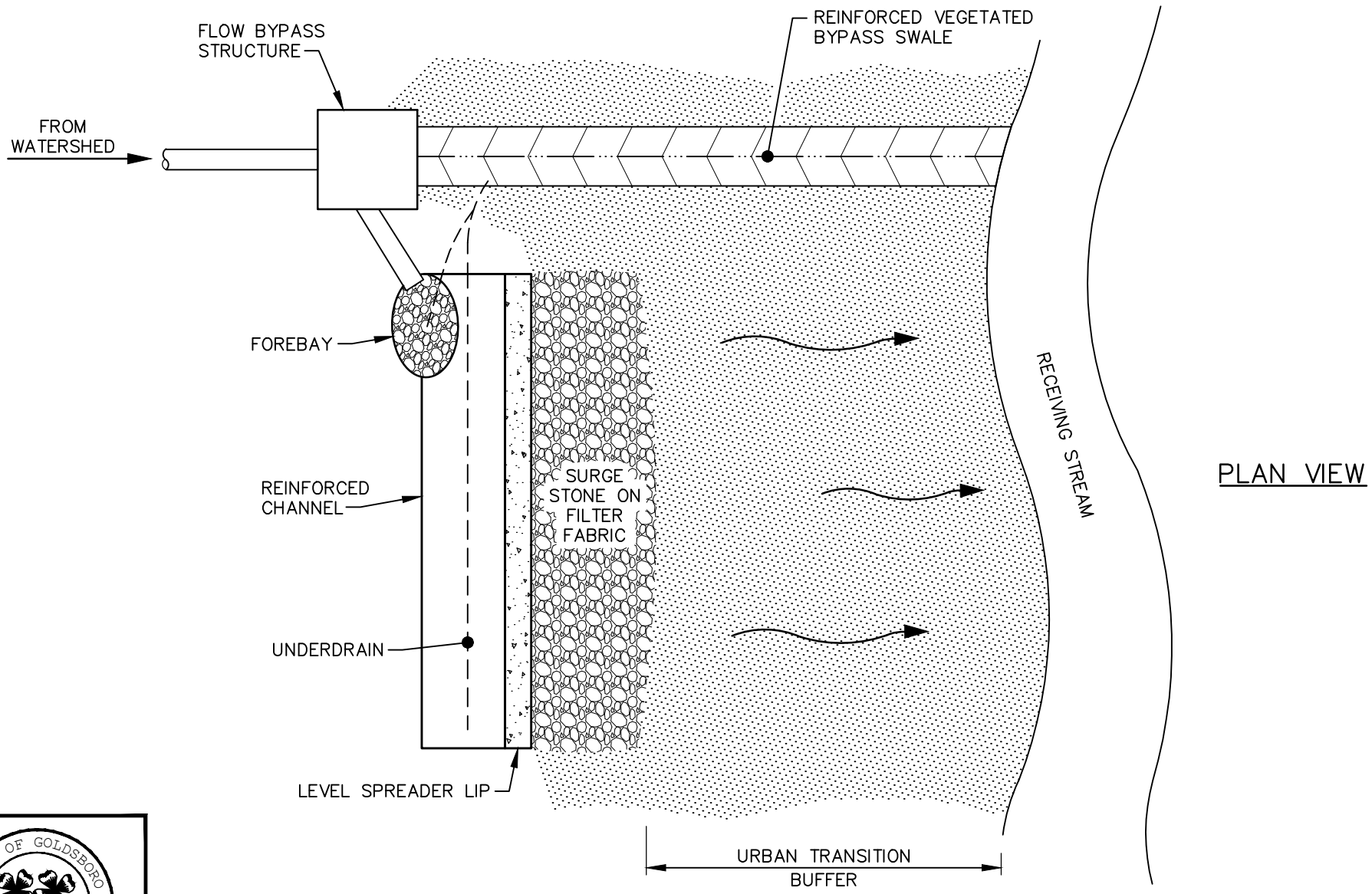
EFFECTIVE: 12/01/18

STANDARD INLET SEDIMENT CONTROL DEVICE

DETAIL No.

04000.18

SHEET 1 OF 1

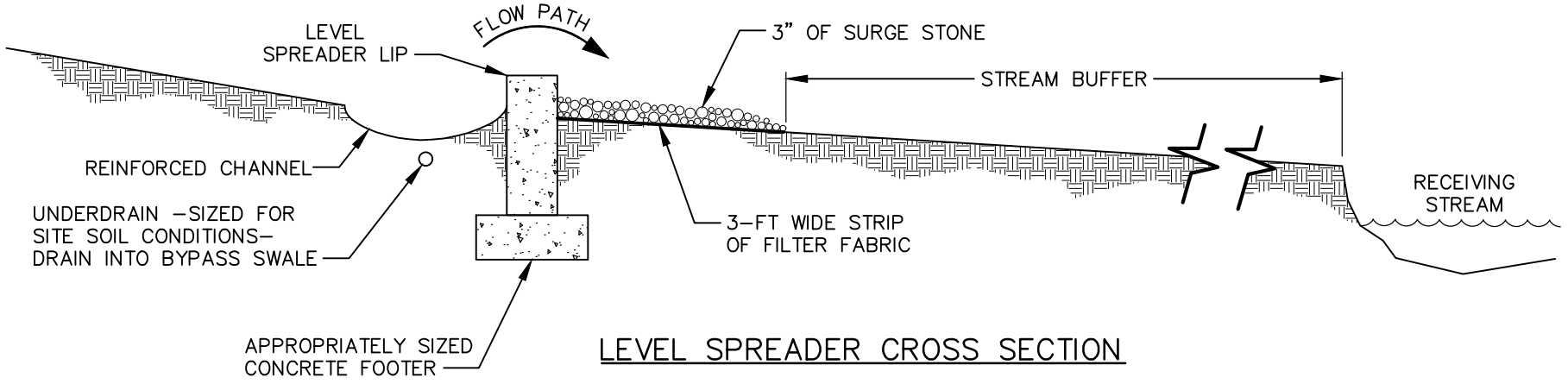


CITY OF GOLDSBORO NORTH CAROLINA

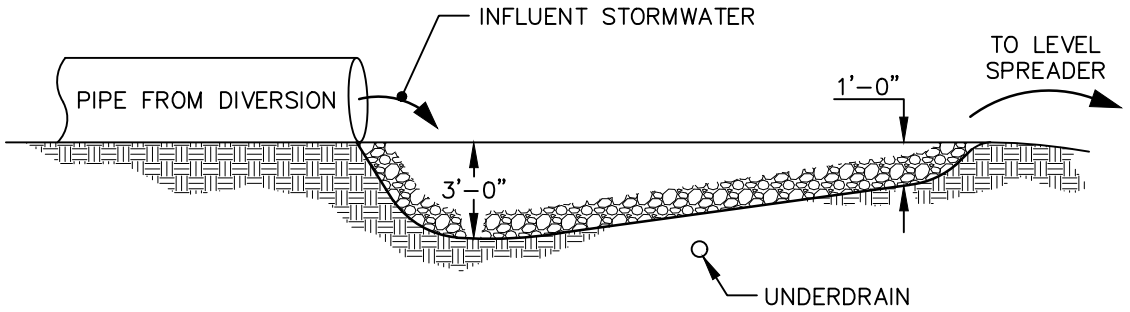
EFFECTIVE: 12/01/18

STANDARD LEVEL SPREADER

DETAIL No.
04000.19
SHEET 1 OF 2



LEVEL SPREADER CROSS SECTION



FOREBAY SCHEMATIC

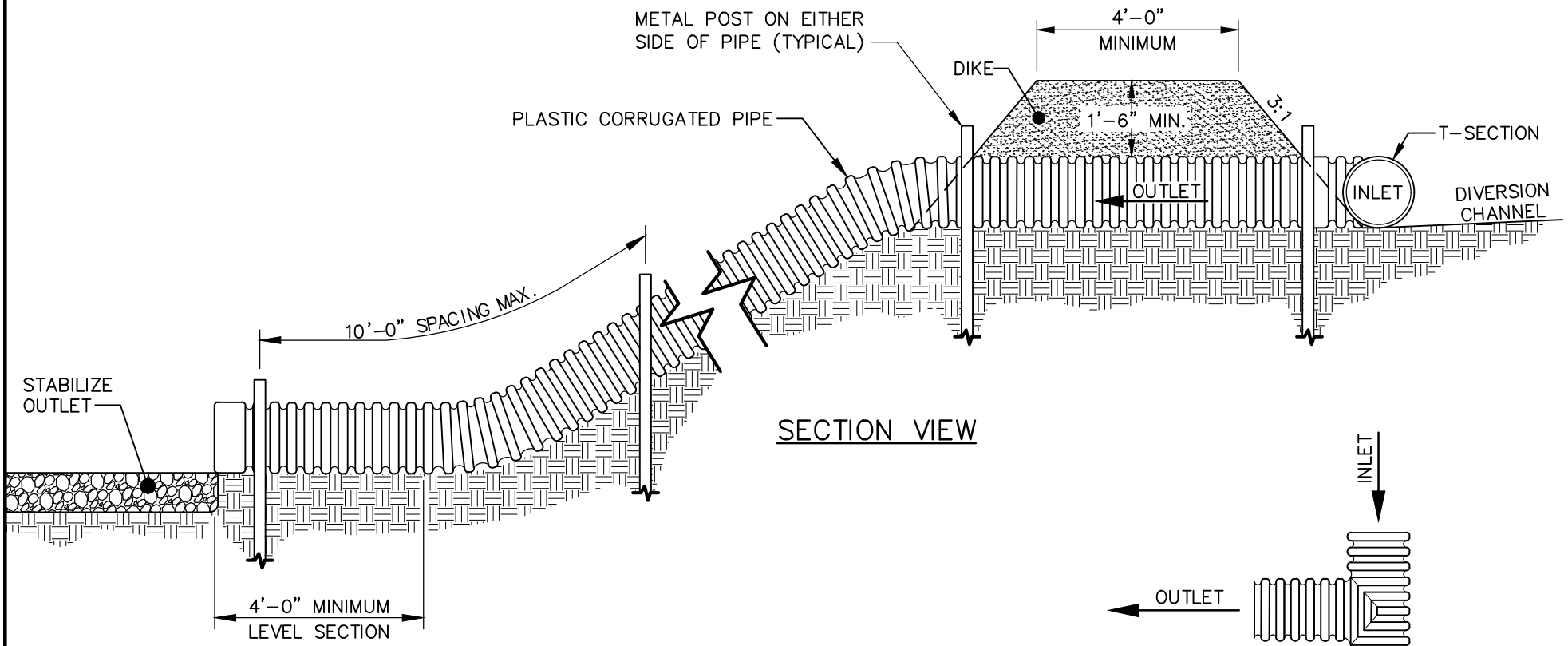
NOTES:
1. LEVEL SPREADER DESIGN WILL BE BASED ON CURRENT NC DIVISION OF ENVIRONMENTAL QUALITY DESIGN GUIDELINES.
2. INSPECT AFTER EACH RAINFALL, UNTIL VEGETATION IS WELL ESTABLISHED, AND MAKE ANY NECESSARY REPAIRS; AFTERWARDS, INSPECT PERIODICALLY AND KEEP VEGETATION HEALTHY AND MAINTAINED.

CITY OF GOLDSBORO NORTH CAROLINA

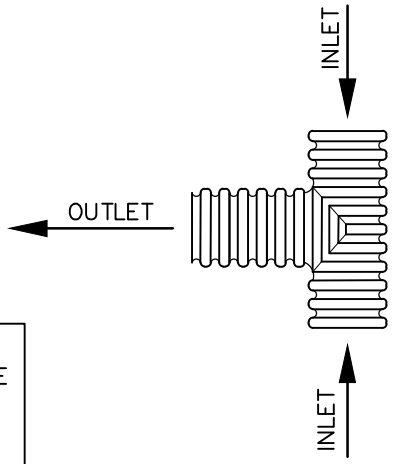
EFFECTIVE: 12/01/18

STANDARD LEVEL SPREADER

DETAIL No.
04000.19
SHEET 2 OF 2



SECTION VIEW



T–SECTION
PLAN VIEW

NOTES:

1. TEMPORARY DIVERSION: GENERALLY, USE AN EARTHEN DIVERSION WITH A DIKE RIDGE TO DIRECT SURFACE RUNOFF INTO THE TEMPORARY SLOPE DRAIN. MAKE THE HEIGHT OF THE RIDGE OVER THE DRAIN CONDUIT A MINIMUM OF 1.5 FEET AND AT LEAST 6 INCHES HIGHER THAN THE ADJOINING RIDGE ON EITHER SIDE. THE LOWEST POINT OF THE DIVERSION RIDGE SHOULD BE A MINIMUM OF 1 FOOT ABOVE THE TOP OF THE DRAIN SO THAT DESIGN FLOW CAN FREELY ENTER THE PIPE.
2. OUTLET PROTECTION: PROTECT THE OUTLET OF THE SLOPE DRAIN FROM EROSION.
3. MINIMUM OF 10 INCH PIPE OR GREATER BASED ON AREA OF DRAINAGE.

CITY OF GOLDSBORO NORTH CAROLINA

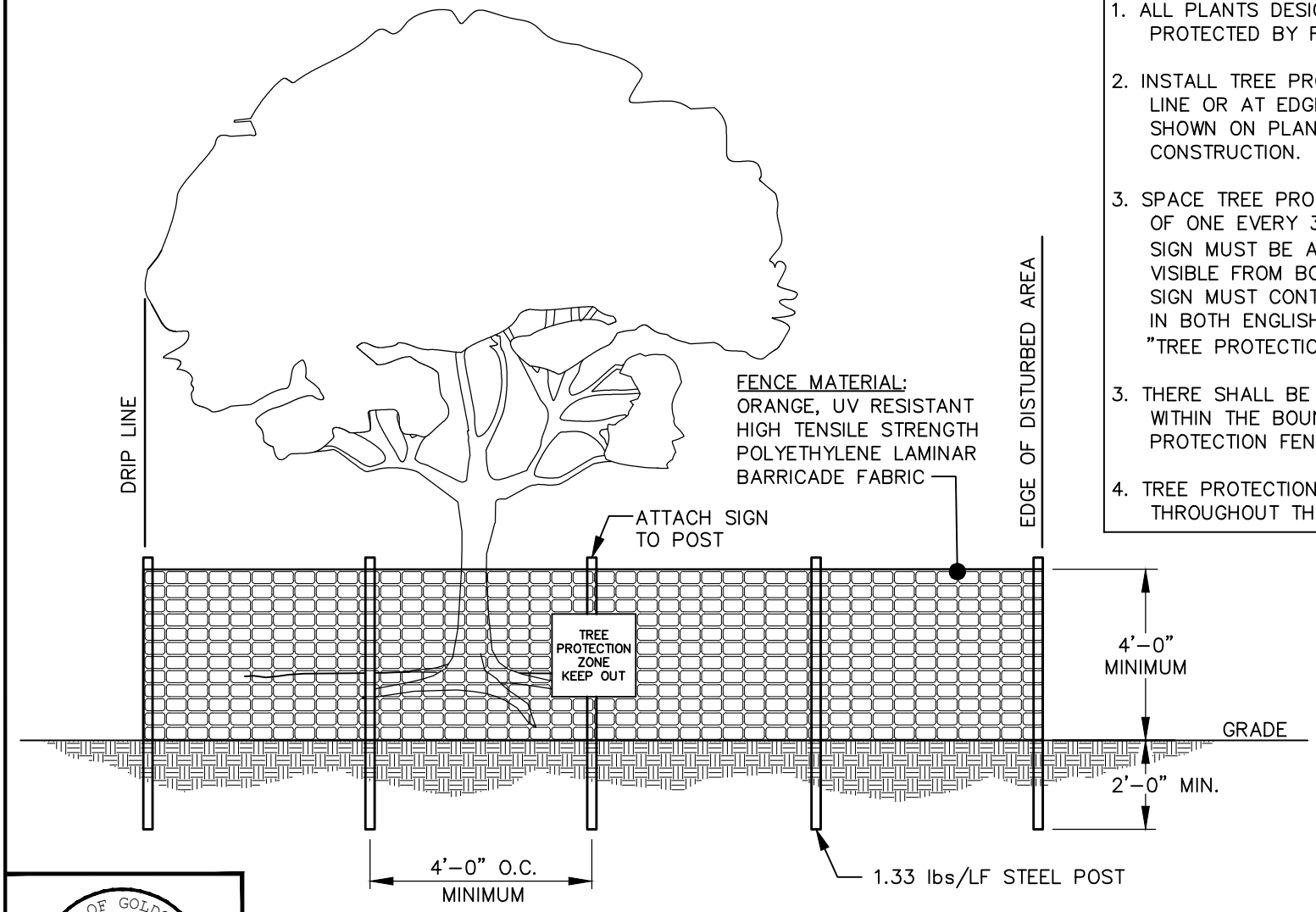
EFFECTIVE: 12/01/18

STANDARD TEMPORARY SLOPE DRAIN

DETAIL No.
04000.20
SHEET 1 OF 1

NOTES:

1. ALL PLANTS DESIGNATED TO BE SAVED SHALL BE PROTECTED BY FENCING, AS ILLUSTRATED.
2. INSTALL TREE PROTECTION FENCE AT TREE DRIP LINE OR AT EDGE OF DISTURBED AREA, AS SHOWN ON PLANS, PRIOR TO COMMENCEMENT OF CONSTRUCTION.
3. SPACE TREE PROTECTION ZONE SIGNS A MINIMUM OF ONE EVERY 300 FEET. THE SIZE OF EACH SIGN MUST BE A MINIMUM OF 2' x 2' AND BE VISIBLE FROM BOTH SIDES OF THE FENCE. THE SIGN MUST CONTAIN THE FOLLOWING LANGUAGE IN BOTH ENGLISH & SPANISH: "TREE PROTECTION ZONE, KEEP OUT".
3. THERE SHALL BE NO STORAGE OF MATERIAL WITHIN THE BOUNDARIES OF THE TREE PROTECTION FENCING.
4. TREE PROTECTION FENCING SHALL BE MAINTAINED THROUGHOUT THE DURATION OF THE PROJECT.



CITY OF GOLDSBORO NORTH CAROLINA

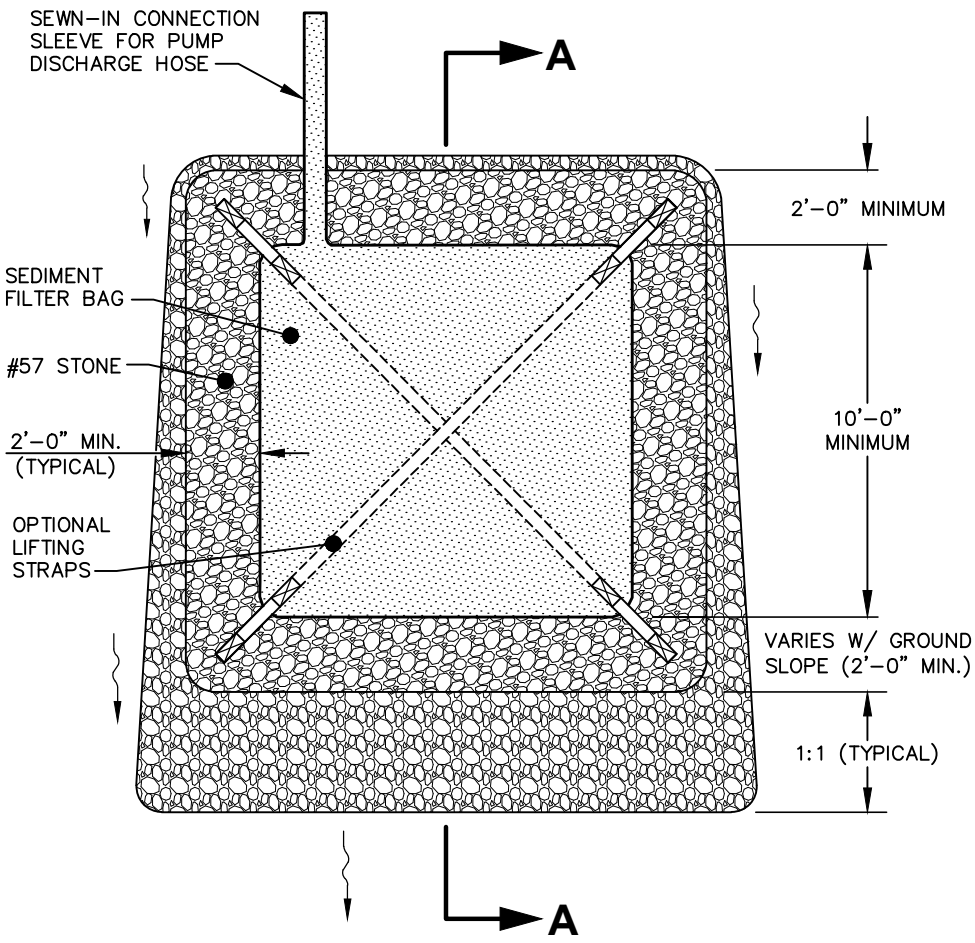
EFFECTIVE: 12/01/18

TREE PROTECTION FENCE

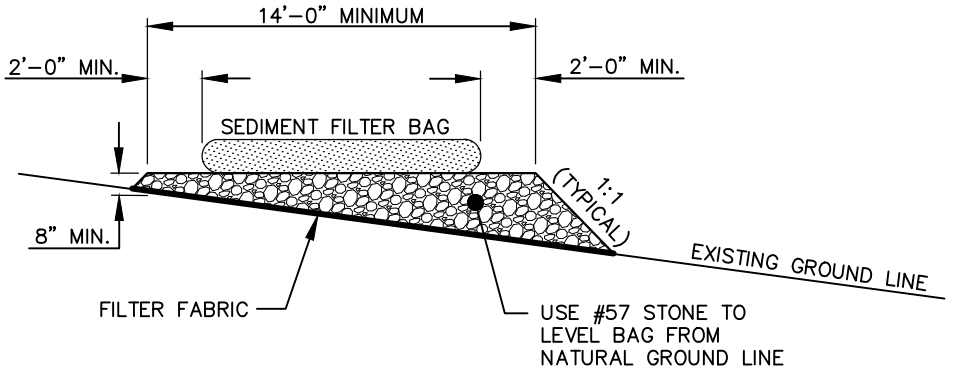
DETAIL No.

04000.21

SHEET 1 OF 1



PLAN VIEW



SECTION A–A

SEDIMENT FILTER BAG GENERAL NOTES:

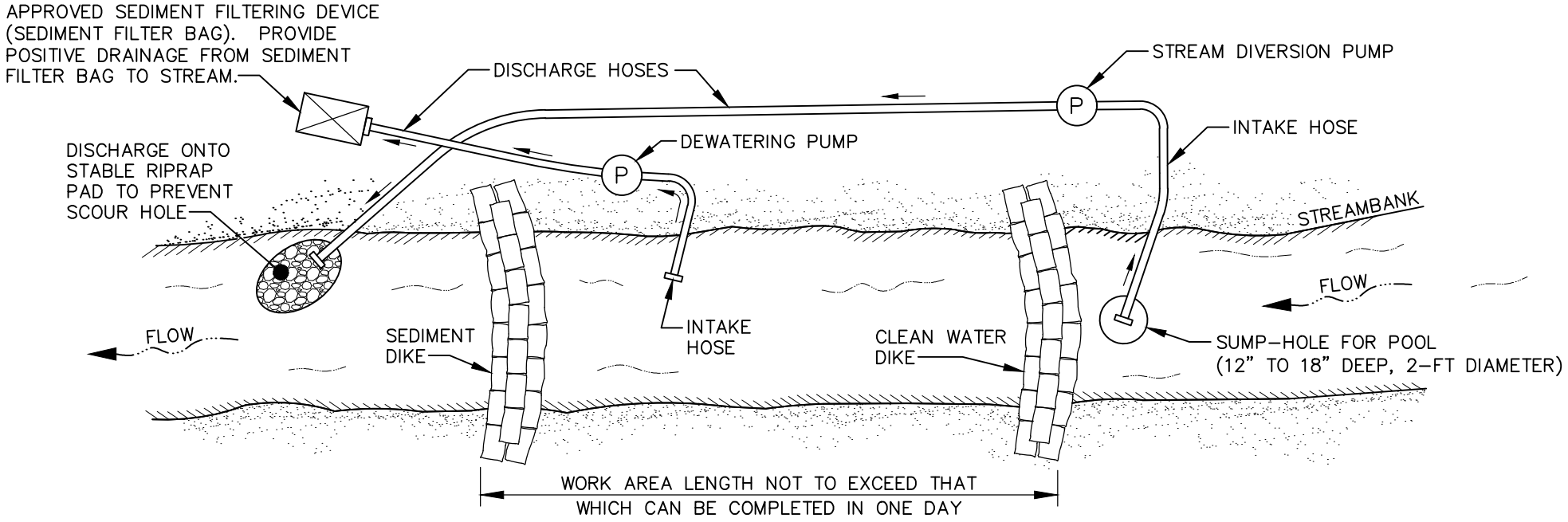
1. CONTRACTOR SHALL EXERCISE CAUTION NOT TO BURST OR DAMAGE THE SEDIMENT FILTER BAG WHEN PUMPING.
2. THE LENGTH AND WIDTH OF THE TEMPORARY SEDIMENT BAG SHOWN ON THIS DRAWING MAY VARY PER VENDOR SPECIFICATIONS. THE MINIMUM "FOOTPRINT" OF THE BAG SHALL BE 10 x 15 FEET.
3. SEDIMENT FILTER BAGS SHALL BE EQUIPPED WITH A SEWN–IN SLEEVE OF SUFFICIENT SIZE TO ACCEPT A MINIMUM 4 INCH DIAMETER PUMP DISCHARGE HOSE. THE DISCHARGE HOSE SHOULD BE EXTENDED INTO THIS SLEEVE A MINIMUM OF 6 INCHES AND BE TIGHTLY SECURED WITH A HOSE CLAMP OR OTHER SUITABLE MEANS TO PREVENT LEAKAGE. HOSE CONNECTION THROUGH A SLIT IN THE BAG WILL NOT BE ACCEPTABLE.
4. THE PUMP DISCHARGE HOSE CONNECTION SLEEVE SHALL BE SECURELY TIED OFF DURING DISPOSAL OF THE SEDIMENT FILTER BAG IN ORDER TO PREVENT LEAKAGE OF COLLECTED SEDIMENTS.
5. SEDIMENT FILTER BAG SHALL BE MAINTAINED AND REPLACED WHEN ONE HALF FULL OF SEDIMENT OR IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

SEDIMENT FILTER BAG WITH GRAVEL PAD

DETAIL No.
04000.23
SHEET 1 OF 1



TEMPORARY PUMP AROUND SEQUENCE

1. SET UP PUMP WITH SUCTION AND DISCHARGE HOSE.
2. INSTALL UP–STREAM SANDBAG DAM.
3. INSTALL DOWN–STREAM SANDBAG DAM.
4. THE PUMP MUST RUN CONTINUOUSLY WHILE WORKING IN THE STREAM.
5. STREAMBANKS MUST BE STABILIZED AT THE END OF EACH DAY.

NOTES:

1. SANDBAG DIKES SHALL BE SITUATED AT THE UPSTREAM AND DOWNSTREAM ENDS OF THE WORK AREA, AND STREAM FLOW SHALL BE PUMPED AROUND THE WORK AREA. THE PUMP SHOULD DISCHARGE ONTO A STABLE VELOCITY DISSIPATER CONSTRUCTED OF RIPRAP OR SANDBAGS.
2. WATER FROM THE WORK AREA SHALL BE PUMPED TO A SEDIMENT FILTERING MEASURE SUCH AS A SEDIMENT BAG OR OTHER APPROVED DEVICE. THE MEASURE SHALL BE LOCATED SUCH THAT THE WATER DRAINS BACK INTO THE CHANNEL BELOW THE DOWNSTREAM SANDBAG DIKE WITHOUT CAUSING FURTHER EROSION BETWEEN THE SEDIMENT FILTER BAG AND THE STREAMBANK.

CITY OF GOLDSBORO NORTH CAROLINA

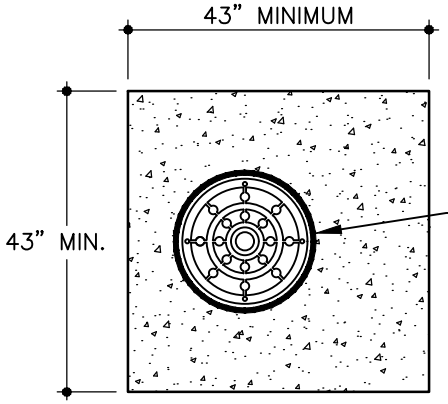
EFFECTIVE: 12/01/18

TEMPORARY PUMP AROUND

DETAIL No.

04000.24

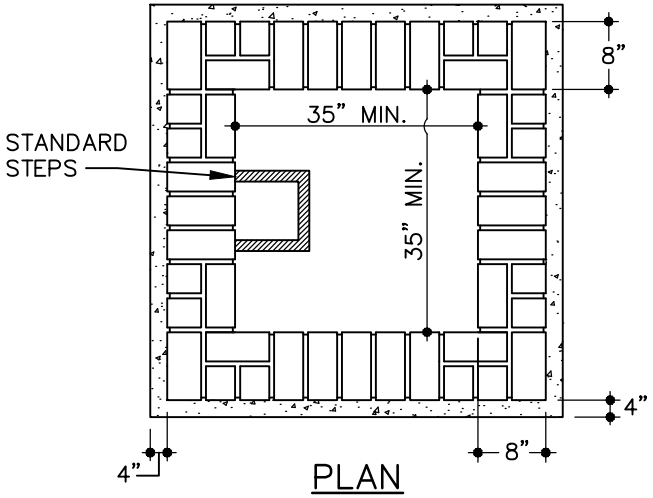
SHEET 1 OF 1



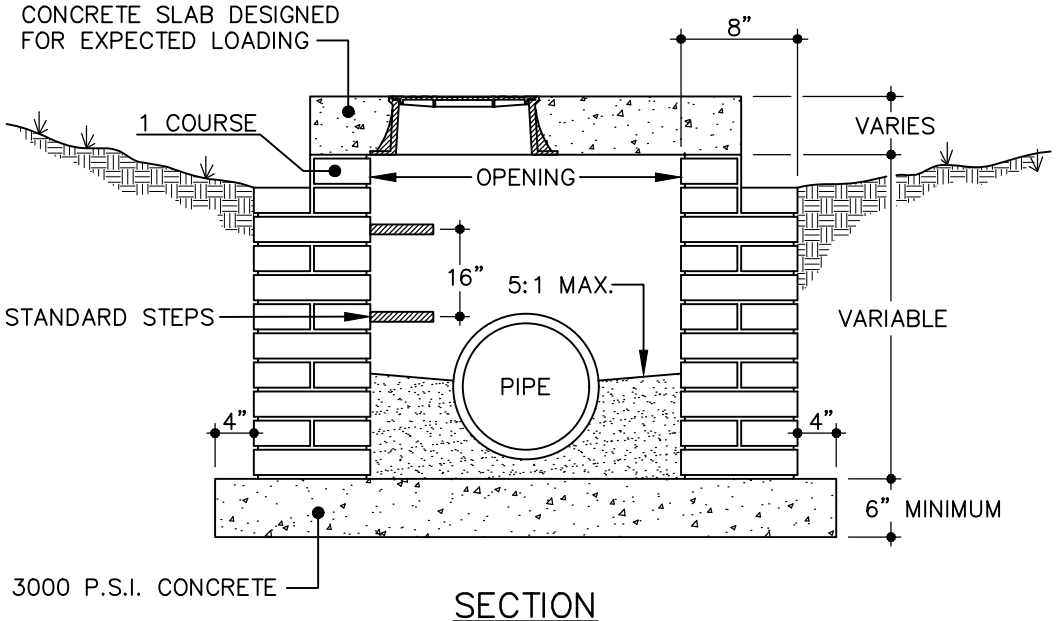
CONCRETE SLAB

NOTES:

1. EITHER SOLID BRICK, SOLID BLOCK, OR PRECAST CONCRETE MAY BE USED.
2. STANDARD STEPS REQUIRED, 16 INCHES ON CENTER, WHERE DEPTH EXCEEDS 3 FEET.
3. USE MINIMUM 3,000 P.S.I. CONCRETE MIX.
4. INSIDE DIMENSION FOR 24 INCH PIPE AND GREATER USE PIPE DIAMETER PLUS 12 INCHES.
5. WHERE DEPTH EXCEEDS 3 FEET, MANHOLE RING AND COVER TO BE LOCATED OVER STEPS.
6. LETTERING FOR MANHOLE COVER PER DETAIL 08000.03.



PLAN



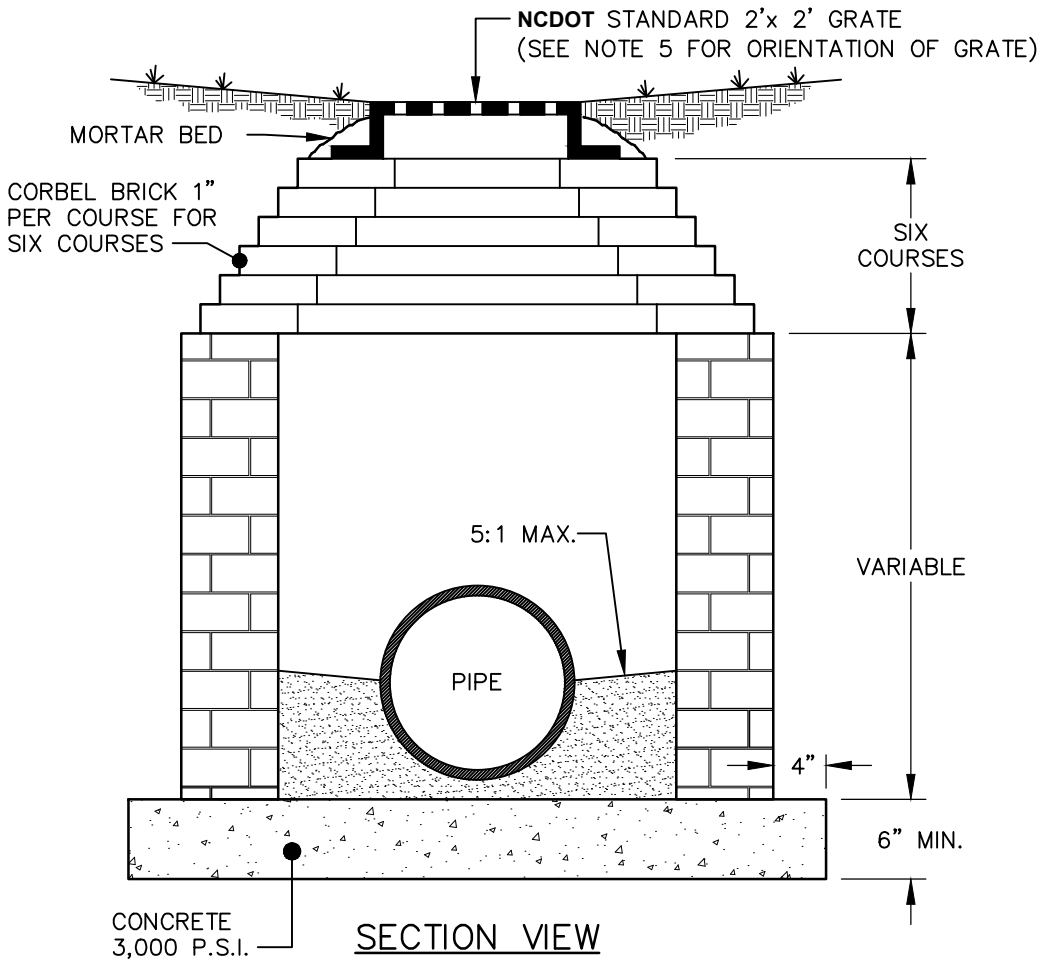
SECTION

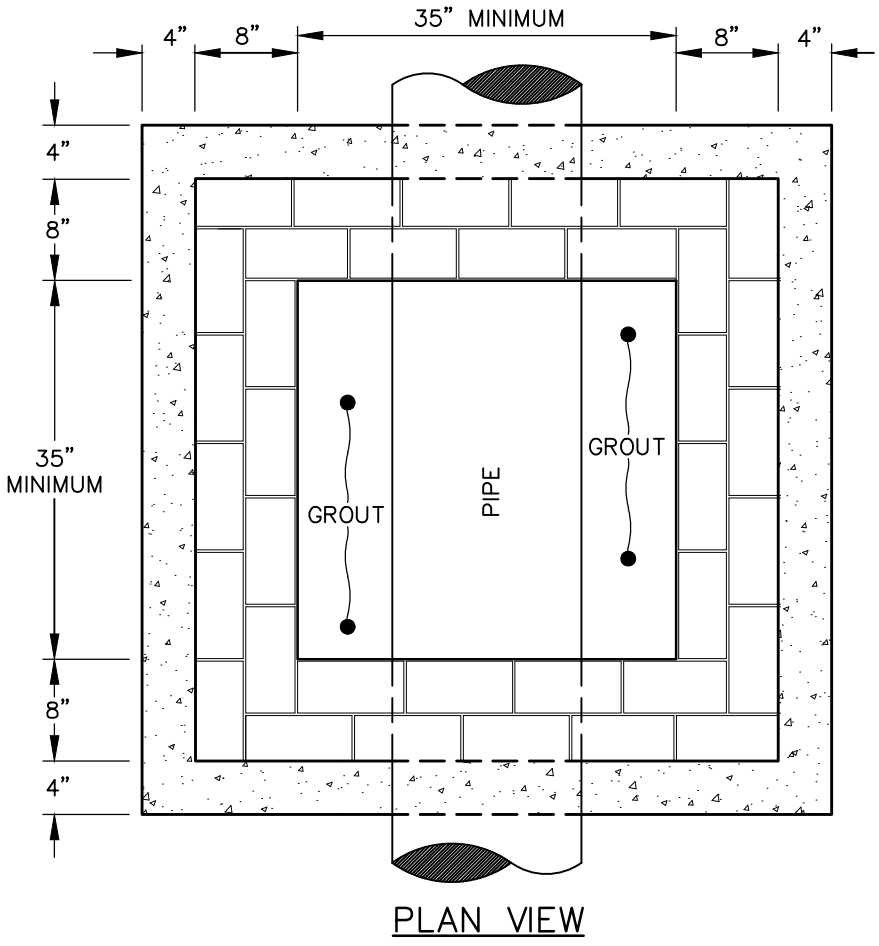
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD YARD INLET WITH CONCRETE SLAB

DETAIL No.
05000.01
SHEET 1 OF 1





NOTES:
1. EITHER SOLID BRICK, SOLID BLOCK, OR PRECAST CONCRETE MAY BE USED.
2. FOR 24 INCH RCP AND LARGER USE PIPE DIAMETER PLUS 12 INCHES FOR MINIMUM INSIDE DIMENSION.
3. GRATED INLETS SHALL NOT BE USED WITHIN TRAVEL AREAS.
4. STANDARD STEPS REQUIRED, 16 INCHES ON CENTER, WHERE DEPTH EXCEEDS 3 FEET.
5. WHERE STEPS ARE REQUIRED, USE OF PRECAST CONCRETE SLAB SHALL BE USED AS TOP AND GRATE POSITIONED OVER STEPS.
6. YARD INLETS DEEPER THAN 10 FEET SHALL REQUIRE DOUBLE WALLS.

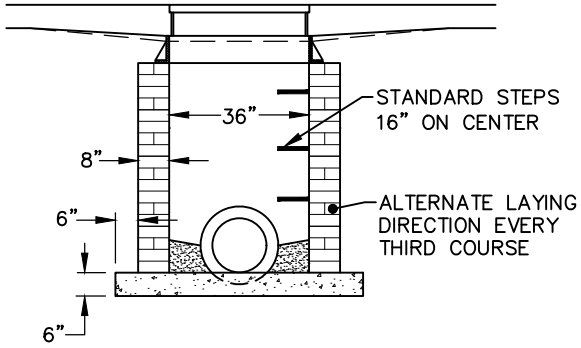
CITY OF GOLDSBORO NORTH CAROLINA

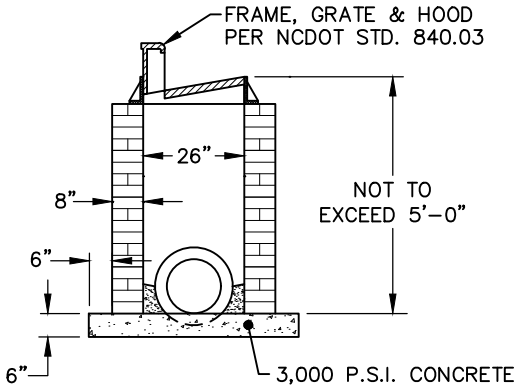
EFFECTIVE: 12/01/18

STANDARD YARD INLET WITH GRATE AND FRAME

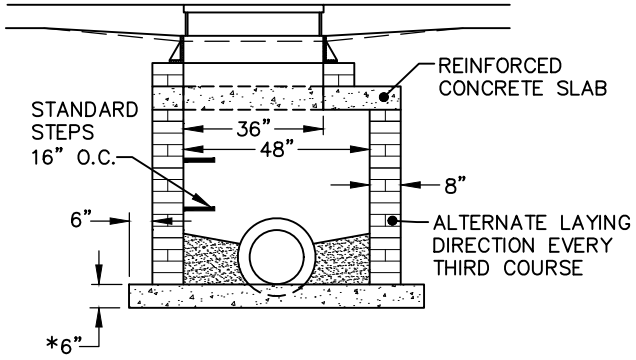
DETAIL No.
05000.02
SHEET 1 OF 1

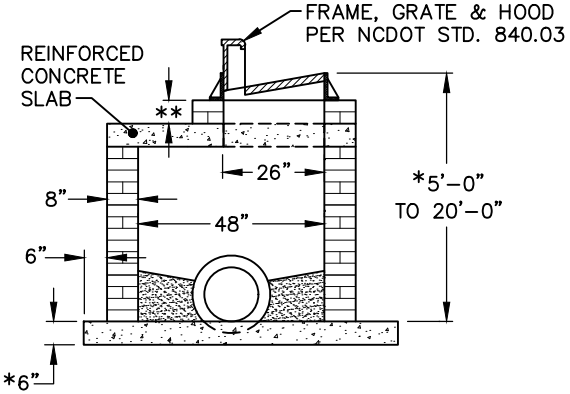
SHALLOW TYPE
(5 FEET OR LESS IN DEPTH)



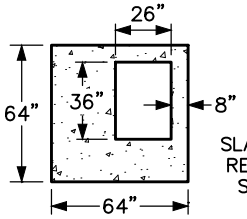


INTERMEDIATE TYPE (4'X4')
(5 FEET TO 20 FEET IN DEPTH)



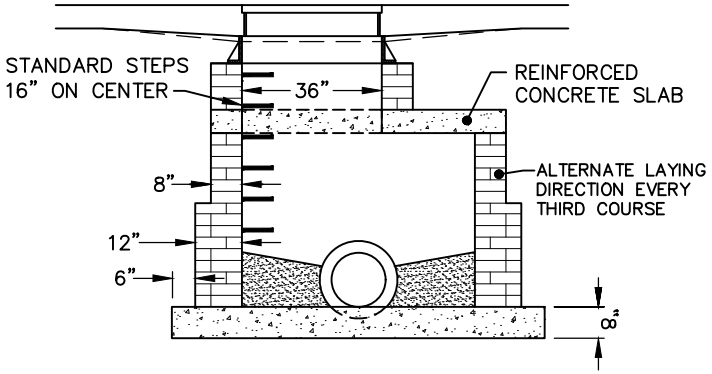


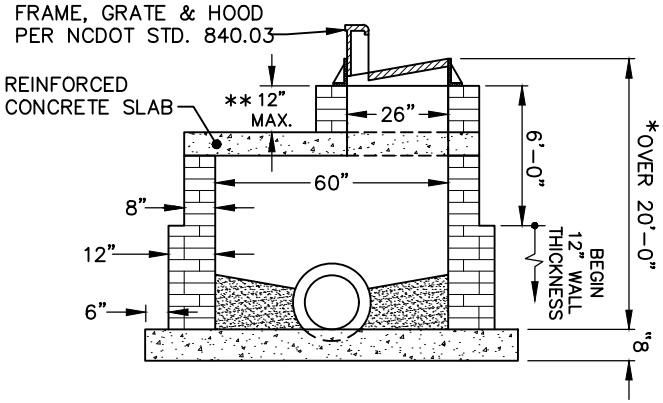
SLAB DETAIL



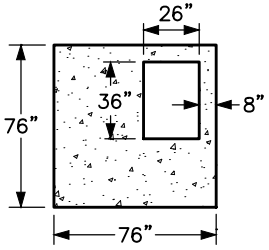
SLAB THICKNESS AND REINFORCEMENT FOR SOIL AND TRAFFIC LOADING BY AN ENGINEER

DEEP TYPE (5'X5')
(OVER 20 FEET IN DEPTH)





SLAB DETAIL



SLAB THICKNESS AND REINFORCEMENT FOR SOIL AND TRAFFIC LOADING BY AN ENGINEER

* OVER 8' IN DEPTH, 12" WALL THICKNESS TO 6' FROM TOP OF WALL, AND 8" BOTTOM SLAB SHALL BE USED.

** BRICK MAY BE USED TO ADJUST FRAME, GRATE & HOOD TO SURFACE ELEVATION A MAXIMUM OF 12 INCHES.

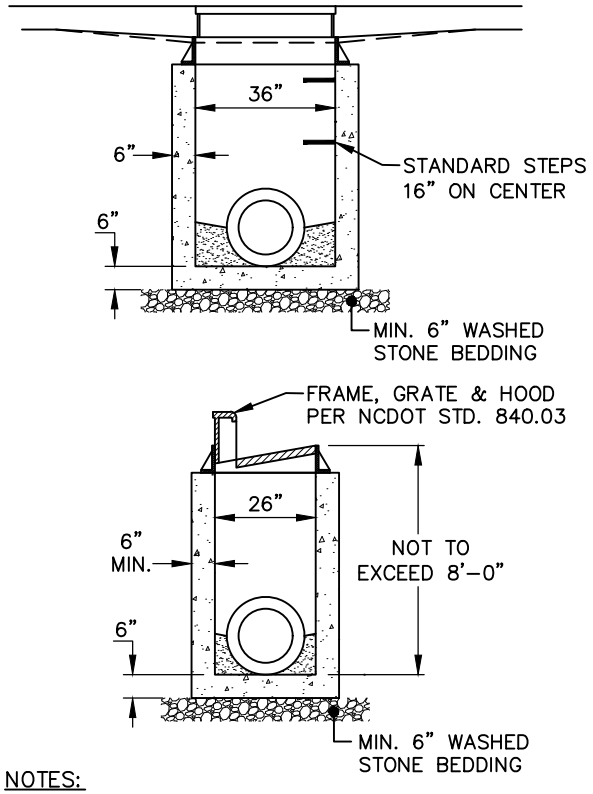
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD CONCRETE BLOCK OR BRICK CATCH BASIN

DETAIL No.
05000.03
SHEET 1 OF 2

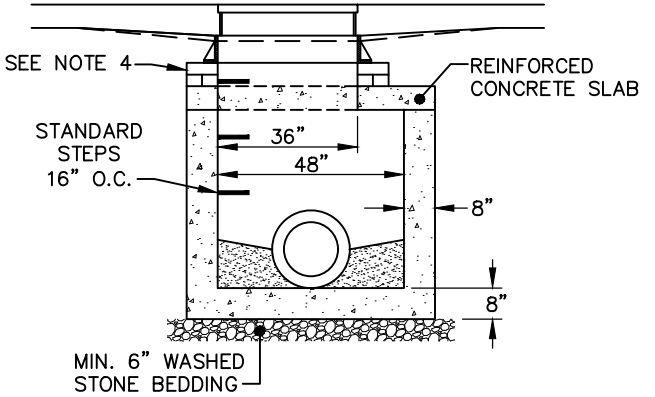
SHALLOW TYPE
(8 FEET OR LESS IN DEPTH)

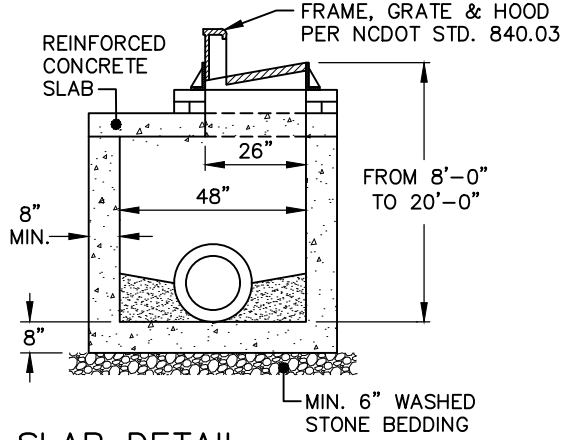


NOTES:

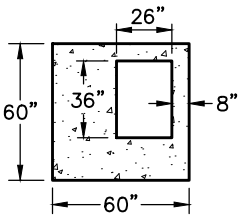
1. CONCRETE SHALL BE 4,000 P.S.I. MINIMUM FOR ALL PRECAST CONCRETE CATCH BASINS.
2. PRECAST CONCRETE STRUCTURES MAY ONLY BE INSTALLED TO DEPTHS CERTIFIED AS ACCEPTABLE BY THE MANUFACTURER.
3. "WAFFLE" BOXES ARE ACCEPTABLE FOR SHALLOW TYPE CATCH BASINS.
4. BRICK MAY BE USED TO ADJUST FRAME, GRATE & HOOD TO SURFACE ELEVATION A MAXIMUM OF 12 INCHES.

INTERMEDIATE TYPE (4'X4')
(8 FEET TO 20 FEET IN DEPTH)



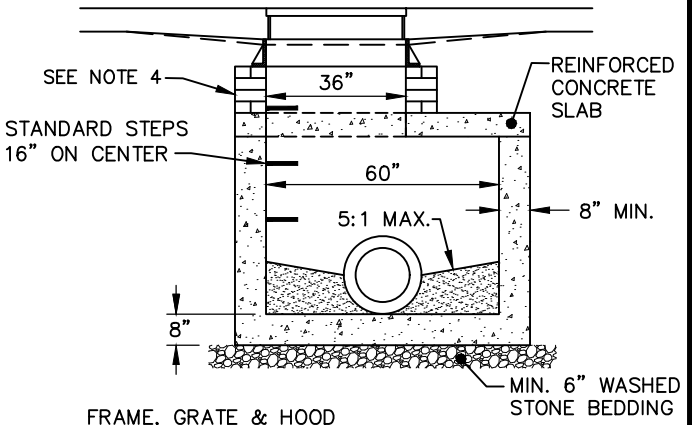


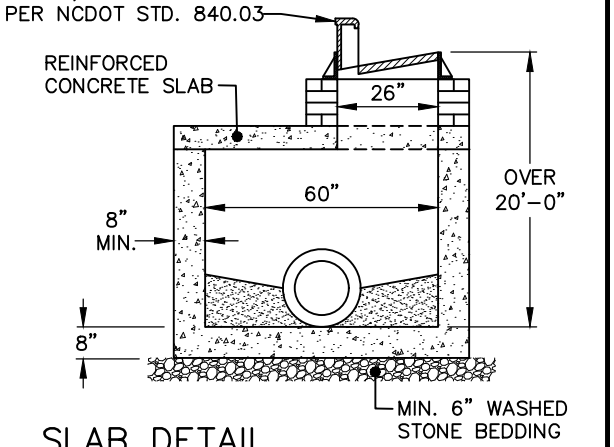
SLAB DETAIL



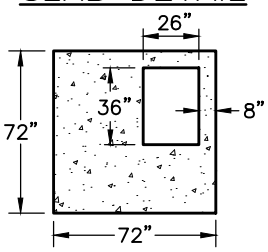
SLAB THICKNESS AND REINFORCEMENT FOR SOIL AND TRAFFIC LOADING BY AN ENGINEER

DEEP TYPE (5'X5')
(OVER 20 FEET IN DEPTH)





SLAB DETAIL



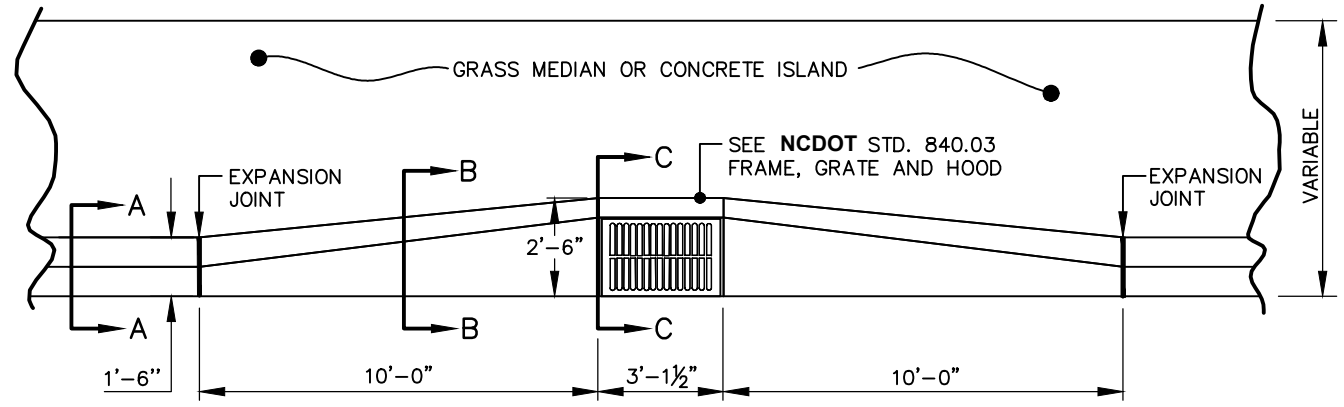
SLAB THICKNESS AND REINFORCEMENT FOR SOIL AND TRAFFIC LOADING BY AN ENGINEER

CITY OF GOLDSBORO NORTH CAROLINA

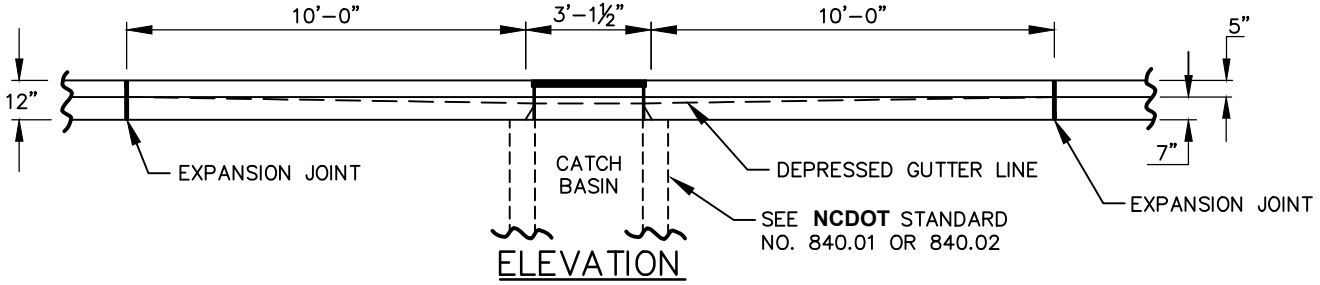
EFFECTIVE: 12/01/18

STANDARD PRECAST CONCRETE CATCH BASIN

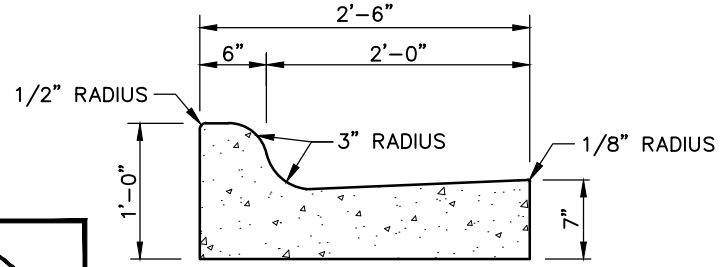
DETAIL No.
05000.03
SHEET 2 OF 2



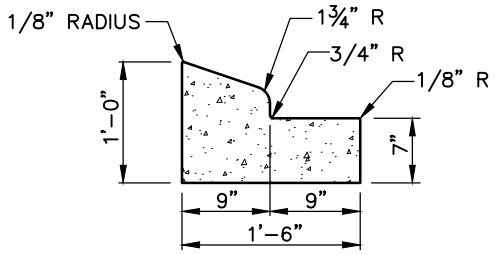
PLAN VIEW



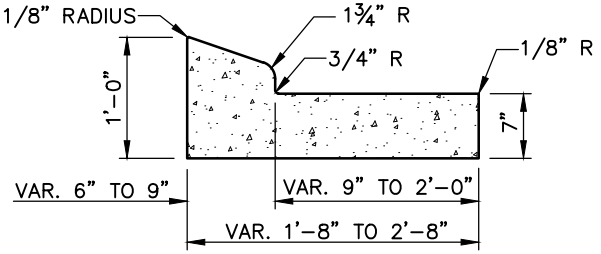
ELEVATION



SECTION "C–C"



SECTION "A–A"



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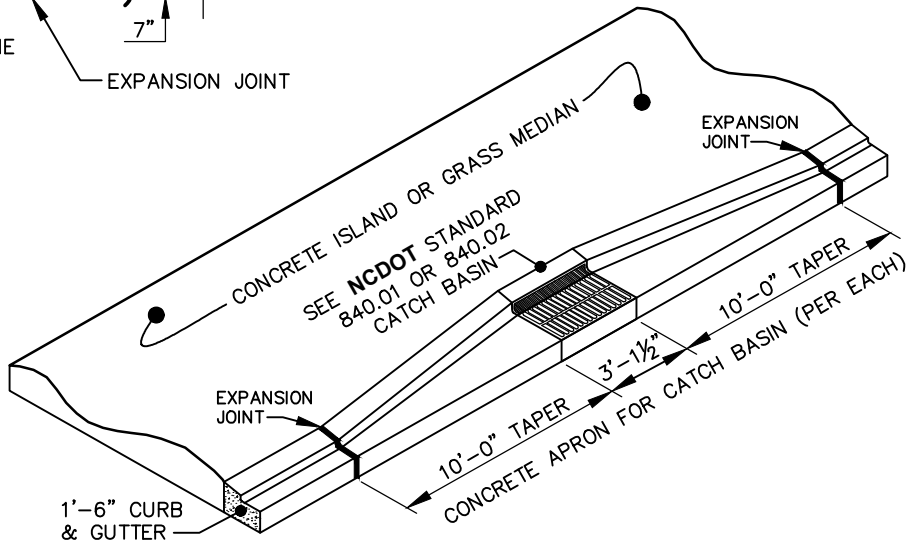


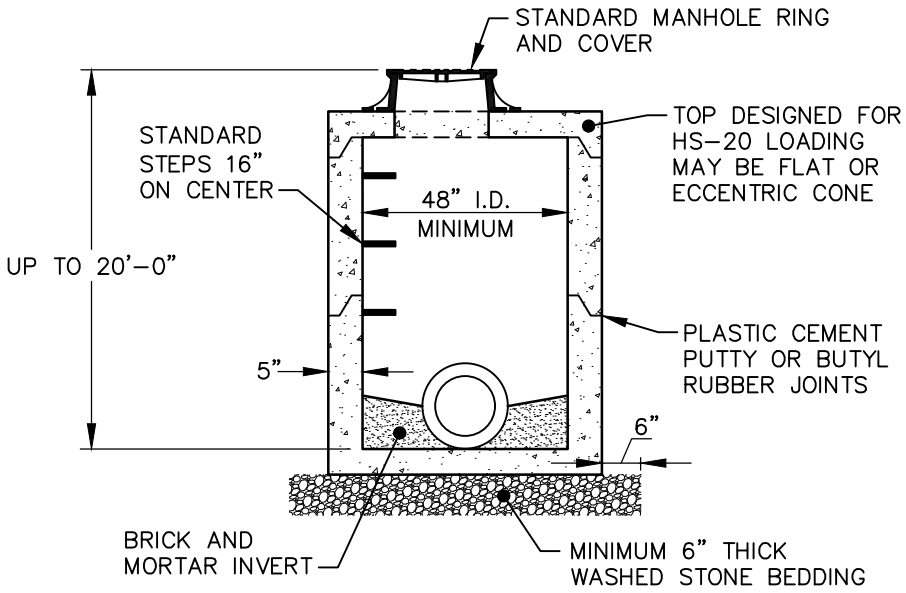
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

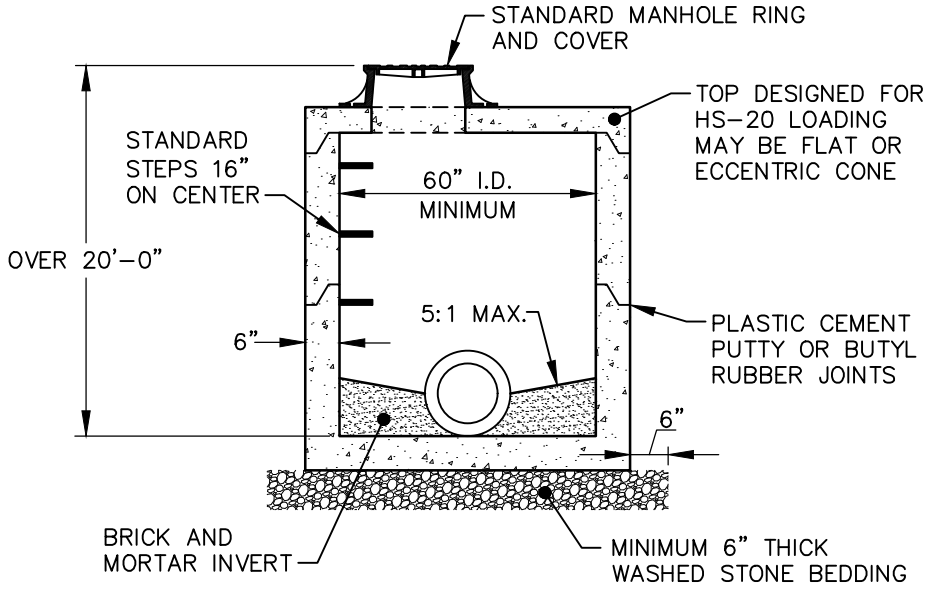
STANDARD MEDIAN CURB FOR CATCH BASIN

DETAIL No.
05000.04
SHEET 1 OF 1

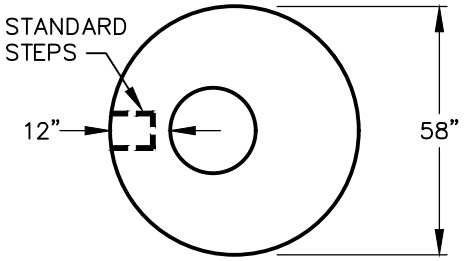
STANDARD TYPE
(UP TO 20 FEET IN DEPTH)



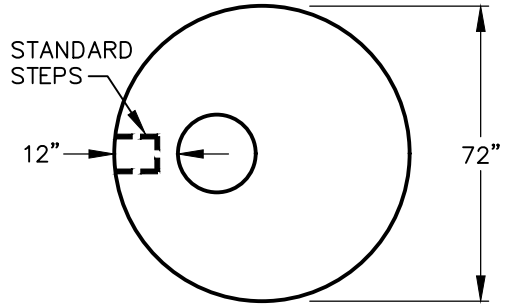
DEEP TYPE
(OVER 20 FEET IN DEPTH)



FLAT TOP DETAIL



FLAT TOP DETAIL

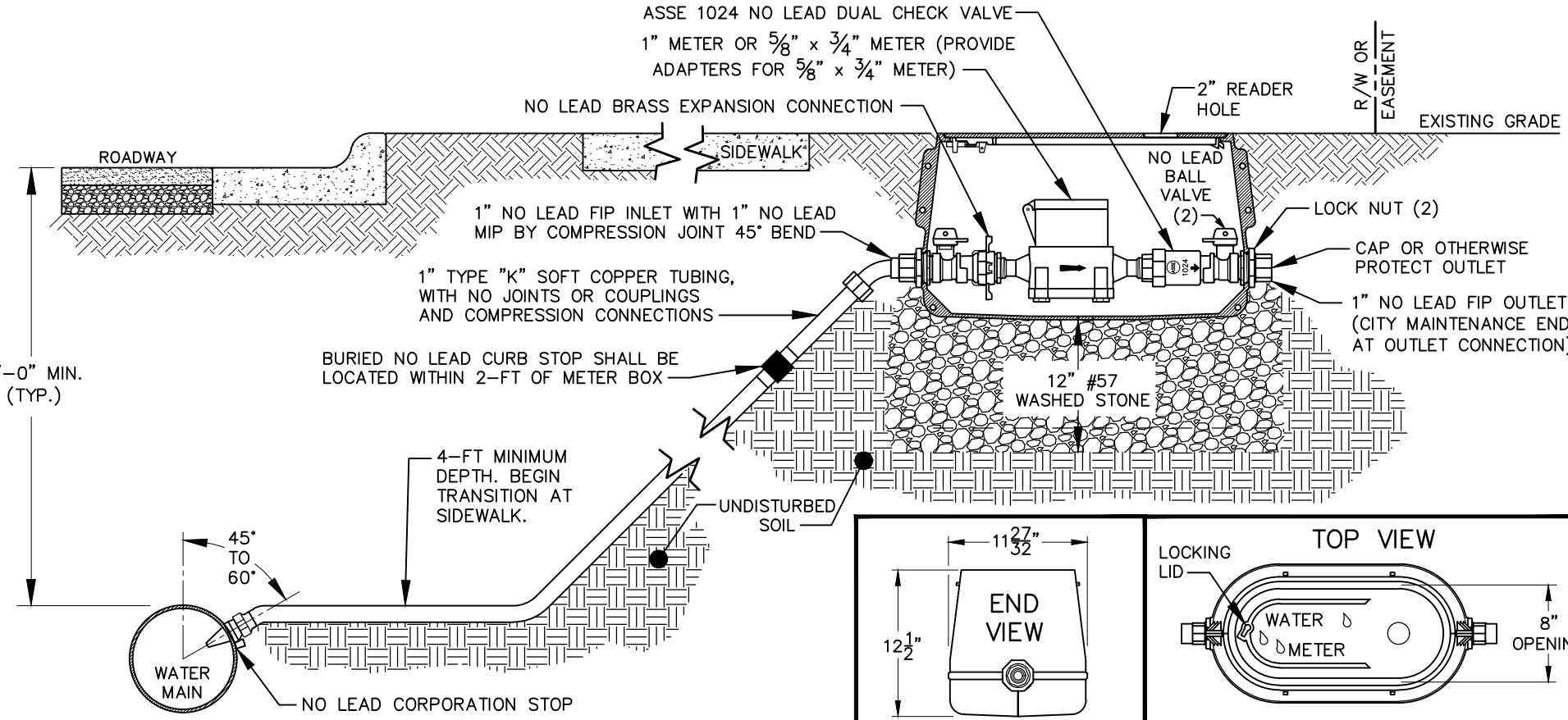


CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD PRECAST CONCRETE MANHOLE JUNCTION BOX

DETAIL No.
05000.05
SHEET 1 OF 1



NOTES:

1. WATER METER SHALL NOT BE LOCATED IN AREAS SUBJECT TO VEHICULAR TRAFFIC.
2. ALL METER BOXES AND LIDS SHALL BE APPROVED BY THE CITY.
3. ALL SERVICE LINES, VALVES AND FITTINGS SHALL COMPLY WITH AWWA C800.
4. FOR NON-RESIDENTIAL APPLICATIONS THAT REQUIRE AN ABOVE-GROUND BACKFLOW PREVENTER, THE DUAL CHECK ASSEMBLY MAY BE OMITTED.
5. BOX AND LID SHALL BE CAST GRAY IRON, ASTM A48, CLASS 25 OR ASTM A126 CLASS B.
6. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.
7. ONE 2 OR 6 INCH GRADE ADJUSTER MAY BE UTILIZED WHEN NEEDED TO MEET FINAL GRADE (NO GRADE ADJUSTERS MAY BE USED ON NEW CONSTRUCTION PROJECTS). GRADE ADJUSTER AND BOX SHALL BE BY THE SAME MANUFACTURER.
8. TRACER WIRE SHALL BE INSTALLED FOR ALL SERVICE CONNECTIONS FROM THE MAIN LINE TO THE METER FOR ALL NEW CONSTRUCTION OR RETROFIT INSTALLATIONS USING OPEN TRENCH METHODS.

CITY OF GOLDSBORO NORTH CAROLINA

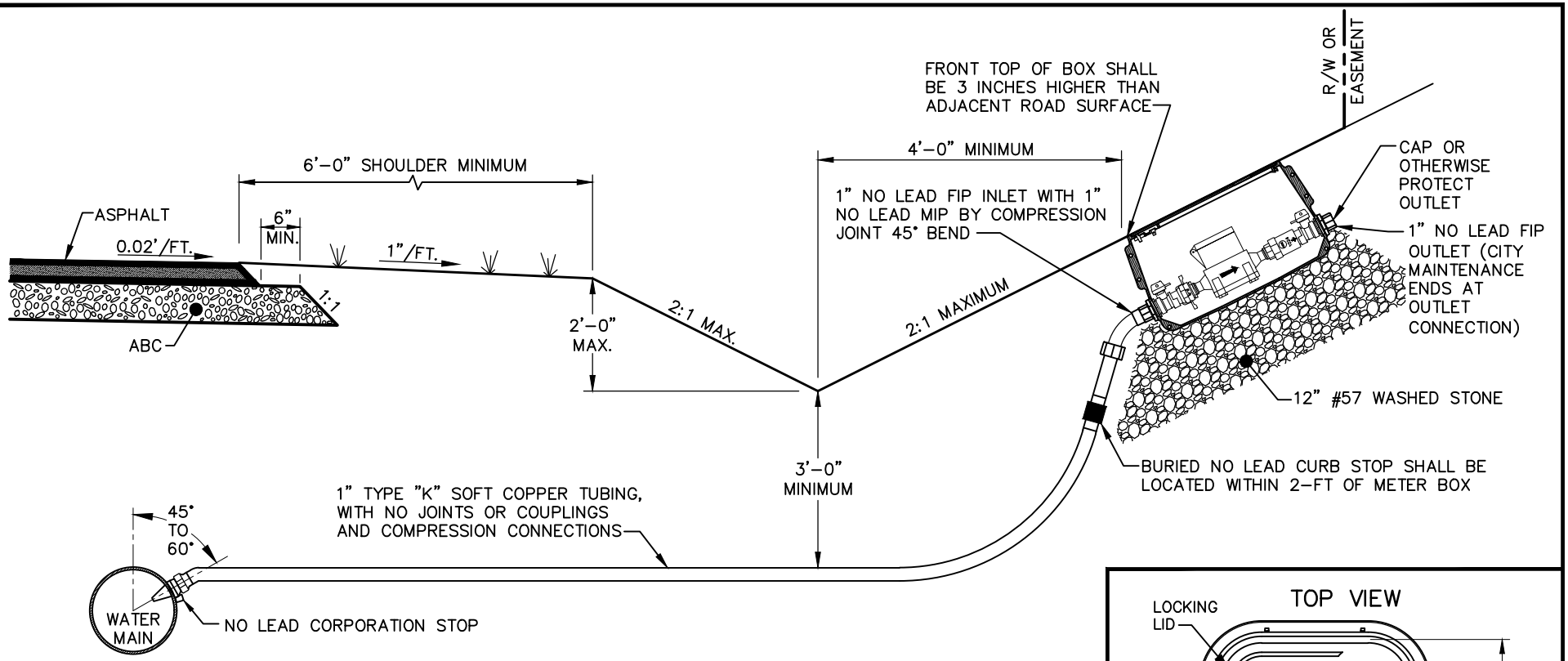
EFFECTIVE: 12/01/18

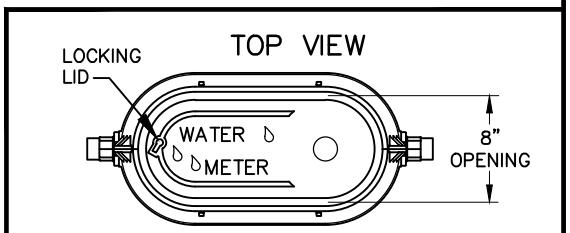
STANDARD 1" WATER SERVICE AND METER BOX INSTALLATION FOR ROADWAY WITH CURB AND GUTTER

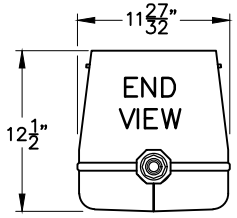
DETAIL No.

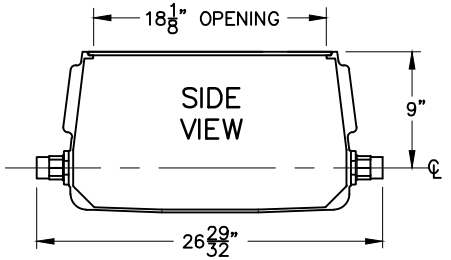
06000.01

SHEET 1 OF 2









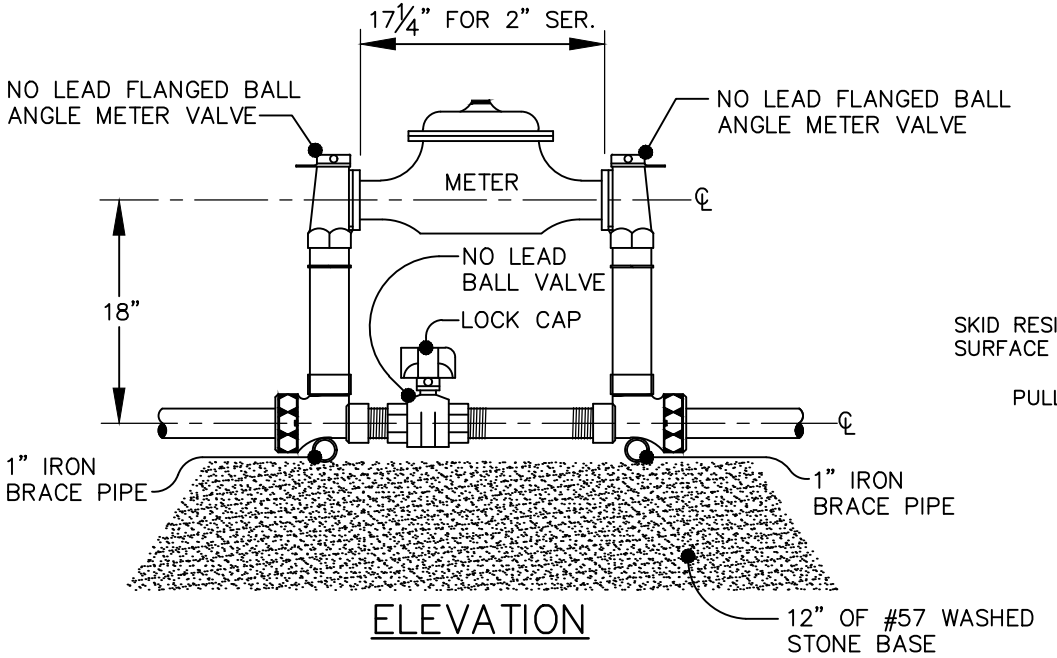
NOTES:
1. WATER METER SHALL NOT BE LOCATED IN AREAS SUBJECT TO VEHICULAR TRAFFIC.
2. ALL METER BOXES AND LIDS SHALL BE APPROVED BY THE CITY.
3. ALL SERVICE LINES, VALVES AND FITTINGS SHALL COMPLY WITH AWWA C800.
4. FOR NON–RESIDENTIAL APPLICATIONS THAT REQUIRE AN ABOVE–GROUND BACKFLOW PREVENTER, THE DUAL CHECK ASSEMBLY MAY BE OMITTED.
5. BOX AND LID SHALL BE CAST GRAY IRON, ASTM A48, CLASS 25 OR ASTM A126 CLASS B.
6. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.
7. ONE 2 OR 6 INCH GRADE ADJUSTER MAY BE UTILIZED WHEN NEEDED TO MEET FINAL GRADE (NO GRADE ADJUSTERS MAY BE USED ON NEW CONSTRUCTION PROJECTS). GRADE ADJUSTER AND BOX SHALL BE BY THE SAME MANUFACTURER.
8. TRACER WIRE SHALL BE INSTALLED FOR ALL SERVICE CONNECTIONS FROM THE MAIN LINE TO THE METER FOR ALL NEW CONSTRUCTION OR RETROFIT INSTALLATIONS USING OPEN TRENCH METHODS.

CITY OF GOLDSBORO NORTH CAROLINA

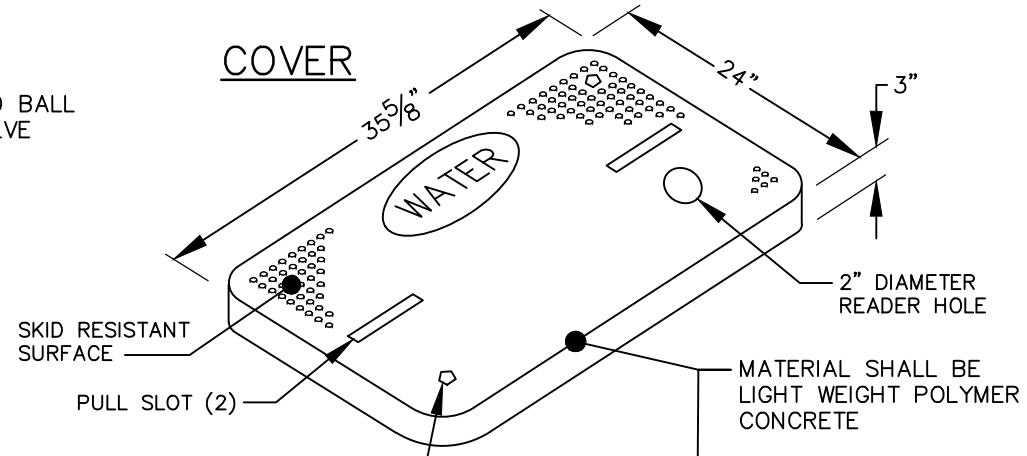
EFFECTIVE: 12/01/18

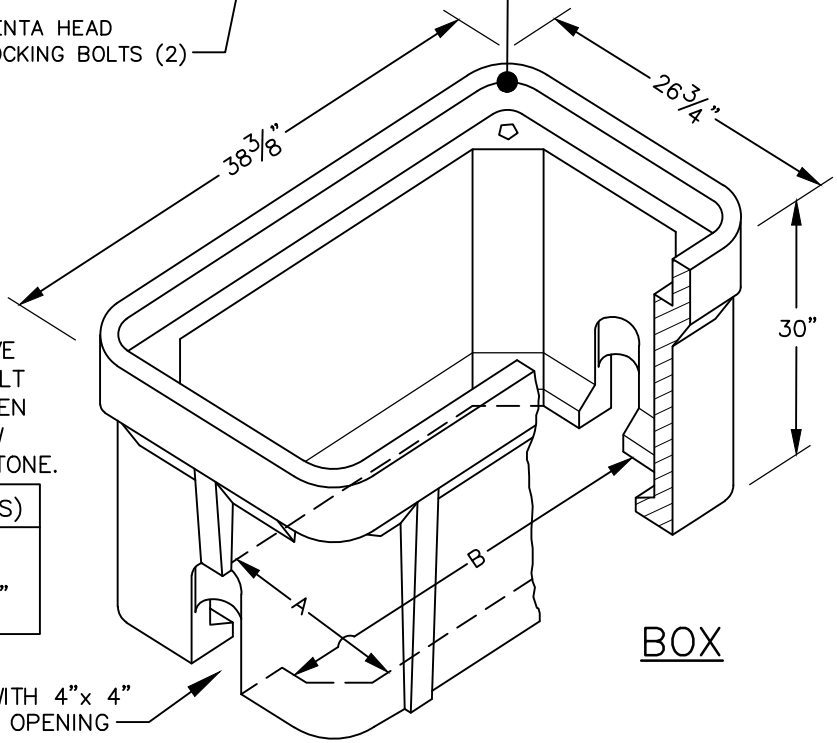
STANDARD 1" WATER SERVICE AND METER BOX FOR ROADWAY WITHOUT CURB AND GUTTER

DETAIL No.
06000.01
SHEET 2 OF 2



ELEVATION





BOX

NOTES:
1. PIPING TO BE 'NO LEAD' BRASS AND COPPER TUBING. METER INLET AND OUTLET TO BE EQUIPPED WITH FLANGED BALL ANGLE METER VALVES.
2. CUSTOM SETTERS SHALL BE EQUIPPED WITH STANDARD LOW BYPASS WITH BALL VALVE AND PADLOCK WINGS.
3. CUSTOM SETTERS SHALL BE AS MANUFACTURED BY MUELLER, FORD, AY MCDONALD, OR APPROVED EQUAL.
4. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.
5. ALL APPLICATIONS REQUIRE A SEPARATE ABOVE GROUND BACKFLOW PREVENTER.
6. CUSTOM SETTER SHALL BE INSTALLED SUCH THAT METER REGISTER IS LOCATED 5 TO 8 INCHES BELOW METER BOX COVER.

NOTE:
TO ENSURE POSITIVE DRAINAGE, THE VAULT SHALL HAVE AN OPEN BOTTOM TO ALLOW DRAINAGE THROUGH STONE.

DIMENSIONS (INCHES)	
A	B
18¾"	30⅜"

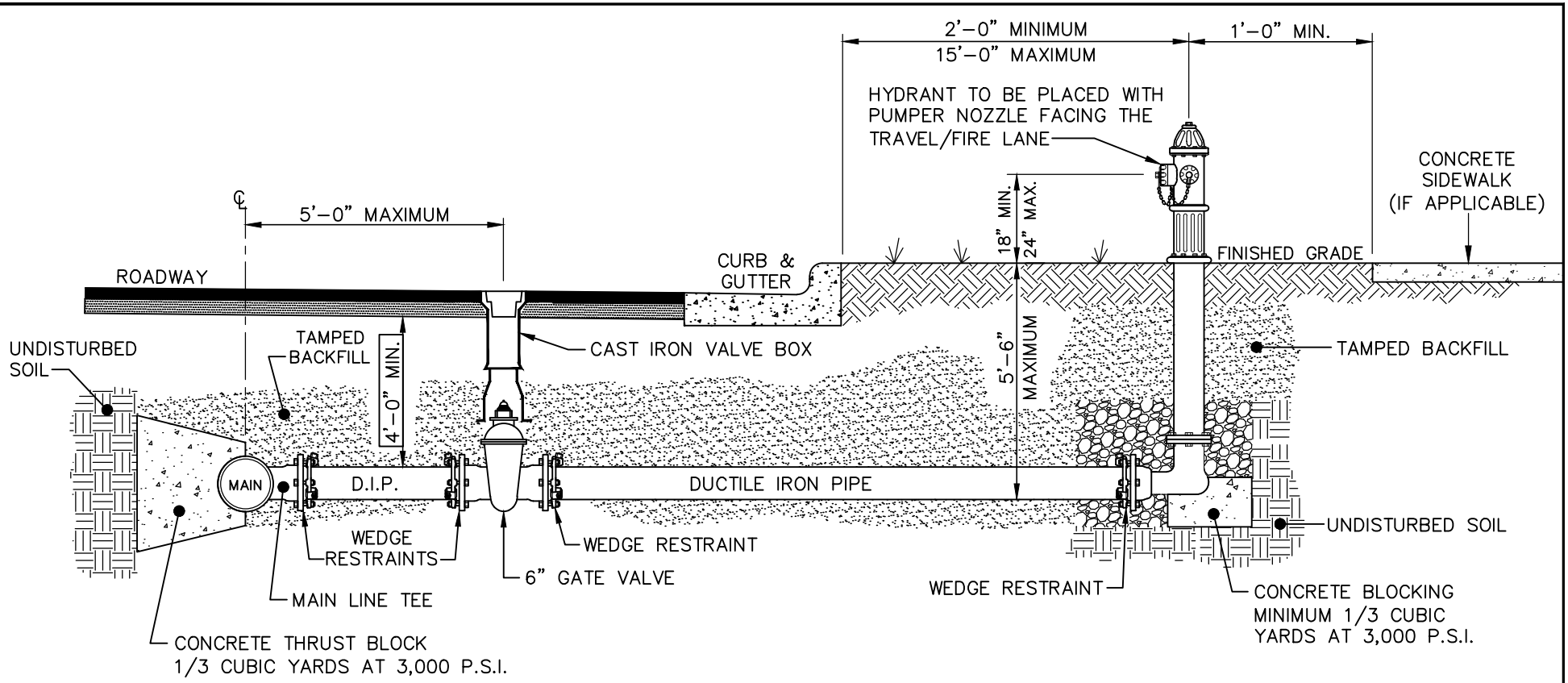
MOUSE HOLES (2)
4"x 4" OPENING WITH 4"x 4" KNOCKOUT ABOVE OPENING

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD 2" METER INSTALLATION AND VAULT

DETAIL No.
06000.02
SHEET 1 OF 1



NOTES:

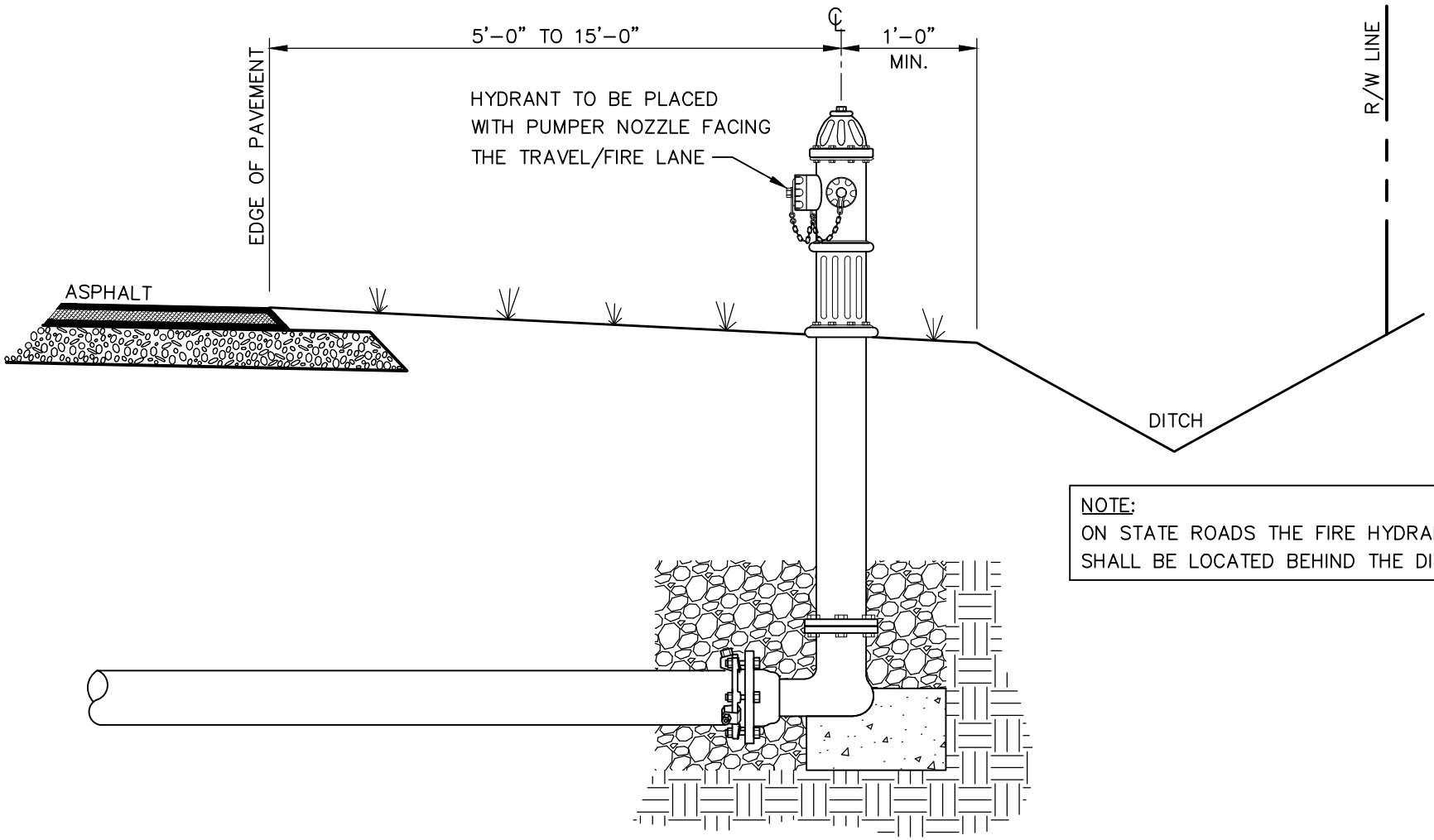
1. TOP OF BLOCKING TO BE 2 INCHES FROM HYDRANT WEEP HOLES.
2. IF HYDRANT IS LOCATED ON A DEPARTMENT OF TRANSPORTATION ROADWAY USE D.O.T. STANDARDS FOR LOCATION OF HYDRANT.
3. HYDRANT SHALL BE LOCATED FROM 2 TO 15 FEET FROM BACK OF CURB.
4. HYDRANT MAY BE LOCATED (AT LEAST 1 FOOT) BEHIND SIDEWALK WHEN IT CANNOT BE LOCATED INSIDE THE UTILITY STRIP.
5. HYDRANT SHALL BE INSTALLED AT LEAST 2 FEET BEYOND TOP SLOPE OF ANY DRAINAGE DITCHES. HYDRANT INSTALLATION WITHIN THE DITCH LINE OR SLOPE SHALL BE PROHIBITED.
6. STANDARD WEDGE ACTION RETAINER GLANDS MAY BE SUBSTITUTED WITH 3/4 INCH STAINLESS STEEL RODDING IN ORDER TO ACHIEVE CONTINUOUS RESTRAINT BETWEEN THE HYDRANT AND THE MAIN.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD HYDRANT INSTALLATION FOR ROADS WITH CURB AND GUTTER

DETAIL No.
06000.05
SHEET 1 OF 2



NOTE:
ON STATE ROADS THE FIRE HYDRANT SHALL BE LOCATED BEHIND THE DITCH.

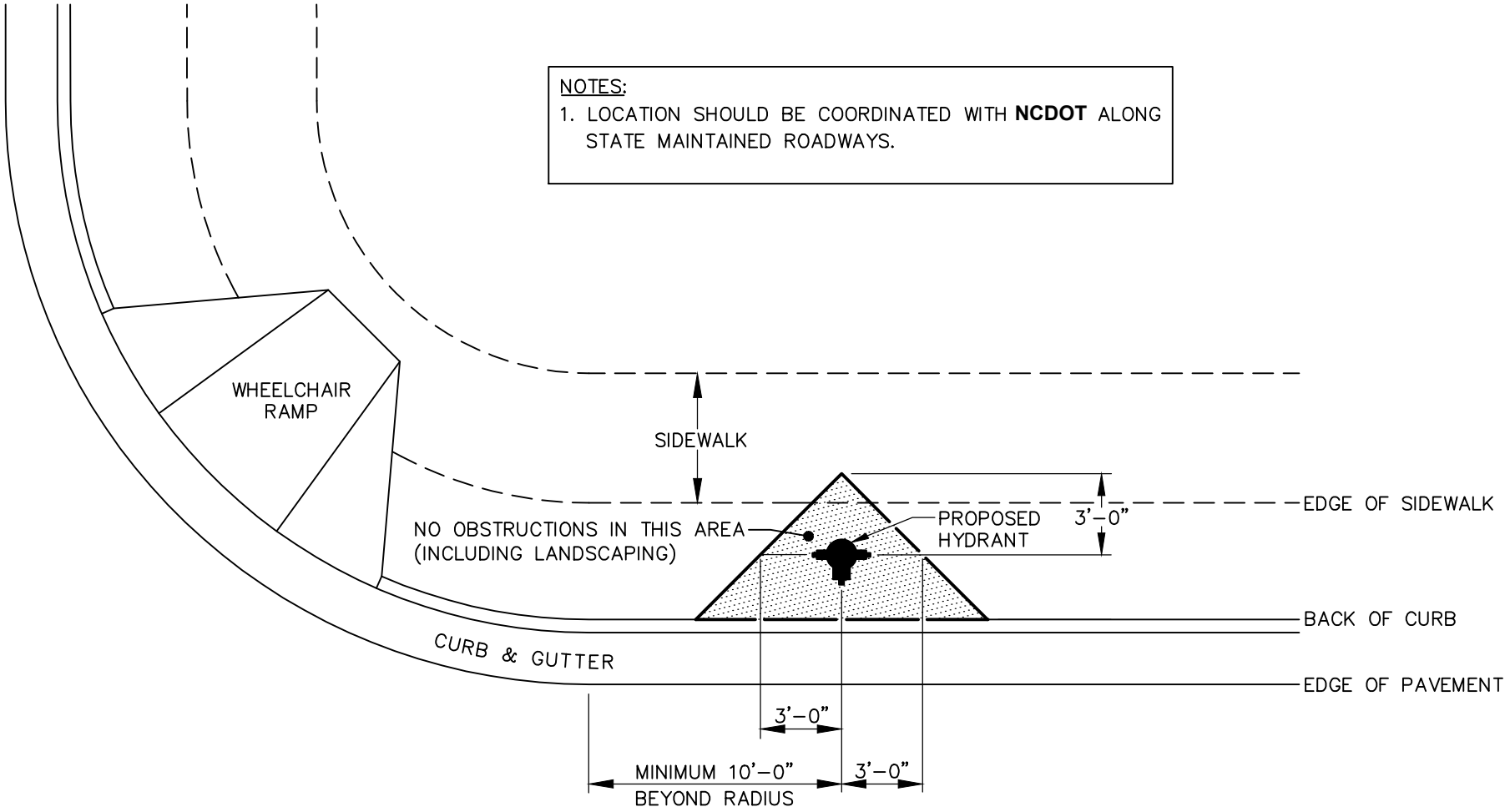
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD HYDRANT INSTALLATION FOR ROADS WITHOUT CURB AND GUTTER

DETAIL No.
06000.05
SHEET 2 OF 2

NOTES:
1. LOCATION SHOULD BE COORDINATED WITH **NCDOT** ALONG STATE MAINTAINED ROADWAYS.

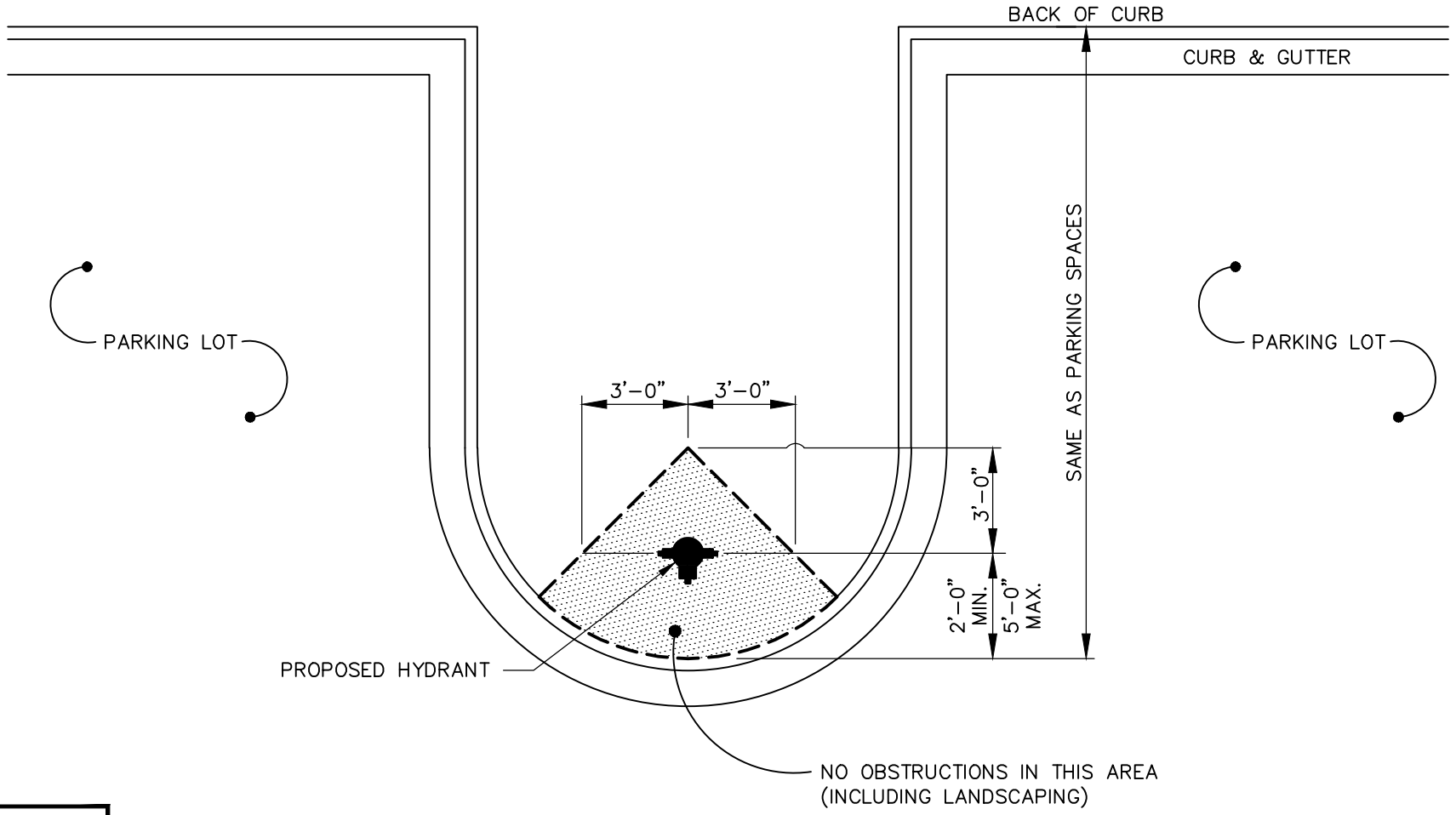


CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD HYDRANT LOCATION

DETAIL No.
06000.06
SHEET 1 OF 2



CITY OF GOLDSBORO NORTH CAROLINA

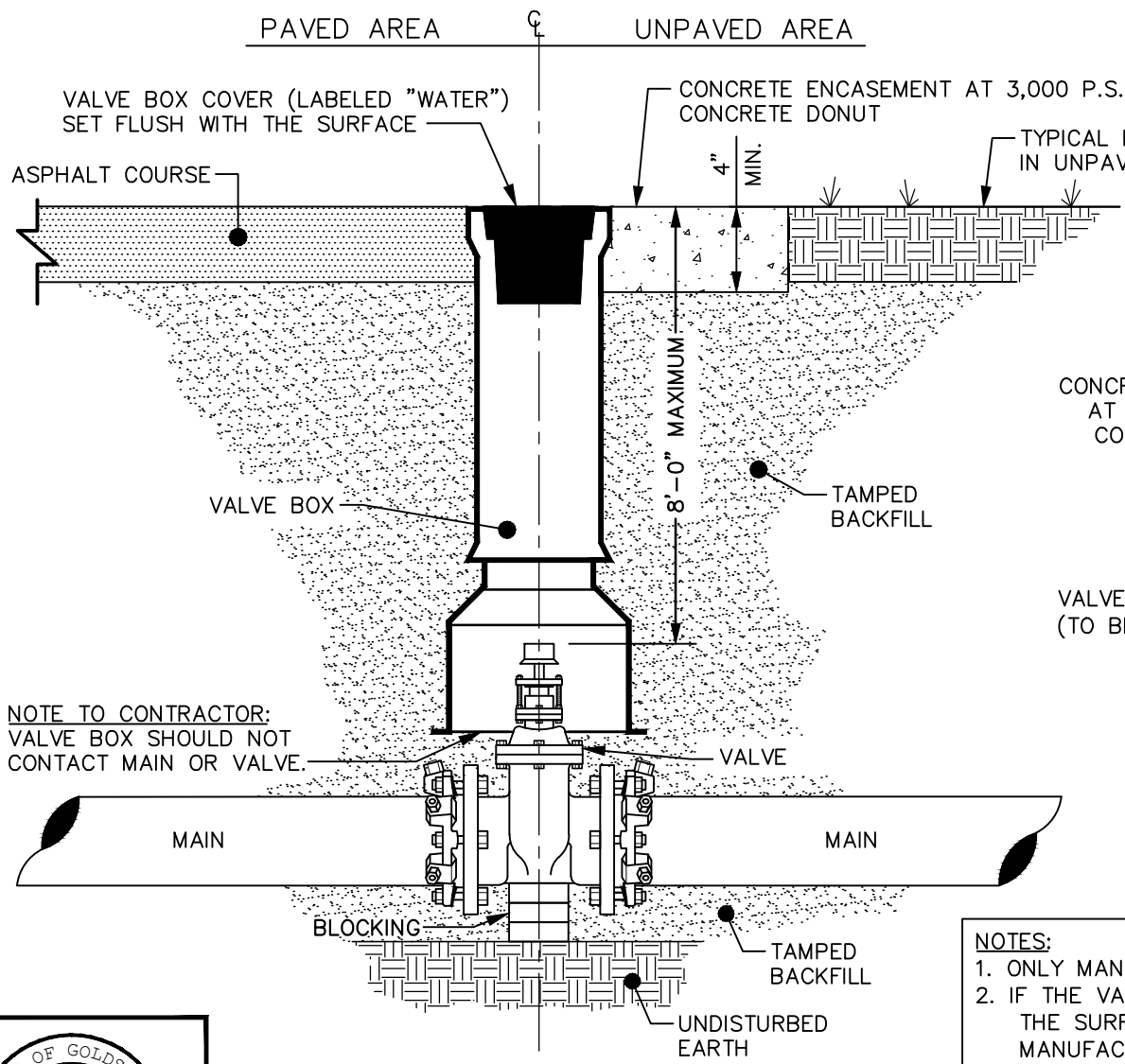
EFFECTIVE: 12/01/18

STANDARD HYDRANT LOCATION FOR PARKING LOT

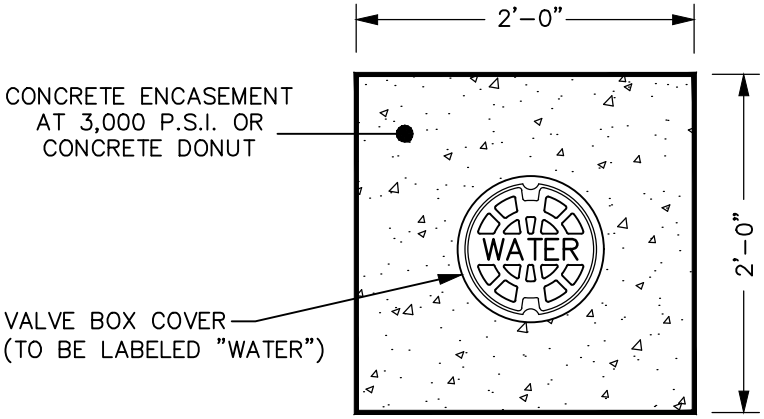
DETAIL No.

06000.06

SHEET 2 OF 2



SECTION VIEW



PLAN VIEW FOR
UNPAVED AREAS

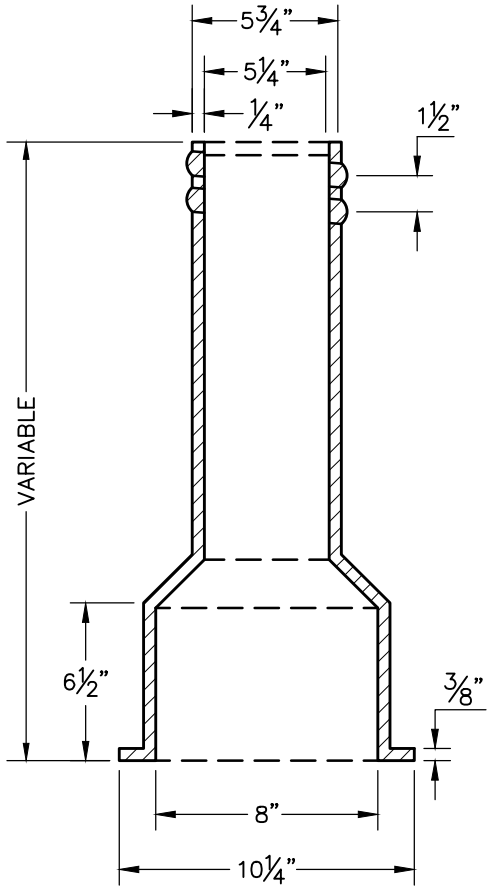
NOTES:
1. ONLY MANUFACTURED VALVE BOX EXTENSIONS SHALL BE ALLOWED.
2. IF THE VALVE OPERATING NUT IS GREATER THAN 6 FEET FROM THE SURFACE AN EXTENSION KIT FROM THE VALVE MANUFACTURER MUST BE PROVIDED.
3. PRECAST CONCRETE ENCASEMENT IS ALSO ALLOWED OUTSIDE OF PAVED AREAS.

CITY OF GOLDSBORO NORTH CAROLINA

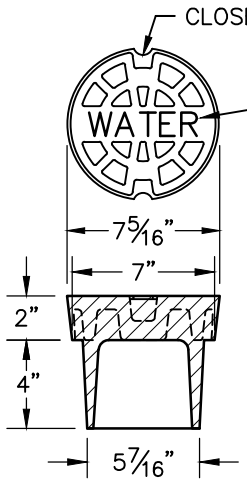
EFFECTIVE: 12/01/18

STANDARD WATER VALVE BOX INSTALLATION

DETAIL No.
06000.07
SHEET 1 OF 3



BOTTOM SECTION



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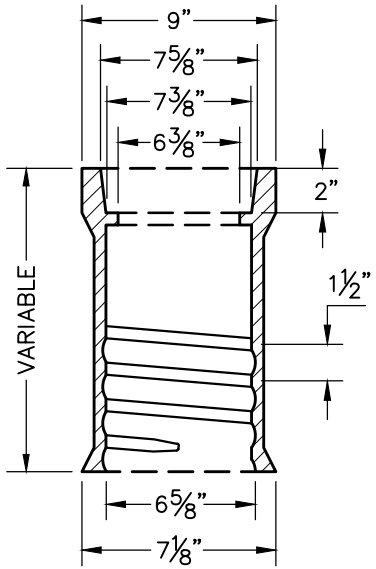
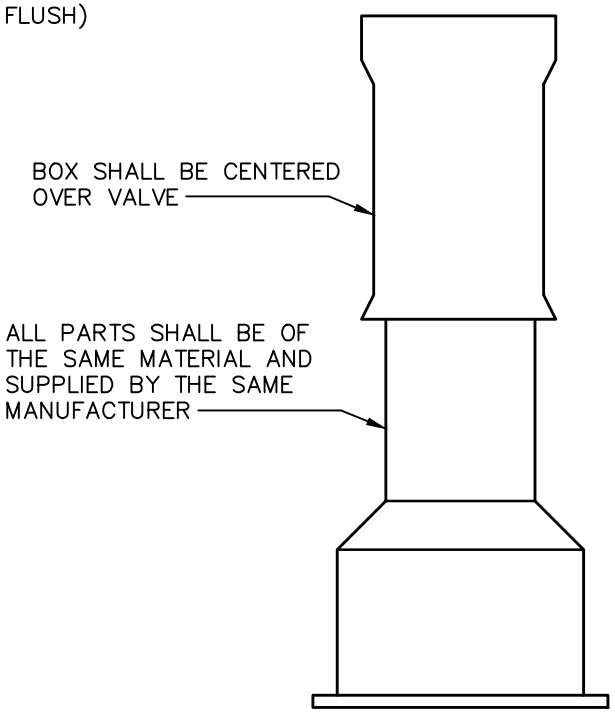


TOP SECTION



COMPLETE BOX

NOTES:

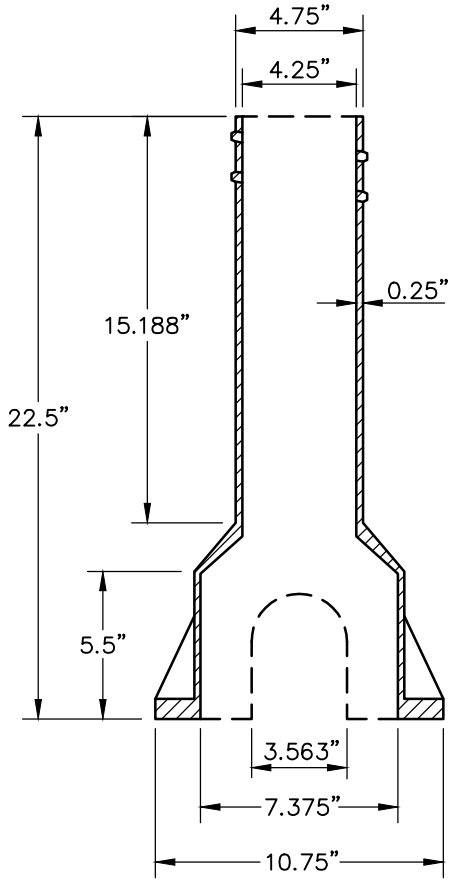
1. VALVE BOX COVER SHALL WEIGH A MINIMUM 24 lbs.
2. ENTIRE VALVE BOX ASSEMBLY & COVER SHALL BE CAST FROM CLASS 35 GRAY IRON.
3. ASSEMBLY SHALL BE DOMESTICALLY MADE AND MANUFACTURED IN THE U.S.A.

CITY OF GOLDSBORO NORTH CAROLINA

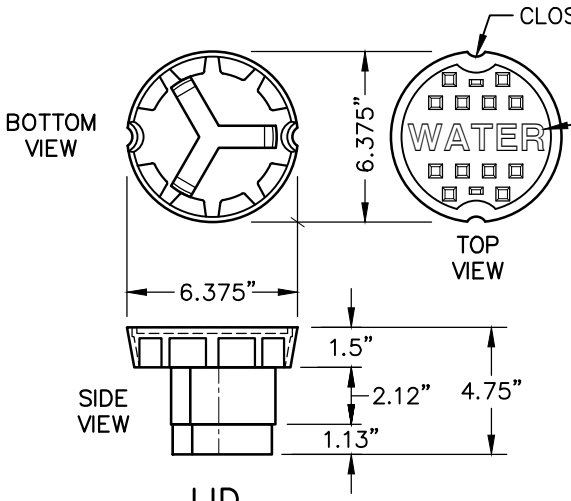
EFFECTIVE: 12/01/18

STANDARD WATER VALVE BOX

DETAIL No.
06000.07
SHEET 2 OF 3



BOTTOM SECTION



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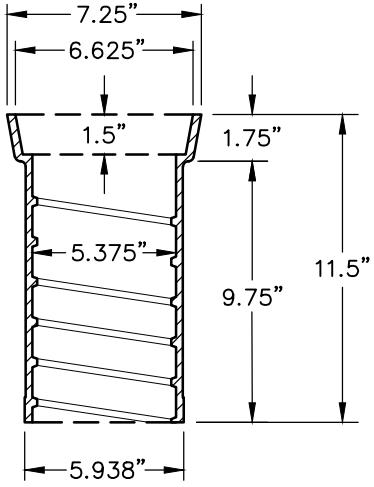

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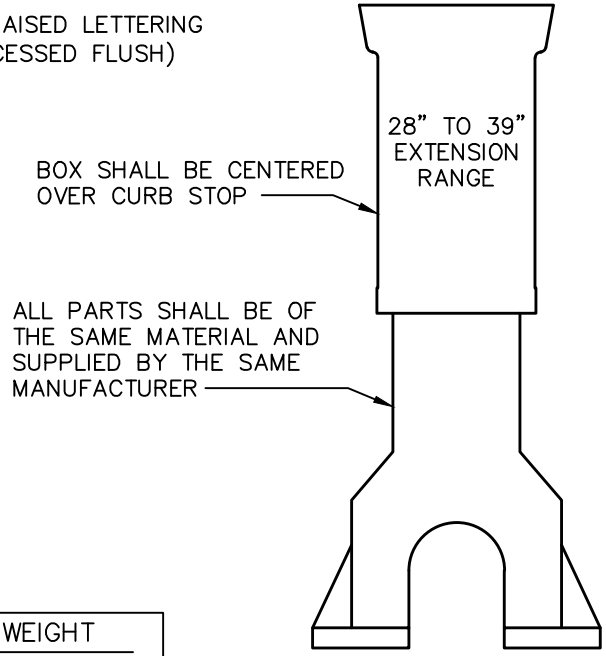


COMPLETE BOX

WEIGHT	
BOTTOM	29
TOP	16
LID	25
TOTAL	70

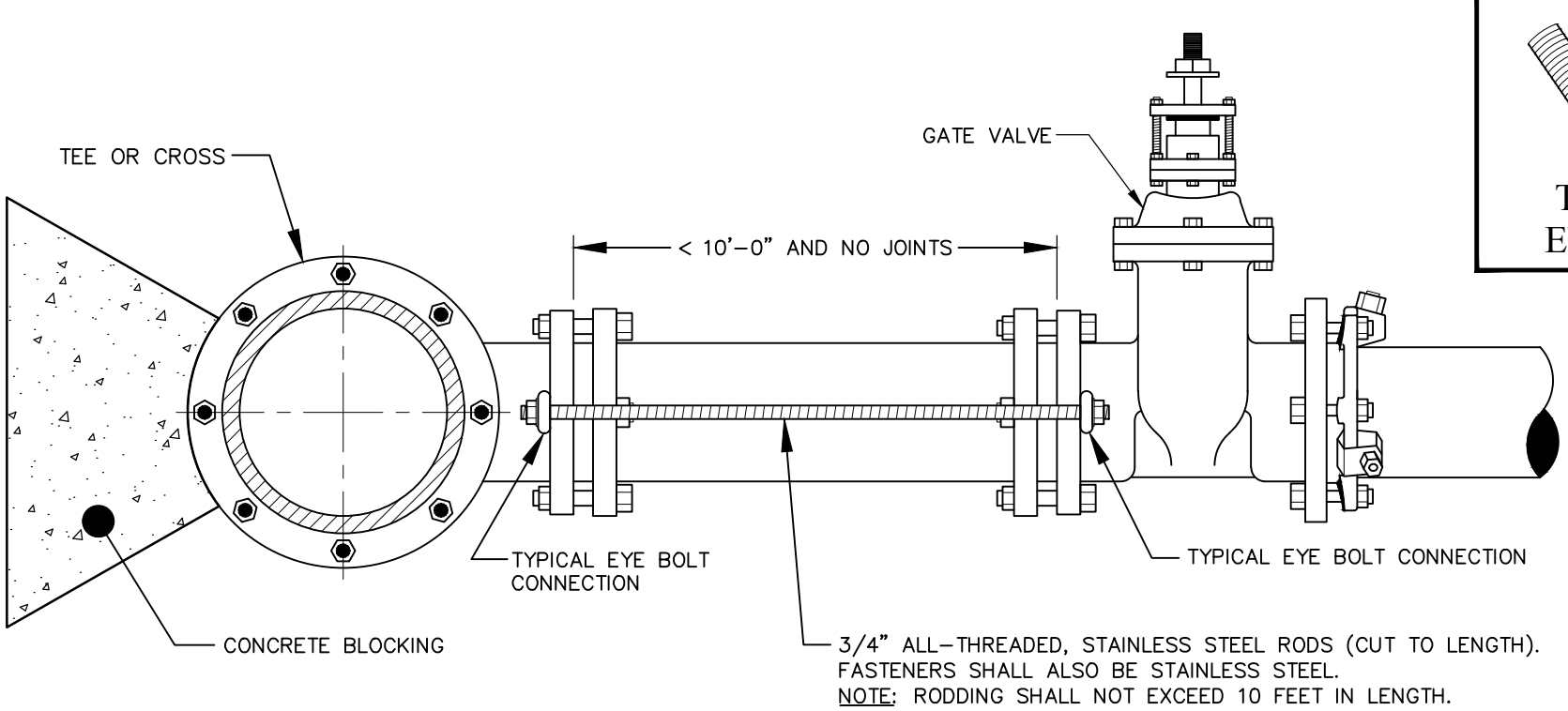
NOTES:
1. CURB STOP BOXES SHALL ONLY BE USED AS APPROVED.
2. MOUSE HOLES SHALL BE COVERED WITH FILTER FABRIC PRIOR TO BACKFILLING.
3. ENTIRE VALVE BOX ASSEMBLY & COVER SHALL BE CAST FROM CLASS 35 GRAY IRON.
4. ASSEMBLY SHALL BE DOMESTICALLY MADE AND MANUFACTURED IN THE U.S.A.

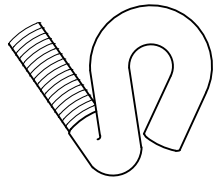
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD WATER CURB STOP BOX

DETAIL No.
06000.07
SHEET 3 OF 3





TYPICAL
EYE BOLT

STAINLESS STEEL ROD REQUIREMENTS	
BRANCH SIZE	No. OF RODS
4"	2
6"	2
8"	4
12"	6
16"	8

GENERAL NOTES:

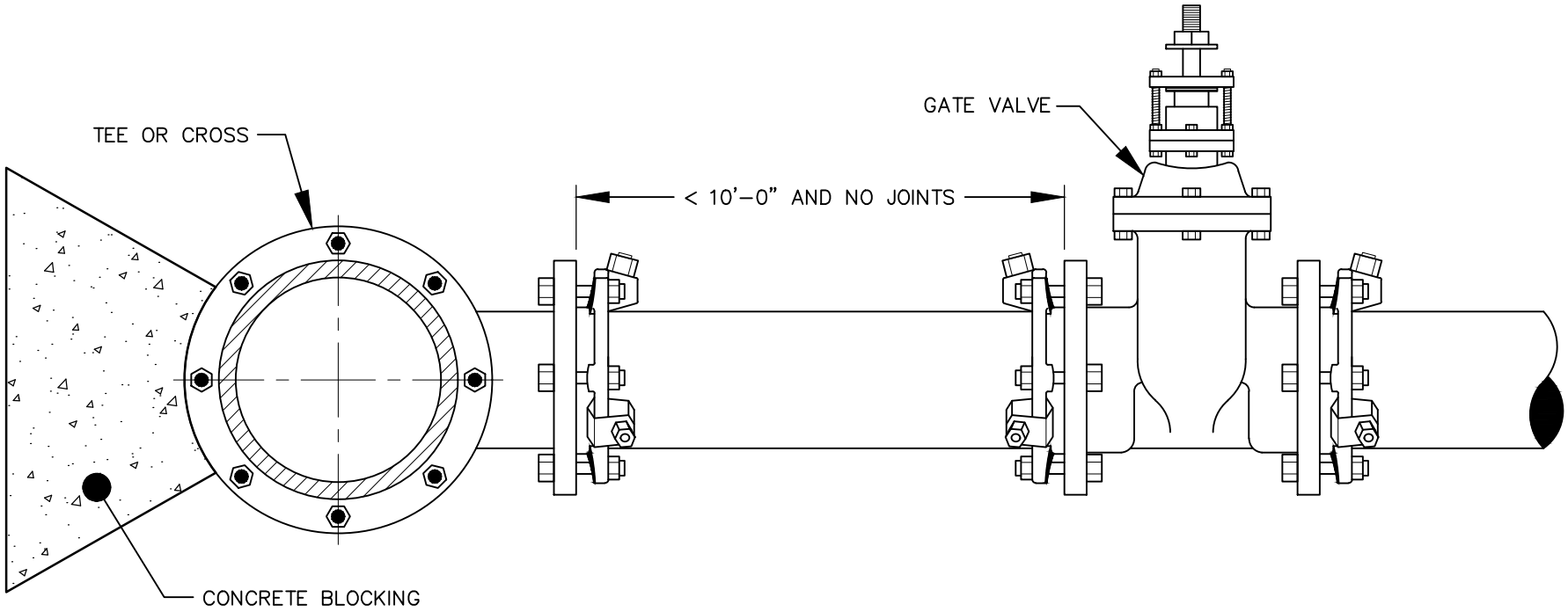
1. SEE STANDARD THRUST BLOCK DETAIL.
2. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL FITTINGS.
3. RODS SHALL NOT BE COUPLED.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD VALVE RESTRAINT WITH RODDING AT A TEE OR CROSS UP TO 16" IN DIAMETER

DETAIL No.
06000.08
SHEET 1 OF 2



GENERAL NOTES:

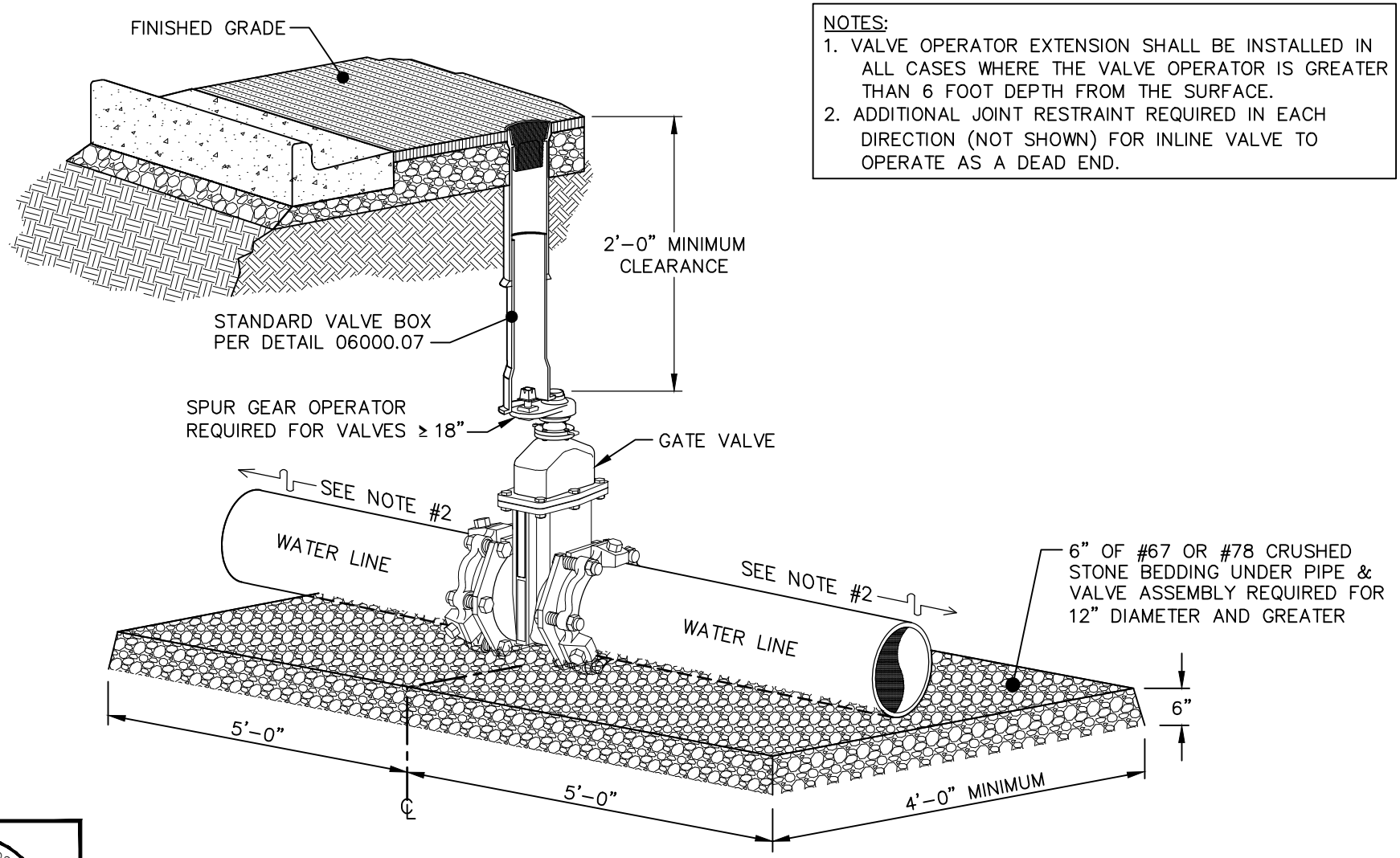
1. SEE STANDARD THRUST BLOCK DETAIL.
2. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL FITTINGS.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

ALTERNANTE VALVE RESTRAINT WITH WEDGE ACTION RETAINER GLANDS AT AT TEE OR CROSS

DETAIL No.
06000.08
SHEET 2 OF 2



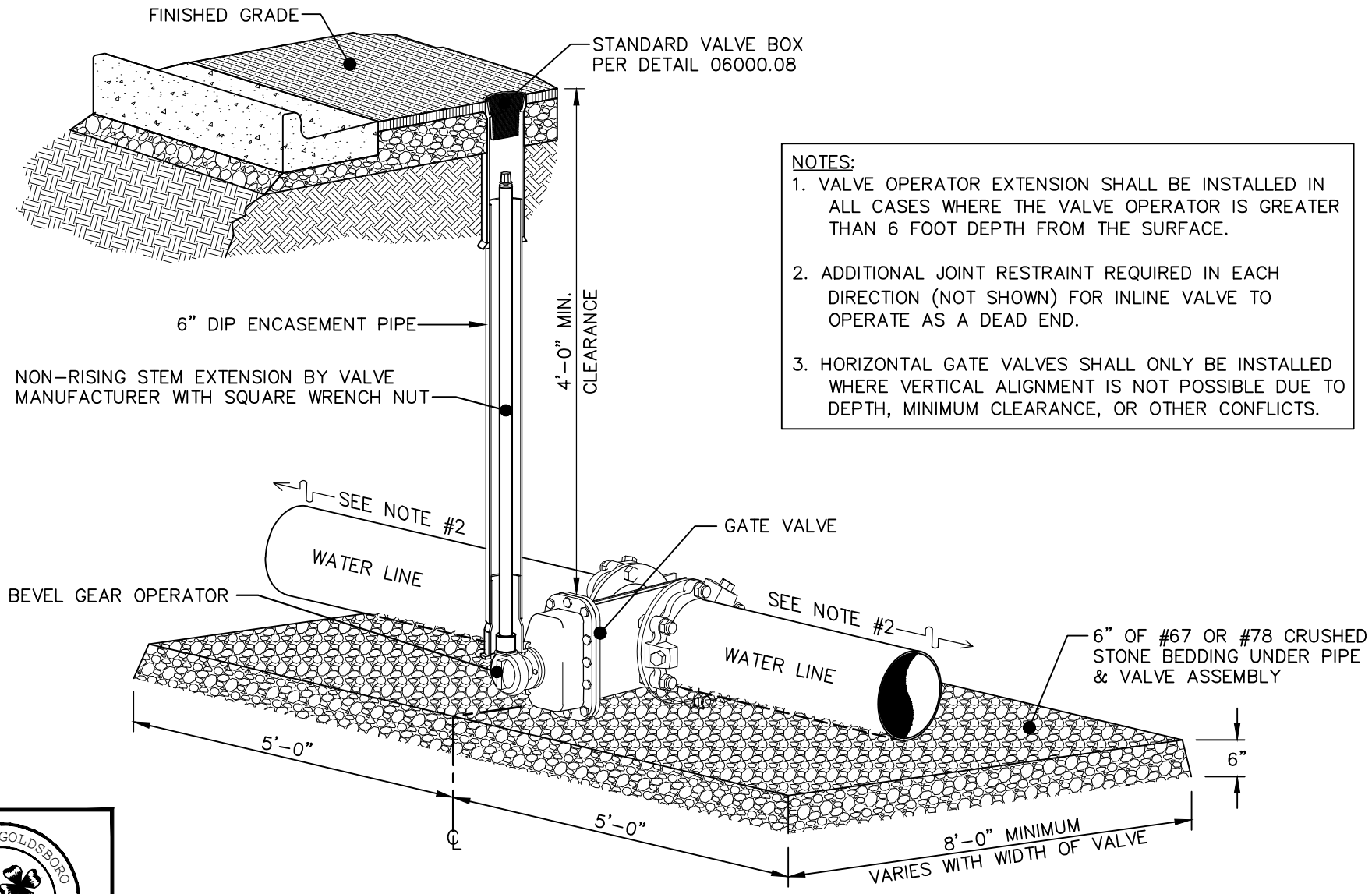
NOTES:
1. VALVE OPERATOR EXTENSION SHALL BE INSTALLED IN ALL CASES WHERE THE VALVE OPERATOR IS GREATER THAN 6 FOOT DEPTH FROM THE SURFACE.
2. ADDITIONAL JOINT RESTRAINT REQUIRED IN EACH DIRECTION (NOT SHOWN) FOR INLINE VALVE TO OPERATE AS A DEAD END.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

RESILIENT WEDGE GATE VALVE ASSEMBLY FOR VERTICAL INSTALLATIONS

DETAIL No.
06000.09
SHEET 1 OF 2



NOTES:

1. VALVE OPERATOR EXTENSION SHALL BE INSTALLED IN ALL CASES WHERE THE VALVE OPERATOR IS GREATER THAN 6 FOOT DEPTH FROM THE SURFACE.
2. ADDITIONAL JOINT RESTRAINT REQUIRED IN EACH DIRECTION (NOT SHOWN) FOR INLINE VALVE TO OPERATE AS A DEAD END.
3. HORIZONTAL GATE VALVES SHALL ONLY BE INSTALLED WHERE VERTICAL ALIGNMENT IS NOT POSSIBLE DUE TO DEPTH, MINIMUM CLEARANCE, OR OTHER CONFLICTS.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

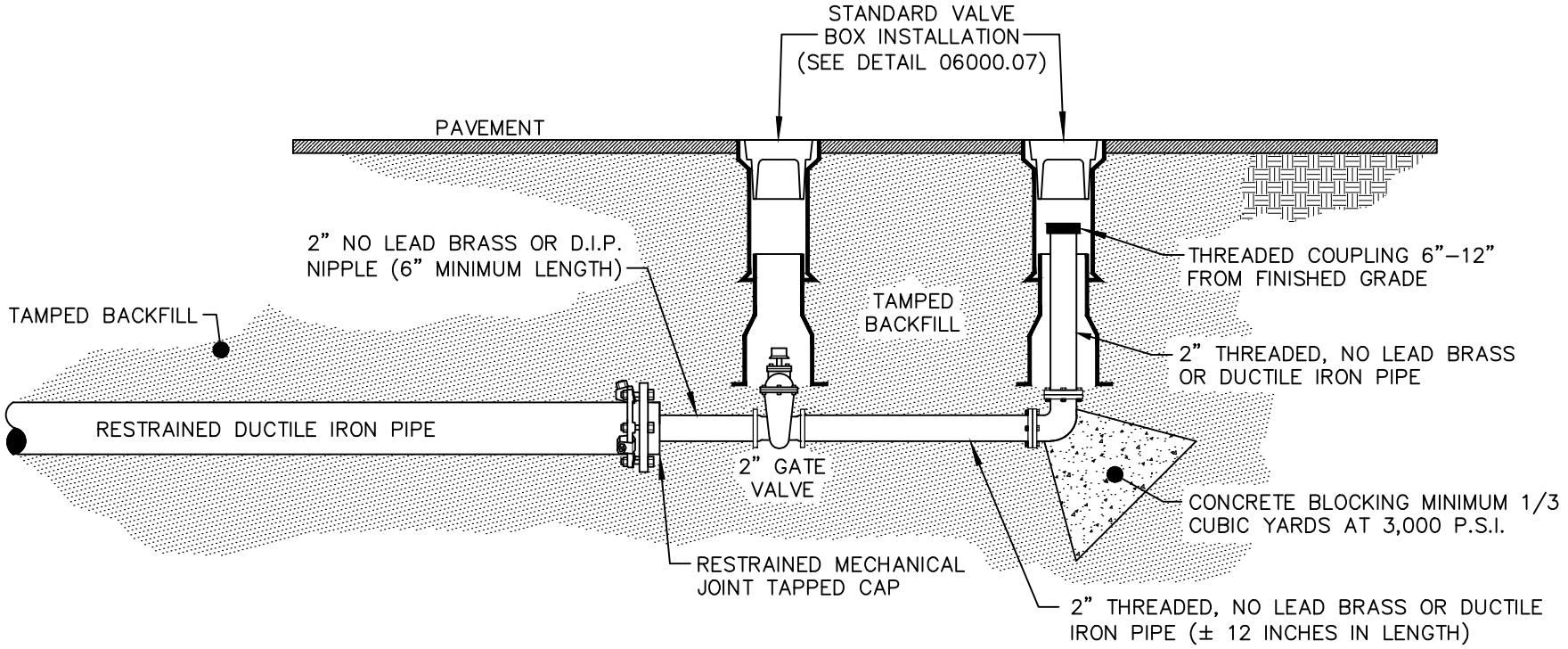
RESILIENT WEDGE GATE VALVE ASSEMBLY FOR HORIZONTAL INSTALLATIONS

DETAIL No.
06000.09
SHEET 2 OF 2

MAIN SIZE	END PIPE SIZE
4" – 12"	2" BLOW–OFF
14" & GREATER	AS APPROVED BY CITY

NOTES:

1. FOR MAINS THAT ARE TO BE EXTENDED, USE A VALVE EQUAL TO THE MAIN SIZE AS THE BLOW–OFF VALVE AND THEN REDUCE TO THE 2 INCH STANDPIPE.
2. PIPE SHALL BE RESTRAINED AWAY FROM THE TAPPED CAP.

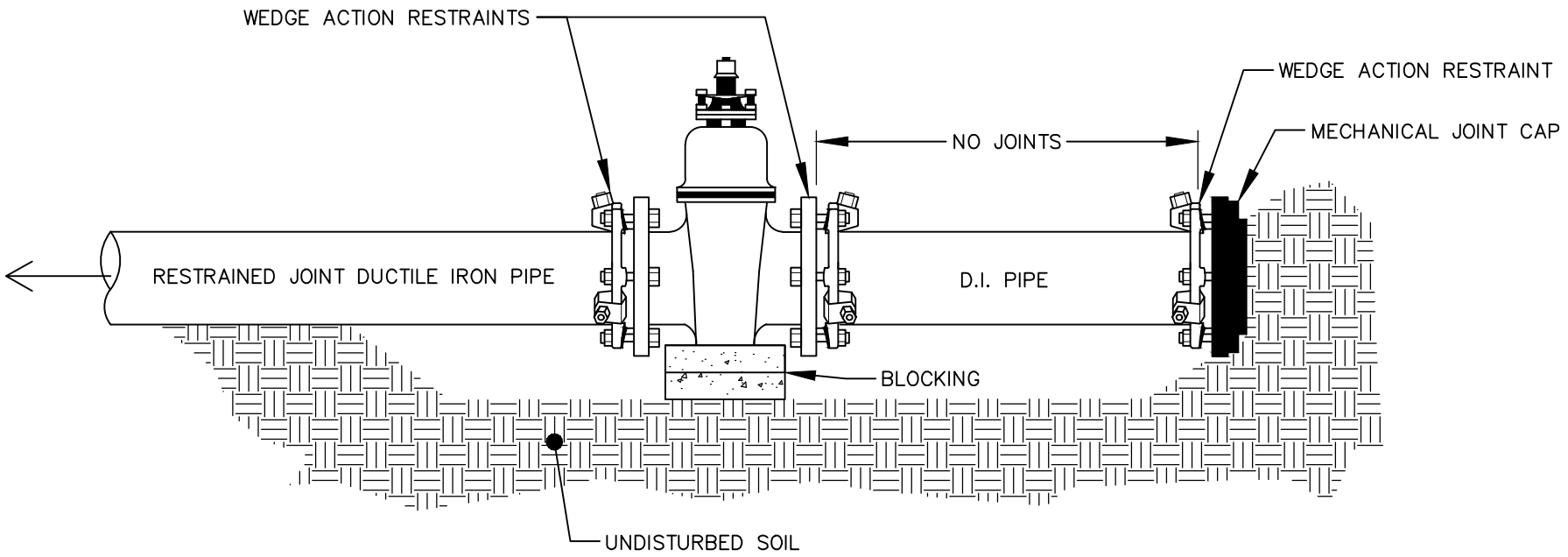


CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD 2" BLOW-OFF ASSEMBLY

DETAIL No.
06000.10
SHEET 1 OF 1



NOTES:
1. THIS DETAIL SHALL APPLY ONLY TO TEMPORARY CAPPING. PERMANENT DEAD END LINES TO BE IN ACCORDANCE WITH STANDARD DETAIL 06000.10.

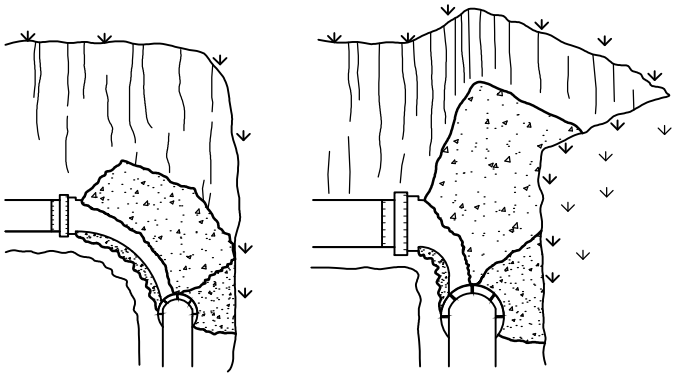
2. REQUIRED RESTRAINT AWAY FROM THE DEAD END MAY BE MJ PIPE WITH WEDGE ACTION RESTRAINTS FOR PIPE ≤ 12 INCH DIAMETER.

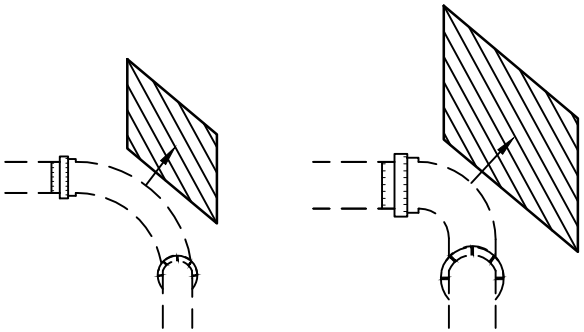
CITY OF GOLDSBORO NORTH CAROLINA

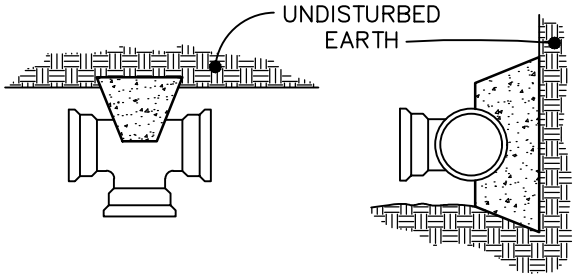
EFFECTIVE: 12/01/18

STANDARD CAPPING DETAIL

DETAIL No.
06000.11
SHEET 1 OF 1







MINIMUM CONCRETE BLOCKING (C.Y.) *					
NOMINAL PIPE DIAMETER INCHES	TEES & DEAD ENDS	90° BEND	45° BEND	22½° BEND	11¼° BEND
4	⅓	⅓	⅓	⅓	⅓
6	⅓	⅓	⅓	⅓	⅓
8	⅓	½	⅓	⅓	⅓
10	⅔	¾	½	⅓	⅓
12	¾	1.0	⅔	⅓	⅓

NOTES:
1. FITTING SHALL BE WRAPPED WITH A MINIMUM 4 MIL PLASTIC.
2. NO CONCRETE SHALL COVER BOLTS OR GLANDS.
3. PIPE DIAMETERS BEYOND 12 INCHES SHALL UTILIZE A PROFESSIONAL ENGINEER'S SEALED DESIGN CONSISTING OF RESTRAINED JOINT PIPE OR BLOCKING.

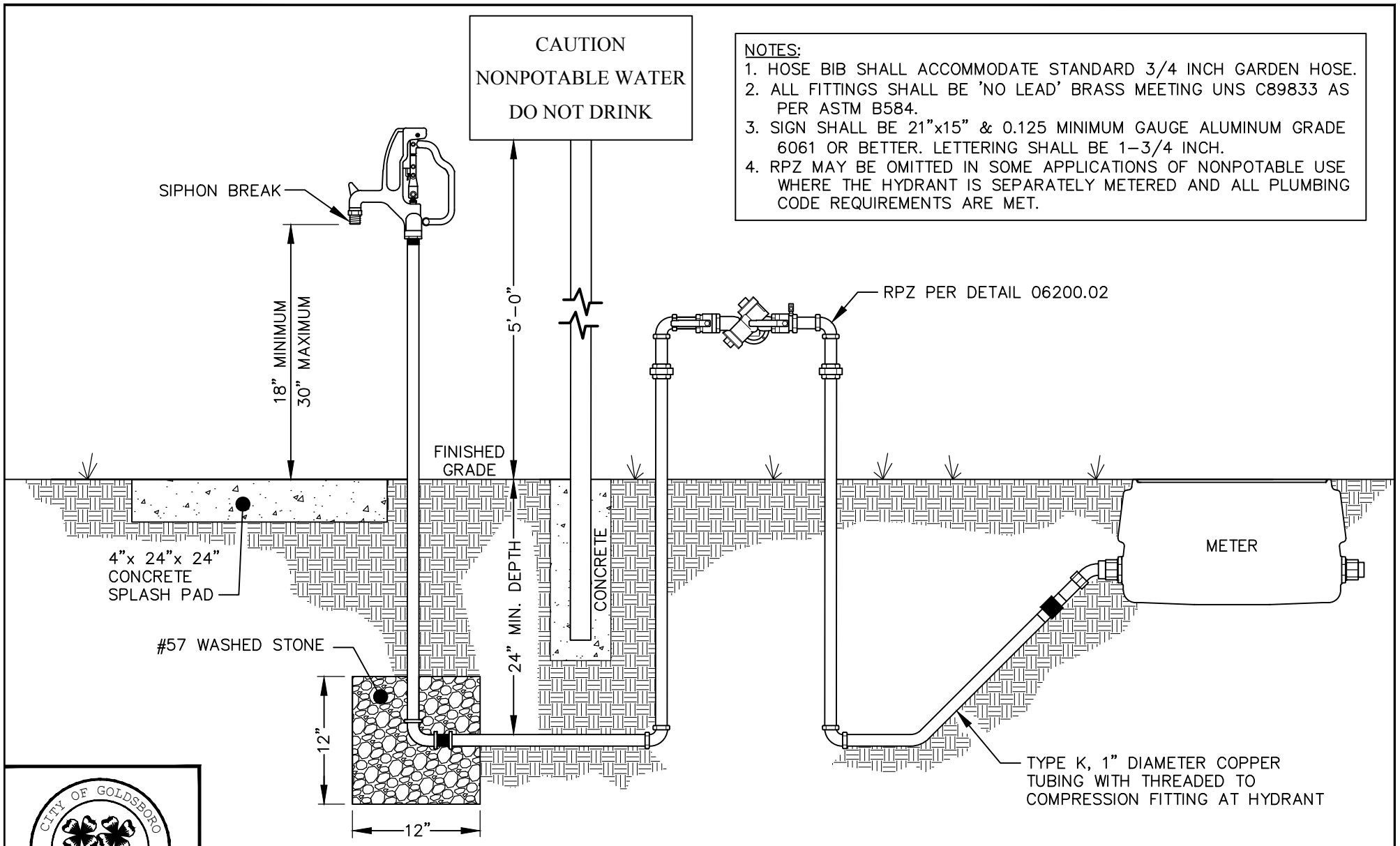
* CONCRETE SHALL BE 3,000 P.S.I. MIX.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD THRUST BLOCKING

DETAIL No.
06000.12
SHEET 1 OF 1



CITY OF GOLDSBORO NORTH CAROLINA

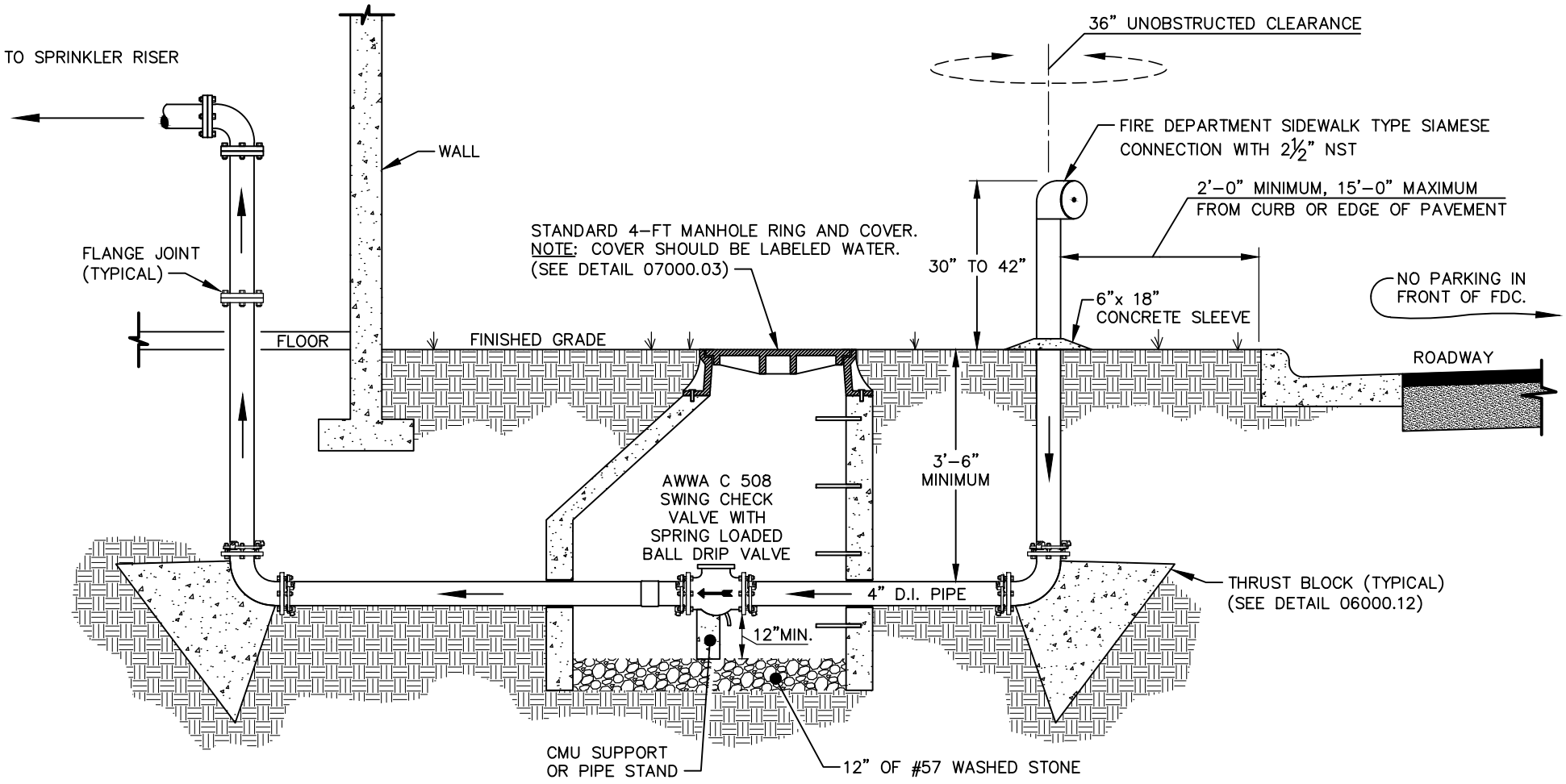
EFFECTIVE: 12/01/18

STANDARD YARD HYDRANT (NON-FREEZE)

DETAIL No.

06000.13

SHEET 1 OF 1



NOTES:

1. SIAMESE CONNECTIONS MUST BE WITHIN 50 FEET OF A FIRE HYDRANT, EXCEPT AT TOWNHOMES, APARTMENT BUILDINGS, AND WITHIN URBAN SETTINGS.
2. SIAMESE CONNECTION CAN BE ATTACHED TO BUILDING.
3. TWO 3/4 INCH STAINLESS STEEL RODS ON EACH PIPE SEGMENT MAY BE SUBSTITUTED FOR WEDGE ACTION RESTRAINTS.
4. SPRING LOADED BALL DRIP VALVE SHALL BE INSTALLED VERTICALLY IN FRONT OF CHECK VALVE DISC. AN ADDITIONAL FITTING MAY BE REQUIRED SO THAT DRIP VALVE IS VERTICAL.

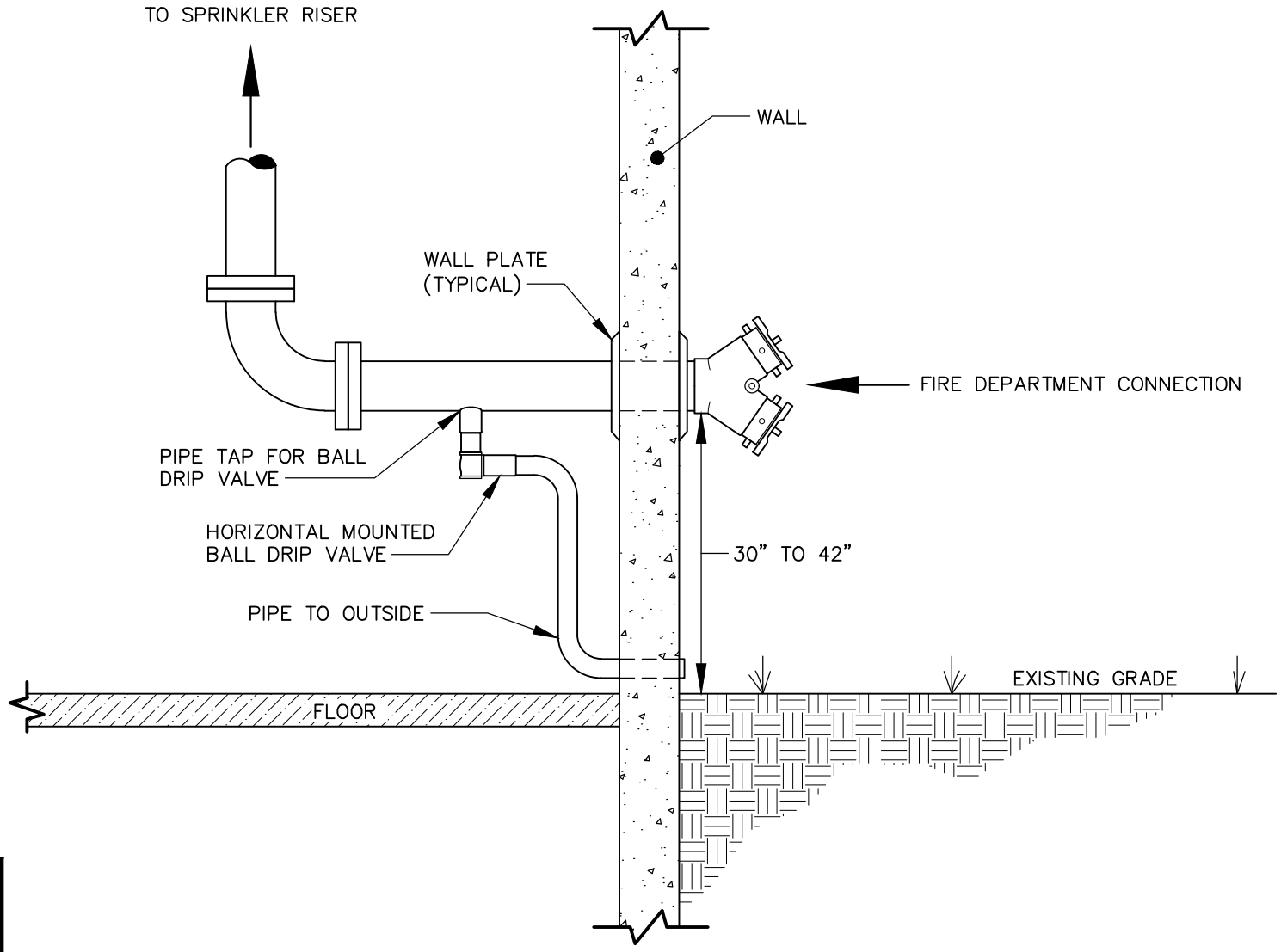
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD CURB SIDE FIRE DEPARTMENT CONNECTION

DETAIL No.

06000.14



CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

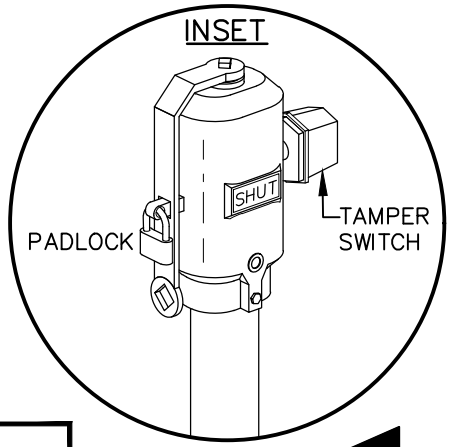
STANDARD WALL MOUNTED FIRE DEPARTMENT CONNECTION

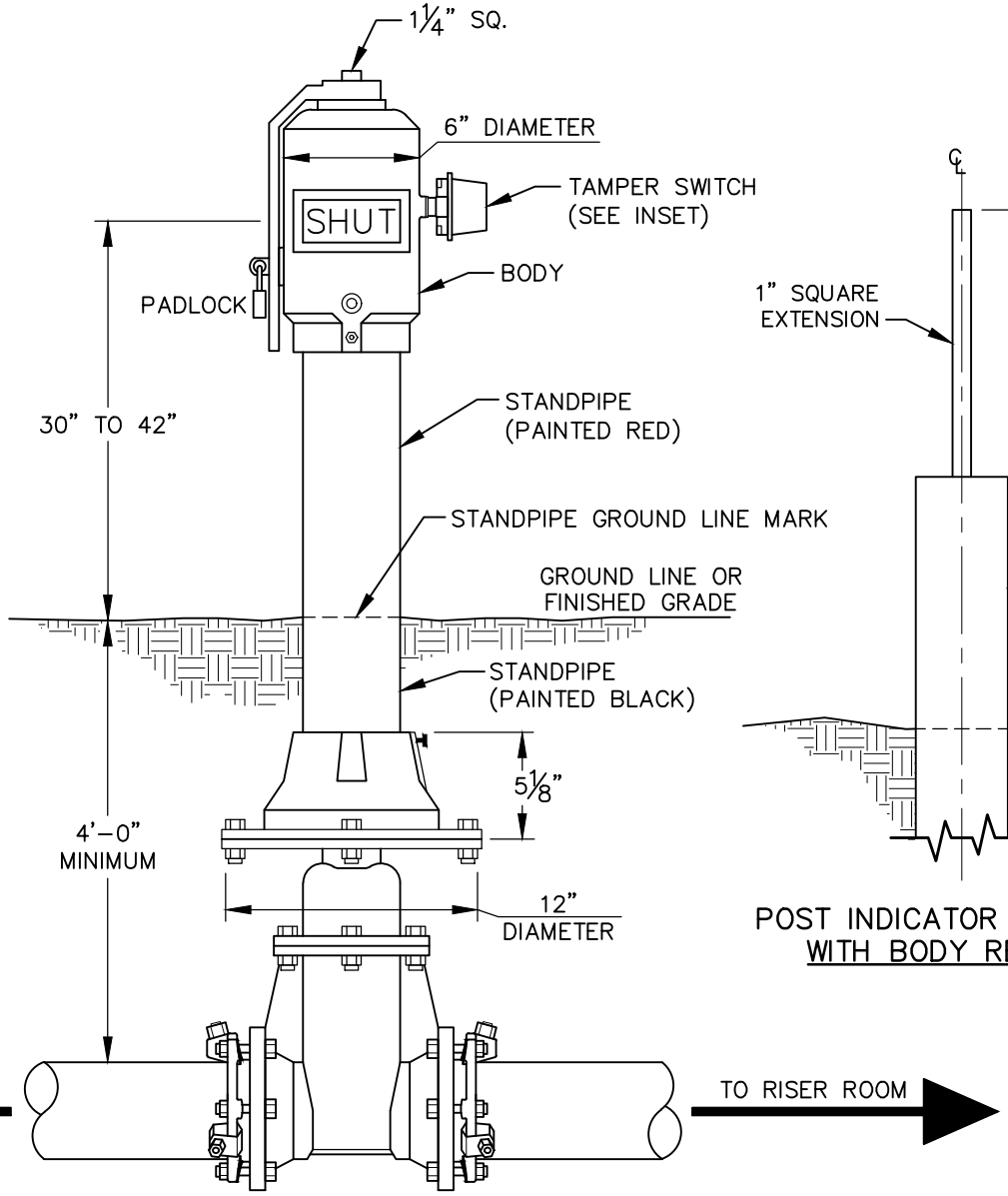
DETAIL No.

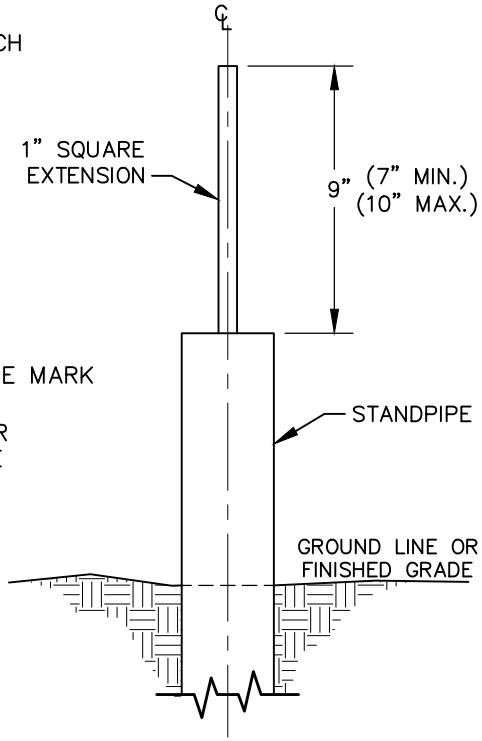
06000.14

FIELD ADJUSTMENT INSTRUCTIONS

1. REMOVE THE BODY FROM THE TOP OF THE INDICATOR POST ASSEMBLY.
2. CUT THE REQUIRED LENGTH OFF THE BOTTOM OF THE STANDPIPE FOR THE GROUND LINE TO MATCH UP WITH STANDPIPE GROUND LINE MARK.
3. CUT THE 1 INCH SQ. EXTENSION AT A DISTANCE OF 9 INCHES ABOVE THE TOP OF THE STANDPIPE.
4. SET THE "OPEN" AND "SHUT" TARGETS FOR THE APPROPRIATE VALVE SIZE.
5. RE-ATTACH THE BODY TO THE TOP OF THE INDICATOR POST ASSEMBLY.
6. ALL POST INDICATOR VALVES SHALL BE INSTALLED WITH AN ELECTRONIC UL LISTED TAMPER SWITCH.
7. THERE SHALL BE 36 INCHES OF UNOBSTRUCTED CLEARANCE AROUND THE PERIMETER OF ALL POST INDICATOR VALVES.
8. POST INDICATOR VALVE SHALL BE LOCATED AT A MINIMUM 5 FEET FROM BUILDING.







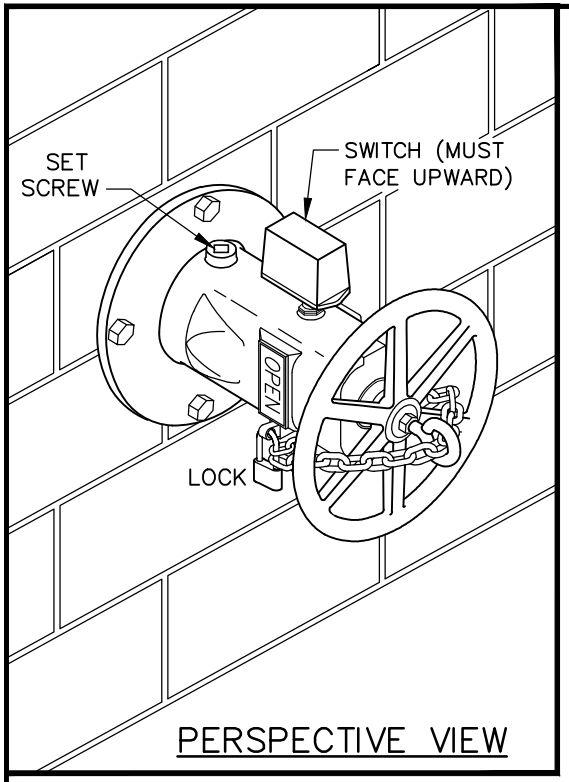
POST INDICATOR ASSEMBLY
WITH BODY REMOVED

CITY OF GOLDSBORO NORTH CAROLINA

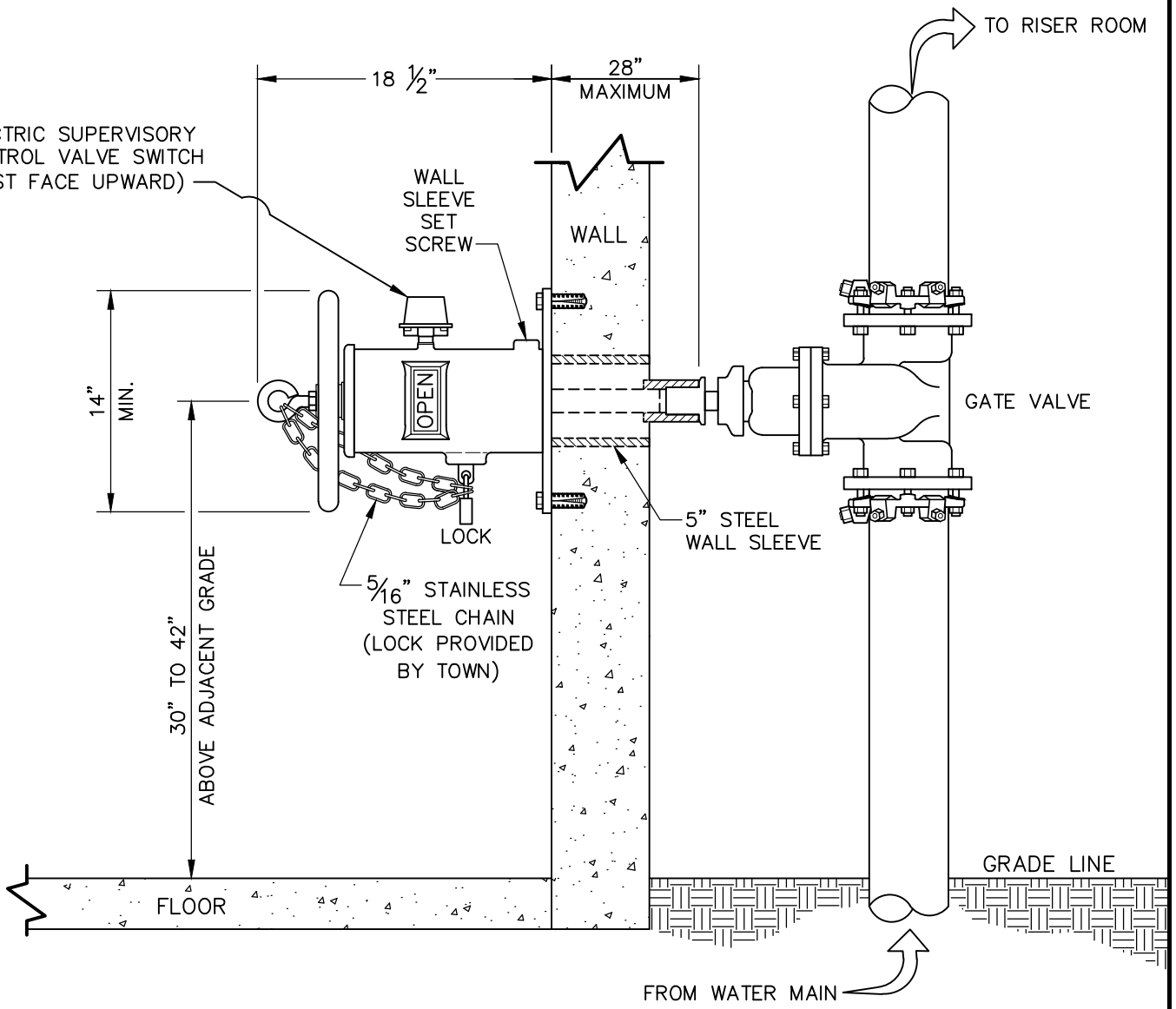
EFFECTIVE: 12/01/18

STANDARD POST INDICATOR VALVE

DETAIL No.
06000.15
SHEET 1 OF 2



PERSPECTIVE VIEW

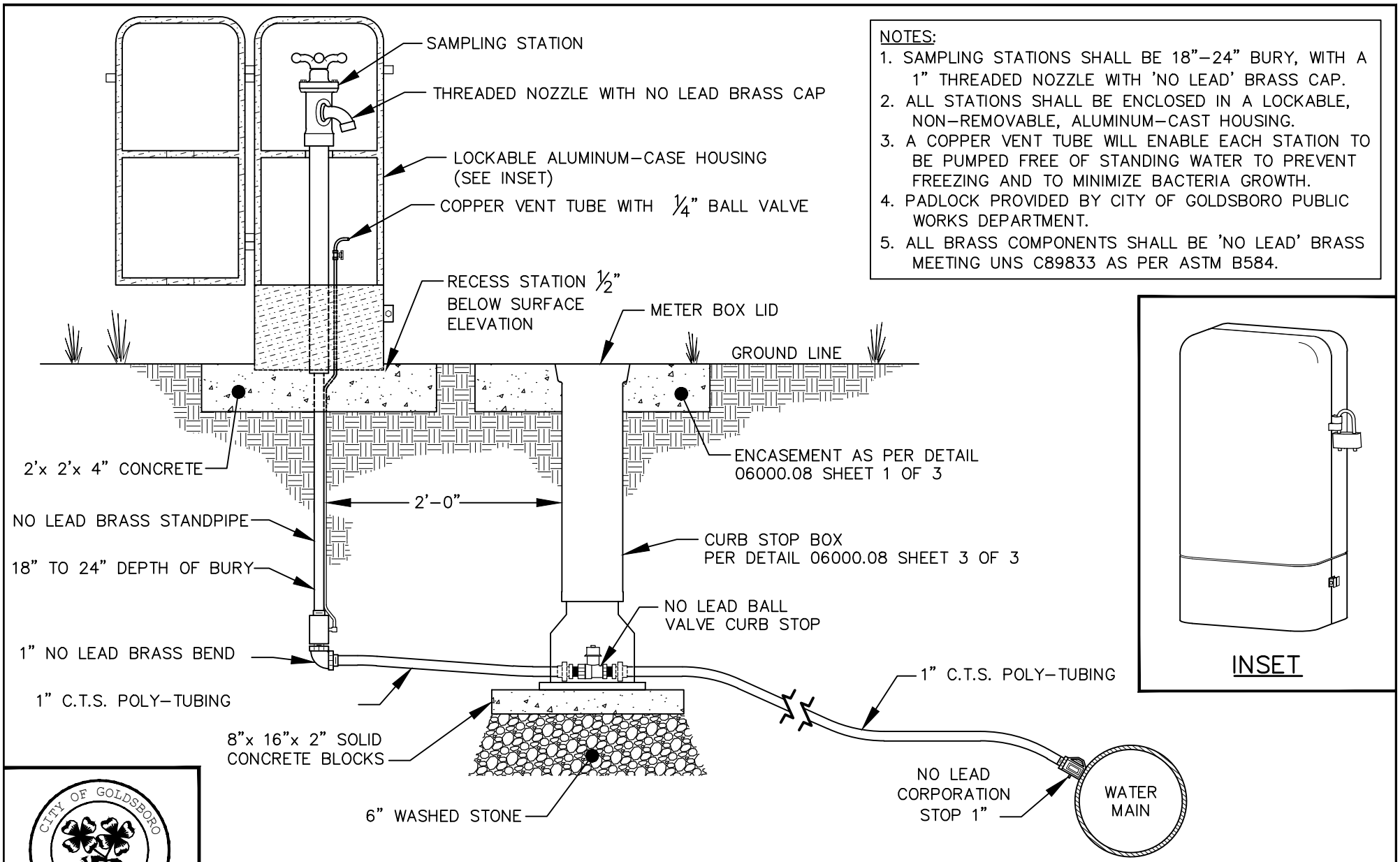


CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

WALL MOUNTED INDICATOR VALVE

DETAIL No.
06000.15
SHEET 2 OF 2



NOTES:

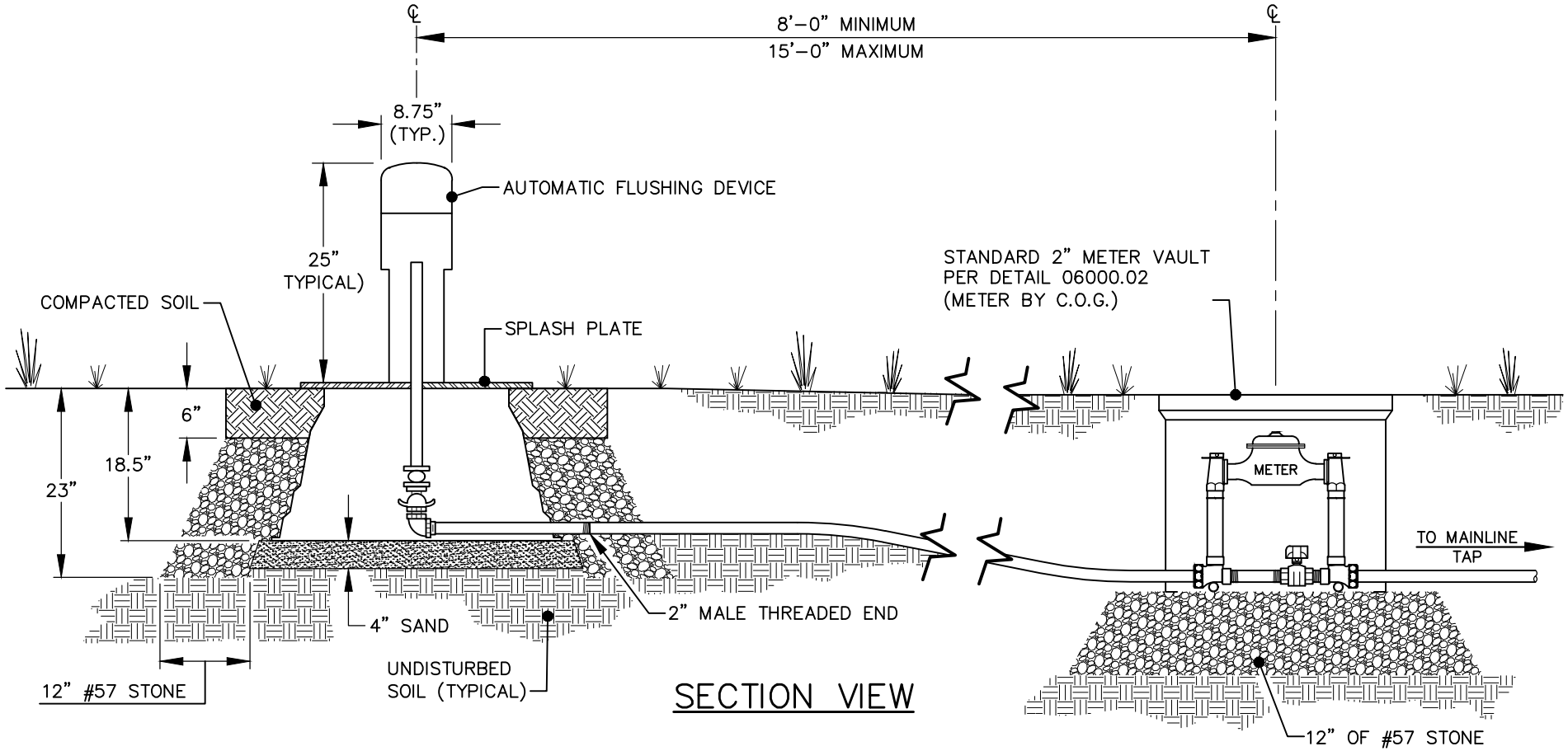
1. SAMPLING STATIONS SHALL BE 18"–24" BURY, WITH A 1" THREADED NOZZLE WITH 'NO LEAD' BRASS CAP.
2. ALL STATIONS SHALL BE ENCLOSED IN A LOCKABLE, NON–REMOVABLE, ALUMINUM–CAST HOUSING.
3. A COPPER VENT TUBE WILL ENABLE EACH STATION TO BE PUMPED FREE OF STANDING WATER TO PREVENT FREEZING AND TO MINIMIZE BACTERIA GROWTH.
4. PADLOCK PROVIDED BY CITY OF GOLDSBORO PUBLIC WORKS DEPARTMENT.
5. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

SAMPLING STATION

DETAIL No.
06000.16
SHEET 1 OF 2



SECTION VIEW

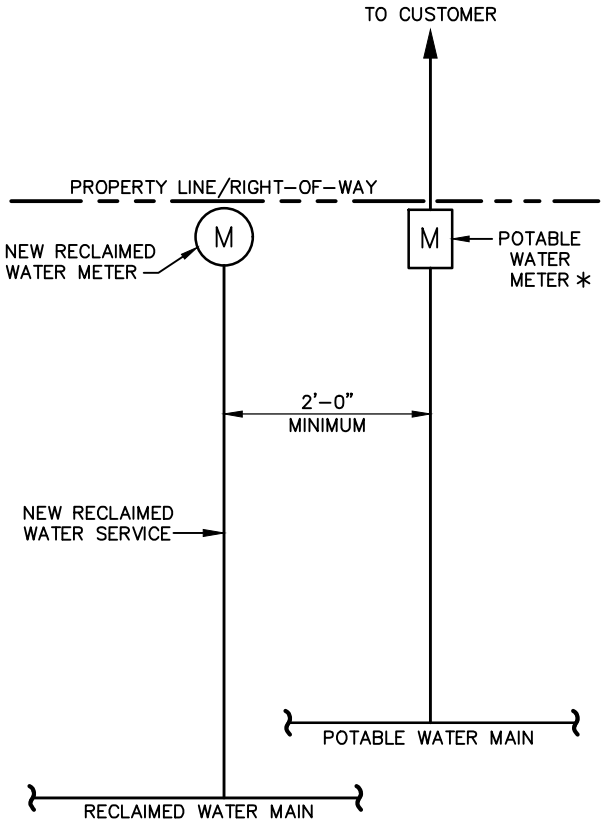
NOTES:
1. FLUSHING DEVICE SHALL HAVE A SELF DRAINING, DOUBLE CHECK VALVE FOR FREEZE PROTECTION.
2. PIPING SHALL BE 2 INCH BRASS OR COPPER TUBING.
3. AREA AROUND FLUSHING DEVICE SHALL BE GRADED TO FACILITATE FLOW AWAY FROM THE SPLASH PLATE.
4. ENTIRE ASSEMBLY SHALL BE LOCATED IN A DEDICATED CITY OF GOLDSBORO EASEMENT OR AS DIRECTED.

CITY OF GOLDSBORO NORTH CAROLINA

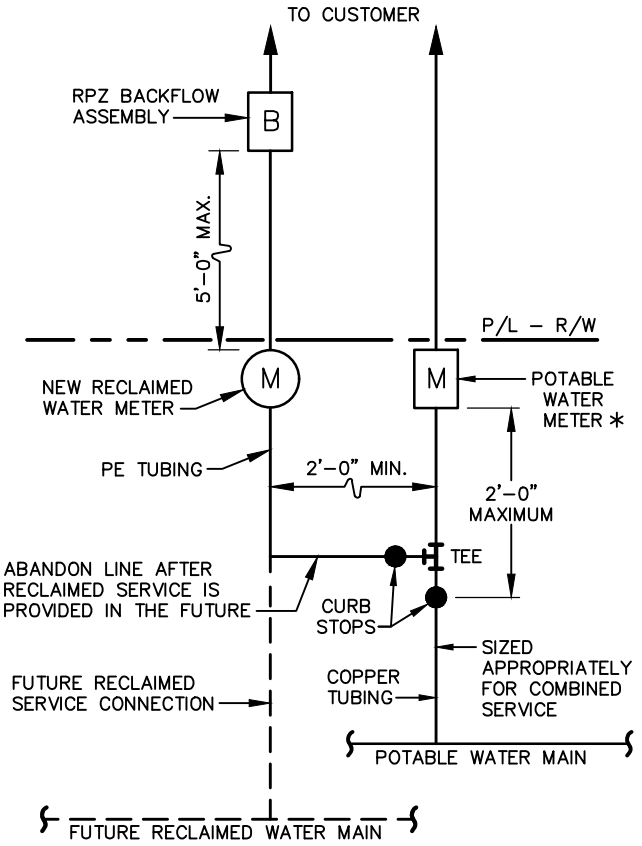
EFFECTIVE: 12/01/18

STANDARD AUTOMATIC FLUSHING DEVICE

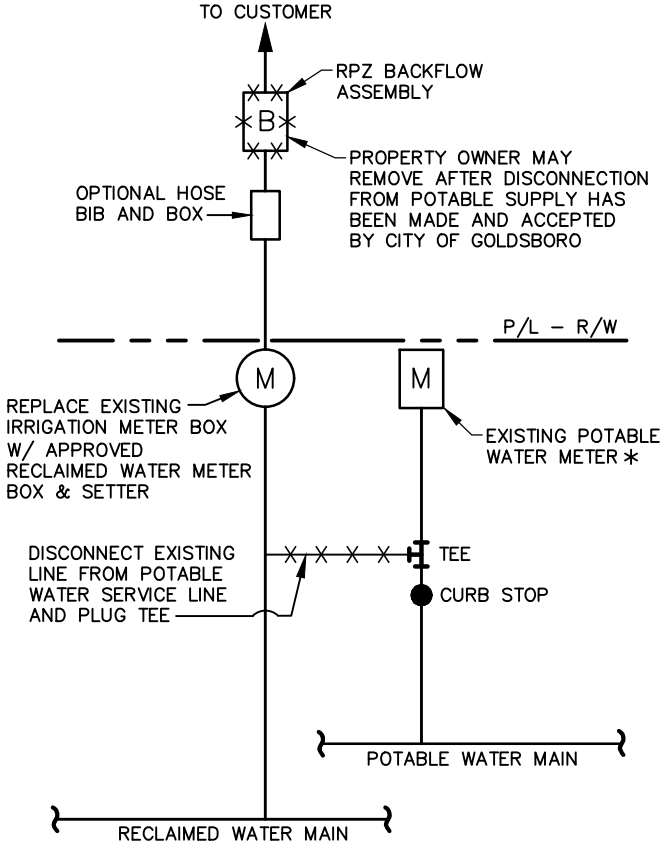
DETAIL No.
06000.16
SHEET 2 OF 2



SCENARIO 1
RECLAIMED SERVICE CONNECTION
(NEW INSTALLATION)



SCENARIO 2
PRESENT POTABLE IRRIGATION
CONNECTION WHERE RECLAIMED SERVICE
IS NOT YET AVAILABLE



SCENARIO 3
RETROFIT OF EXISTING
IRRIGATION METER ASSEMBLY
FROM POTABLE TO RECLAIMED SERVICE

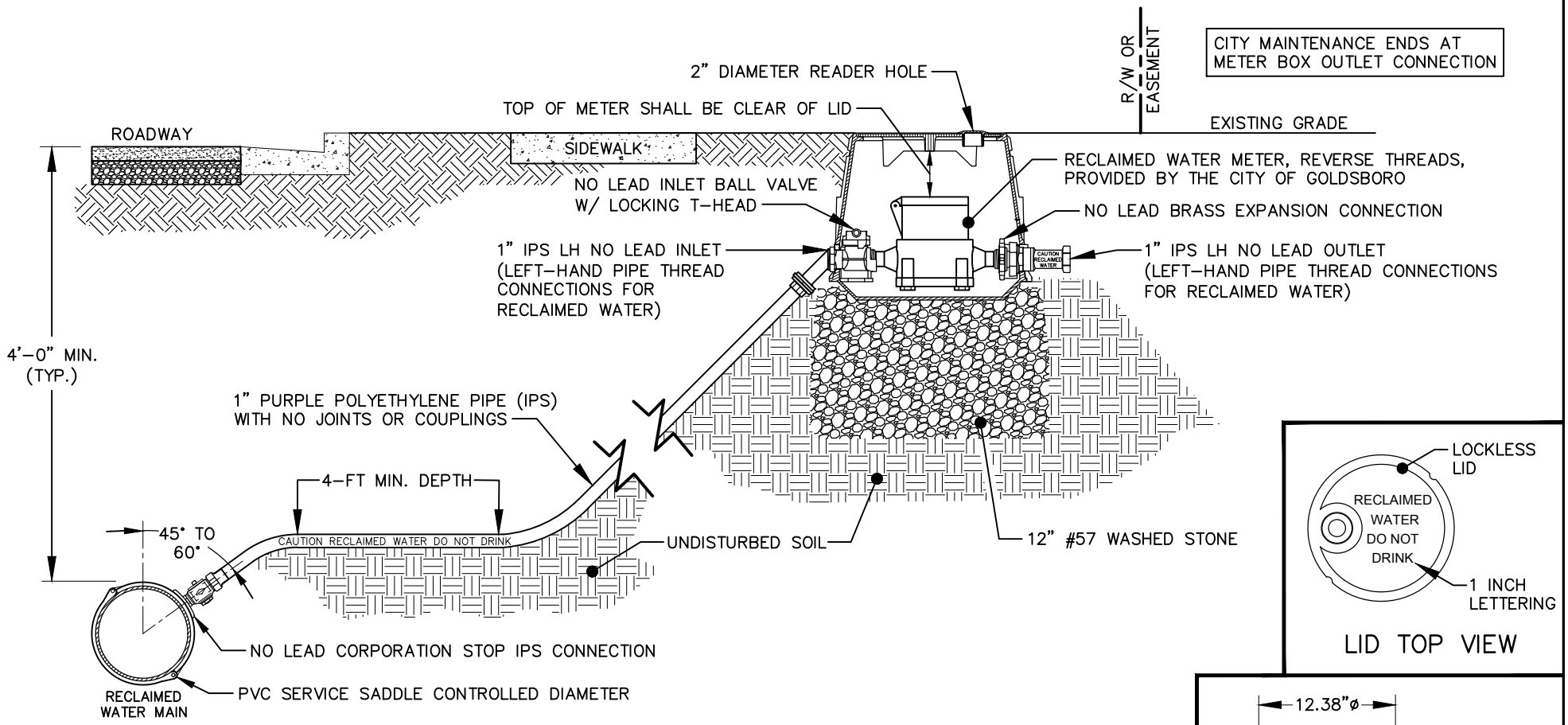
*NOTES:
1. POTABLE WATER METER SHALL BE FITTED WITH DUAL CARTRIDGE CHECK VALVE.
2. METERS ARE TO BE PLACED IMMEDIATELY INSIDE OF R/W OR UTILITY EASEMENT LINE.
3. ALL PIPE AND APPURTENANCES LOCATED OUTSIDE OF THE RIGHT-OF-WAY OR EASEMENT ARE MAINTAINED BY THE PROPERTY OWNER.
4. MARKING TAPE SHALL BE INSTALLED FOR ALL SERVICE CONNECTIONS FROM THE MAIN LINE TO THE METER FOR ALL NEW CONSTRUCTION OR RETROFIT INSTALLATIONS USING OPEN TRENCH METHODS.

CITY OF GOLDSBORO NORTH CAROLINA

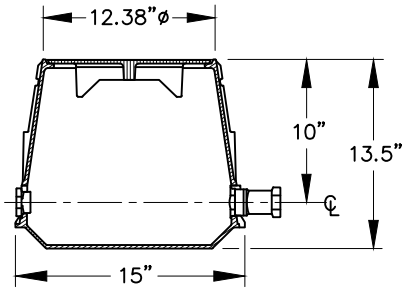
EFFECTIVE: 12/01/18

STANDARD RECLAIMED WATER SERVICE CONNECTIONS IN DEFINED RECLAIMED SERVICE AREAS

DETAIL No.
06500.01
SHEET 1 OF 1



LID TOP VIEW



SIDE VIEW

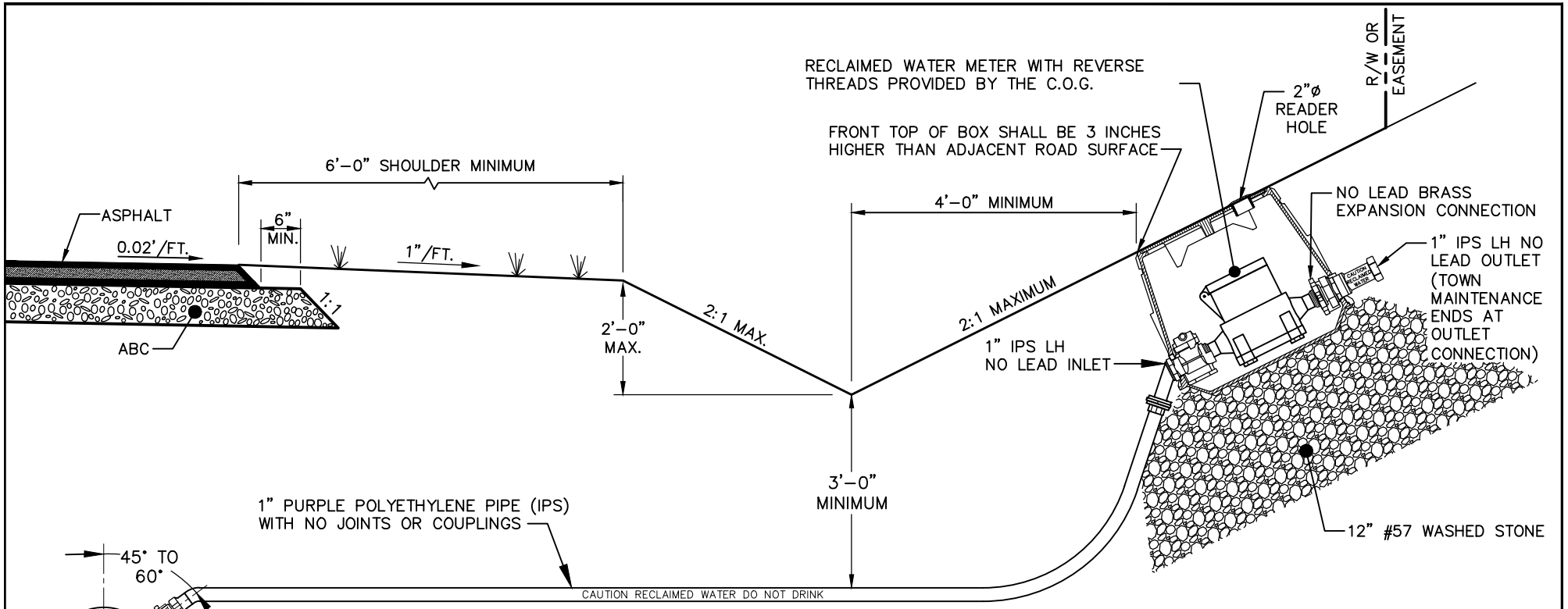
NOTES:
1. WATER METER SHALL NOT BE LOCATED IN AREAS SUBJECT TO VEHICULAR TRAFFIC.
2. ALL METER BOXES AND LIDS SHALL BE APPROVED BY THE CITY.
3. ALL SERVICE LINES, VALVES AND FITTINGS SHALL COMPLY WITH AWWA C800.
4. THE INTERIOR AND EXTERIOR OF THE BOX AND LID SHALL BE COLORED PANTONE 522 PURPLE.
5. ALL RELOCATIONS OF EXISTING OR PERMITTED RECLAIMED WATER INFRASTRUCTURE INCLUDING SERVICE PIPING AND METER BOXES SHALL BE PERMITTED AND INSPECTED IN CONFORMANCE WITH TOWN POLICIES AND PROCEDURES.
6. BOX AND LID SHALL BE CAST IRON, ASTM A48, CLASS 25.
7. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.
8. MARKING TAPE SHALL BE INSTALLED FOR ALL SERVICE CONNECTIONS FROM THE MAIN LINE TO THE METER FOR ALL NEW CONSTRUCTION OR RETROFIT INSTALLATIONS USING OPEN TRENCH METHODS.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

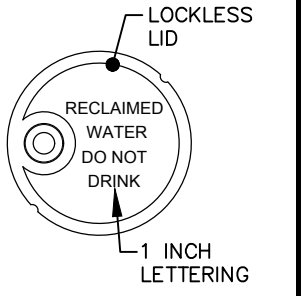
STANDARD 1" RECLAIMED WATER SERVICE AND METER BOX INSTALLATION

DETAIL No.
06500.02
SHEET 1 OF 3

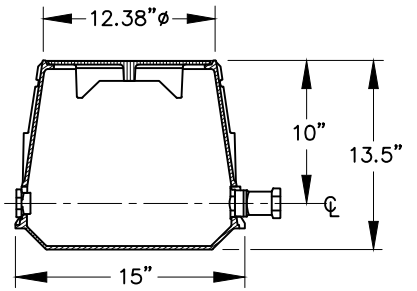


NOTES:

1. WATER METER SHALL NOT BE LOCATED IN AREAS SUBJECT TO VEHICULAR TRAFFIC.
2. ALL METER BOXES AND LIDS SHALL BE APPROVED BY THE CITY.
3. ALL SERVICE LINES, VALVES AND FITTINGS SHALL COMPLY WITH AWWA C800.
4. THE INTERIOR AND EXTERIOR OF THE BOX AND LID SHALL BE COLORED PANTONE 522 PURPLE.
5. ALL RELOCATIONS OF EXISTING OR PERMITTED RECLAIMED WATER INFRASTRUCTURE INCLUDING SERVICE PIPING AND METER BOXES SHALL BE PERMITTED AND INSPECTED IN CONFORMANCE WITH TOWN POLICIES AND PROCEDURES.
6. BOX AND LID SHALL BE CAST IRON, ASTM A48, CLASS 25.
7. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.
8. MARKING TAPE SHALL BE INSTALLED FOR ALL SERVICE CONNECTIONS FROM THE MAIN LINE TO THE METER FOR ALL NEW CONSTRUCTION OR RETROFIT INSTALLATIONS USING OPEN TRENCH METHODS.



LID TOP VIEW



SIDE VIEW

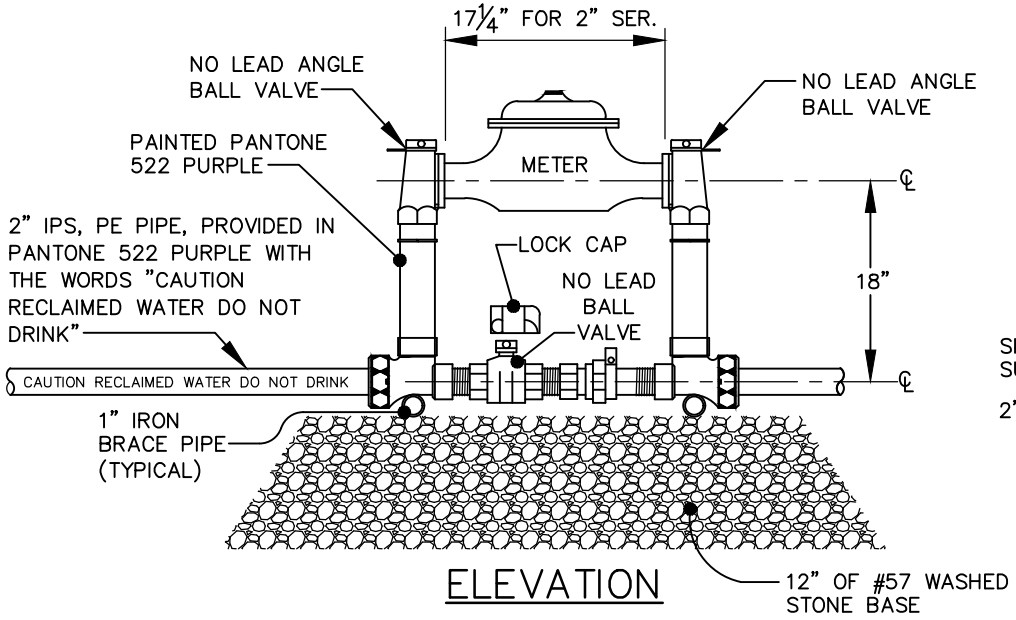
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

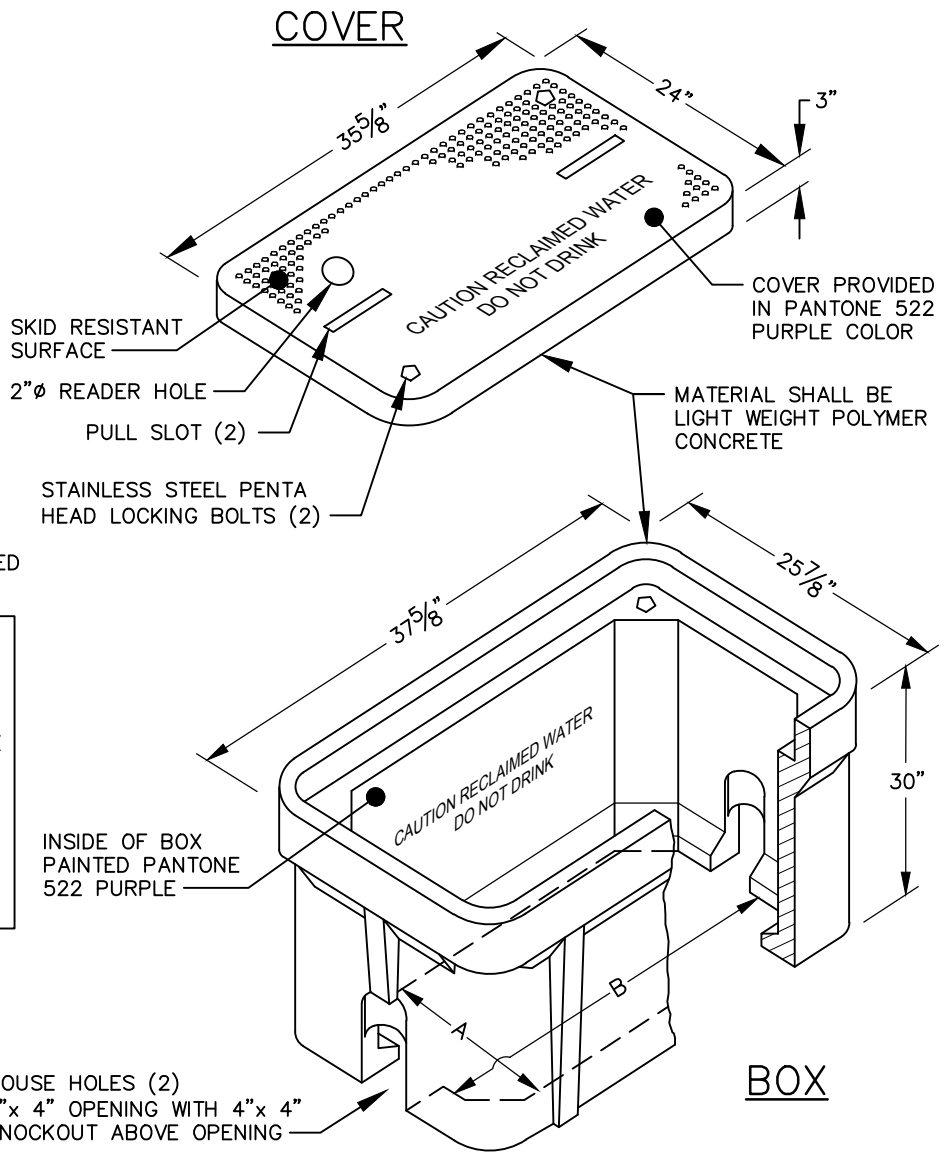
STANDARD 1" RECLAIMED WATER SERVICE AND METER BOX FOR ROADWAY DITCH SECTION

DETAIL No.

06500.02



ELEVATION



BOX

NOTES:
1. CUSTOM SETTER PIPING TO BE NO LEAD BRASS & COPPER TUBING AND SHALL BE EQUIPPED W/ANGLED BALL VALVES & A LOCKABLE BY-PASS FLANGED BALL VALVE.
2. PRECAST CONCRETE BOX WITH ALUMINUM ACCESS HATCH WILL BE AN ACCEPTABLE ALTERNATIVE WITH APPROVAL OF THE DIRECTOR OF WATER RESOURCES.
3. THE INTERIOR OF THE BOX SHALL BE STENCILED WITH THE WORDS "CAUTION RECLAIMED WATER DO NOT DRINK".
4. LOCATE METER REGISTER 5 TO 8 INCHES BELOW COVER.
5. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.

NOTE:
TO ENSURE POSITIVE DRAINAGE, THE VAULT SHALL HAVE AN OPEN BOTTOM TO ALLOW DRAINAGE THROUGH STONE.

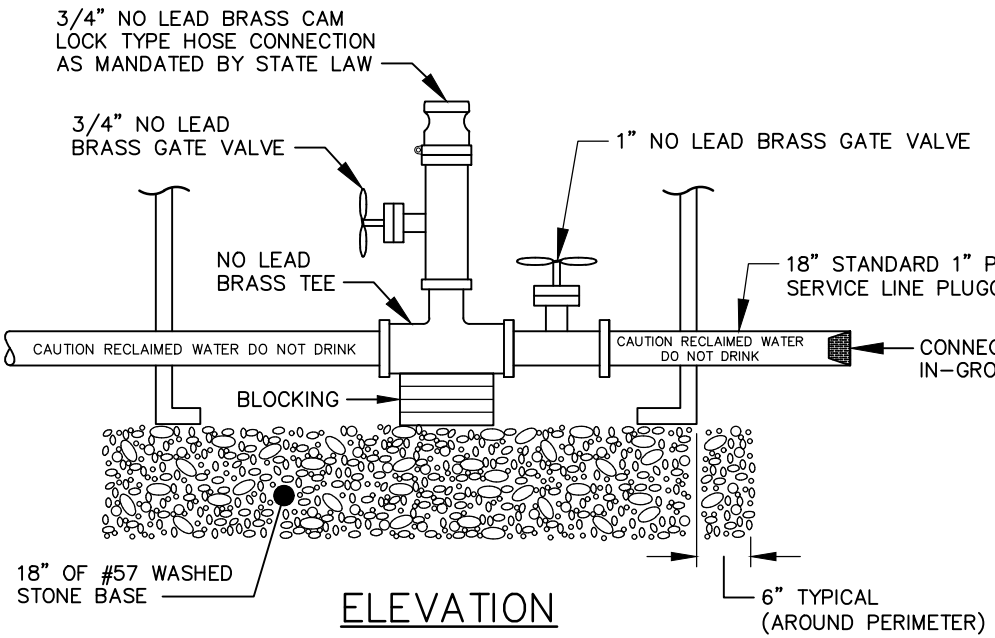
DIMENSIONS (INCHES)	
A	B
18⅜"	30⅛"

CITY OF GOLDSBORO NORTH CAROLINA

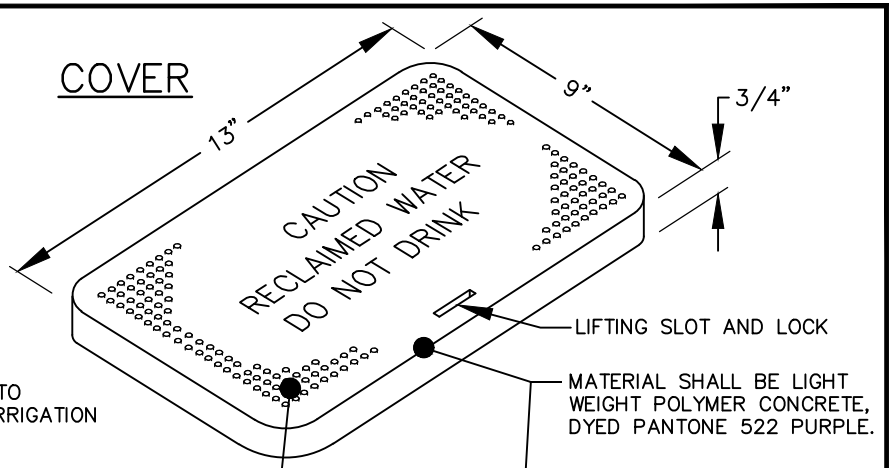
EFFECTIVE: 12/01/18

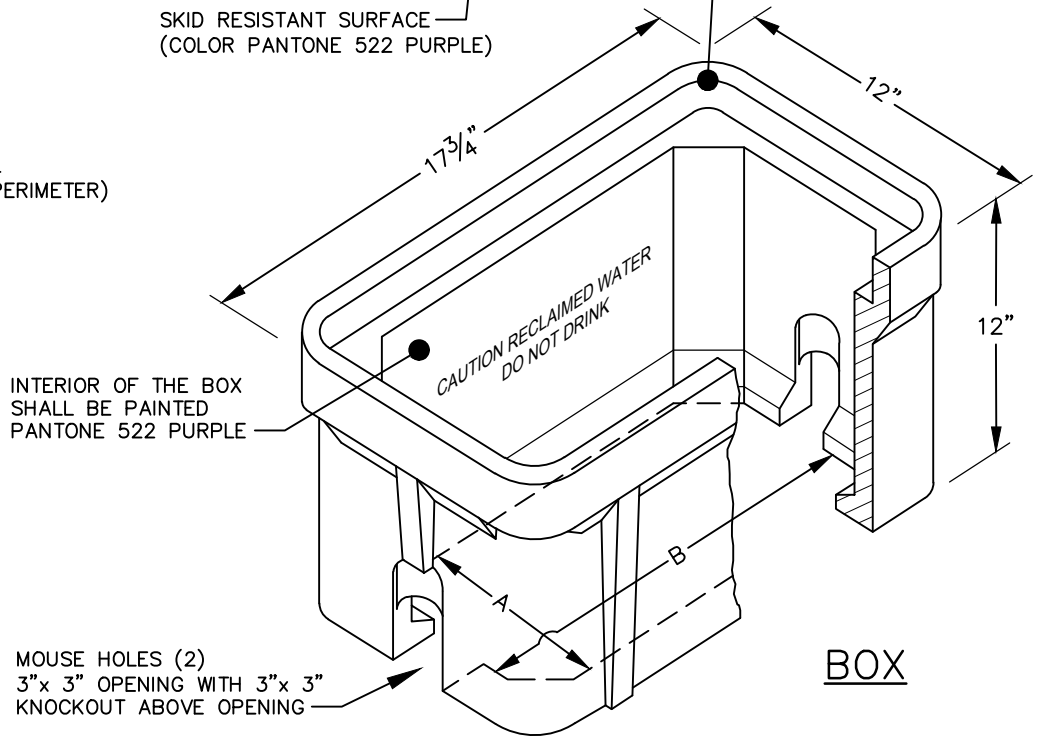
STANDARD 2" RECLAIMED WATER METER INSTALLATION AND VAULT

DETAIL No.
06500.02



ELEVATION





BOX

NOTES:
1. TO ENSURE POSITIVE DRAINAGE, THE VAULT SHALL HAVE AN OPEN BOTTOM TO ALLOW DRAINAGE THROUGH STONE.
2. STANDARD RECLAIMED WATER HOSE BIB AND BOX SHALL BE MAINTAINED ON PRIVATE PROPERTY BY OWNER.
3. PRECAST CONCRETE BOX WITH ALUMINUM ACCESS HATCH WILL BE AN ACCEPTABLE ALTERNATIVE WITH APPROVAL OF THE DIRECTOR OF WATER RESOURCES.
4. THE INTERIOR OF THE BOX SHALL BE STENCILED WITH THE WORDS "CAUTION RECLAIMED WATER DO NOT DRINK".
5. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.

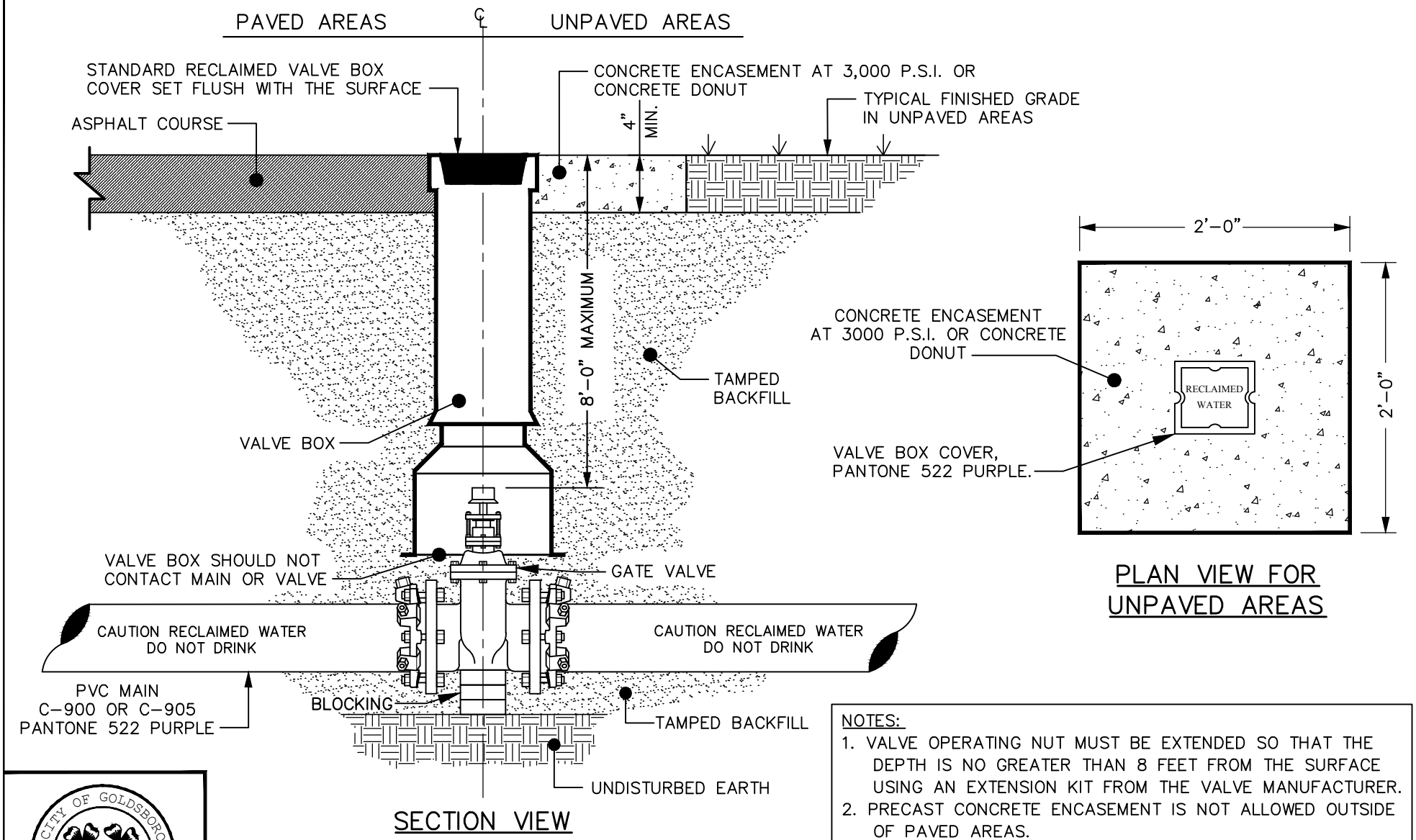
DIMENSIONS (INCHES)	
A	B
10 1/4"	15 1/2"

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD RECLAIMED WATER HOSE BIB AND BOX

DETAIL No.
06500.04
SHEET 1 OF 1



NOTES:

1. VALVE OPERATING NUT MUST BE EXTENDED SO THAT THE DEPTH IS NO GREATER THAN 8 FEET FROM THE SURFACE USING AN EXTENSION KIT FROM THE VALVE MANUFACTURER.
2. PRECAST CONCRETE ENCASEMENT IS NOT ALLOWED OUTSIDE OF PAVED AREAS.

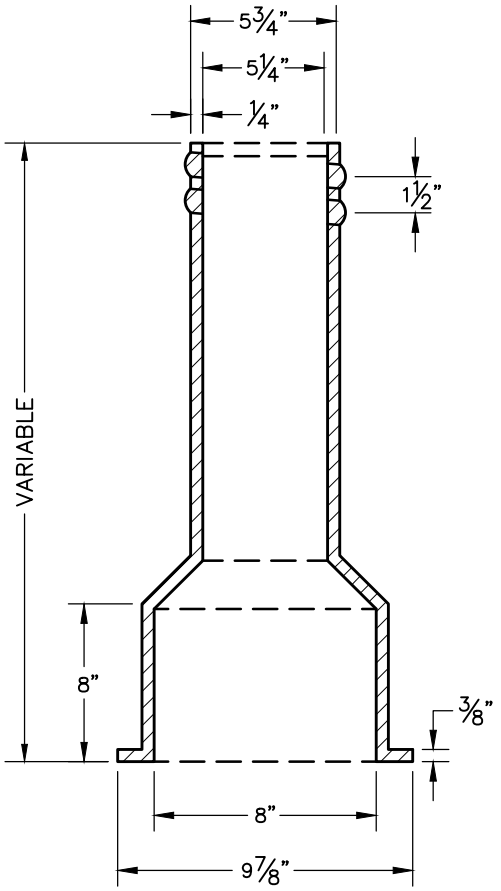
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

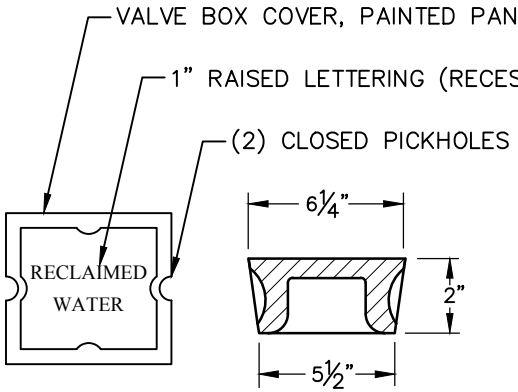
RECLAIMED WATER VALVE BOX INSTALLATION

DETAIL No.

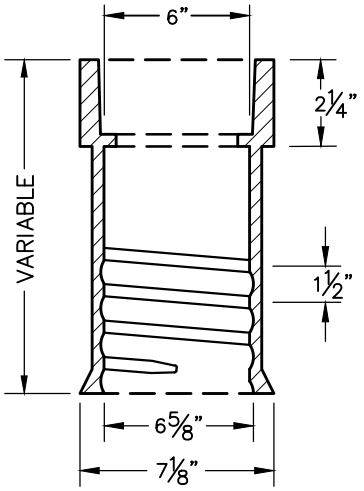
06500.05



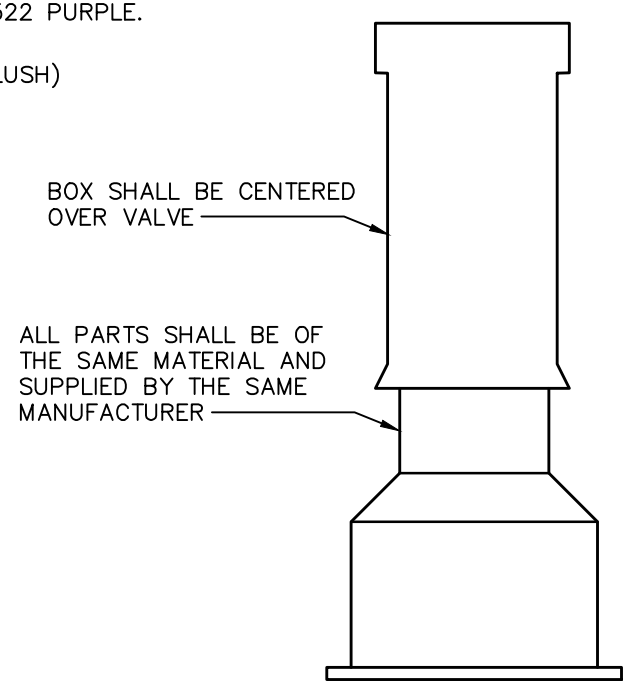
BOTTOM SECTION



LID



SQUARE UPPER SECTION



COMPLETE BOX

NOTES:

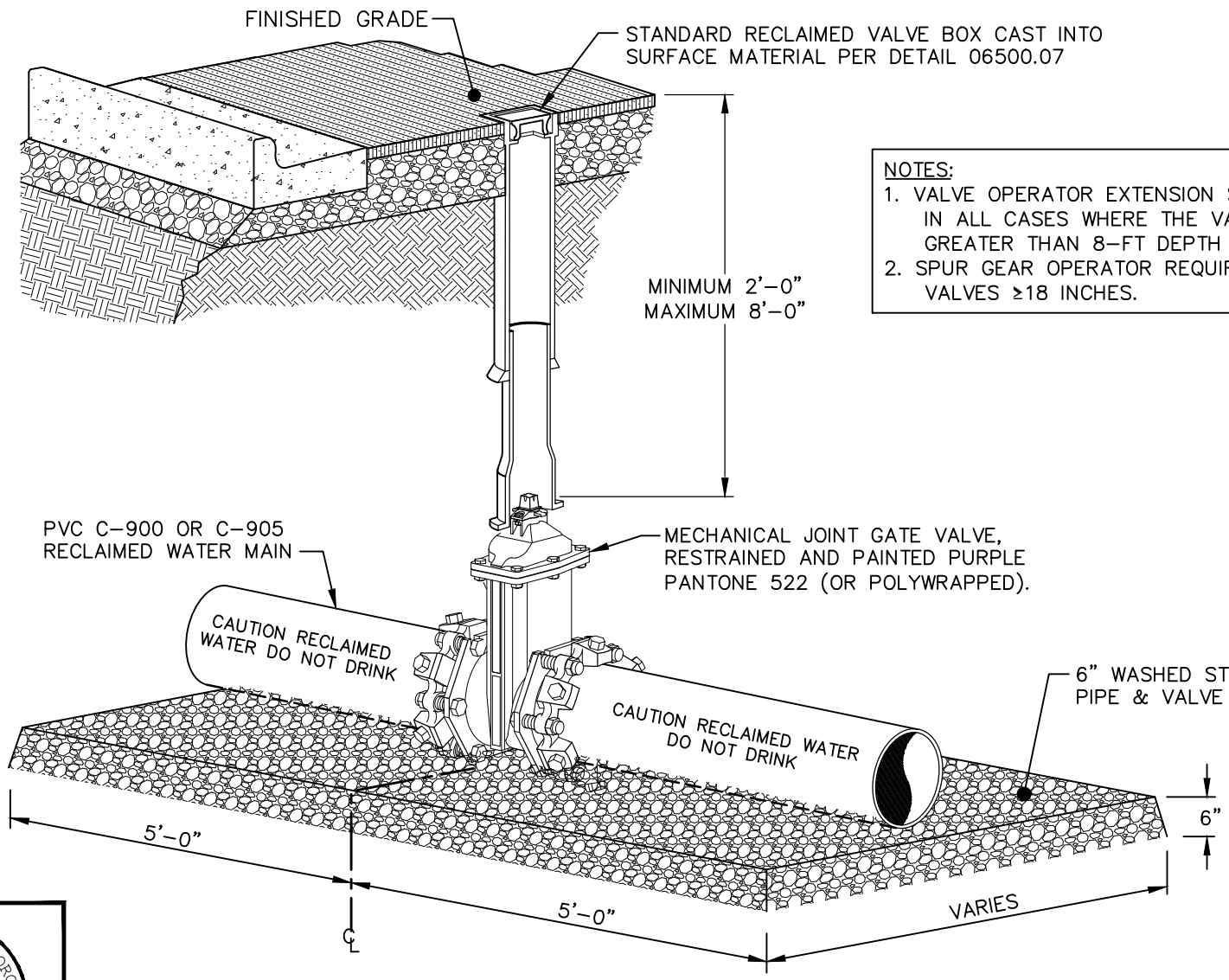
1. VALVE BOX COVER SHALL WEIGH A MINIMUM 13 lbs.
2. ENTIRE VALVE BOX ASSEMBLY & COVER SHALL BE CAST FROM CLASS 35 GRAY IRON.
3. ASSEMBLY SHALL BE DOMESTICALLY MADE AND MANUFACTURED IN THE U.S.A.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD VALVE BOX FOR RECLAIMED WATER

DETAIL No.
06500.05
SHEET 2 OF 2



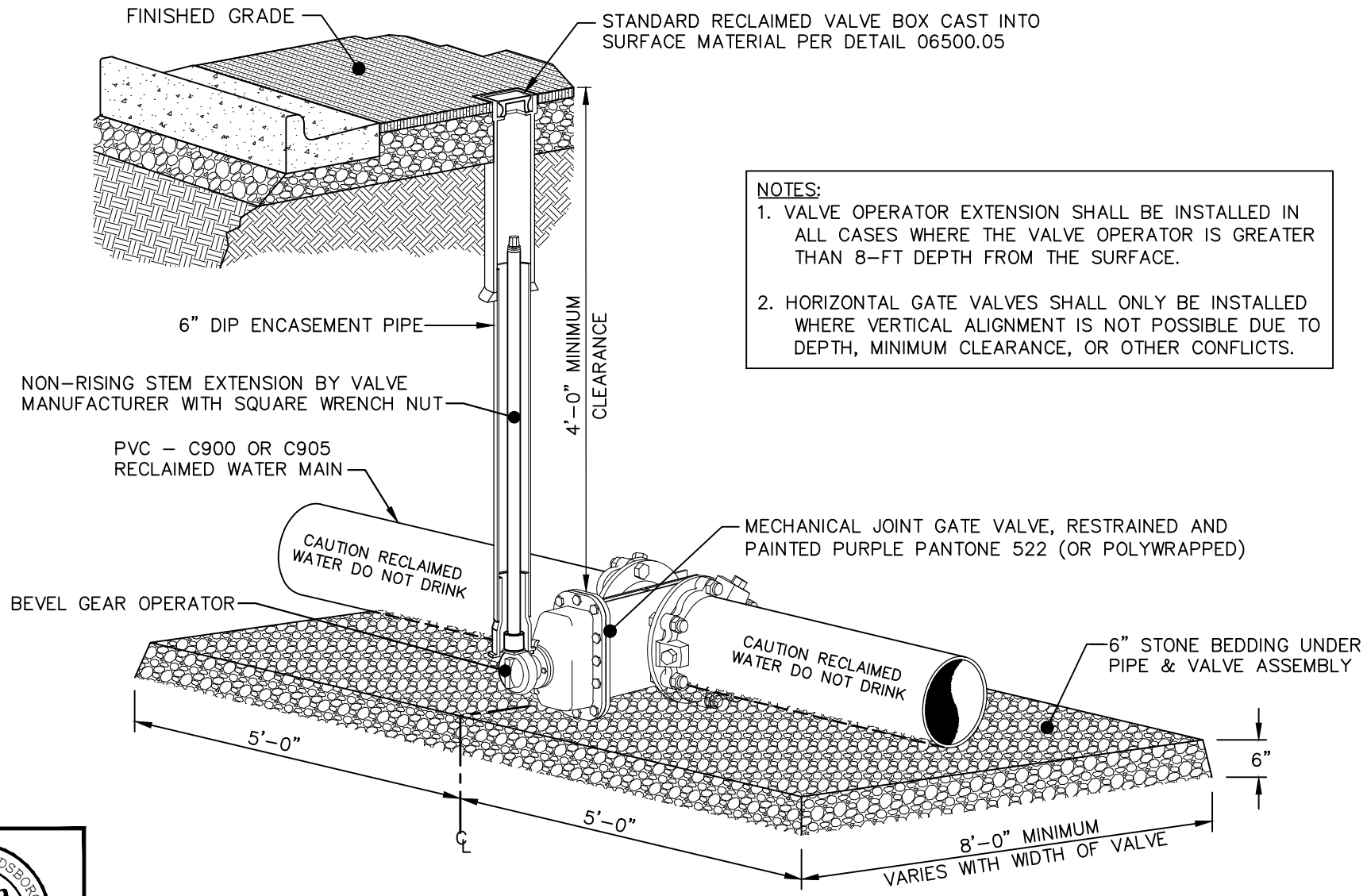
NOTES:
1. VALVE OPERATOR EXTENSION SHALL BE INSTALLED IN ALL CASES WHERE THE VALVE OPERATOR IS GREATER THAN 8–FT DEPTH FROM THE SURFACE.
2. SPUR GEAR OPERATOR REQUIRED FOR GATE VALVES ≥18 INCHES.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

RESILIENT WEDGE GATE VALVE ASSEMBLY FOR RECLAIMED WATER (VERTICAL INSTALLATIONS)

DETAIL No.
06500.06



NOTES:

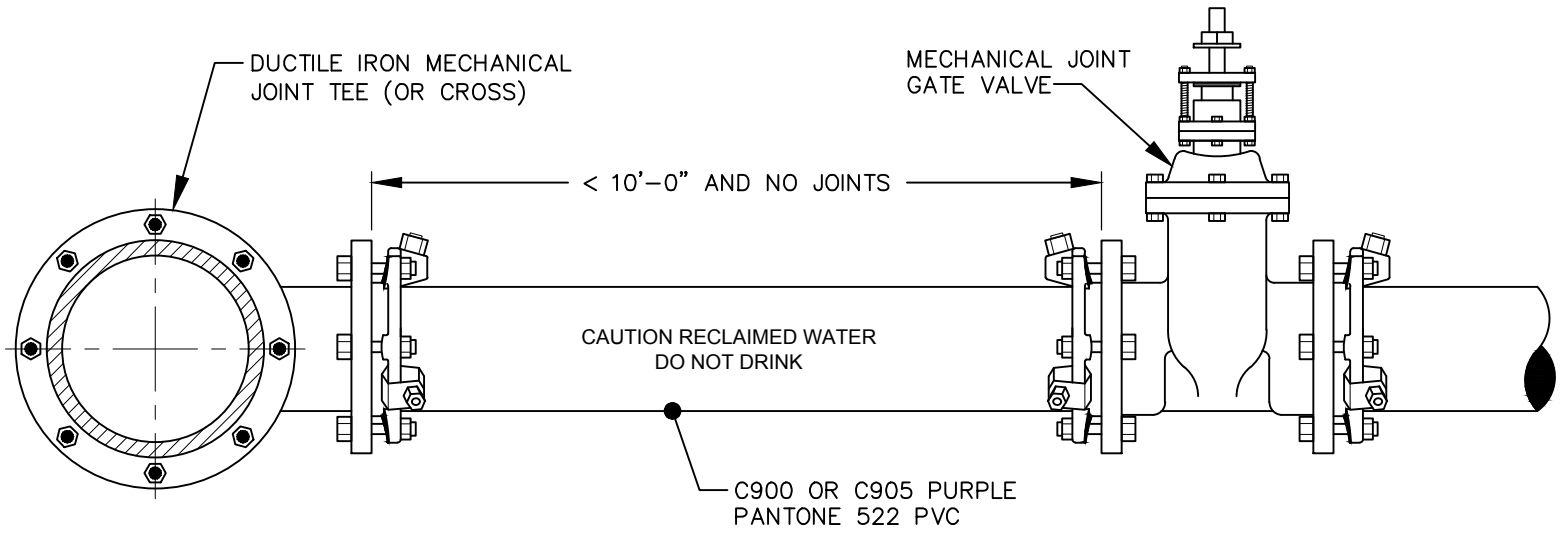
1. VALVE OPERATOR EXTENSION SHALL BE INSTALLED IN ALL CASES WHERE THE VALVE OPERATOR IS GREATER THAN 8-FT DEPTH FROM THE SURFACE.
2. HORIZONTAL GATE VALVES SHALL ONLY BE INSTALLED WHERE VERTICAL ALIGNMENT IS NOT POSSIBLE DUE TO DEPTH, MINIMUM CLEARANCE, OR OTHER CONFLICTS.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

RESILIENT WEDGE GATE VALVE ASSEMBLY FOR RECLAIMED WATER (HORIZONTAL INSTALLATIONS)

DETAIL No.
06500.06



SECTION VIEW

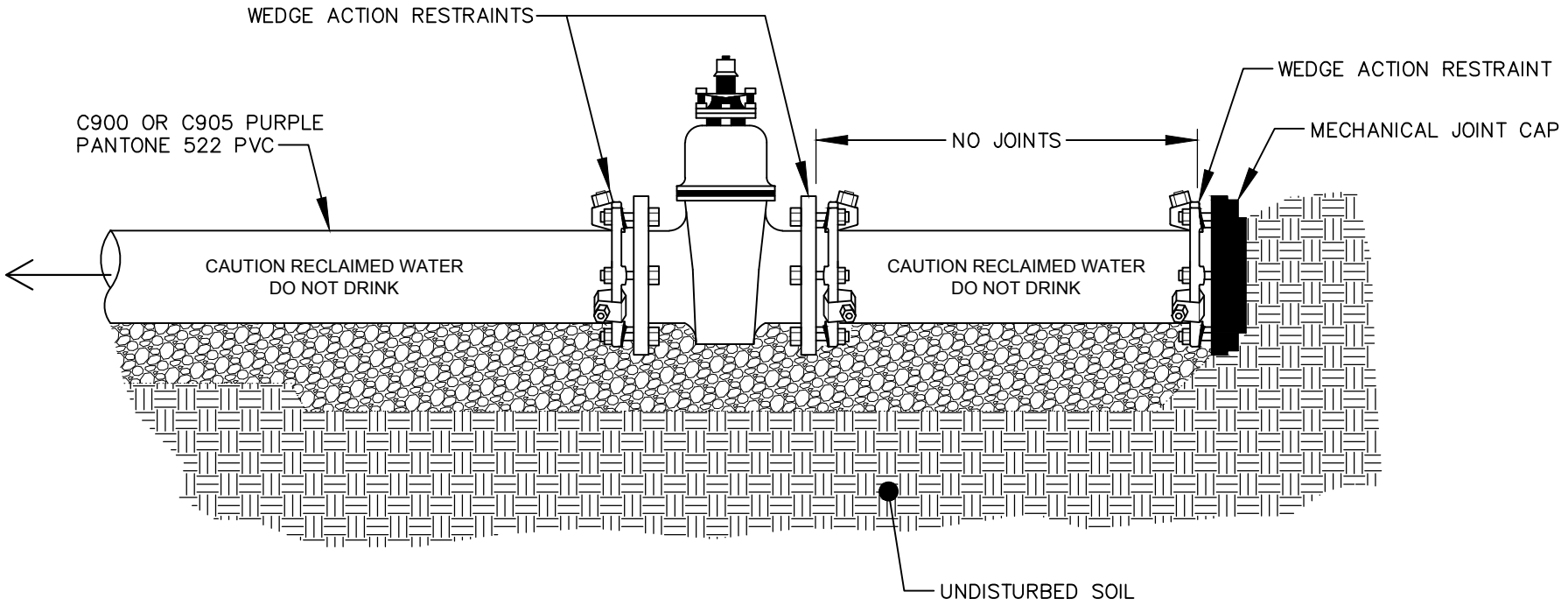
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD RECLAIMED WATER GATE VALVE RESTRAINT AT A TEE OR CROSS

DETAIL No.

06500.06



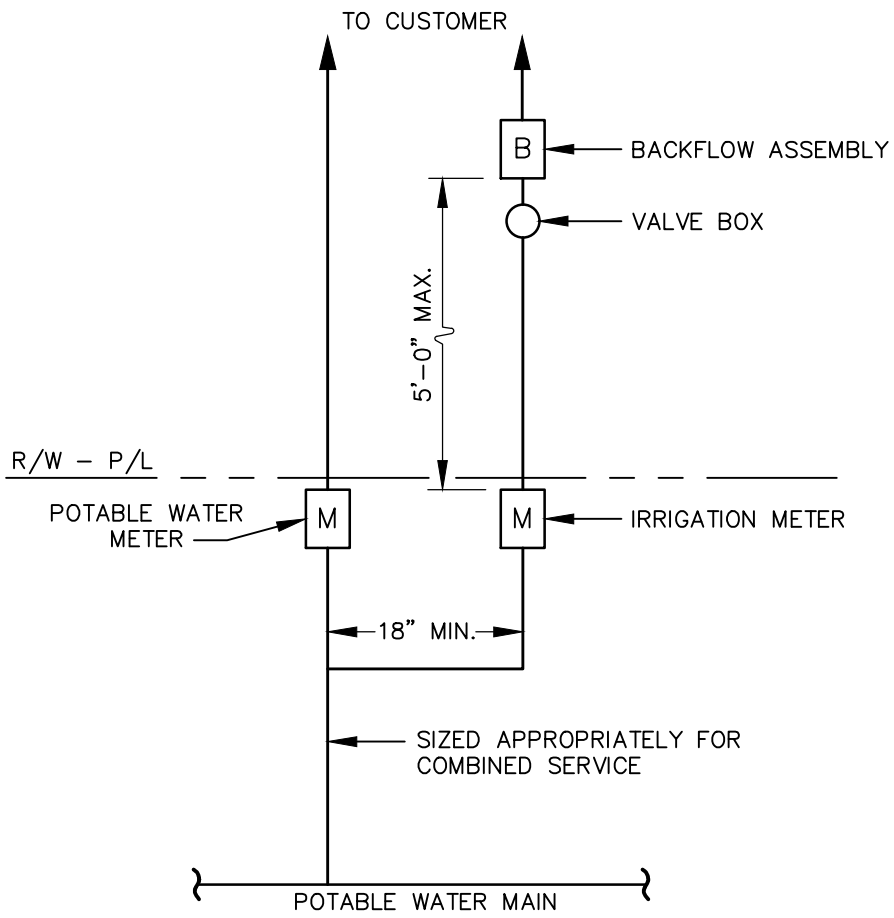
SECTION VIEW

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

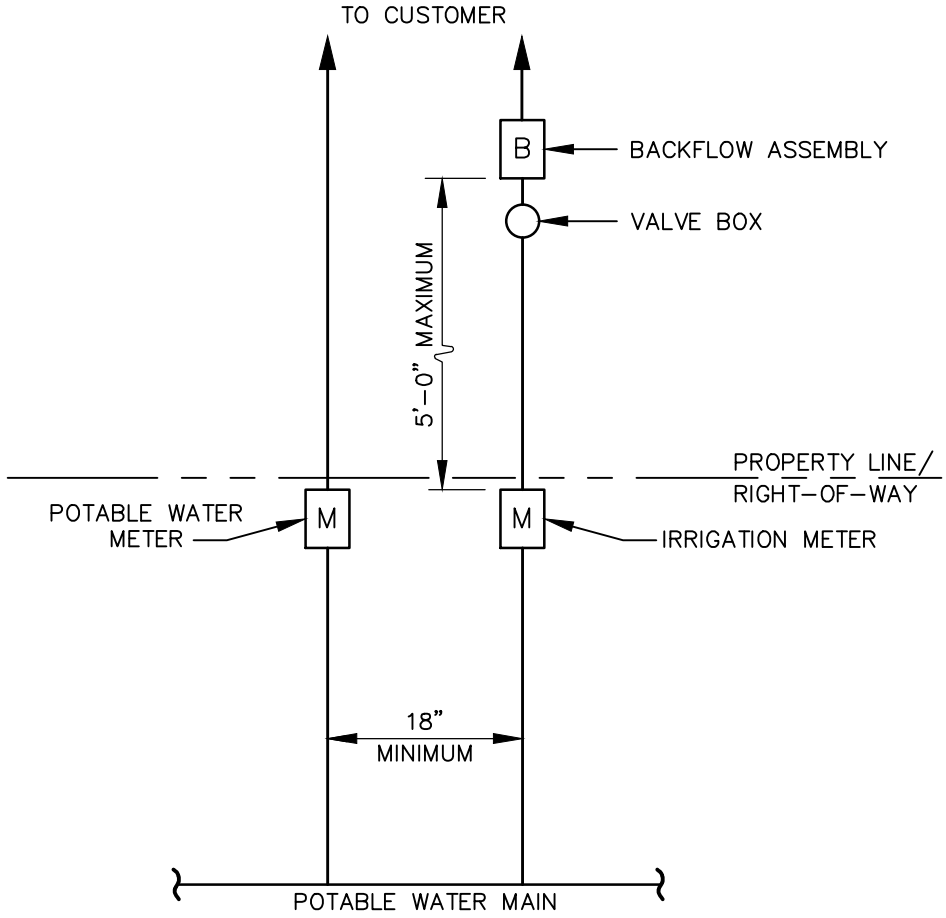
STANDARD CAPPING DETAIL FOR RECLAIMED WATER

DETAIL No.
06500.07
SHEET 1 OF 1



ALTERNATE 1

RETROFIT



ALTERNATE 2

NEW CONSTRUCTION

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

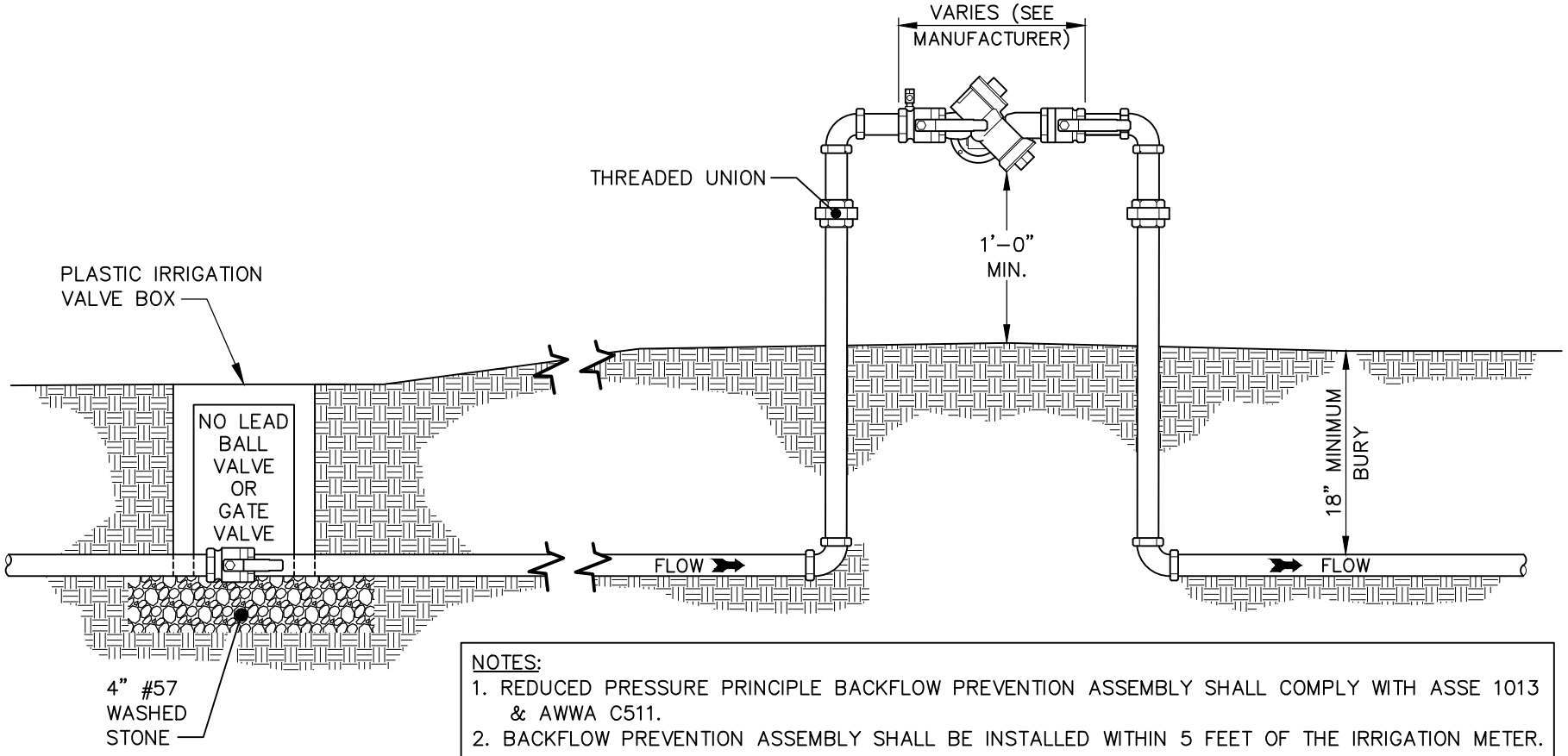
STANDARD IRRIGATION SERVICE CONNECTIONS

DETAIL No.

07000.01

SHEET 1 OF 1

NO LEAD REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY



NOTES:

1. REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1013 & AWWA C511.
2. BACKFLOW PREVENTION ASSEMBLY SHALL BE INSTALLED WITHIN 5 FEET OF THE IRRIGATION METER.
3. PIPE MATERIAL SHALL BE PVC (SCH. 80 OR BETTER), C.T.S. POLY–TUBING, OR 'NO LEAD' BRASS (UNS C89833 PER ASTM B584).
4. IRRIGATION ASSEMBLIES TO BE DRAINED DURING WINTER MONTHS BY PROPERTY OWNER.
5. INSTALLATION SHALL BE IN COMPLIANCE WITH ALL APPLICABLE CITY ORDINANCES AND SPECIFICATIONS IN ADDITION TO THE N.C. PLUMBING CODE.
6. PROPERTY OWNER SHALL BE RESPONSIBLE FOR MAINTENANCE AND OPERATION OF BACKFLOW PREVENTION ASSEMBLY AND COMPLIANCE WITH REPORTING AND TESTING REQUIREMENTS. BACKFLOW DEVICE SHALL BE REMOVED AND DRAINED DURING WINTER STORAGE.
7. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.

CITY OF GOLDSBORO NORTH CAROLINA

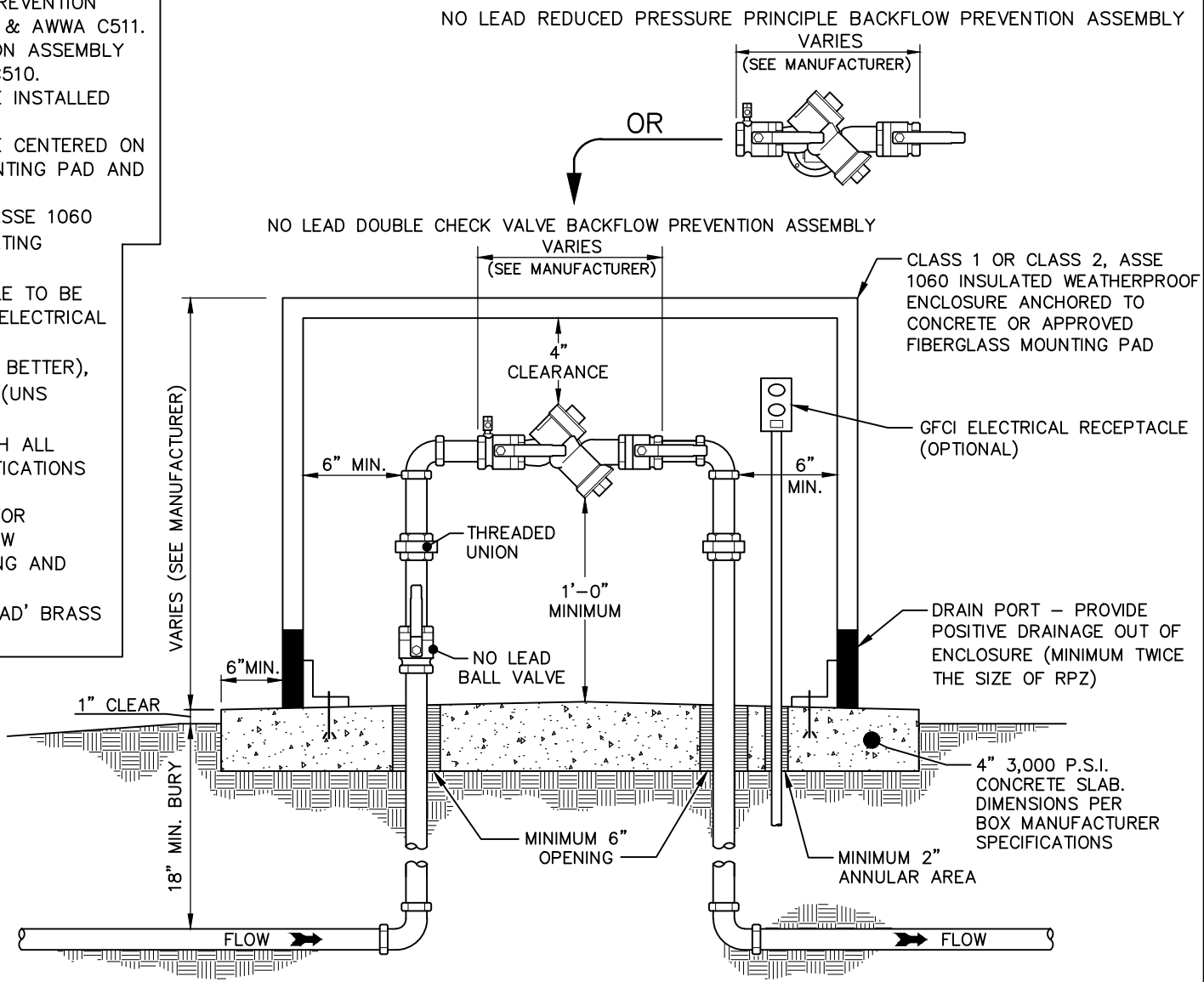
EFFECTIVE: 12/01/18

STANDARD 1" RESIDENTIAL IRRIGATION BACKFLOW ASSEMBLY

DETAIL No.
07000.02
SHEET 1 OF 1

NOTES:

1. REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1013 & AWWA C511.
2. DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1015 & AWWA C510.
3. BACKFLOW PREVENTION ASSEMBLY SHALL BE INSTALLED WITHIN 5 FEET OF THE METER BOX.
4. BACKFLOW PREVENTION ASSEMBLY SHALL BE CENTERED ON CONCRETE OR APPROVED FIBERGLASS MOUNTING PAD AND CENTERED WITHIN ENCLOSURE.
5. MINIMUM INSULATED CLASS I OR CLASS II, ASSE 1060 WEATHERPROOF ENCLOSURE REQUIRED (HEATING OPTIONAL).
6. OPTIONAL 120V GFCI ELECTRICAL RECEPTACLE TO BE INSTALLED IN ACCORDANCE WITH THE N.C. ELECTRICAL CODE FOR OUTDOOR OPERATION.
7. PIPE MATERIAL SHALL BE PVC (SCH. 80 OR BETTER), C.T.S. POLY–TUBING, OR 'NO LEAD' BRASS (UNS C89833 PER ASTM B584).
8. INSTALLATION SHALL BE IN COMPLIANCE WITH ALL APPLICABLE TOWN ORDINANCES AND SPECIFICATIONS IN ADDITION TO THE N.C. PLUMBING CODE.
9. PROPERTY OWNER SHALL BE RESPONSIBLE FOR MAINTENANCE AND OPERATION OF BACKFLOW ASSEMBLY AND COMPLIANCE WITH REPORTING AND TESTING REQUIREMENTS.
10. ALL BRASS COMPONENTS SHALL BE 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.



CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD 1" TO 2" COMMERCIAL OUTDOOR BACKFLOW ASSEMBLY

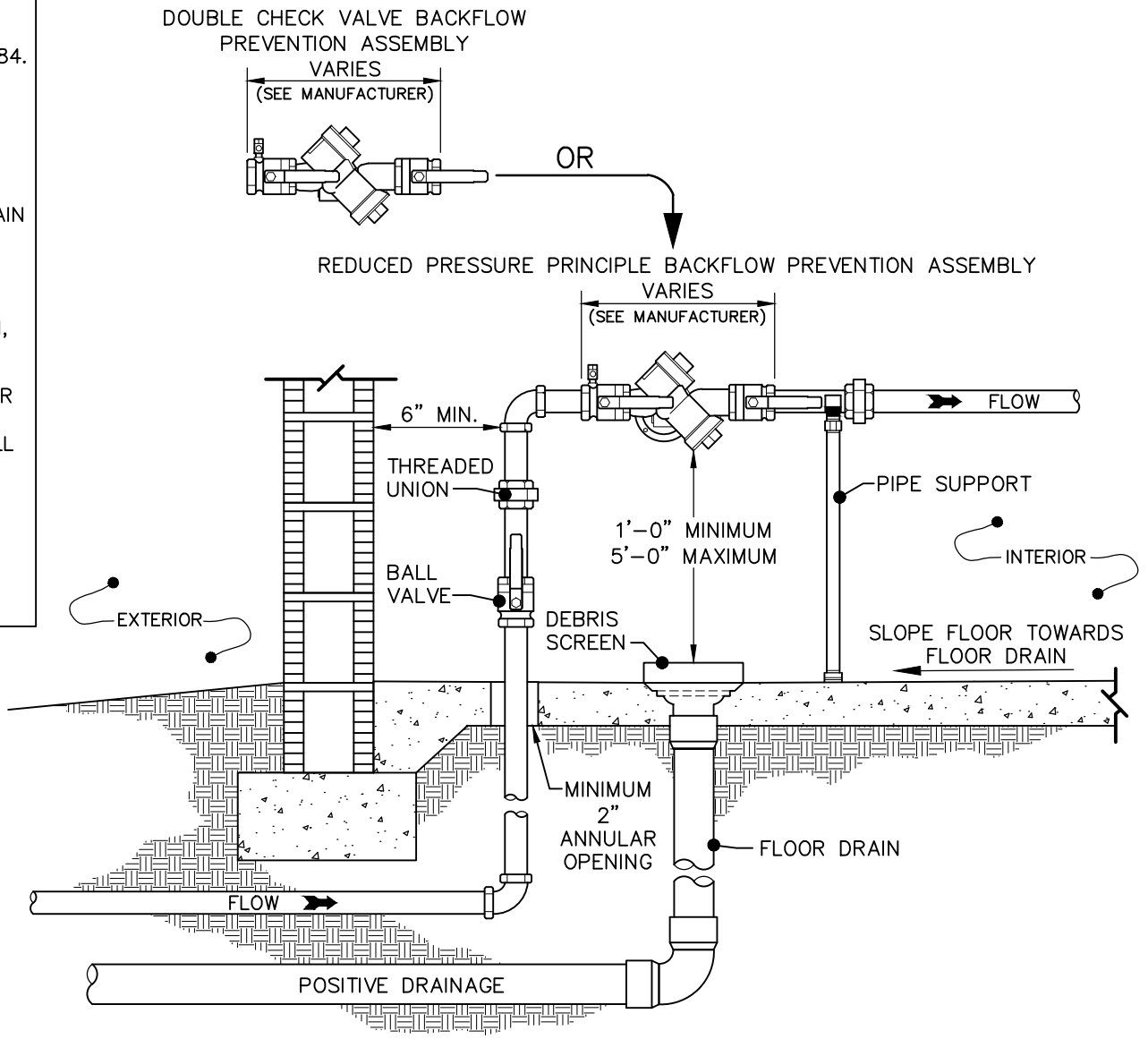
DETAIL No.

07000.03

SHEET 1 OF 1

NOTES:

1. ALL ASSEMBLIES SHALL CONSIST OF 'NO LEAD' BRASS MEETING UNS C89833 AS PER ASTM B584.
2. REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1013 & AWWA C511.
3. DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1015 & AWWA C510.
4. BACKFLOW PREVENTION ASSEMBLY SHALL MAINTAIN MINIMUM CLEARANCES FROM WALLS AND FLOOR AS SPECIFIED.
5. BACKFLOW ASSEMBLY SHALL BE IN A SEPARATE ROOM WITH EXTERIOR DOOR. THIS MAY BE A MECHANICAL ROOM OR A FIRE SPRINKLER ROOM, BUT SHALL BE SEPARATE FROM THE MAIN STRUCTURE.
6. PIPE MATERIAL SHALL BE C.T.S. POLY–TUBING OR BRASS (ASTM B43).
7. INSTALLATION SHALL BE IN COMPLIANCE WITH ALL APPLICABLE TOWN ORDINANCES AND SPECIFICATIONS IN ADDITION TO THE N.C. PLUMBING CODE.
8. PROPERTY OWNER SHALL BE RESPONSIBLE FOR MAINTENANCE AND OPERATION OF BACKFLOW ASSEMBLY AND COMPLIANCE WITH REPORTING AND TESTING REQUIREMENTS.



CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

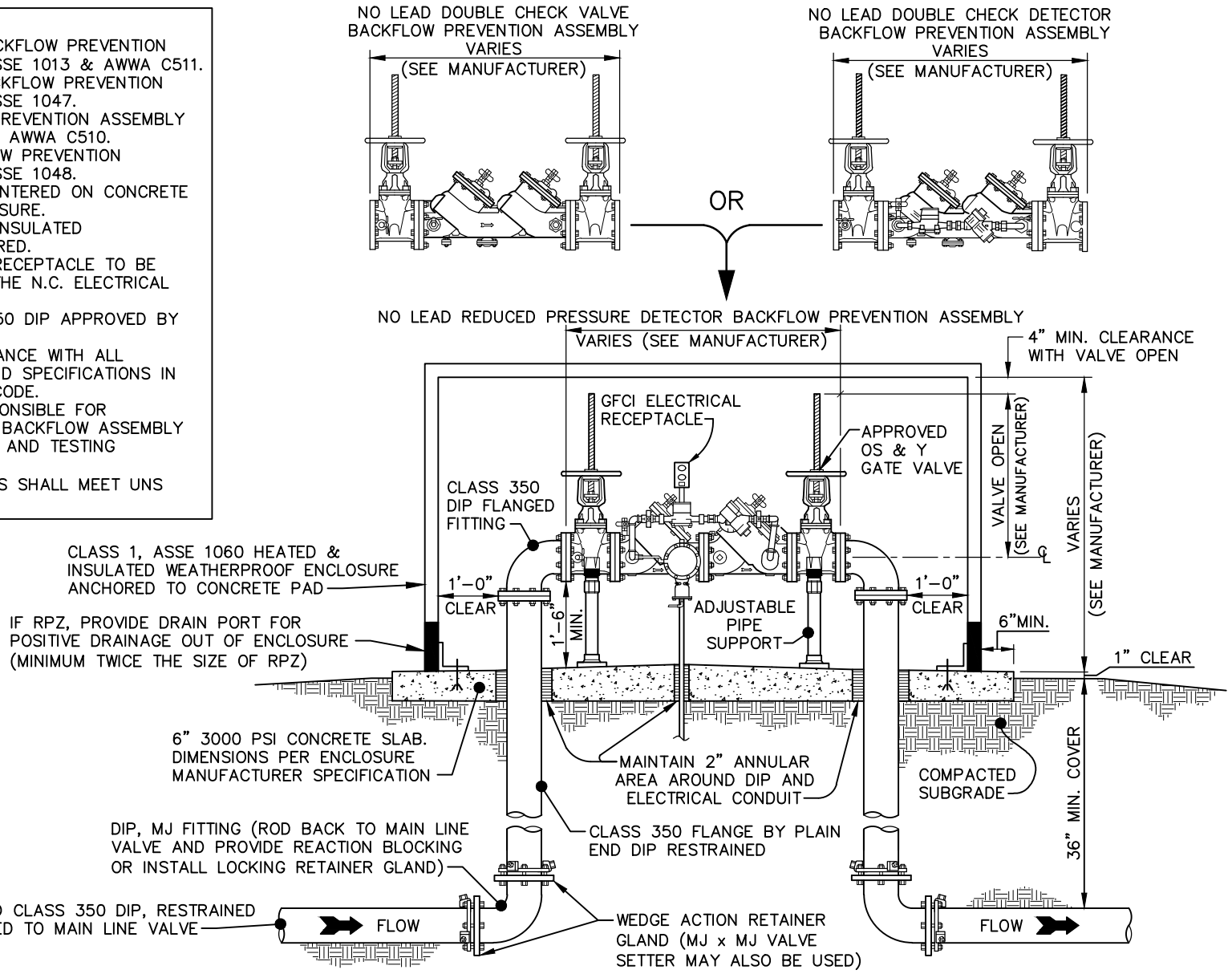
STANDARD 1" TO 2" COMMERCIAL INDOOR BACKFLOW ASSEMBLY

DETAIL No.

07000.04

NOTES:

1. REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1013 & AWWA C511.
2. REDUCED PRESSURE DETECTOR BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1047.
3. DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1015 & AWWA C510.
4. DOUBLE CHECK DETECTOR BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1048.
5. BACKFLOW ASSEMBLY SHALL BE CENTERED ON CONCRETE PAD AND CENTERED WITHIN ENCLOSURE.
6. CLASS I, ASSE 1060 HEATED AND INSULATED WEATHERPROOF ENCLOSURE REQUIRED.
7. STANDARD 120V GFCI ELECTRICAL RECEPTACLE TO BE INSTALLED IN ACCORDANCE WITH THE N.C. ELECTRICAL CODE FOR OUTDOOR OPERATION.
8. PIPE MATERIAL SHALL BE CLASS 350 DIP APPROVED BY THE CITY.
9. INSTALLATION SHALL BE IN COMPLIANCE WITH ALL APPLICABLE TOWN ORDINANCES AND SPECIFICATIONS IN ADDITION TO THE N.C. PLUMBING CODE.
10. PROPERTY OWNER SHALL BE RESPONSIBLE FOR MAINTENANCE AND OPERATION OF BACKFLOW ASSEMBLY AND COMPLIANCE WITH REPORTING AND TESTING REQUIREMENTS.
11. ALL 'NO LEAD' BRASS COMPONENTS SHALL MEET UNS C89833 AS PER ASTM B584.



CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

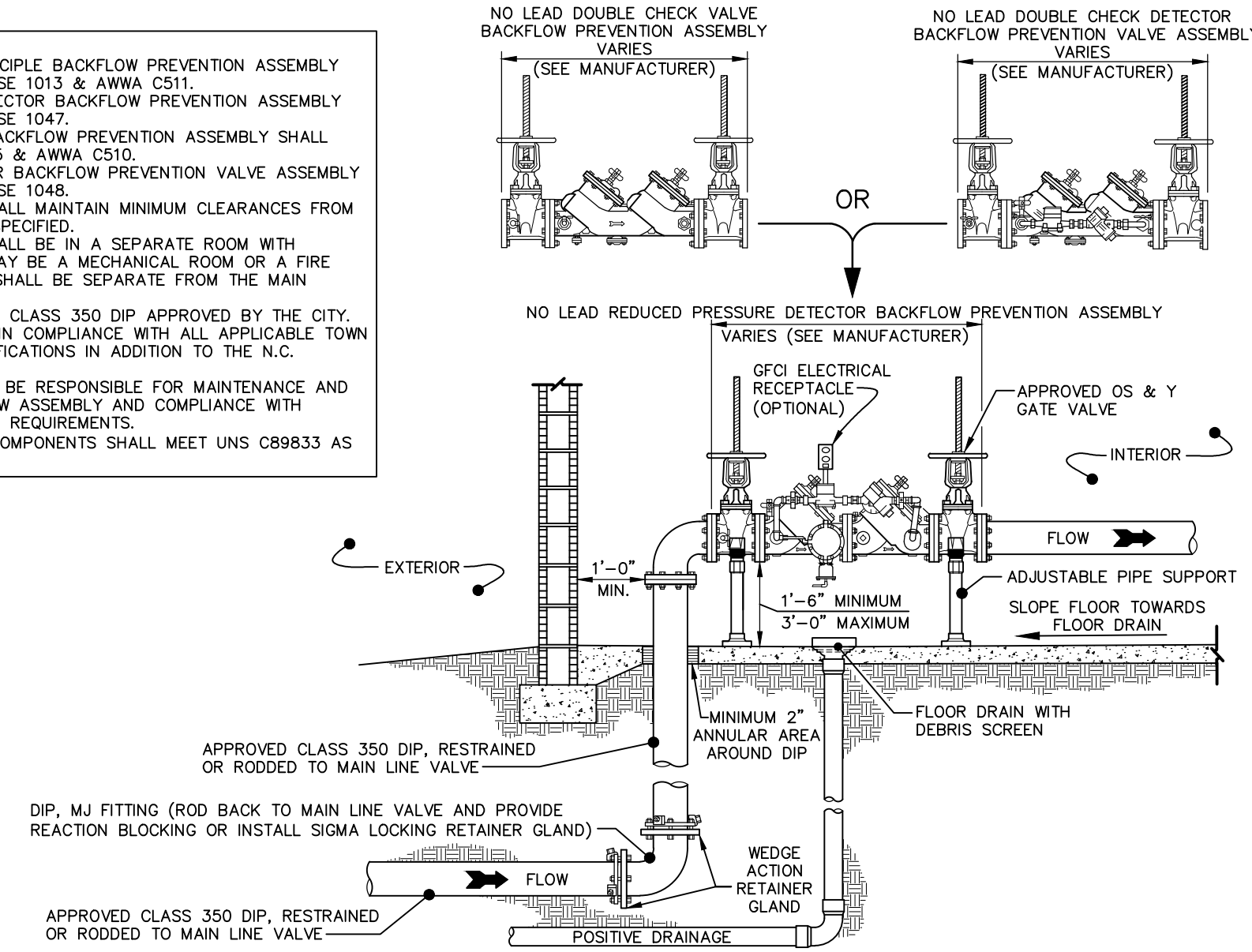
STANDARD COMMERCIAL OUTDOOR BACKFLOW ASSEMBLY - 2 $\frac{1}{2}$" DIAMETER AND LARGER

DETAIL No.

07000.05

SHEET 1 OF 1

NOTES:
1. REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1013 & AWWA C511.
2. REDUCED PRESSURE DETECTOR BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1047.
3. DOUBLE CHECK VALVE BACKFLOW PREVENTION ASSEMBLY SHALL COMPLY WITH ASSE 1015 & AWWA C510.
4. DOUBLE CHECK DETECTOR BACKFLOW PREVENTION VALVE ASSEMBLY SHALL COMPLY WITH ASSE 1048.
5. BACKFLOW ASSEMBLY SHALL MAINTAIN MINIMUM CLEARANCES FROM WALLS AND FLOOR AS SPECIFIED.
6. BACKFLOW ASSEMBLY SHALL BE IN A SEPARATE ROOM WITH EXTERIOR DOOR. THIS MAY BE A MECHANICAL ROOM OR A FIRE SPRINKLER ROOM, BUT SHALL BE SEPARATE FROM THE MAIN STRUCTURE.
7. PIPE MATERIAL SHALL BE CLASS 350 DIP APPROVED BY THE CITY.
8. INSTALLATION SHALL BE IN COMPLIANCE WITH ALL APPLICABLE TOWN ORDINANCES AND SPECIFICATIONS IN ADDITION TO THE N.C. PLUMBING CODE.
9. PROPERTY OWNER SHALL BE RESPONSIBLE FOR MAINTENANCE AND OPERATION OF BACKFLOW ASSEMBLY AND COMPLIANCE WITH REPORTING AND TESTING REQUIREMENTS.
10. ALL 'NO LEAD' BRASS COMPONENTS SHALL MEET UNS C89833 AS PER ASTM B584.

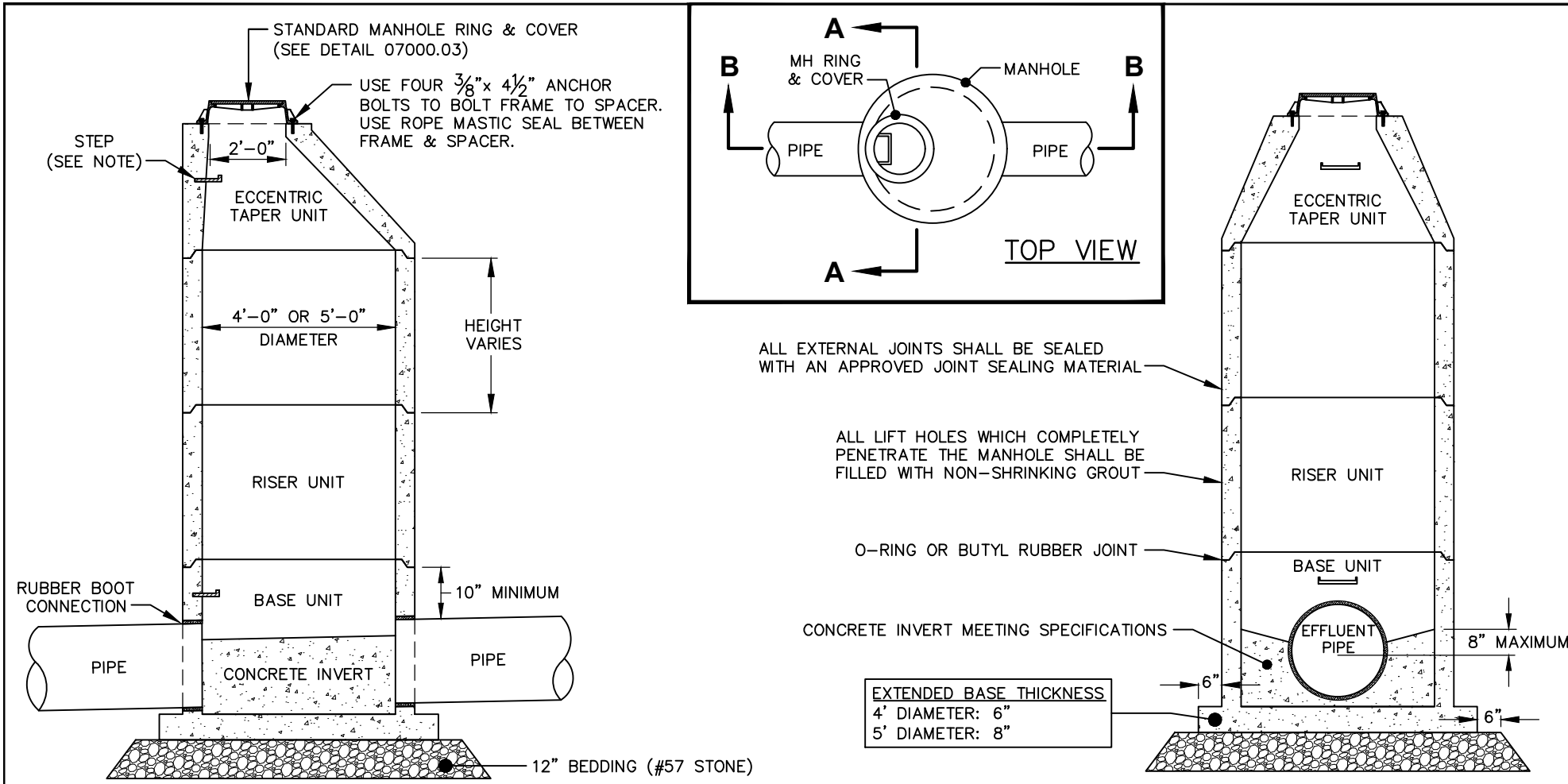


CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD COMMERCIAL INDOOR BACKFLOW ASSEMBLY - 2 $\frac{1}{2}$" DIAMETER AND LARGER

DETAIL No.
07000.06
SHEET 1 OF 1



SECTION B-B

SECTION A-A

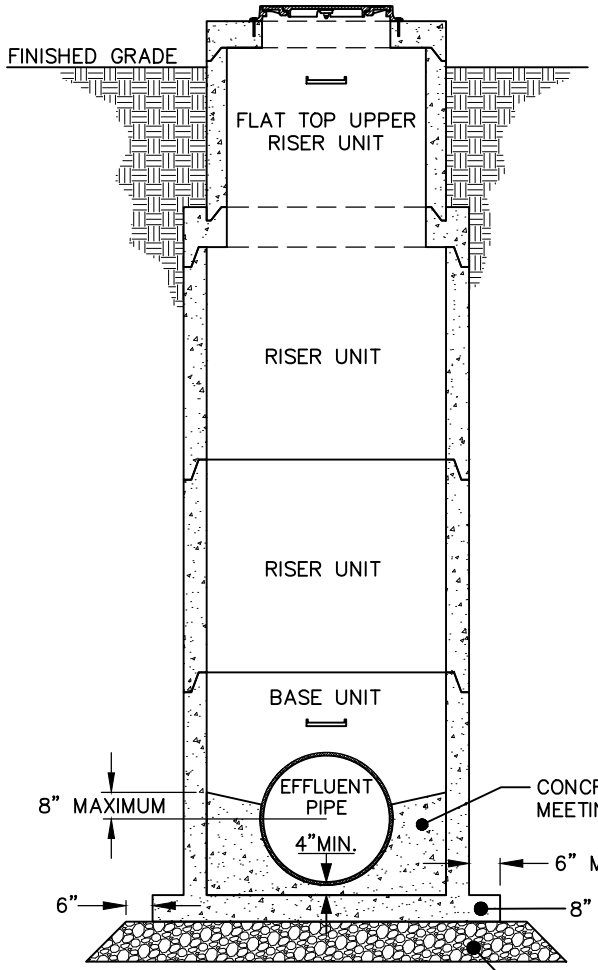
NOTES:
1. ALL MANHOLE CONNECTIONS SHALL BE PREFABRICATED OR CORED WITH A CONCRETE CORING MACHINE.
2. ALL MANHOLES SHALL BE VACUUM TESTED.
3. EXTENDED BASE REQUIRED FOR ALL MANHOLES WITH MORE THAN 12-FT DEPTH OF BURY.
4. PROVIDE A MINIMUM 0.1 FOOT IN-OUT DROP FOR STRAIGHT RUNS AND 0.2 FOOT IN-OUT DROP FOR ANGLE RUNS.
5. PROVIDE ONLY FIRST AND LAST STEP IN MANHOLE.

CITY OF GOLDSBORO NORTH CAROLINA

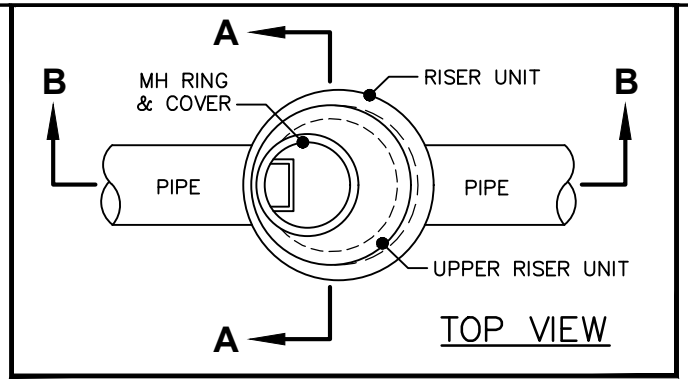
EFFECTIVE: 12/01/18

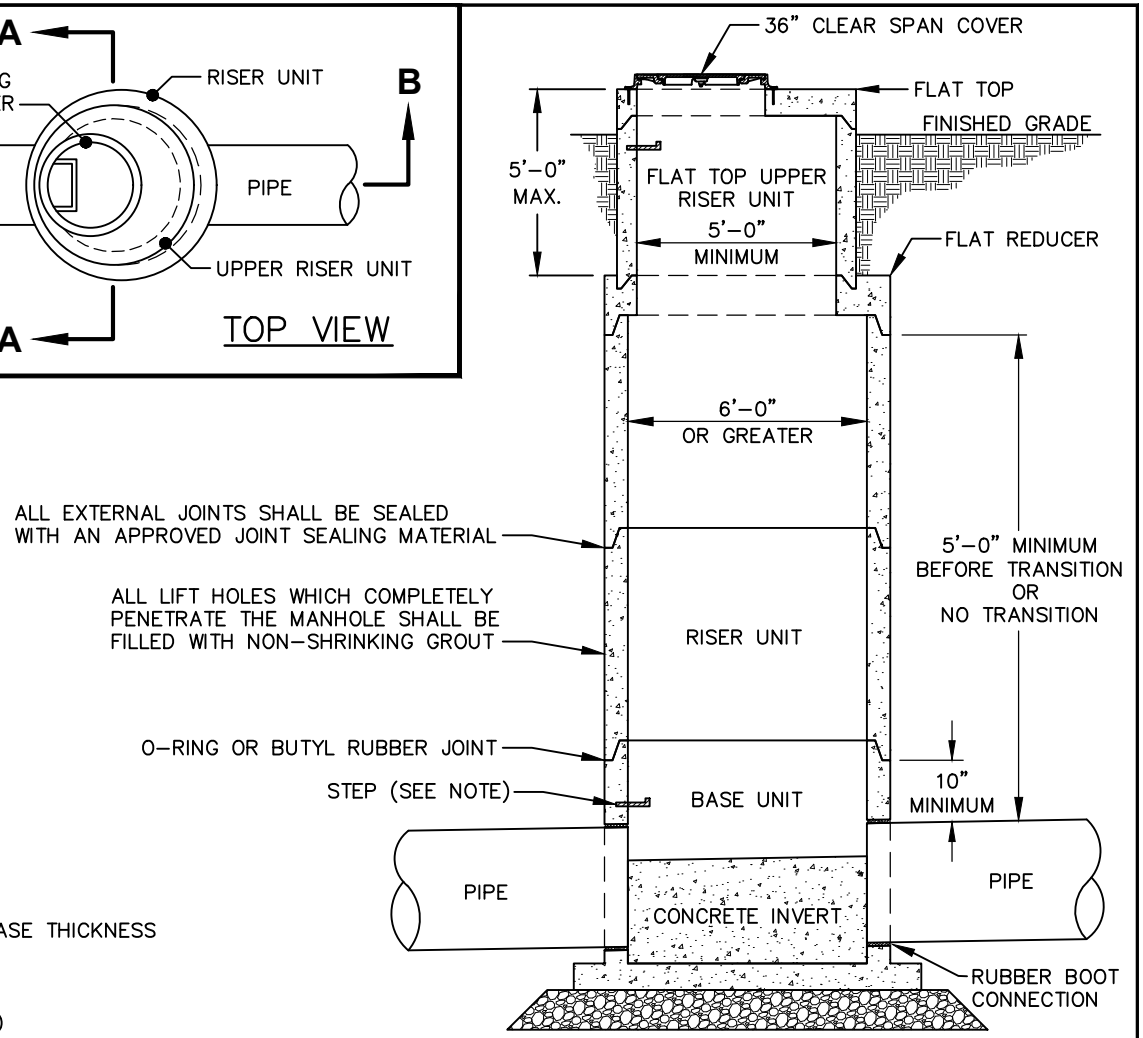
STANDARD PRECAST CONCRETE MANHOLE

DETAIL No.
08000.01
SHEET 1 OF 4



SECTION A–A





SECTION B–B

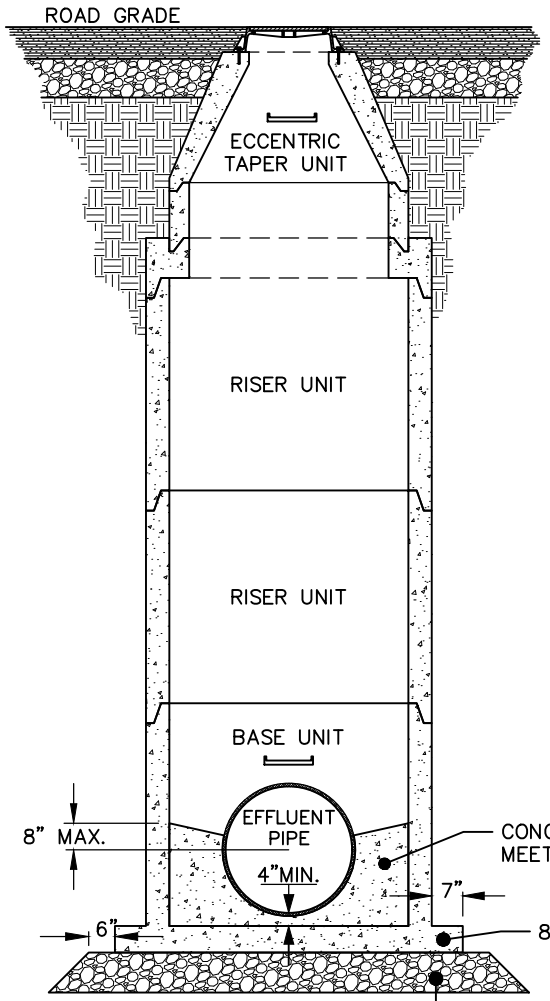
NOTES:
1. ALL MANHOLE CONNECTIONS SHALL BE PREFABRICATED OR CORED WITH A CONCRETE CORING MACHINE.
2. ALL MANHOLES SHALL BE VACUUM TESTED.
3. EXTENDED BASE REQUIRED FOR ALL MANHOLES WITH MORE THAN 12–FT DEPTH OF BURY.
4. PROVIDE A MINIMUM 0.1 FOOT IN–OUT DROP FOR STRAIGHT RUNS AND 0.2 FOOT IN–OUT DROP FOR ANGLE RUNS.
5. PROVIDE ONLY FIRST AND LAST STEP IN MANHOLE.

CITY OF GOLDSBORO NORTH CAROLINA

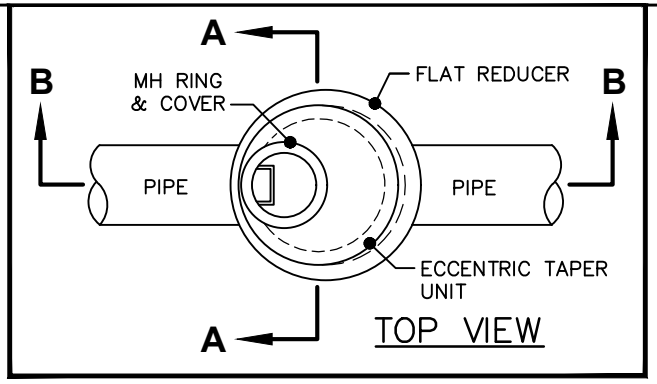
EFFECTIVE: 12/01/18

STANDARD PRECAST CONCRETE MANHOLE 6' DIAMETER OR LARGER FOR NON-PAVED AREAS

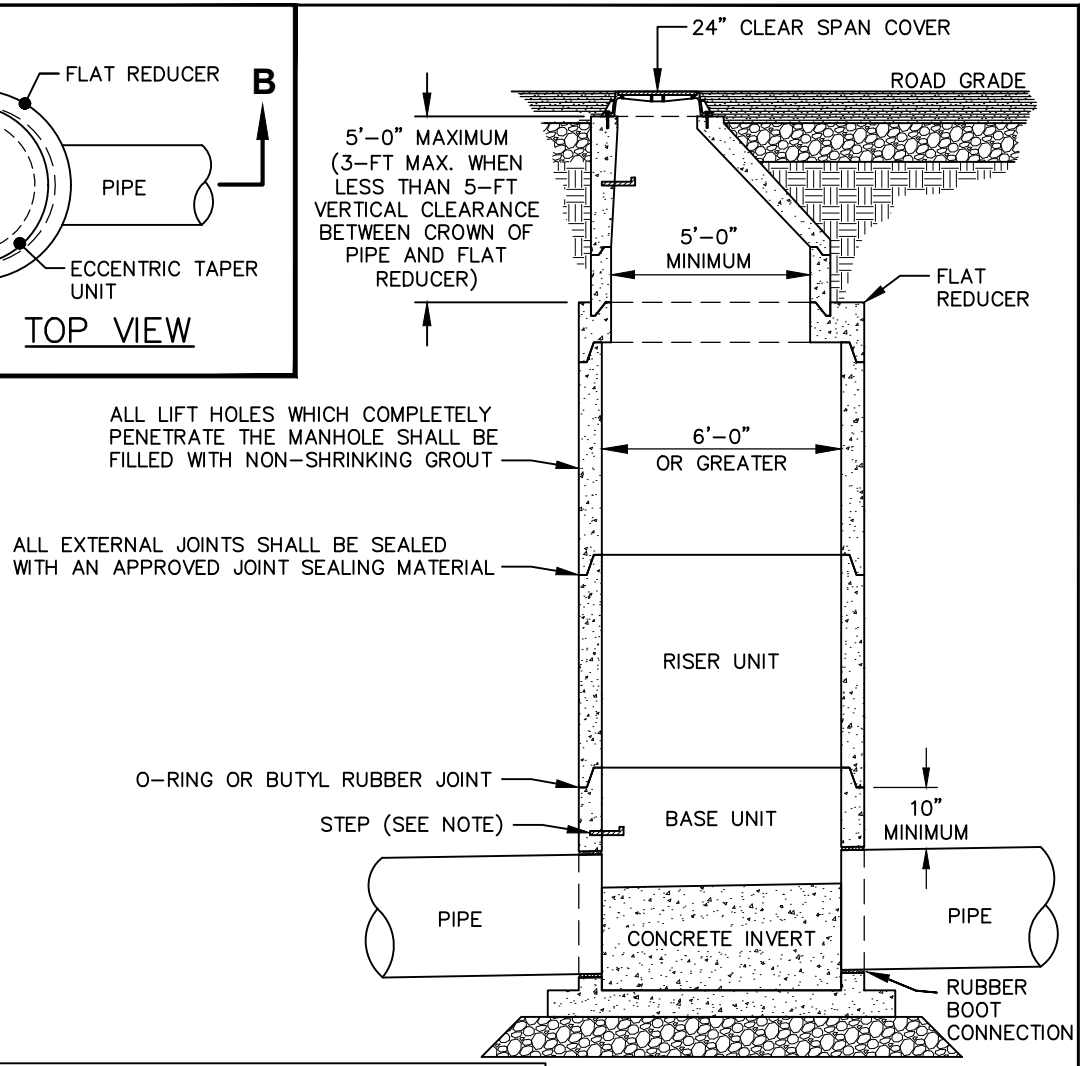
DETAIL No.
08000.01
SHEET 2 OF 4



SECTION A–A



TOP VIEW



SECTION B–B

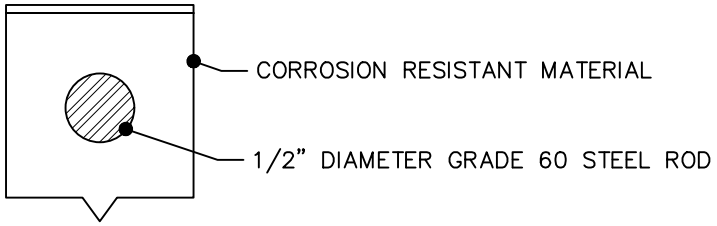
NOTES:
1. ALL MANHOLE CONNECTIONS SHALL BE PREFABRICATED OR CORED WITH A CONCRETE CORING MACHINE.
2. ALL MANHOLES SHALL BE VACUUM TESTED.
3. EXTENDED BASE REQUIRED FOR ALL MANHOLES WITH MORE THAN 12–FT DEPTH OF BURY.
4. PROVIDE A MINIMUM 0.1 FOOT IN–OUT DROP FOR STRAIGHT RUNS AND 0.2 FOOT IN–OUT DROP FOR ANGLE RUNS.
5. PROVIDE ONLY FIRST AND LAST STEP IN MANHOLE.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

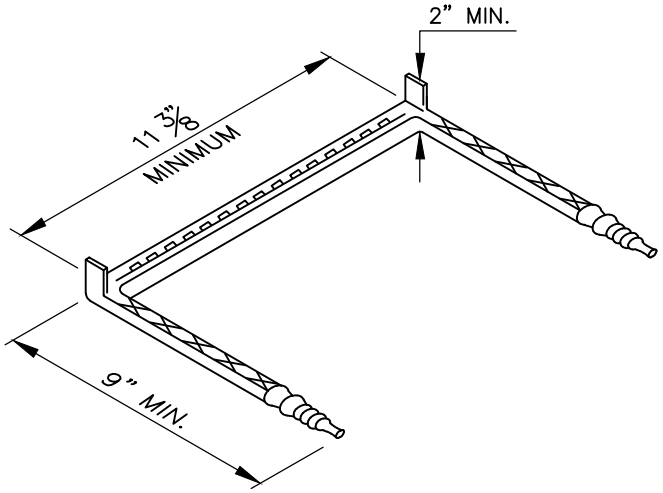
STANDARD PRECAST CONCRETE MANHOLE 6' DIAMETER OR LARGER FOR PAVED AREAS

DETAIL No.
08000.01
SHEET 3 OF 4



SECTION VIEW

NOTES:
1. VERTICAL SPACING = 16 INCHES ON CENTER, ON VERTICAL WALL ONLY.
2. STEPS TO PROTRUDE MINIMUM 5 INCHES FROM FACE OF STRUCTURE WALL.
3. STEPS SHALL MEET THE REQUIREMENTS OF ASTM C478 IN ADDITION TO A HORIZONTAL PULL-OUT LOAD OF 1000 LBS. WHEN INSTALLED.
4. ALL STEPS SHALL BE VERTICALLY ALIGNED IN A STRAIGHT LINE.
5. NO STEPS LOCATED INSIDE MANHOLE CHIMNEY.
6. ONLY THE FIRST AND LAST STEP SHALL BE PROVIDED IN SANITARY SEWER MANHOLES.



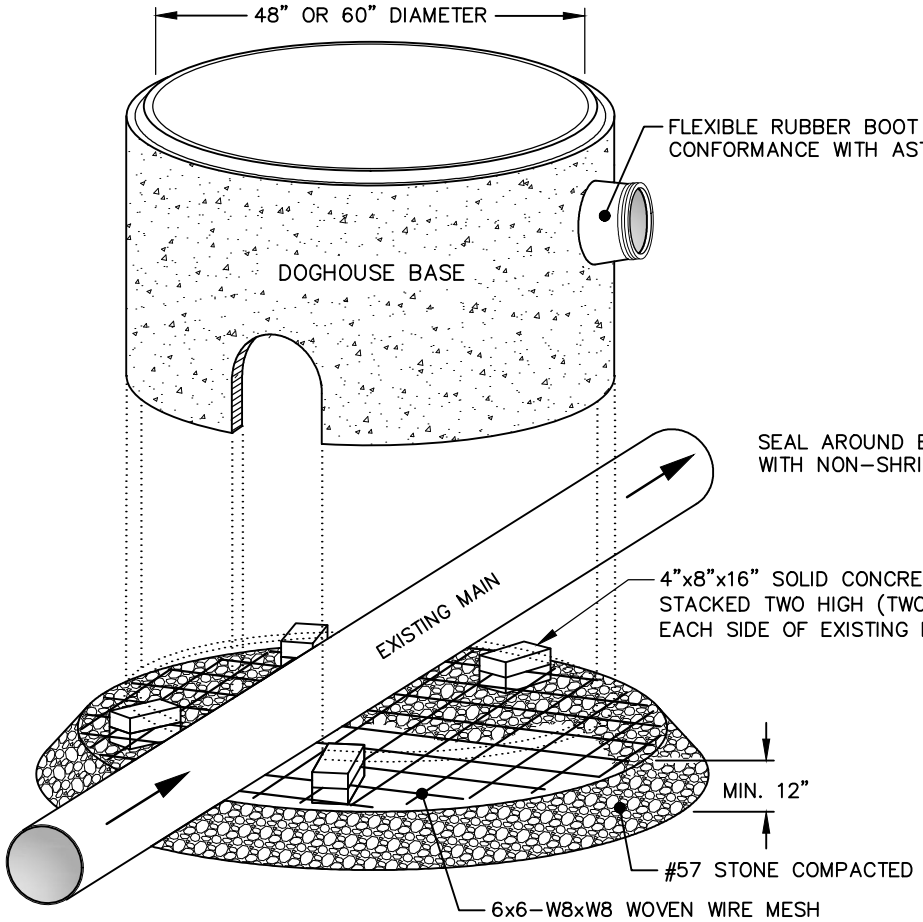
ENCAPSULATED STEEL STEP

CITY OF GOLDSBORO NORTH CAROLINA

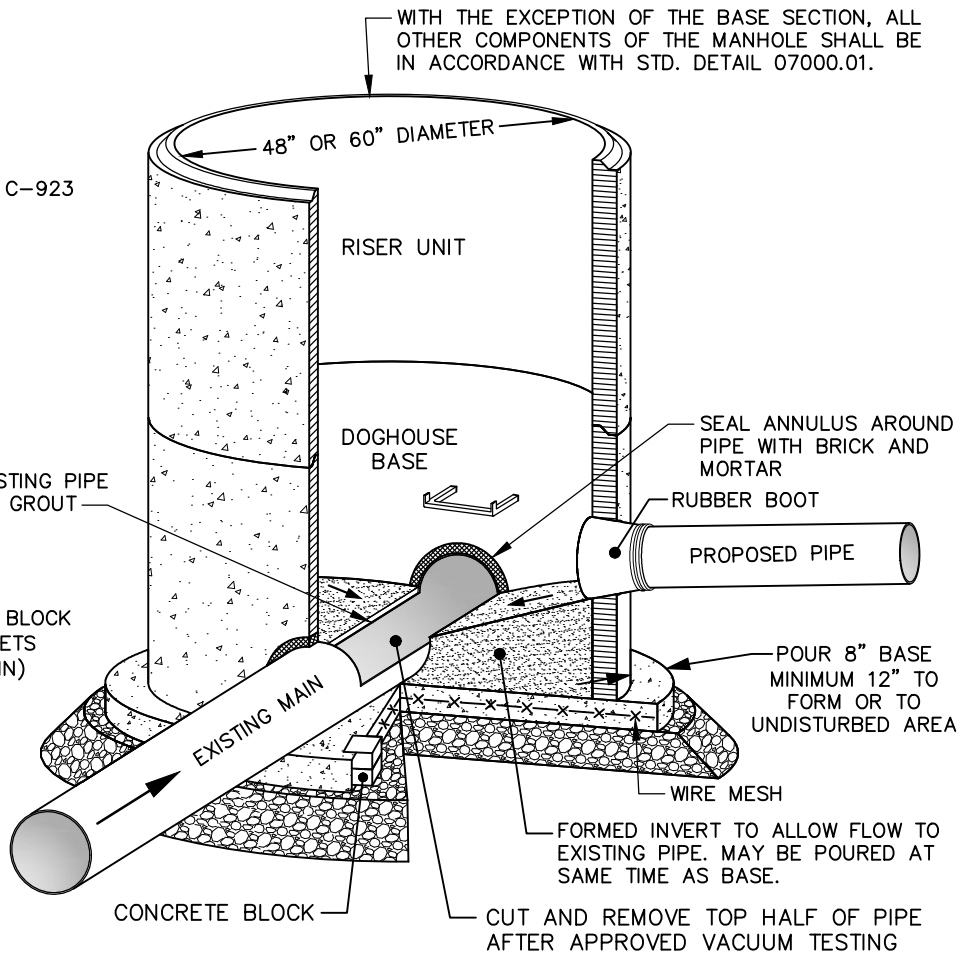
EFFECTIVE: 12/01/18

STANDARD MANHOLE STEPS

DETAIL No.
08000.01
SHEET 4 OF 4



BASE UNIT INSTALLMENT



INVERT INSTALLMENT

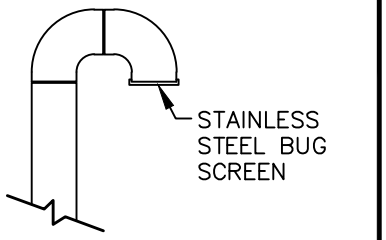
NOTES:
1. DOGHOUSE OPENINGS IN PRECAST UNITS SHALL HAVE A RADIUS OF 4 TO 8 INCHES LARGER THAN THE EXISTING PIPE DIAMETER.
2. CAST-IN-PLACE CONCRETE SHALL BE 4000 PSI, PER ASTM C-94.
3. ALL PRECAST MANHOLE COMPONENTS SHALL MEET ASTM C-478.
4. BENCH SHALL SLOPE UPWARD FROM THE SPRINGLINE TO THE PROJECTED LEVEL OF THE PIPE CROWN OR 8 INCHES ABOVE THE SPRINGLINE, WHICHEVER IS LESS.

CITY OF GOLDSBORO NORTH CAROLINA

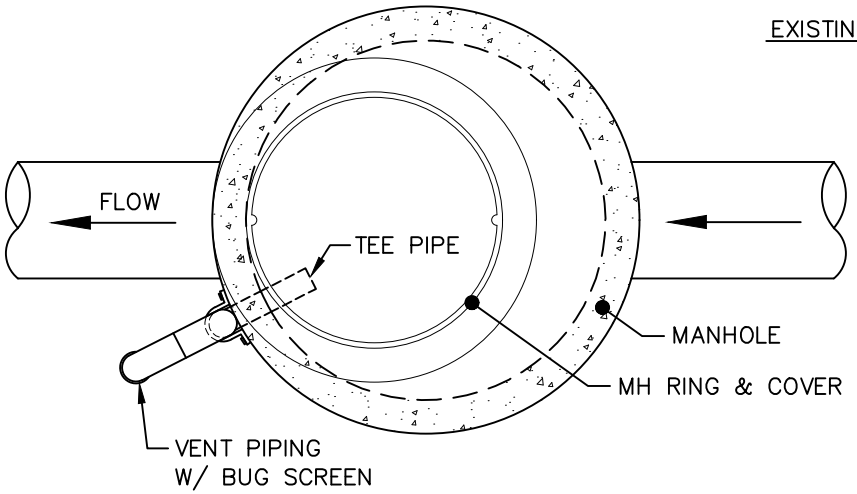
EFFECTIVE: 12/01/18

STANDARD PRECAST CONCRETE DOGHOUSE MANHOLE

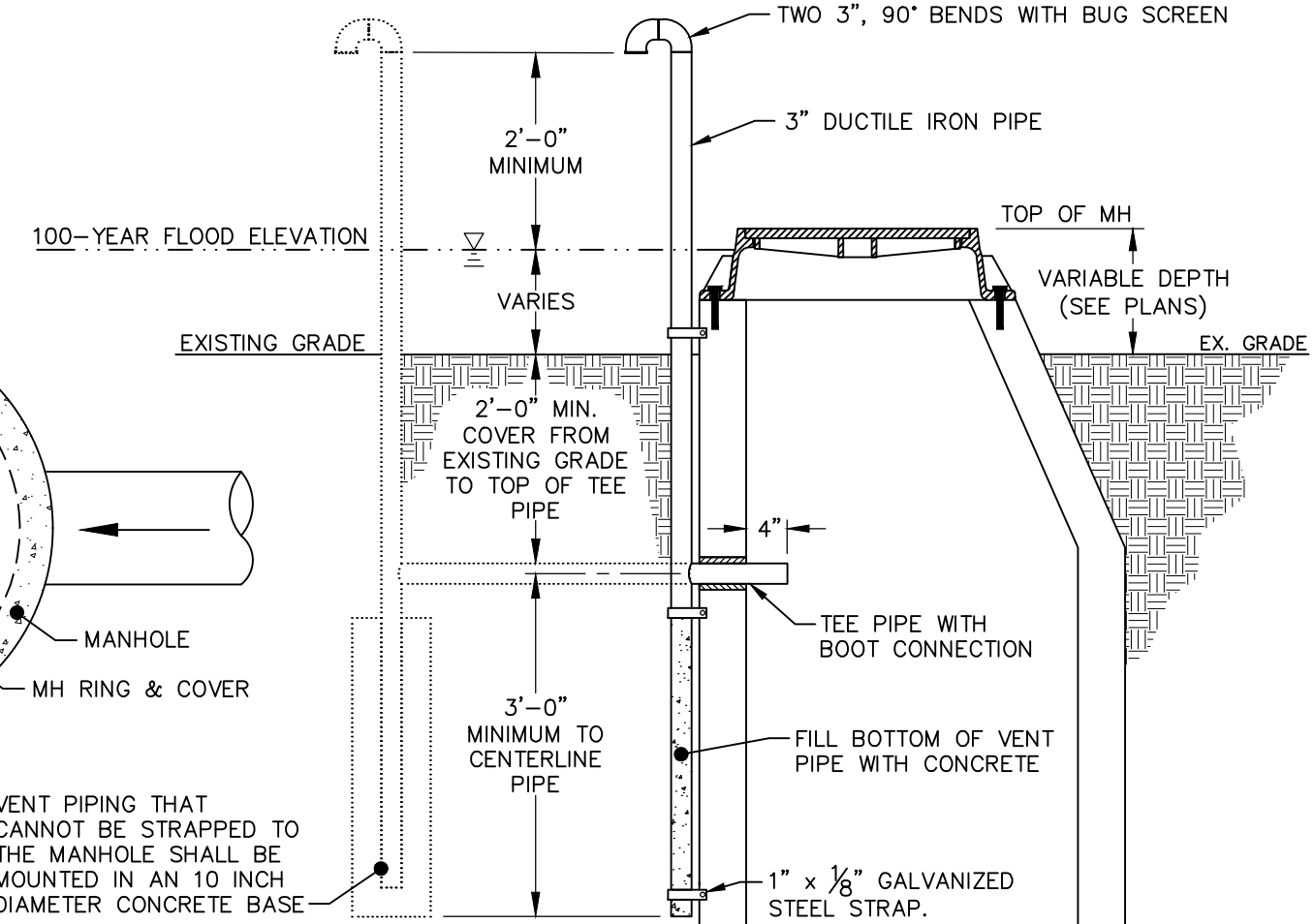
DETAIL No.
08000.02
SHEET 1 OF 1



VENT DETAIL



PLAN VIEW



SECTION VIEW

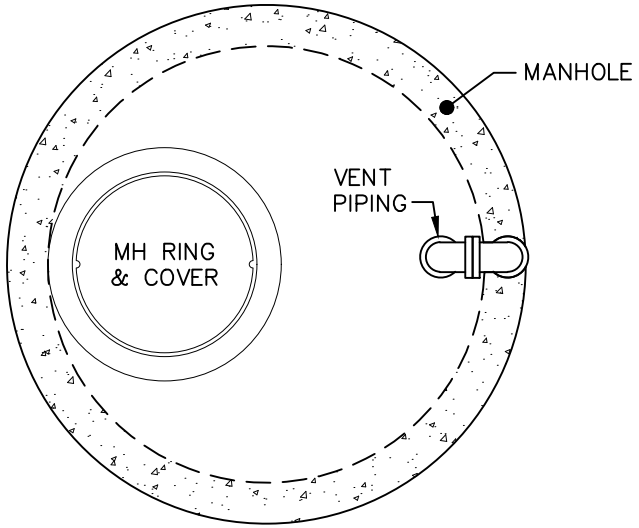
NOTES:
1. VENT PIPE OPENING IN PRECAST CONCRETE MANHOLE WALL SHALL BE CORED WITH A CONCRETE CORING MACHINE.
2. LOCATION OF VENT PIPE SHALL BE AS DIRECTED BY THE FIELD TECHNICIAN WITH WATERTIGHT RING AND COVER VENT TOP TO BE ELEVATED AT LEAST 24 INCHES ABOVE THE 100 YEAR FLOOD PLAIN ELEVATION.
3. 4 INCH PIPING MAY BE SUBSTITUTED FOR THE 3 INCH PIPING.

CITY OF GOLDSBORO NORTH CAROLINA

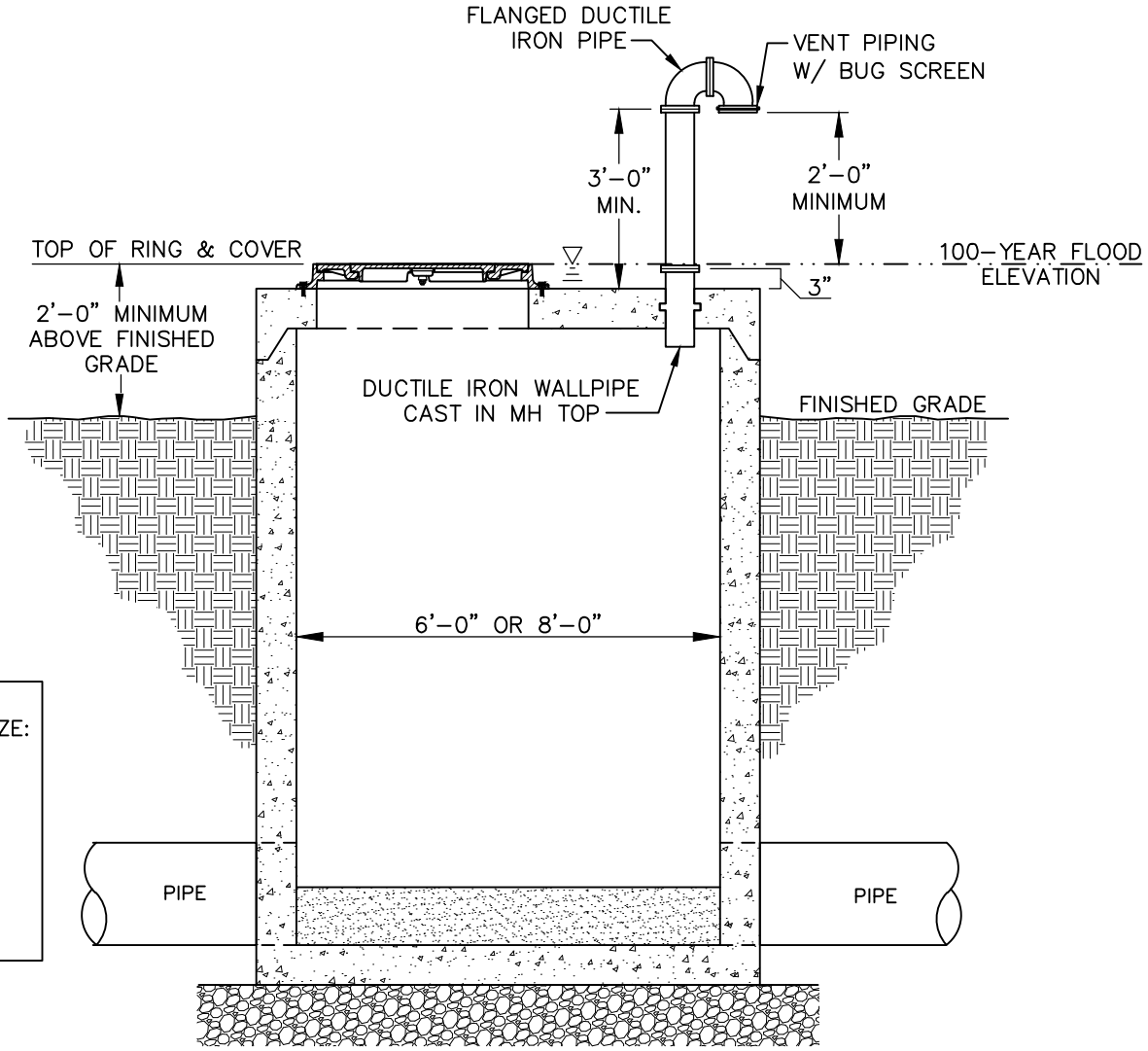
EFFECTIVE: 12/01/18

STANDARD MANHOLE VENT

DETAIL No.
08000.03
SHEET 1 OF 2



PLAN VIEW



SECTION VIEW

NOTES:

1. VENT PIPE DIAMETER SHALL INCREASE WITH SEWER MAIN SIZE:

SEWER MAIN	VENT PIPE
8" TO 20"	4"
24" TO 30"	6"
36" TO 48"	8"
54" TO 64"	10"

2. VENT PIPE OPENING TO BE ELEVATED AT LEAST 24 INCHES ABOVE THE 100 YEAR FLOOD PLAIN ELEVATION.

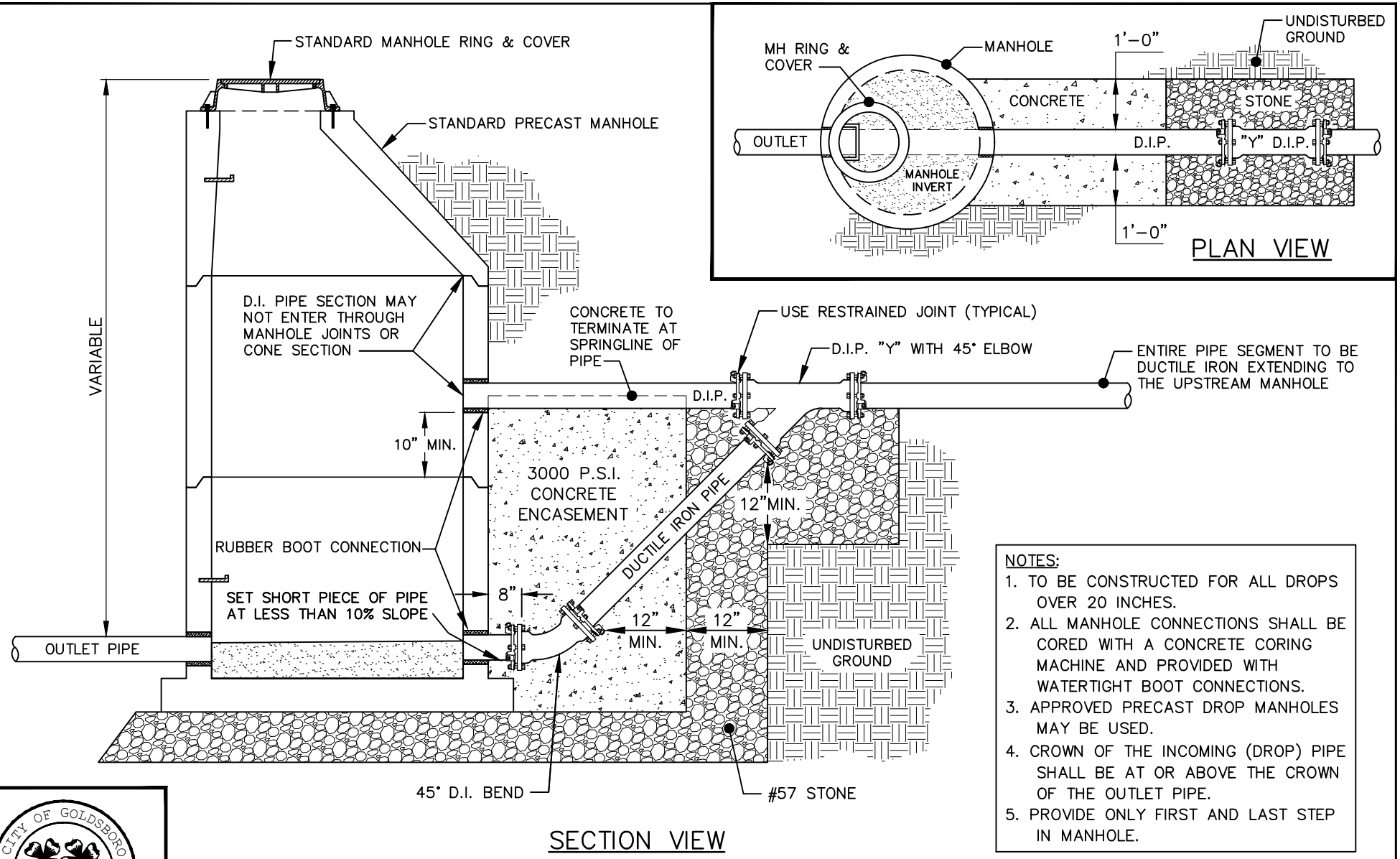
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD MANHOLE VENT WITH FLAT TOP MANHOLE

DETAIL No.

08000.03



SECTION VIEW

NOTES:

1. TO BE CONSTRUCTED FOR ALL DROPS OVER 20 INCHES.
2. ALL MANHOLE CONNECTIONS SHALL BE CORED WITH A CONCRETE CORING MACHINE AND PROVIDED WITH WATERTIGHT BOOT CONNECTIONS.
3. APPROVED PRECAST DROP MANHOLES MAY BE USED.
4. CROWN OF THE INCOMING (DROP) PIPE SHALL BE AT OR ABOVE THE CROWN OF THE OUTLET PIPE.
5. PROVIDE ONLY FIRST AND LAST STEP IN MANHOLE.

CITY OF GOLDSBORO NORTH CAROLINA

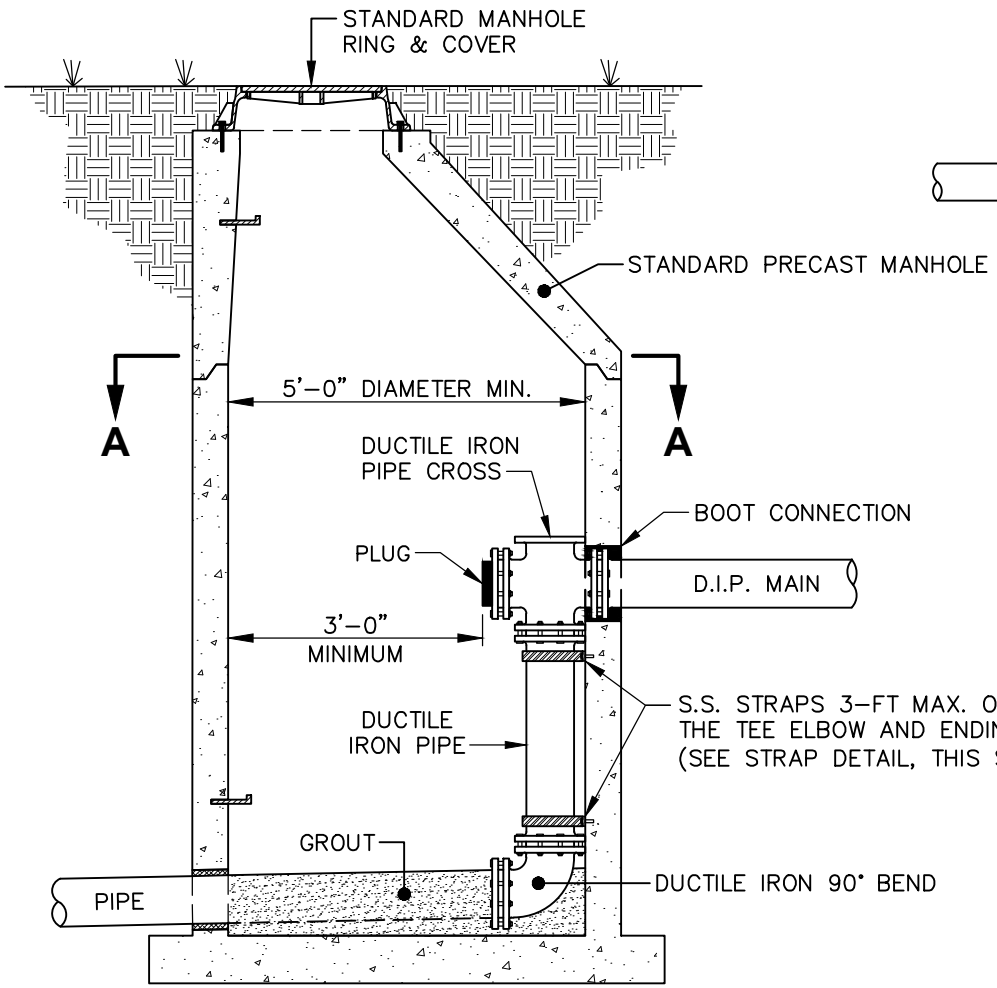
EFFECTIVE: 12/01/18

STANDARD OUTSIDE DROP MANHOLE

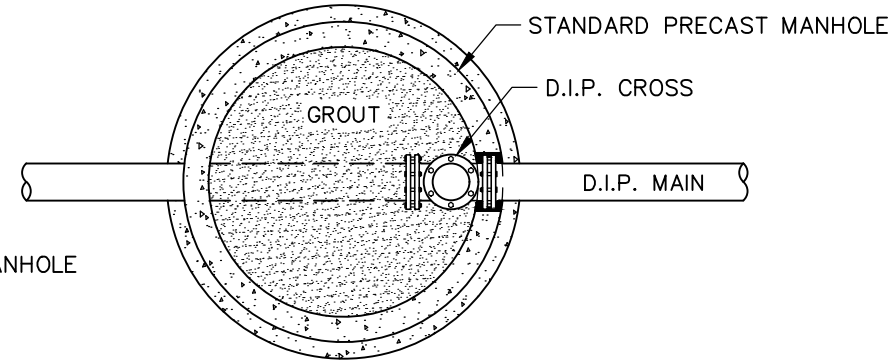
DETAIL No.

08000.04

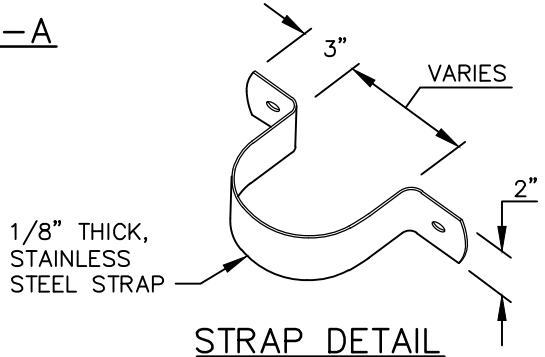
SHEET 1 OF 1



SECTION VIEW



SECTION A–A



STRAP DETAIL

NOTES:
1. INSIDE DROP MANHOLES SHALL ONLY BE ALLOWED BY WRITTEN PERMISSION FROM THE CITY OF GOLDSBORO.
2. ONE INSIDE DROP ALLOWED FOR 5 FOOT MANHOLE.
3. PIPE SIZE FOR DROP TO EQUAL INFLOW SEWER PIPE SIZE.
4. MECHANICAL JOINT TO BE USED.
5. ALL MANHOLE CONNECTIONS SHALL BE CORED.
6. DROP MANHOLE MANDATORY WHEN DIFFERENTIAL BETWEEN INVERTS IS GREATER THAN 20 INCHES.
7. STRAP INTERVALS OF 18 INCHES SHALL BE USED ON ALL DROPS GREATER THAN 5 FEET.
8. USE 1/2 INCH DIAMETER EXPANSION TYPE STAINLESS STEEL CINCH BOLTS WITH STAINLESS STEEL WASHERS AND NUTS TO ATTACH STRAPS.
9. PROVIDE ONLY FIRST AND LAST STEP IN MANHOLE.

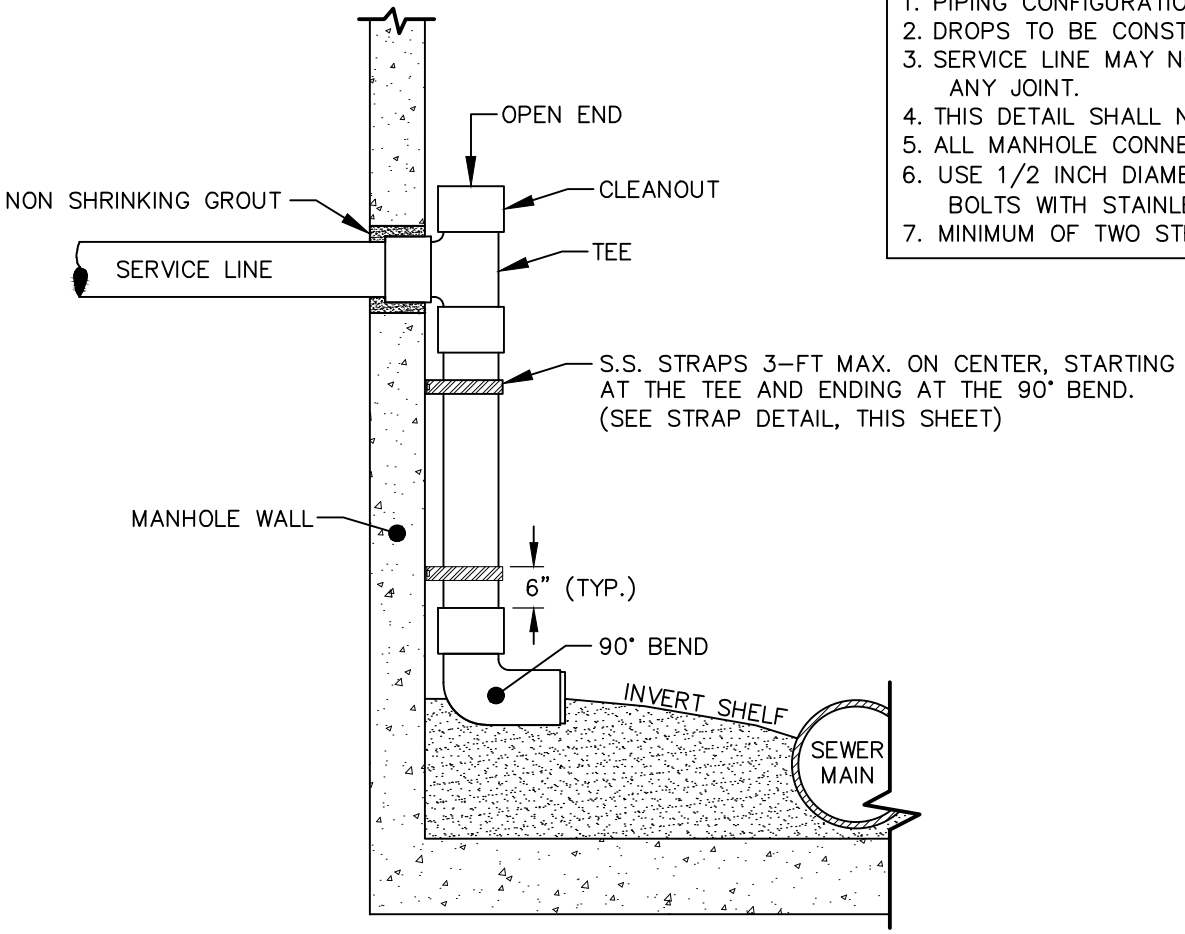
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

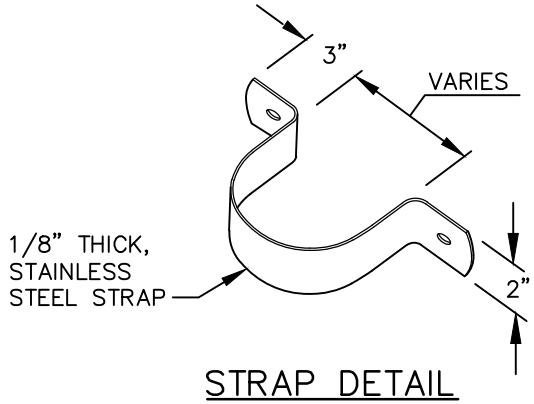
STANDARD INSIDE DROP MANHOLE

DETAIL No.
08000.05
SHEET 1 OF 1

NOTES:
1. PIPING CONFIGURATION TO BE USED ON ALL DROPS OVER 20 INCHES.
2. DROPS TO BE CONSTRUCTED OF DUCTILE IRON OR SCH 80 PVC PIPE.
3. SERVICE LINE MAY NOT ENTER MANHOLE THROUGH CONE SECTION OR ANY JOINT.
4. THIS DETAIL SHALL NOT BE USED FOR FORCE MAINS
5. ALL MANHOLE CONNECTIONS SHALL BE CORED.
6. USE 1/2 INCH DIAMETER EXPANSION TYPE STAINLESS STEEL CINCH BOLTS WITH STAINLESS STEEL WASHERS AND NUTS TO ATTACH STRAPS.
7. MINIMUM OF TWO STRAPS REQUIRED.



SECTION VIEW



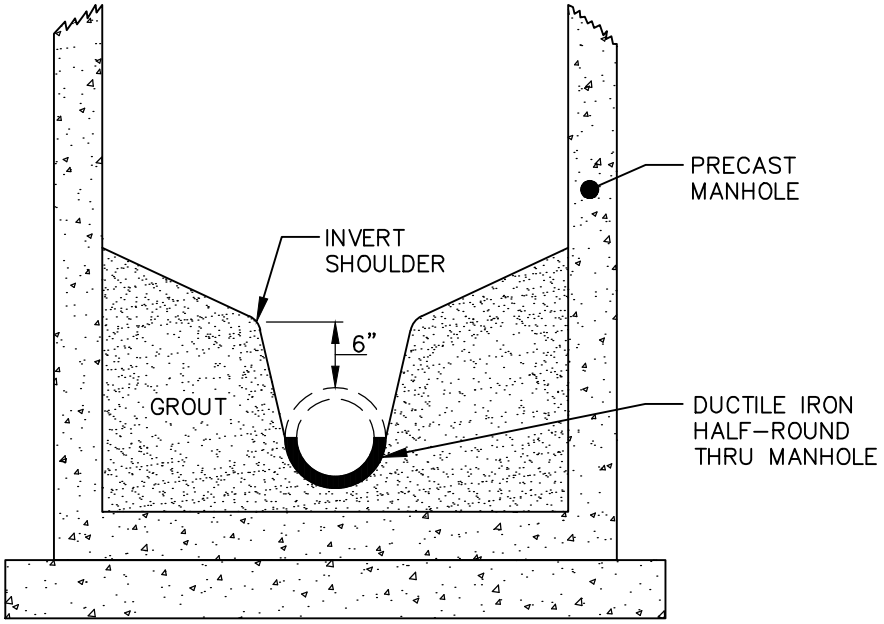
STRAP DETAIL

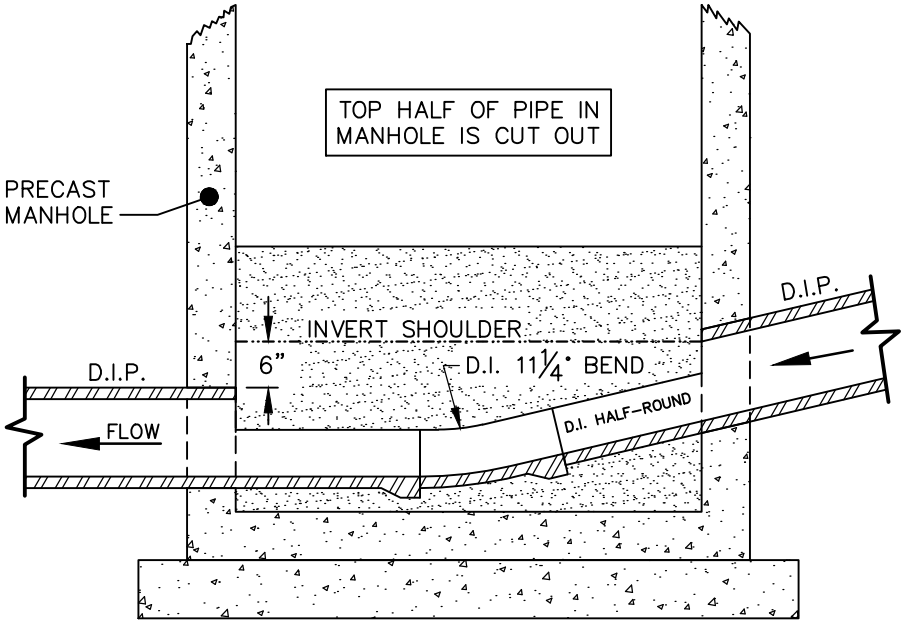
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD INSIDE DROP FOR SANITARY SEWER SERVICE

DETAIL No.
08000.06
SHEET 1 OF 1





NOTES:

1. NO HORIZONTAL ALIGNMENT CHANGE CAN BE MADE WITHIN THIS MANHOLE TYPE. USE ON GRADES OF 10% OR GREATER.

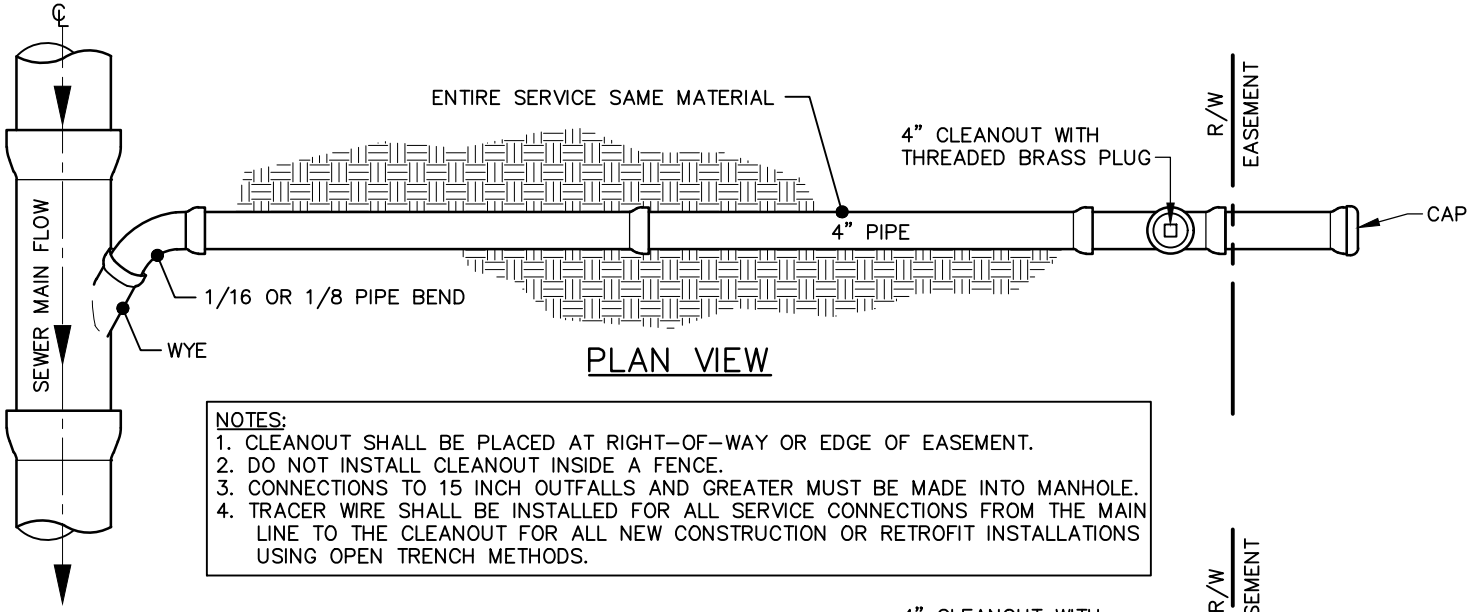
2. EACH JOINT OF PIPE BETWEEN HIGH VELOCITY MANHOLE & MANHOLE UPGRADE SHALL HAVE A THRUST COLLAR.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

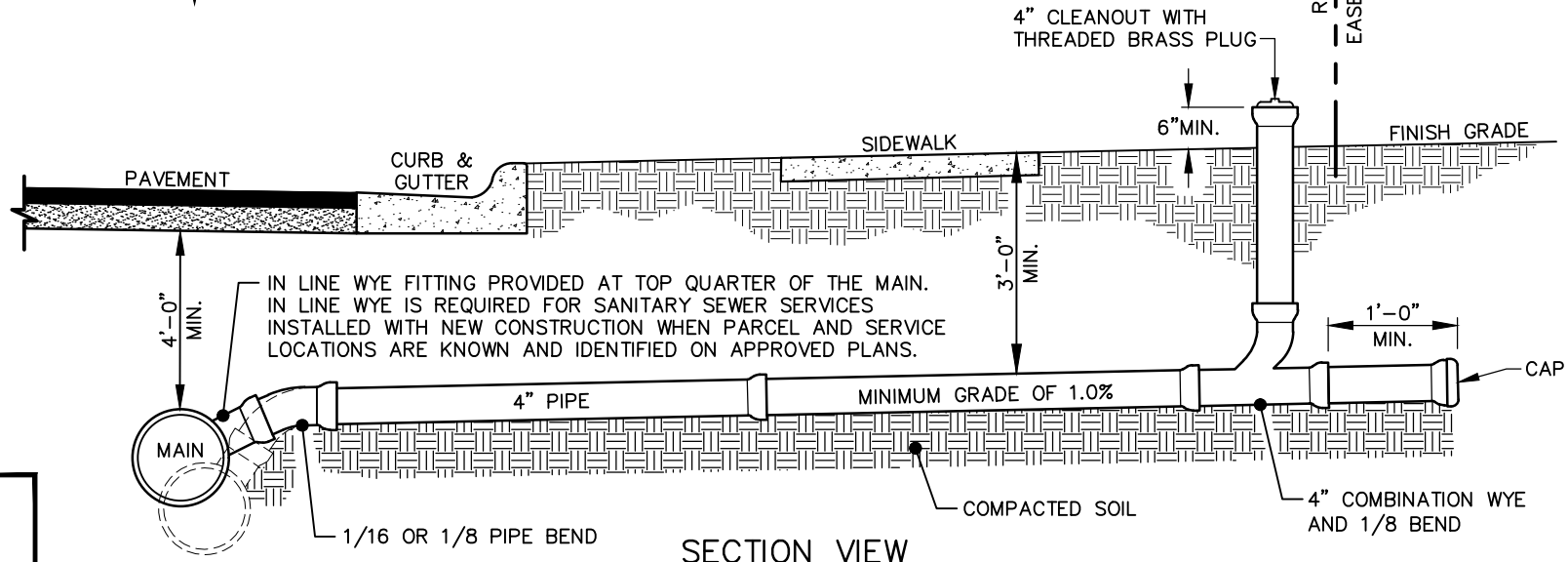
STANDARD HIGH VELOCITY MANHOLE INVERT

DETAIL No.
08000.07
SHEET 1 OF 1



PLAN VIEW

NOTES:
1. CLEANOUT SHALL BE PLACED AT RIGHT-OF-WAY OR EDGE OF EASEMENT.
2. DO NOT INSTALL CLEANOUT INSIDE A FENCE.
3. CONNECTIONS TO 15 INCH OUTFALLS AND GREATER MUST BE MADE INTO MANHOLE.
4. TRACER WIRE SHALL BE INSTALLED FOR ALL SERVICE CONNECTIONS FROM THE MAIN LINE TO THE CLEANOUT FOR ALL NEW CONSTRUCTION OR RETROFIT INSTALLATIONS USING OPEN TRENCH METHODS.



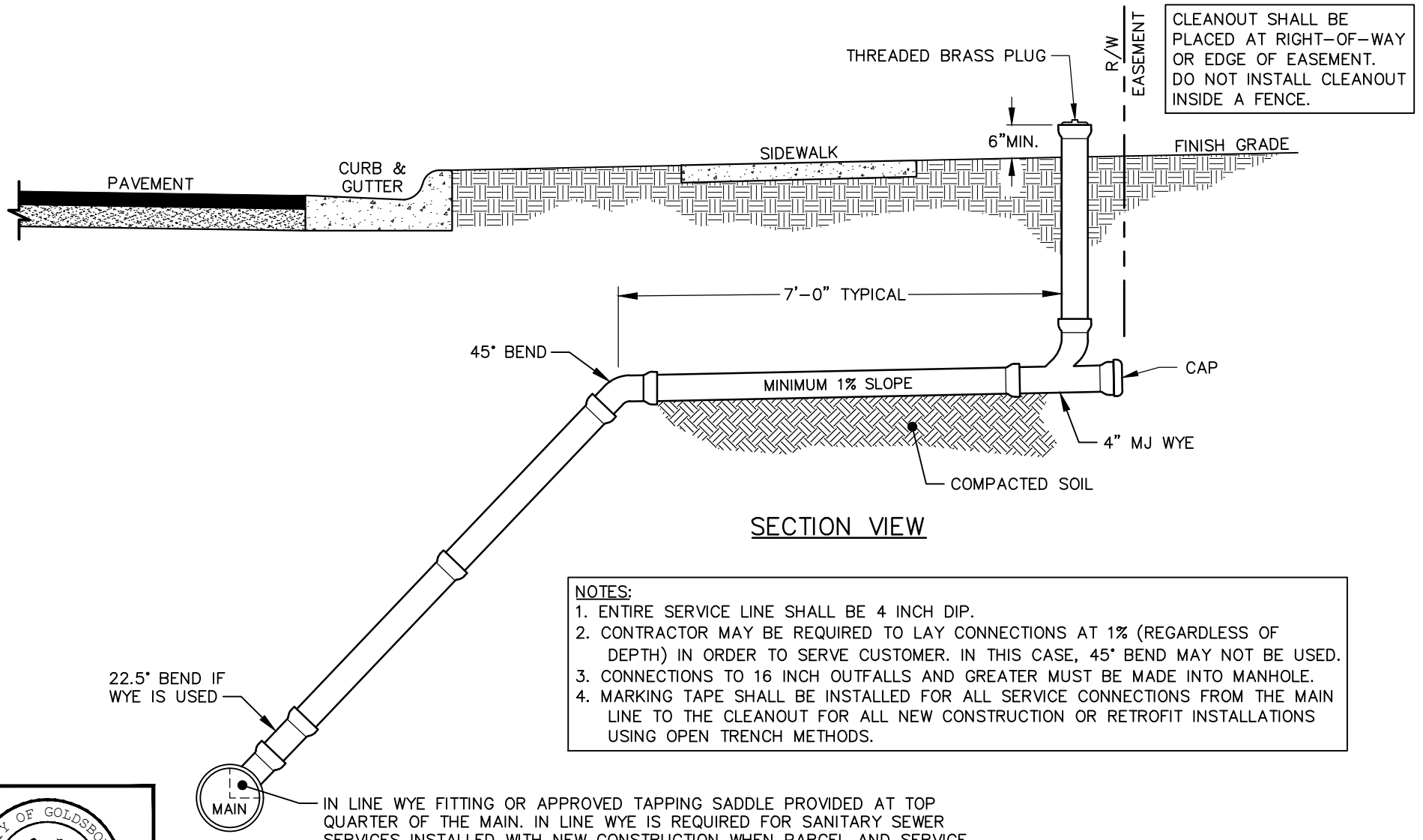
SECTION VIEW

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD 4" SANITARY SEWER SERVICE FOR CURB AND GUTTER SECTIONS

DETAIL No.
08000.08
SHEET 1 OF 4



SECTION VIEW

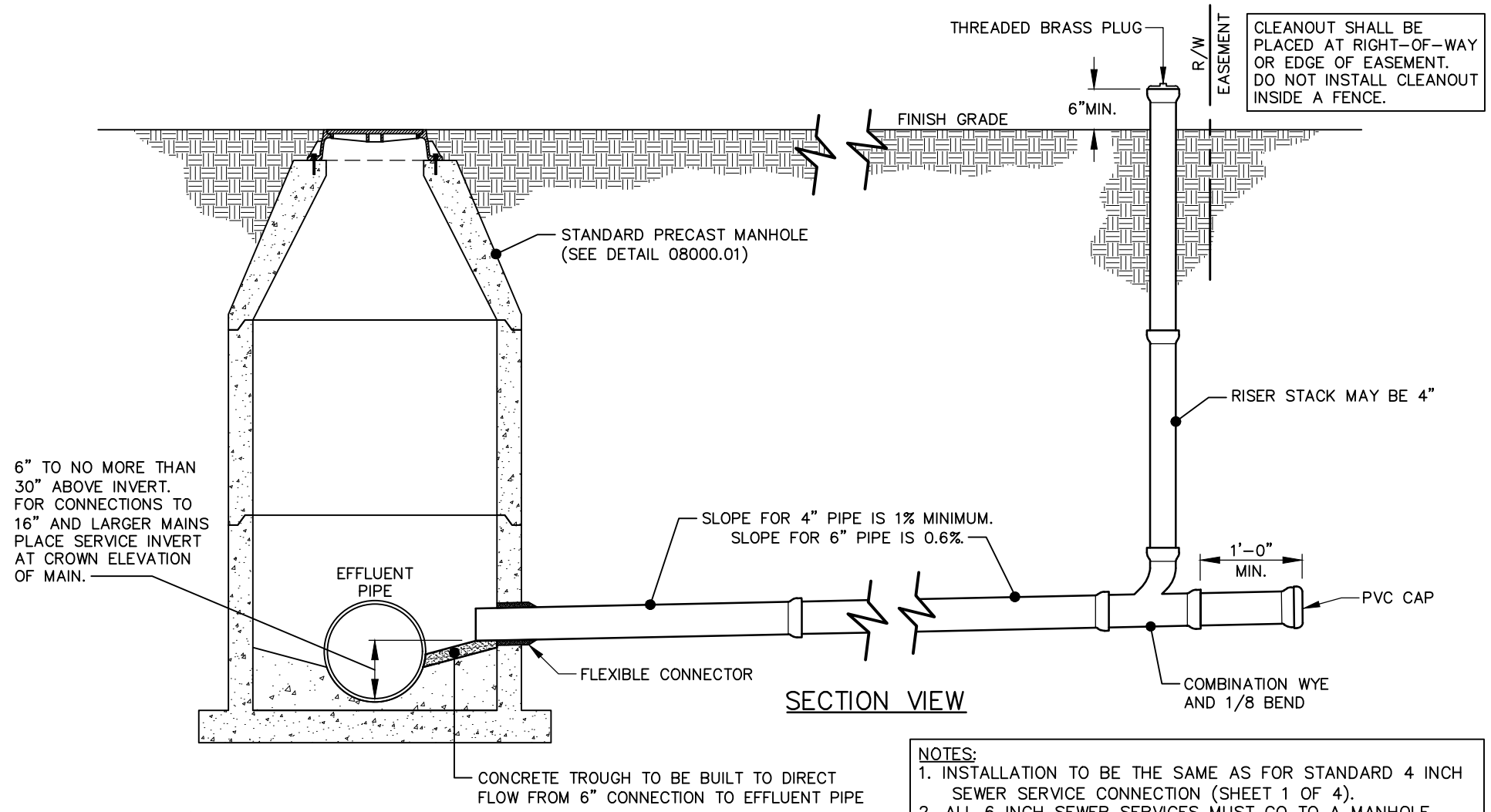
NOTES:
1. ENTIRE SERVICE LINE SHALL BE 4 INCH DIP.
2. CONTRACTOR MAY BE REQUIRED TO LAY CONNECTIONS AT 1% (REGARDLESS OF DEPTH) IN ORDER TO SERVE CUSTOMER. IN THIS CASE, 45° BEND MAY NOT BE USED.
3. CONNECTIONS TO 16 INCH OUTFALLS AND GREATER MUST BE MADE INTO MANHOLE.
4. MARKING TAPE SHALL BE INSTALLED FOR ALL SERVICE CONNECTIONS FROM THE MAIN LINE TO THE CLEANOUT FOR ALL NEW CONSTRUCTION OR RETROFIT INSTALLATIONS USING OPEN TRENCH METHODS.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD 4" SANITARY SEWER SERVICE FOR DEEP SEWER MAINS (14-FT AND GREATER)

DETAIL No.
08000.08



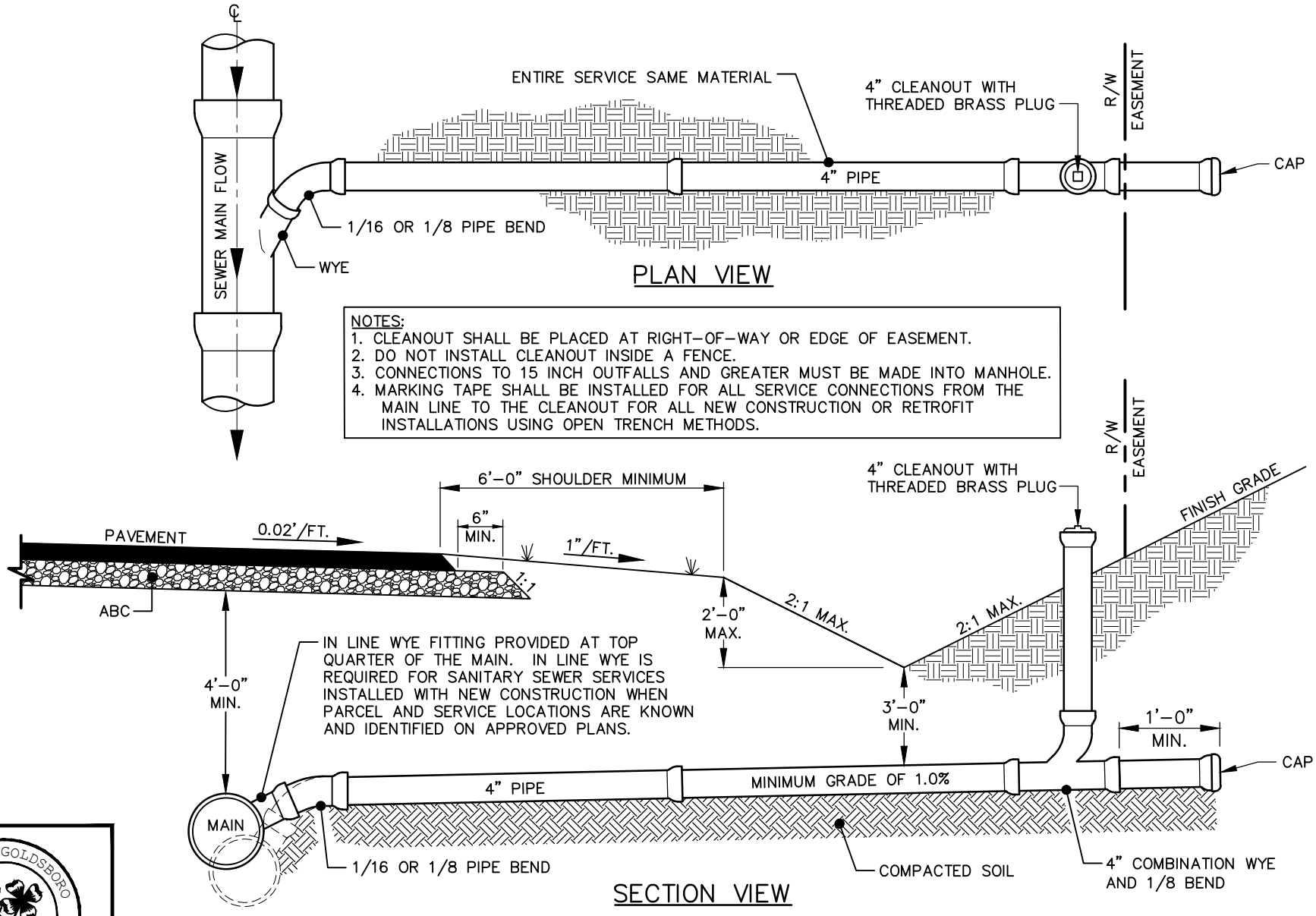
NOTES:
1. INSTALLATION TO BE THE SAME AS FOR STANDARD 4 INCH SEWER SERVICE CONNECTION (SHEET 1 OF 4).
2. ALL 6 INCH SEWER SERVICES MUST GO TO A MANHOLE.
3. TRACER WIRE SHALL BE INSTALLED FOR ALL SERVICE CONNECTIONS FROM THE MAIN LINE TO THE CLEANOUT FOR ALL NEW CONSTRUCTION OR RETROFIT INSTALLATIONS USING OPEN TRENCH METHODS.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD SANITARY SEWER SERVICE MANHOLE TAP

DETAIL No.
08000.08



CITY OF GOLDSBORO NORTH CAROLINA

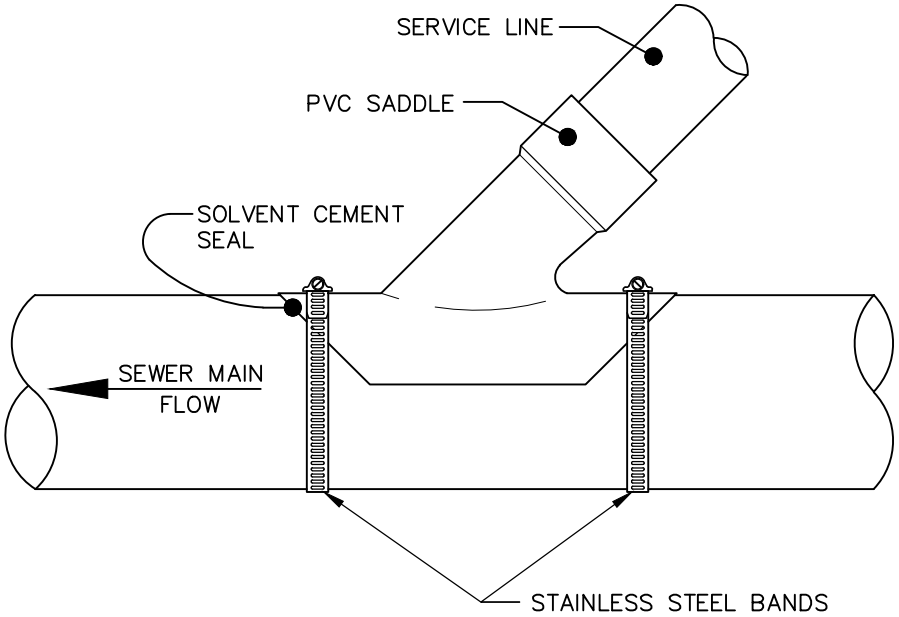
EFFECTIVE: 12/01/18

STANDARD 4" SANITARY SEWER SERVICE FOR DITCH SECTION

DETAIL No.

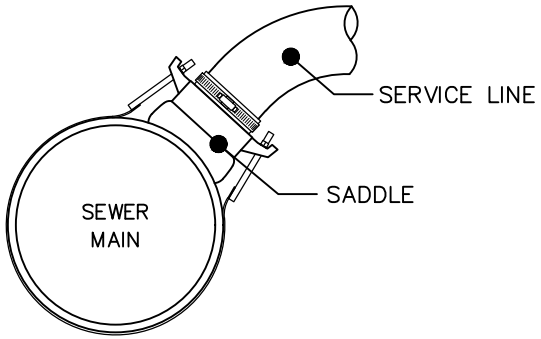
08000.08

SHEET 4 OF 4

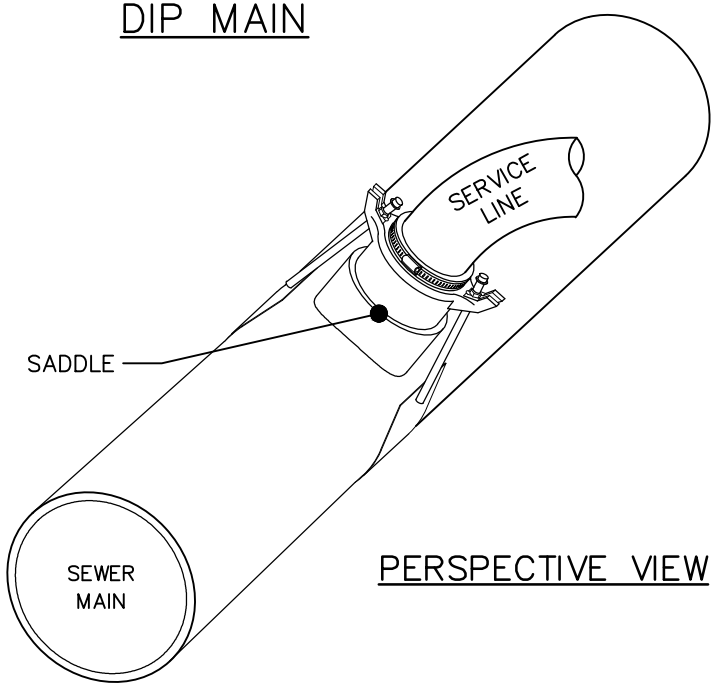


PVC MAIN

NOTES:
1) PVC SOLVENT CEMENT SHALL BE USED FOR PVC SADDLES.
2) TRUSS SADDLES SHALL BE USED WITH TRUSS PIPE.
3) IN-LINE WYE FITTING TO BE PROVIDED WITH NEW CONSTRUCTION.



DIP MAIN



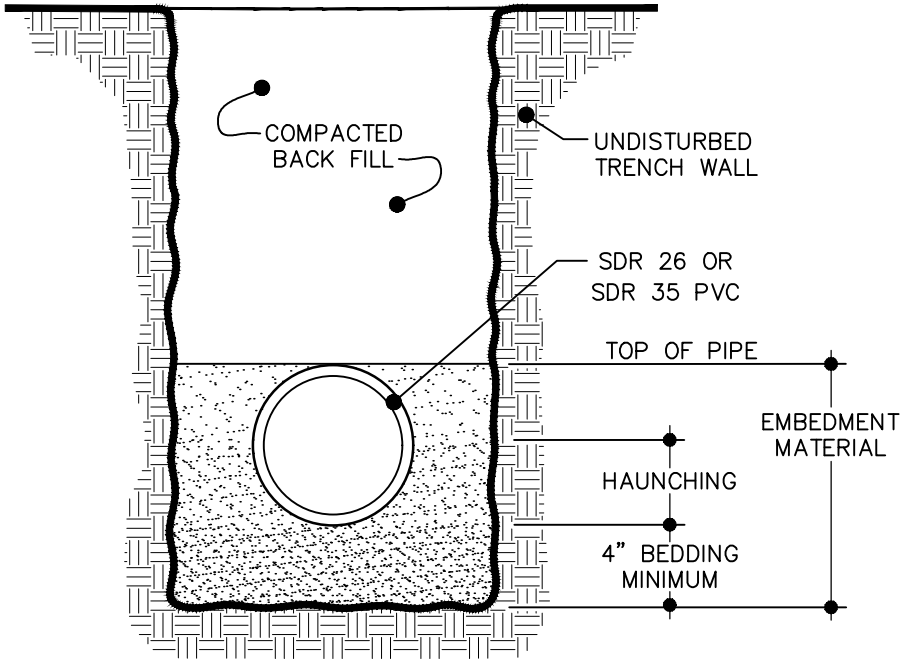
PERSPECTIVE VIEW

CITY OF GOLDSBORO NORTH CAROLINA

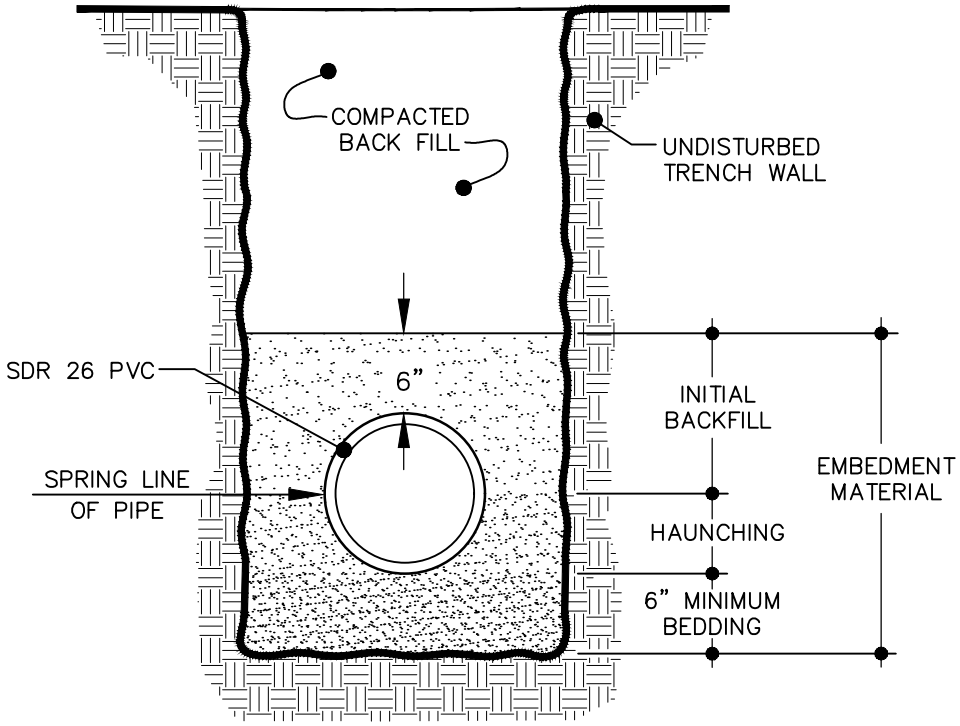
EFFECTIVE: 12/01/18

SANITARY SEWER LATERAL SADDLE CONNECTION TO EXISTING MAIN

DETAIL No.
08000.09
SHEET 1 OF 1



STANDARD BEDDING
FOR 4' TO 14' DEPTHS



SPECIAL BEDDING
FOR 14'–20' DEPTHS

NOTES:

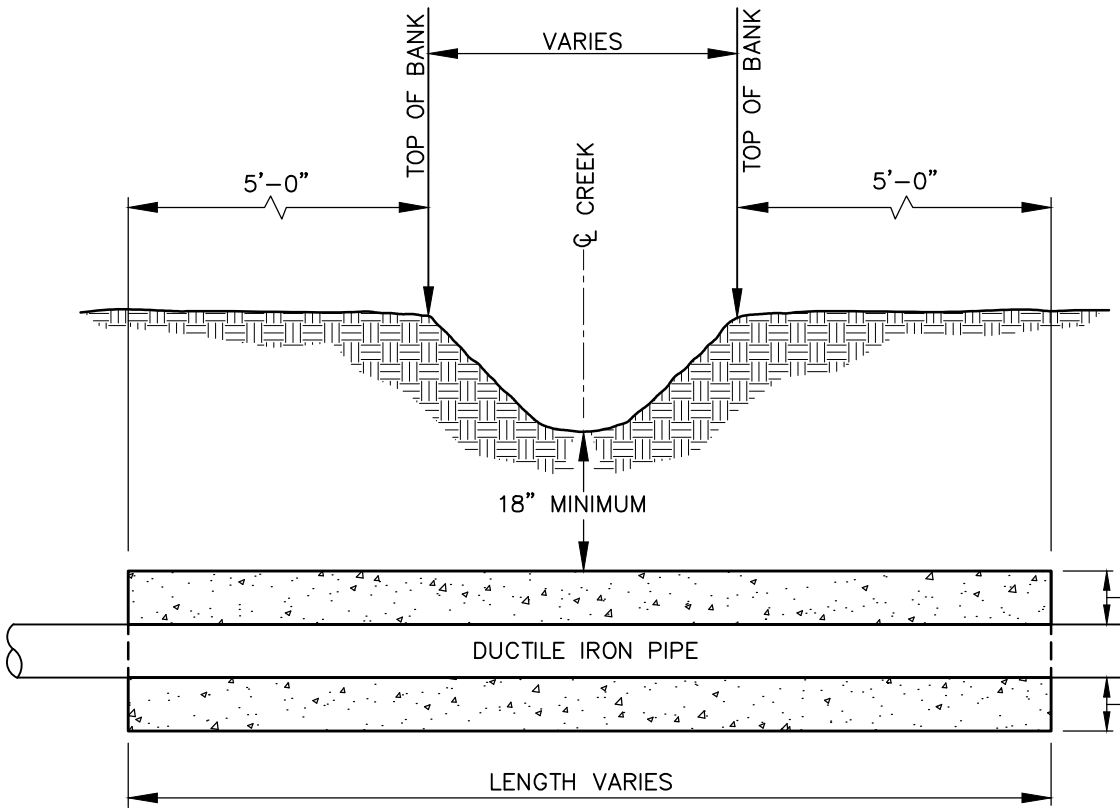
1. EMBEDMENT MATERIAL MUST BE CLASS I (#67 OR #78M WASHED STONE IS TYPICALLY USED).
2. EMBEDMENT MATERIAL SHALL BE COMPACTED TO A MINIMUM 95% STANDARD PROCTOR DENSITY FOR CLASS I MATERIAL.
3. UNSTABLE TRENCH BOTTOMS SHALL HAVE AN APPROVED FOUNDATION PLAN PRIOR TO PIPELINE INSTALLATION.
4. ALL SANITARY SEWER LINES LESS THAN 4 FEET AND OVER 20 FEET IN DEPTH MUST BE DUCTILE IRON PIPE.

CITY OF GOLDSBORO NORTH CAROLINA

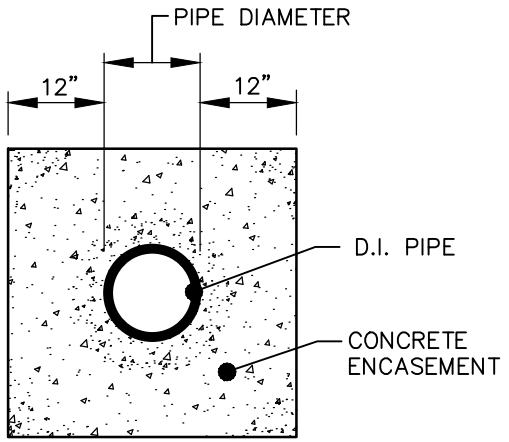
EFFECTIVE: 12/01/18

BEDDING FOR PVC SANITARY SEWER PIPE

DETAIL No.
08000.10
SHEET 1 OF 1



CROSS SECTION



END VIEW

NOTES:

1. CONCRETE SHALL BE 3,000 P.S.I.
2. CONCRETE ENCASEMENT NOT REQUIRED WHEN PIPE IS AT LEAST 3 FEET UNDER CENTERLINE OF CREEK BOTTOM.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD CONCRETE ENCASEMENT FOR STREAM CROSSING

DETAIL No.
08000.11
SHEET 1 OF 1

SPECIFICATION TIME (MIN:SEC) REQUIRED FOR PRESSURE DROP FROM 3-1/2 TO 2-1/2 PSIG															
		NOMINAL PIPE DIAMETER (INCHES)													
		8	10	12	14	15	16	18	20	21	24	27	30	36	42
LENGTH OF TEST SECTION	25	7:33	9:26	11:20	13:13	14:10	15:11	17:00	18:53	19:48	22:40	25:30	28:19	34:00	39:40
	50	7:33	9:26	11:20	13:13	14:10	15:11	17:00	18:53	19:48	22:40	25:30	28:19	34:00	39:40
	75	7:33	9:26	11:20	13:13	14:10	15:11	17:00	18:53	19:48	22:40	25:30	28:19	34:00	52:35
	100	7:33	9:26	11:20	13:13	14:10	15:11	17:00	18:53	19:48	22:47	28:51	35:37	51:17	69:48
	125	7:33	9:26	11:20	13:13	14:10	15:11	17:00	19:47	21:48	28:29	36:03	44:31	64:06	87:15
	150	7:33	9:26	11:20	13:13	14:10	15:12	19:14	23:44	26:10	34:11	43:16	53:25	76:55	104:42
	175	7:33	9:26	11:20	13:34	15:35	17:44	22:26	27:42	30:32	39:53	50:28	62:19	89:45	122:10
	200	7:33	9:26	11:24	15:31	17:48	20:16	25:39	31:39	34:54	45:35	57:42	71:13	102:36	139:36
	225	7:33	9:26	12:49	17:27	20:02	22:48	28:51	35:37	39:16	51:17	64:54	80:08	115:24	157:03
	250	7:33	9:53	14:15	19:23	22:16	25:20	32:03	39:34	43:37	56:58	72:07	89:02	128:12	174:30
	275	7:33	10:52	15:40	21:20	24:29	27:52	35:16	43:31	47:59	62:40	79:19	97:56	141:00	191:57
	300	7:35	11:52	17:06	23:16	26:43	30:23	38:28	47:29	52:21	68:22	86:32	106:48	153:54	209:25
	350	8:52	13:51	19:57	27:09	31:10	35:27	44:52	55:24	61:05	79:46	101:00	124:42	179:30	244:19
	400	10:07	15:50	22:48	31:01	35:37	40:31	51:17	63:19	69:48	91:10	115:24	142:30	205:06	279:13
	450	11:23	17:48	25:39	34:54	40:04	45:35	57:42	71:13	78:31	102:36	129:48	160:18	230:48	314:07
	500	12:39	19:47	28:30	38:47	44:31	50:39	64:06	79:08	87:15	114:00	144:12	178:06	256:24	349:02

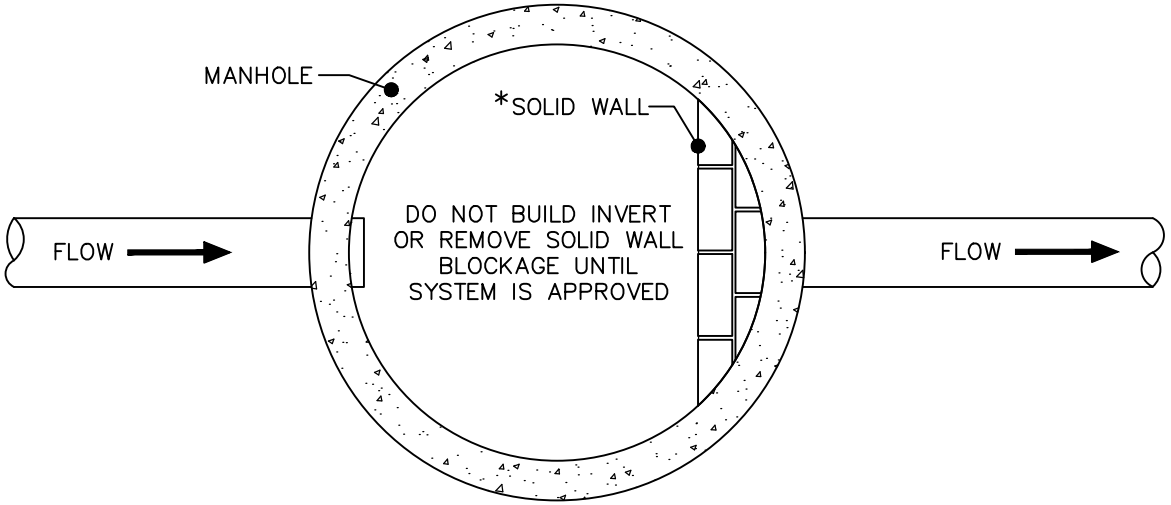
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD AIR TEST TABLE

DETAIL No.

08000.12

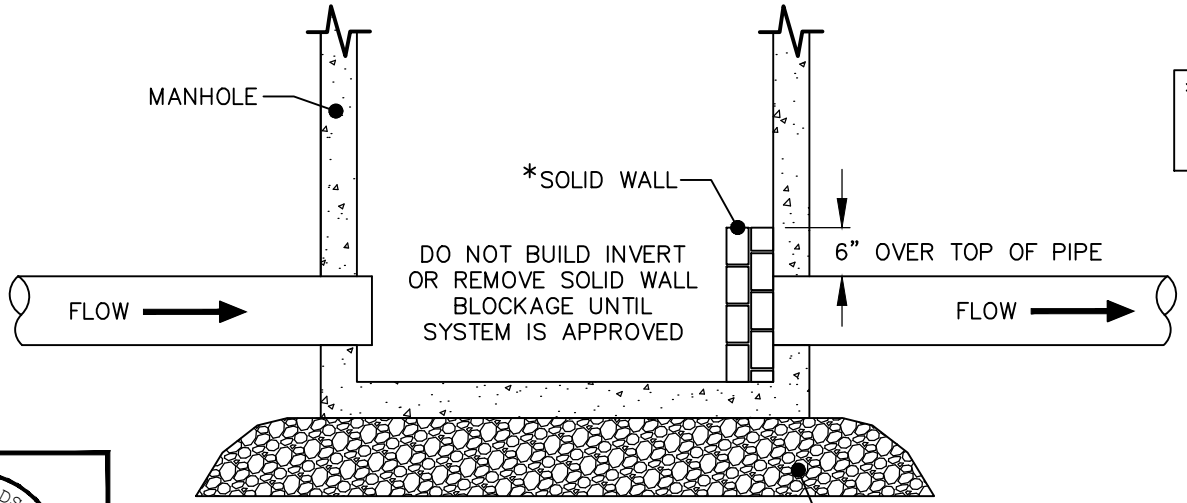


PLAN VIEW

USE SOLID BRICK/BLOCK & MORTAR

PIPE DIAMETER	MINIMUM WALL THICKNESS
8" – 12"	4"
16" OR GREATER	8"

*LOCATED IN FIRST MANHOLE FROM TIE–IN. SOLID WALL MUST BE BUILT BEFORE LAYING NEXT RUN OF PIPE.



SECTION VIEW

CITY OF GOLDSBORO NORTH CAROLINA

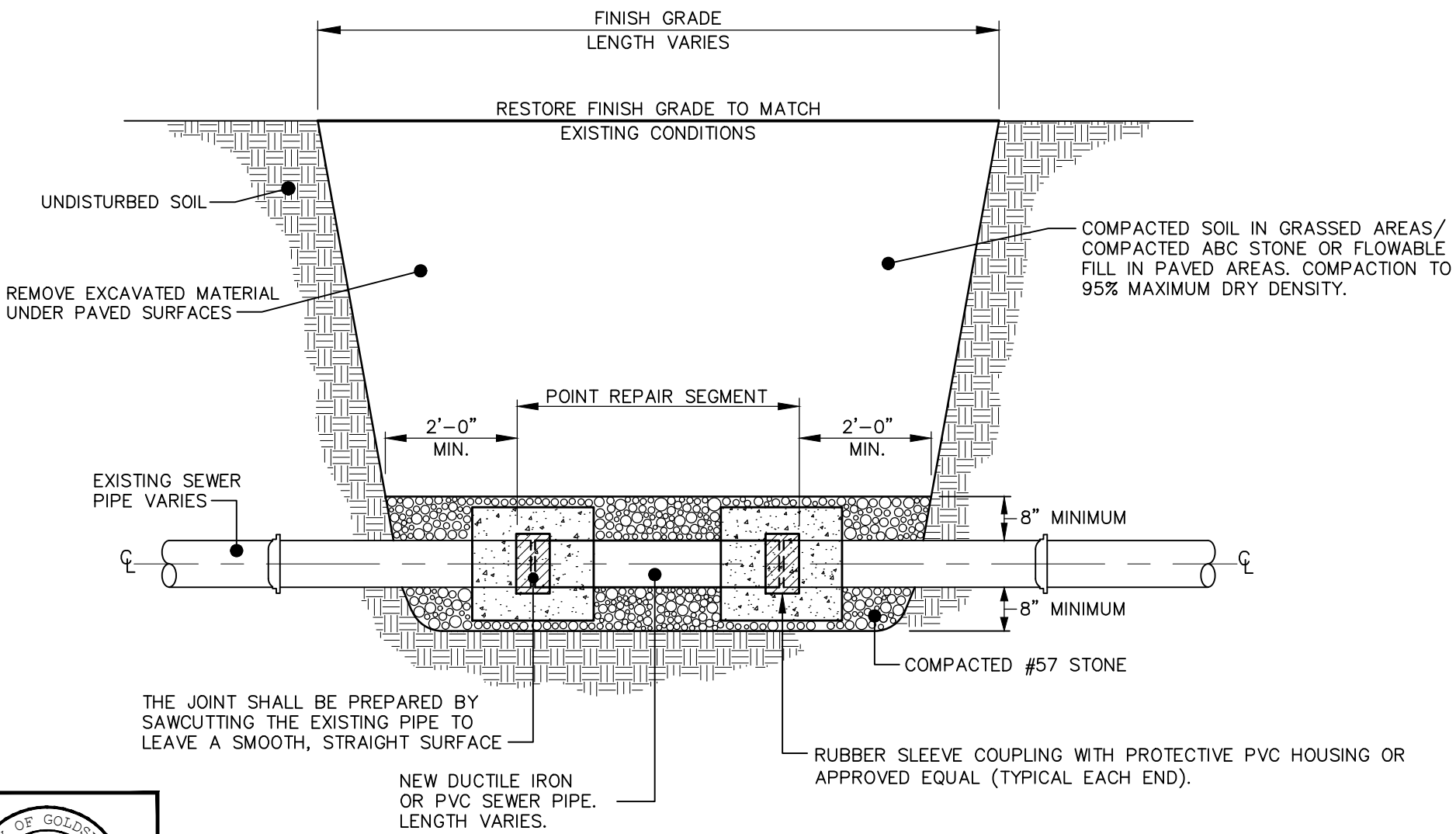
EFFECTIVE: 12/01/18

SANITARY SEWER PROTECTION DURING CONSTRUCTION

DETAIL No.

08000.13

SHEET 1 OF 1



SECTION VIEW

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

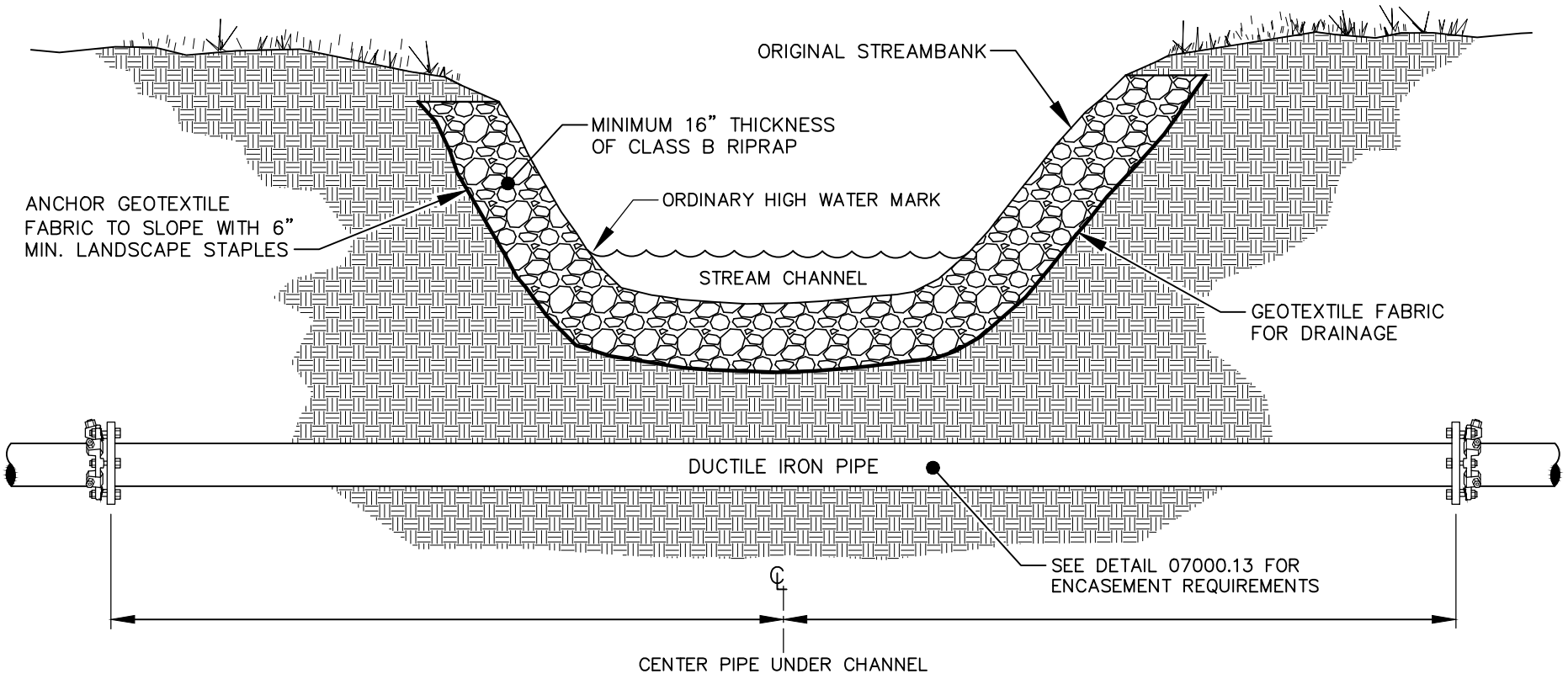
STANDARD TYPICAL SEWER POINT REPAIR

DETAIL No.

08000.14

SHEET 1 OF 1

NOTES:
1. MAINTAIN ORIGINAL CONTOURS IN STREAMBED AND BANKS.
2. FACE OF PROPOSED RIPRAP BANK TO MATCH EXISTING CONTOURS OF STREAMBANKS.
3. RIPRAP MUST BE KEYED INTO THE GROUND AND THE ORIGINAL CONTOURS SHALL BE MAINTAINED AS PER U.S. ARMY CORPS OF ENGINEERS.



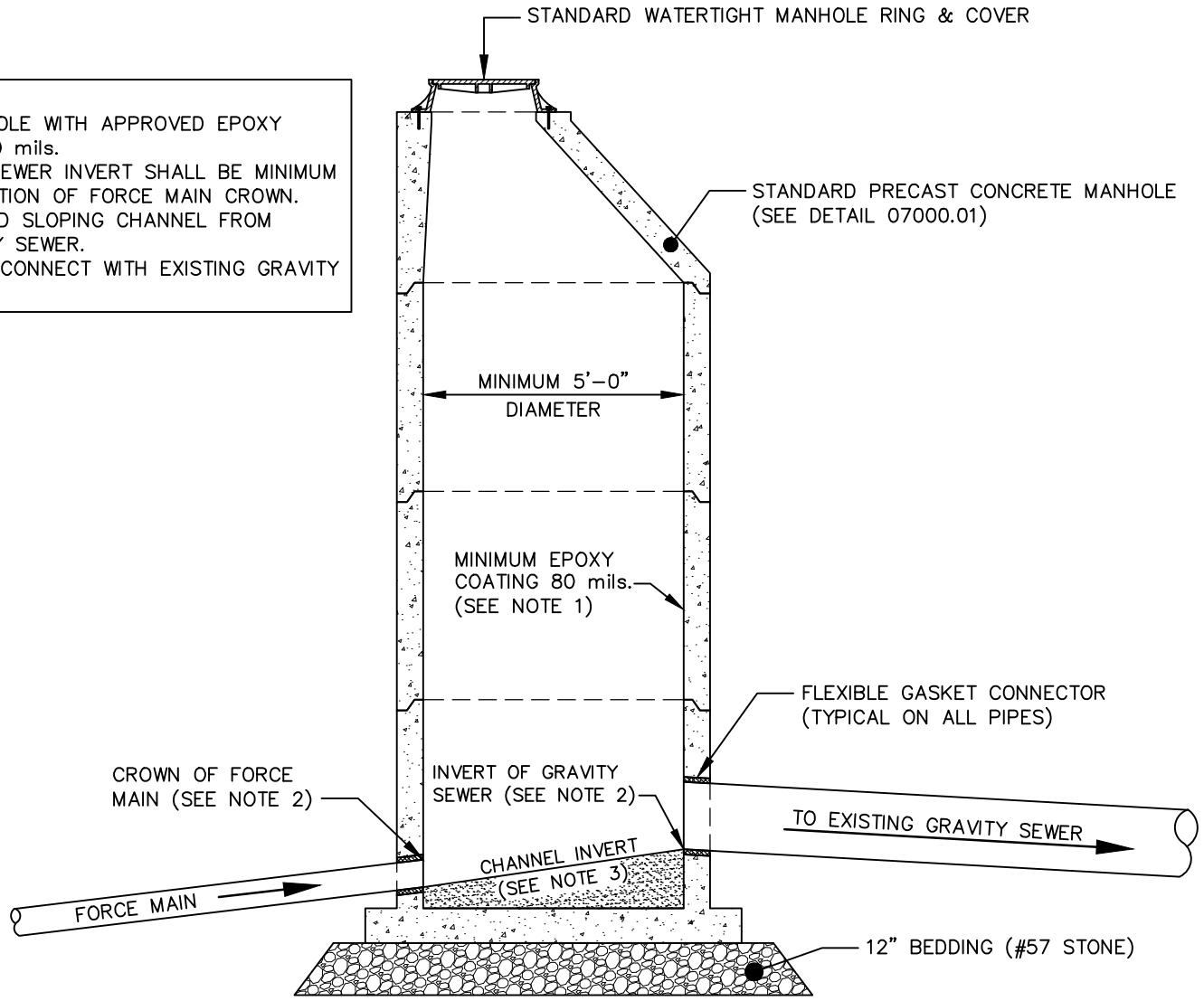
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD RIPRAP BANK STABILIZATION

DETAIL No.
08000.15
SHEET 1 OF 1

NOTES:
1. COAT INTERIOR OF MANHOLE WITH APPROVED EPOXY COATING AT MINIMUM 80 mils.
2. ELEVATION OF GRAVITY SEWER INVERT SHALL BE MINIMUM ONE INCH ABOVE ELEVATION OF FORCE MAIN CROWN.
3. PROVIDE SMOOTH UPWARD SLOPING CHANNEL FROM FORCE MAIN TO GRAVITY SEWER.
4. FORCE MAIN SHALL NOT CONNECT WITH EXISTING GRAVITY SEWER MANHOLES.



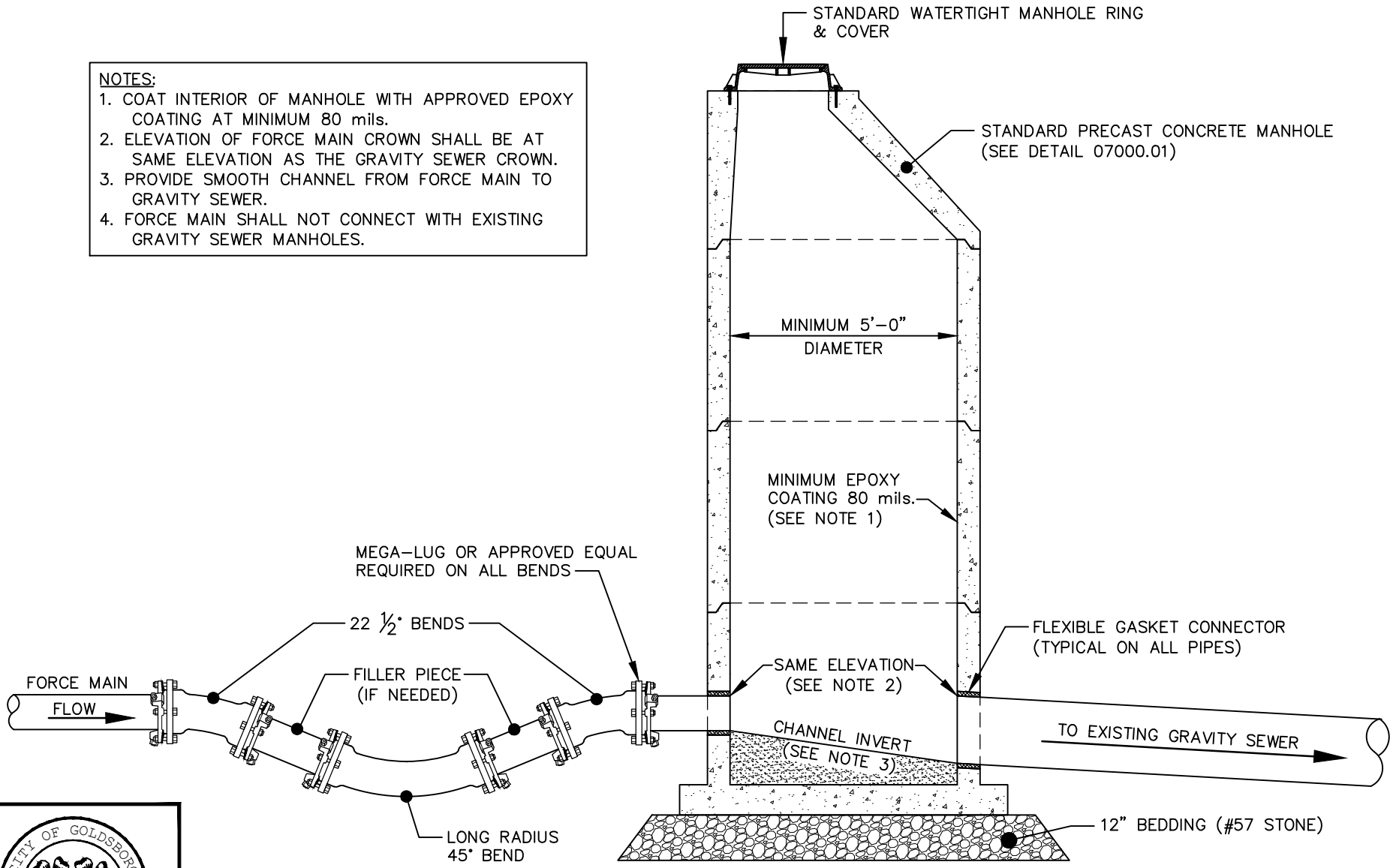
CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

FORCE MAIN DISCHARGE MANHOLE, UPWARD SLOPING FORCE MAIN

DETAIL No.
09000.01
SHEET 1 OF 2

NOTES:
1. COAT INTERIOR OF MANHOLE WITH APPROVED EPOXY COATING AT MINIMUM 80 mils.
2. ELEVATION OF FORCE MAIN CROWN SHALL BE AT SAME ELEVATION AS THE GRAVITY SEWER CROWN.
3. PROVIDE SMOOTH CHANNEL FROM FORCE MAIN TO GRAVITY SEWER.
4. FORCE MAIN SHALL NOT CONNECT WITH EXISTING GRAVITY SEWER MANHOLES.

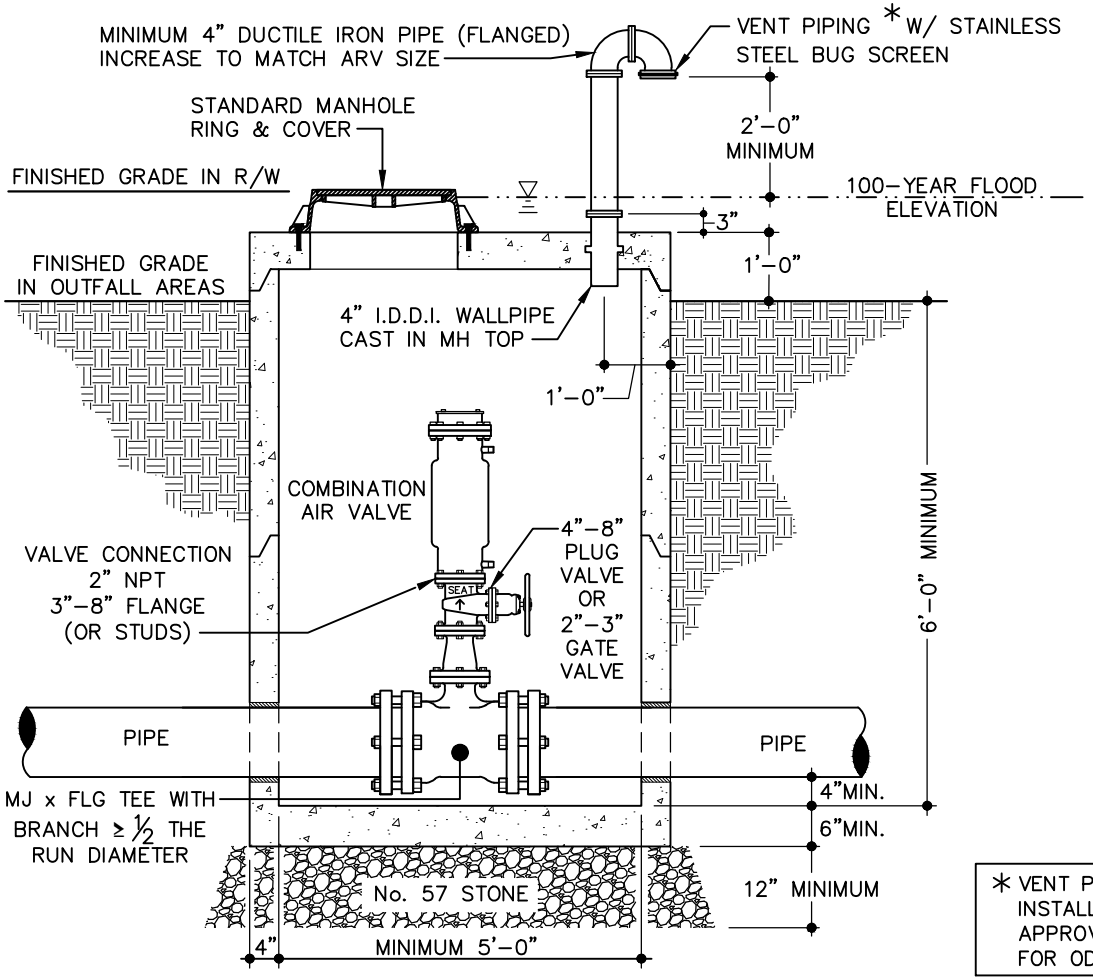


CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

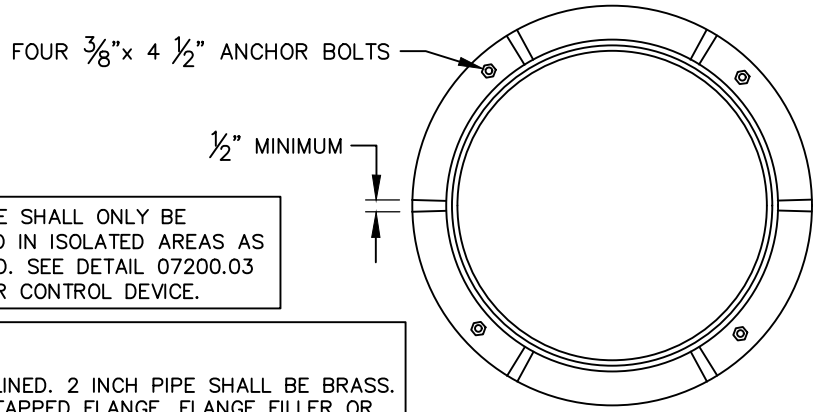
FORCE MAIN DISCHARGE MANHOLE, FLAT OR DOWNWARD SLOPING FORCE MAIN

DETAIL No.
09000.01
SHEET 2 OF 2



MINIMUM WEIGHTS	
RING	180
COVER	120
TOTAL	300

RING & COVER SPECIFICATIONS:
1. CLASS 35 GREY IRON.
2. COMPLIES WITH ASTM A48 CL35B.
3. ALL LETTERING SHALL BE CLEAN, CRISP, AND CLEARLY LEGIBLE.
4. DOMESTICALLY MADE AND MANUFACTURED IN THE USA.
5. TYPE 2 OR 3 MANHOLE RING AND COVERS SHALL BE USED IN AREAS OUTSIDE THE RIGHT-OF-WAY.



RING TOP VIEW
(IN R/W)

* VENT PIPE SHALL ONLY BE INSTALLED IN ISOLATED AREAS AS APPROVED. SEE DETAIL 07200.03 FOR ODOR CONTROL DEVICE.

NOTES:
1. ISOLATION VALVE TO BE SAME SIZE AS AIR VALVE.
2. ALL PIPING AND FITTINGS, IN THE MANHOLE, SHALL BE PROTECTO 401 LINED. 2 INCH PIPE SHALL BE BRASS.
3. 2 INCH VALVE AND BRASS PIPING SHALL CONNECT TO THE TEE VIA A TAPPED FLANGE, FLANGE FILLER OR FLANGE REDUCER.
4. MANHOLE INTERIOR SHALL BE COATED WITH MINIMUM 80 mils OF AN APPROVED EPOXY COATING.
5. MINIMUM 6 FOOT DIAMETER MANHOLE SHALL BE USED WITH FORCE MAINS 20 INCHES AND LARGER.
6. WHERE MANHOLE MUST BE LOCATED IN PAVED AREAS, PROVIDE TYPICAL ECCENTRIC TAPERED CONE SECTION.
7. VENT PIPE MAY BE OMITTED TO MEET RIGHT-OF-WAY REQUIREMENTS.
8. MANHOLES DEEPER THAN 12 FEET SHALL HAVE AN EXTENDED BASE.

CITY OF GOLDSBORO NORTH CAROLINA

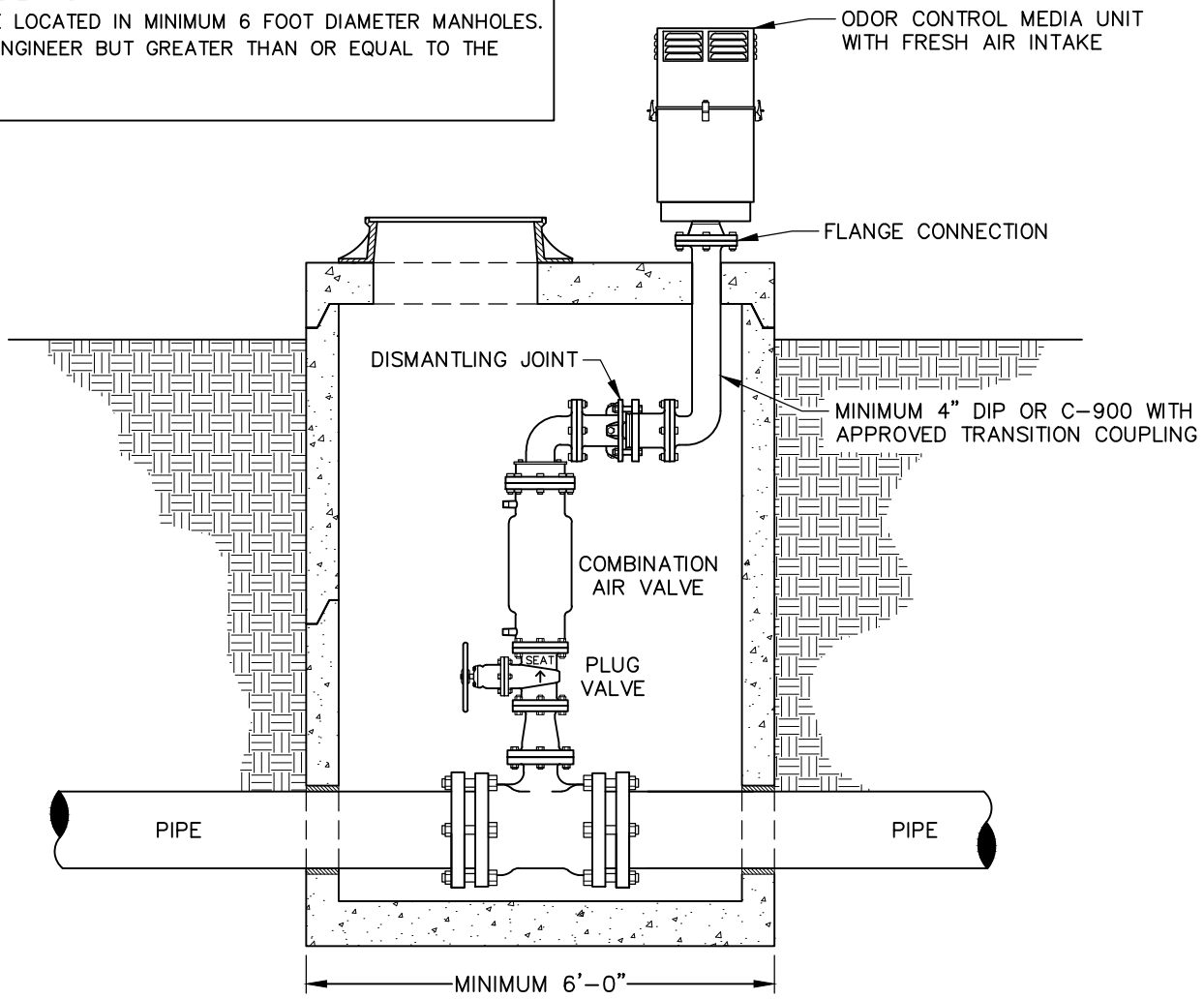
EFFECTIVE: 12/01/18

STANDARD COMBINATION AIR RELEASE VALVE MANHOLE FOR FORCE MAINS

DETAIL No.
09000.02
SHEET 1 OF 1

NOTES:

1. ODOR CONTROL CANISTERS WITHOUT A FRESH AIR INTAKE SHALL BE PIPED WITH A TEE ON THE ARV. ONE BRANCH WITH A PVC BALL CHECK VALVE & BUG SCREEN FOR AIR INTAKE, AND THE OTHER BRANCH WITH A PVC SWING CHECK VALVE LEADING TO THE CARBON SCRUBBER. CARBON UNIT MUST BE SECURED ON A 4 INCH CONCRETE PAD.
2. ARV's WITH ODOR CONTROL SYSTEMS SHALL BE LOCATED IN MINIMUM 6 FOOT DIAMETER MANHOLES.
3. PIPING AND VALVES SHALL BE SIZED BY THE ENGINEER BUT GREATER THAN OR EQUAL TO THE SIZE OF THE AIR VALVE.



CITY OF GOLDSBORO NORTH CAROLINA

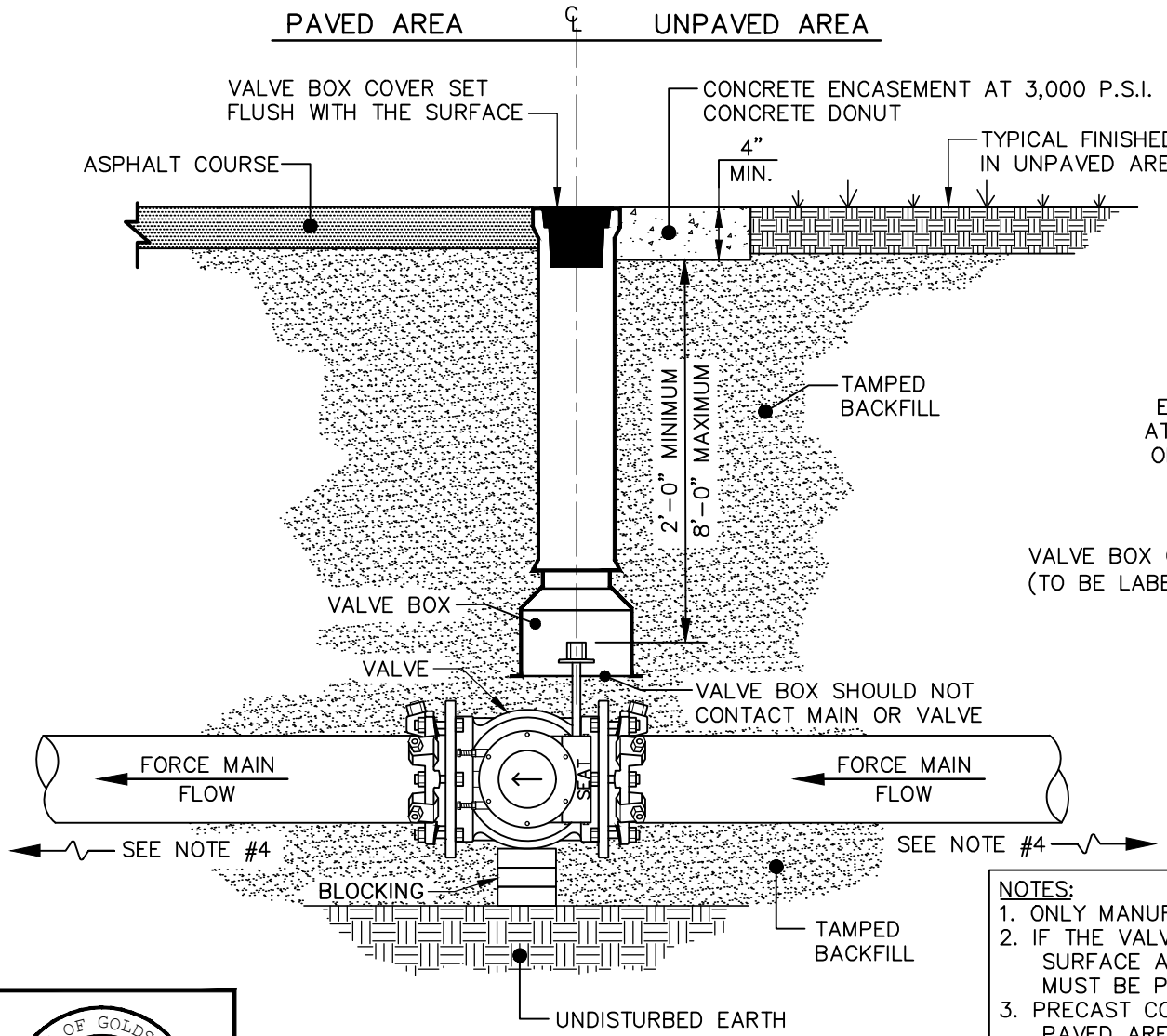
EFFECTIVE: 12/01/18

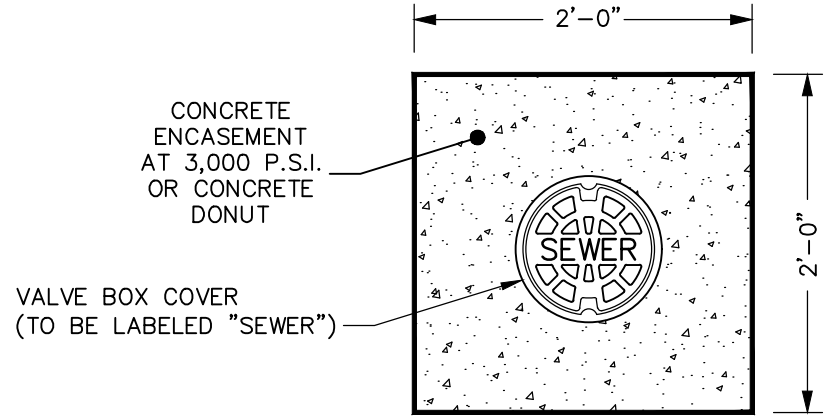
TYPICAL FORCE MAIN PASSIVE ODOR CONTROL SYSTEM

DETAIL No.

09000.03

SHEET 1 OF 1





PLAN VIEW FOR UNPAVED AREAS

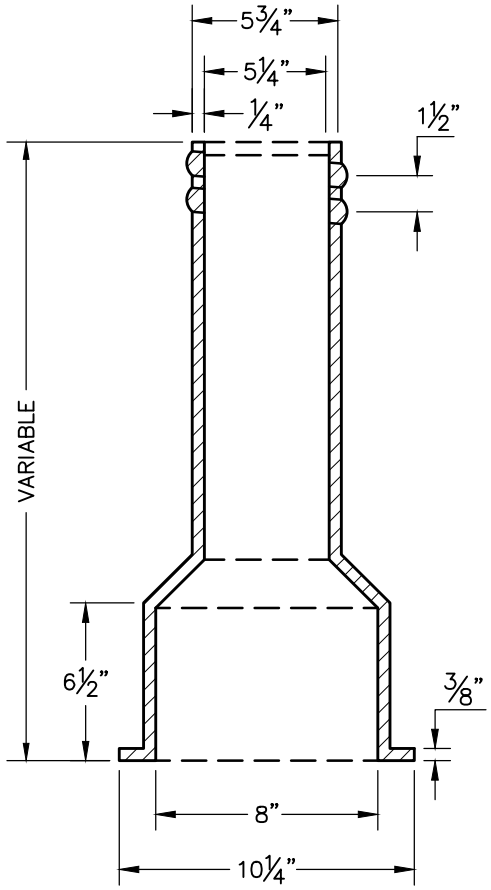
NOTES:
1. ONLY MANUFACTURED VALVE BOX EXTENSIONS SHALL BE ALLOWED.
2. IF THE VALVE OPERATING NUT IS GREATER THAN 6 FEET FROM THE SURFACE AN EXTENSION KIT FROM THE VALVE MANUFACTURER MUST BE PROVIDED.
3. PRECAST CONCRETE ENCASEMENT IS ALSO ALLOWED OUTSIDE OF PAVED AREAS.
4. ADDITIONAL JOINT RESTRAINT REQUIRED IN EACH DIRECTION (NOT SHOWN) FOR INLINE VALVE TO OPERATE AS A DEAD END.

CITY OF GOLDSBORO NORTH CAROLINA

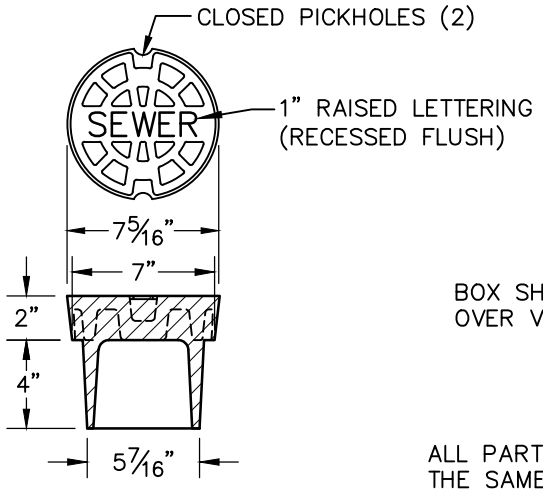
EFFECTIVE: 12/01/18

STANDARD PLUG VALVE INSTALLATION - 12" AND LESS

DETAIL No.
09000.05



BOTTOM SECTION



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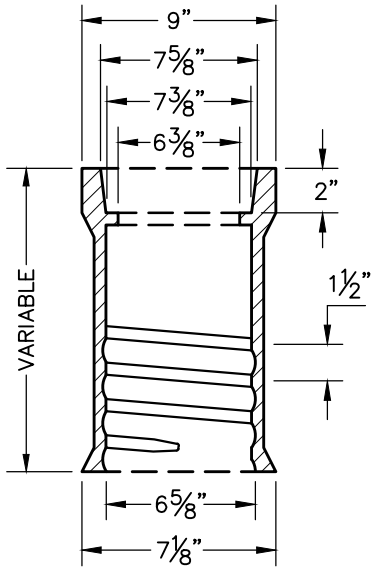
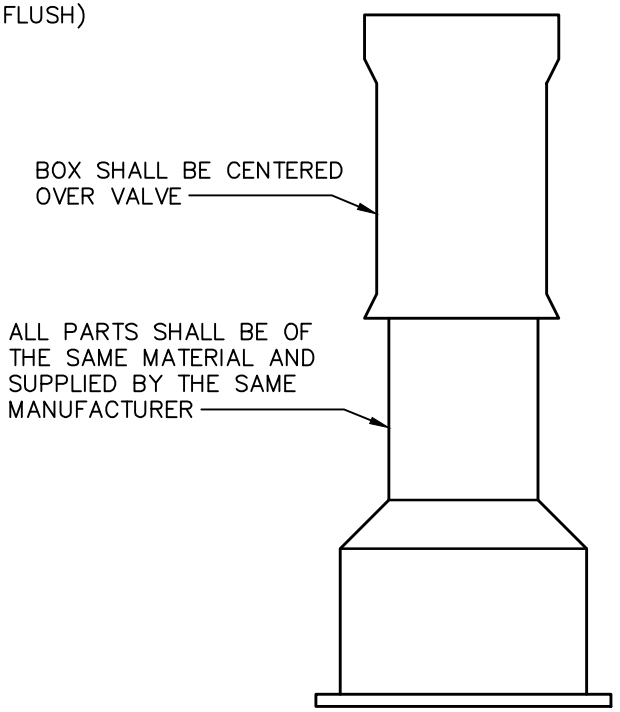


TOP SECTION



COMPLETE BOX

NOTES:

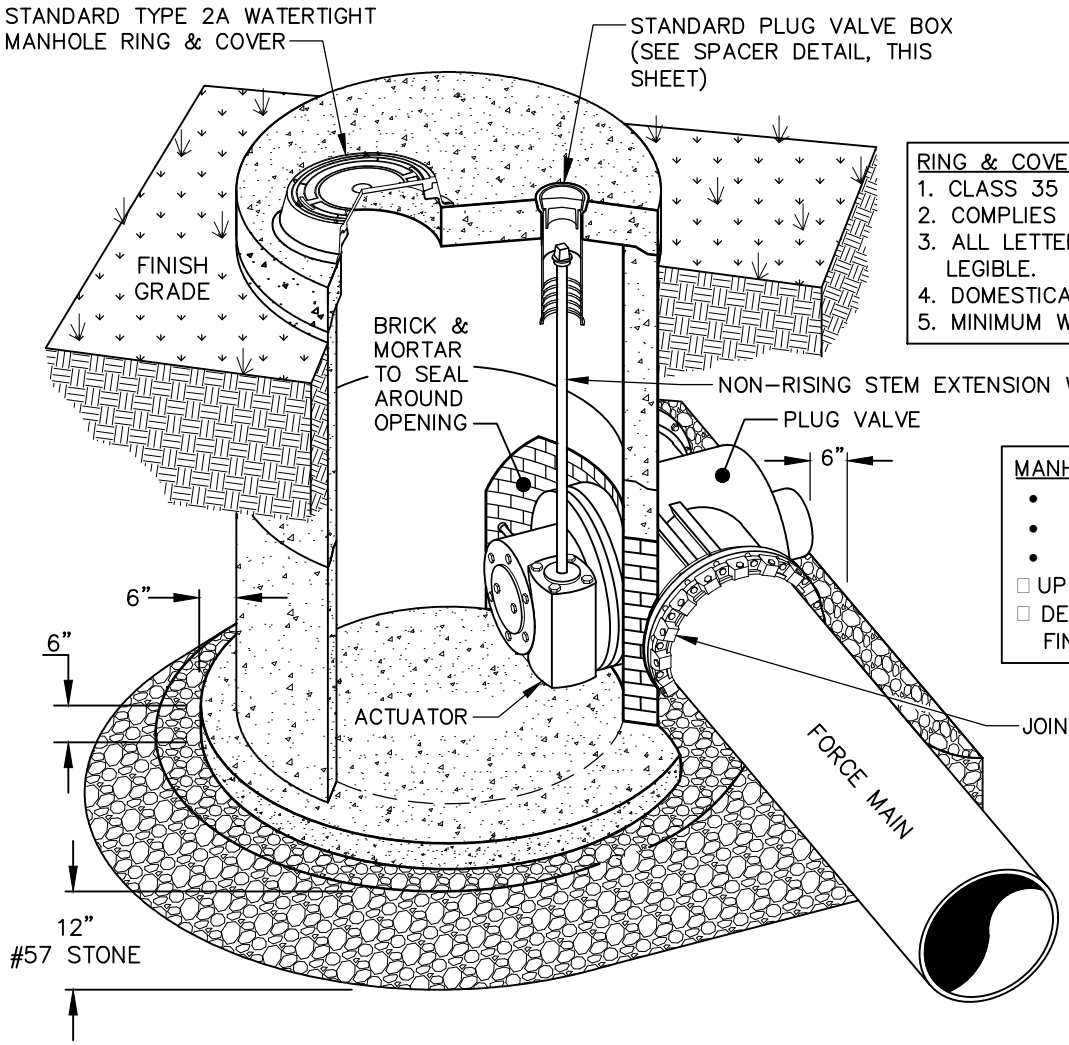
1. VALVE BOX COVER SHALL WEIGH A MINIMUM 24 lbs.
2. ENTIRE VALVE BOX ASSEMBLY & COVER SHALL BE CAST FROM CLASS 35 GRAY IRON.
3. ASSEMBLY SHALL BE DOMESTICALLY MADE AND MANUFACTURED IN THE U.S.A.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD PLUG VALVE BOX

DETAIL No.
09000.05
SHEET 2 OF 2



RING & COVER SPECIFICATIONS:

1. CLASS 35 GREY IRON.
2. COMPLIES WITH ASTM A48 CL35B.
3. ALL LETTERING SHALL BE CLEAN, CRISP, AND CLEARLY LEGIBLE.
4. DOMESTICALLY MADE AND MANUFACTURED IN THE USA.
5. MINIMUM WEIGHTS: RING = 95, COVER = 60.

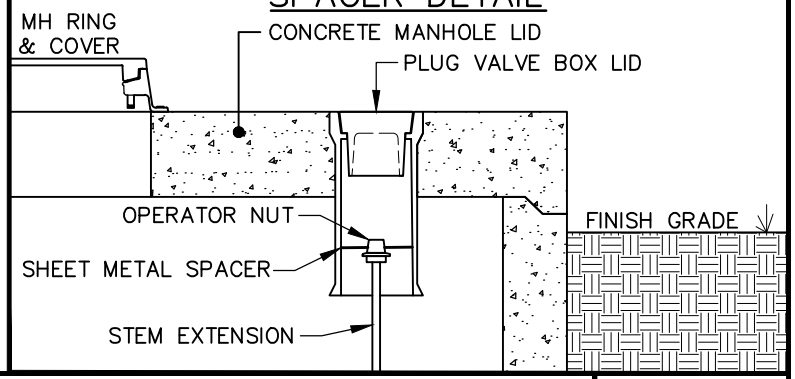
MANHOLE SIZES:

- 4' UP TO 18" FORCE MAIN AND 5' DEPTH.
- 5' UP TO 24" FORCE MAIN AND 6' DEPTH.
- 6' UP TO 36" FORCE MAN AND 10' DEPTH.

□ UP SIZE IF BOTH CRITERIA ARE NOT MET.
□ DEPTH MEASURED FROM TOP OF PIPE TO FINISHED GRADE.

NOTE:
1. PROVIDE PIPE SUPPORT IF MORE THAN 50% OF THE VALVE IS IN THE MANHOLE.

SPACER DETAIL

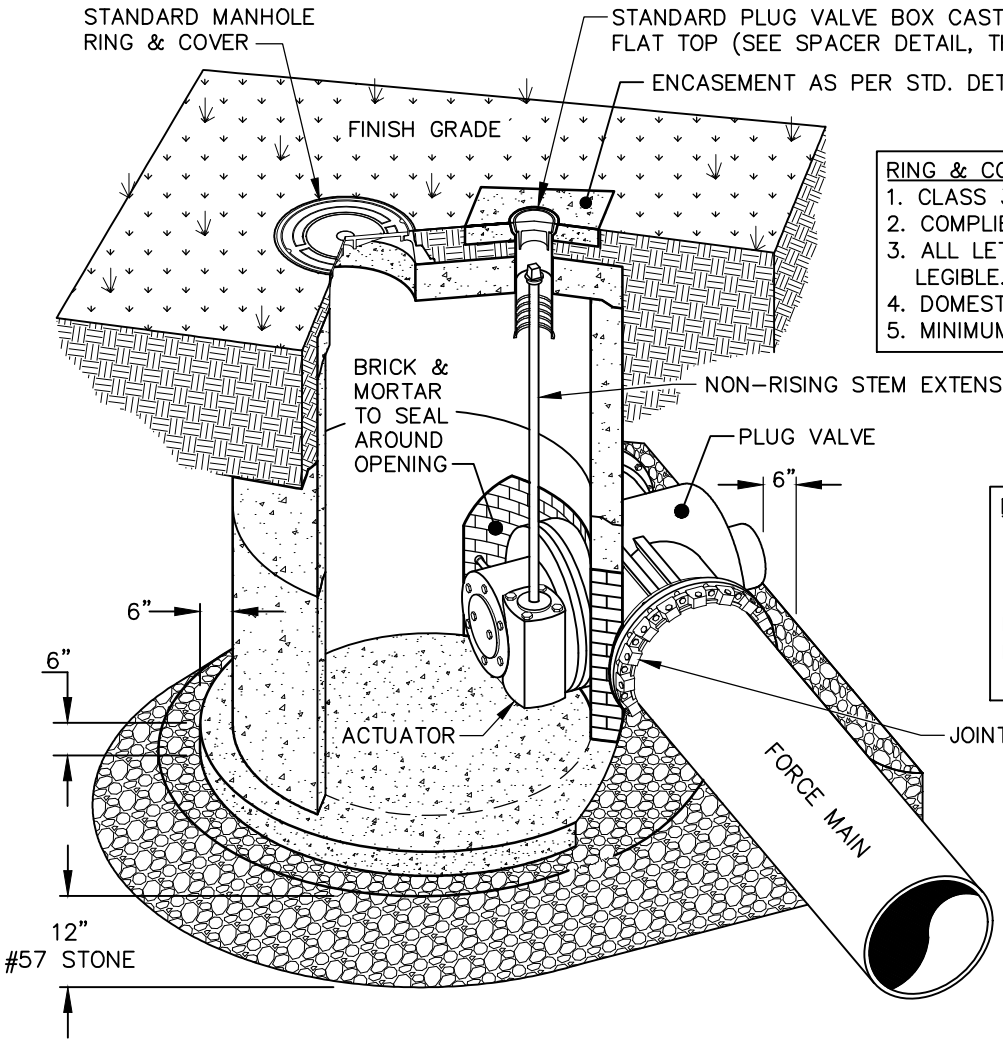


CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD PLUG VALVE INSTALLATION GREATER THAN 12" OUTSIDE OF RIGHT OF WAY

DETAIL No.
09000.06
SHEET 1 OF 3



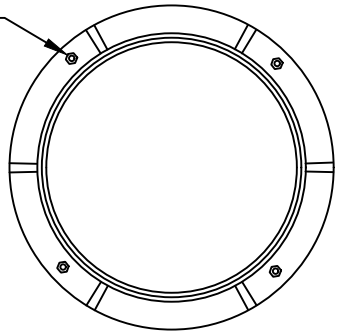
RING & COVER SPECIFICATIONS:
1. CLASS 35 GREY IRON.
2. COMPLIES WITH ASTM A48 CL35B.
3. ALL LETTERING SHALL BE CLEAN, CRISP, AND CLEARLY LEGIBLE.
4. DOMESTICALLY MADE AND MANUFACTURED IN THE USA.
5. MINIMUM WEIGHTS: RING = 180, COVER = 120.

MANHOLE SIZES:
- 4' UP TO 18" FORCE MAIN AND 5' DEPTH.
- 5' UP TO 24" FORCE MAIN AND 6' DEPTH.
- 6' UP TO 36" FORCE MAN AND 10' DEPTH.

□ UP SIZE IF BOTH CRITERIA ARE NOT MET.
□ DEPTH MEASURED FROM TOP OF PIPE TO FINISHED GRADE.

JOINT RESTRAINT SHALL BE POLY WRAPPED

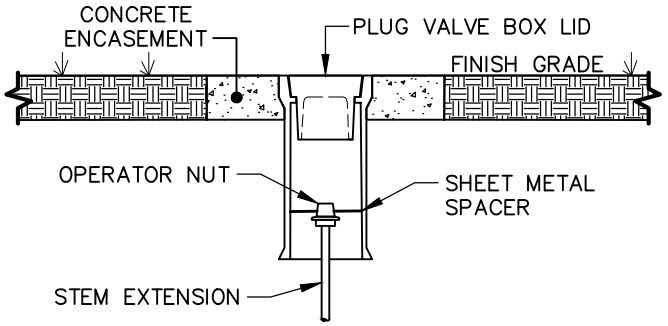
(4) $\frac{3}{8}$"x 4$\frac{1}{2}$" ANCHOR BOLTS



RING TOP VIEW

NOTE:
1. PROVIDE PIPE SUPPORT IF MORE THAN 50% OF THE VALVE IS IN THE MANHOLE.

SPACER DETAIL

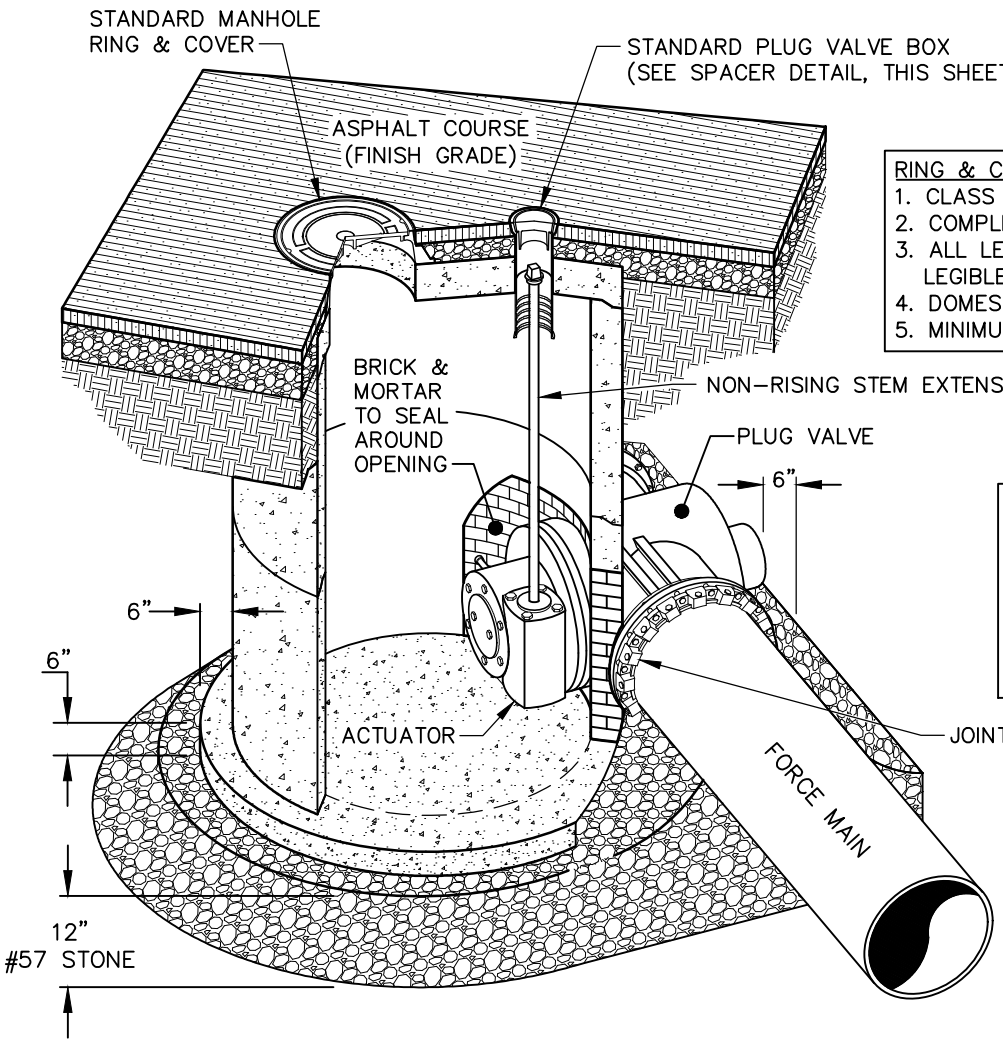


CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

STANDARD PLUG VALVE INSTALLATION GREATER THAN 12" WITHIN RIGHT OF WAY (OUTSIDE OF PAVEMENT)

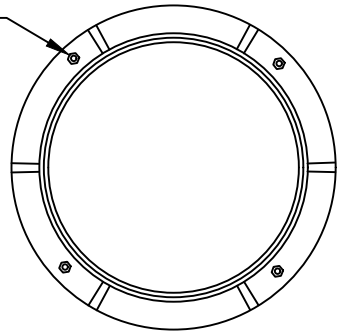
DETAIL No.
09000.06
SHEET 2 OF 3



RING & COVER SPECIFICATIONS:
1. CLASS 35 GREY IRON.
2. COMPLIES WITH ASTM A48 CL35B.
3. ALL LETTERING SHALL BE CLEAN, CRISP, AND CLEARLY LEGIBLE.
4. DOMESTICALLY MADE AND MANUFACTURED IN THE USA.
5. MINIMUM WEIGHTS: RING = 180, COVER = 120.

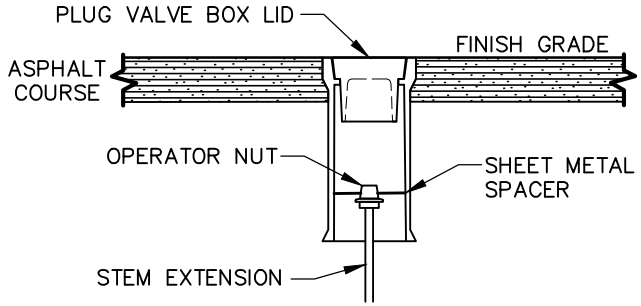
MANHOLE SIZES:
- 4' UP TO 18" FORCE MAIN AND 5' DEPTH.
- 5' UP TO 24" FORCE MAIN AND 6' DEPTH.
- 6' UP TO 36" FORCE MAN AND 10' DEPTH.

□ UP SIZE IF BOTH CRITERIA ARE NOT MET.
□ DEPTH MEASURED FROM TOP OF PIPE TO FINISHED GRADE.



RING TOP VIEW

SPACER DETAIL



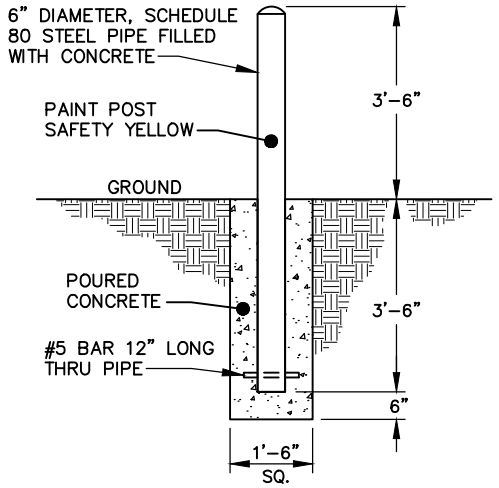
NOTES:
1. PROVIDE PIPE SUPPORT IF MORE THAN 50% OF THE VALVE IS IN THE MANHOLE.
2. TOP OF MANHOLE SHALL NOT BE WITHIN ASPHALT COURSE. ONE GRADE RING MAY BE USED WHEN ASPHALT DEPTH EXCEEDS 7 INCHES. THREADED ANCHOR BOLT SHALL EXTEND A MINIMUM 4 INCHES INTO MANHOLE TOP.

CITY OF GOLDSBORO NORTH CAROLINA

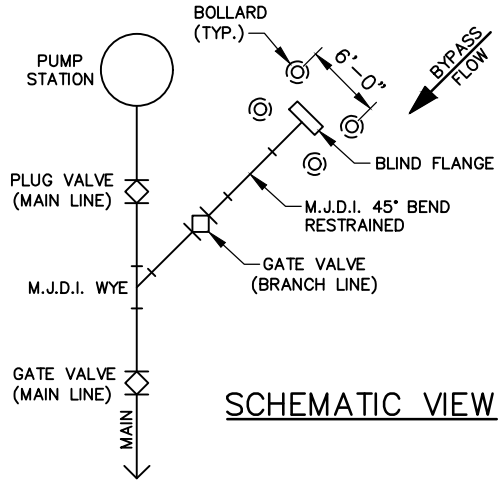
EFFECTIVE: 12/01/18

STANDARD PLUG VALVE INSTALLATION GREATER THAN 12" WITHIN PAVEMENT

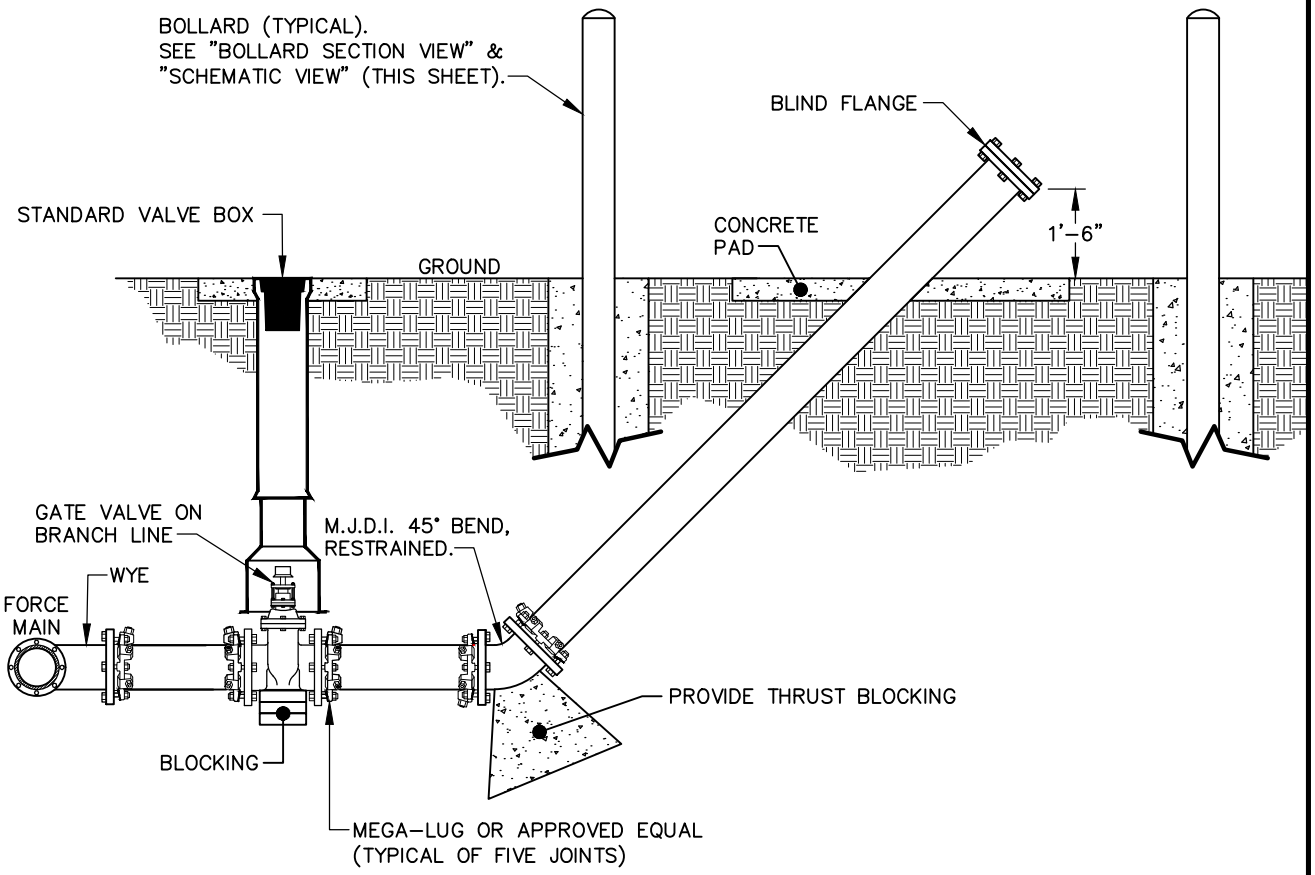
DETAIL No.
09000.06



BOLLARD SECTION VIEW



SCHEMATIC VIEW



BYPASS PUMPING CONNECTION SECTION VIEW

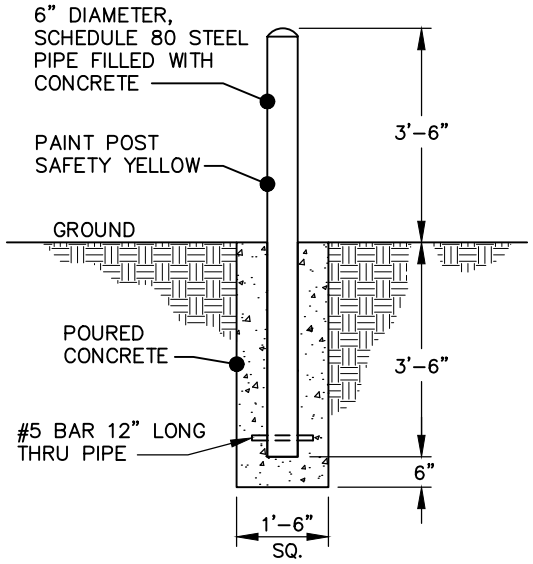
NOTES:
1. THE PIGGING/BYPASS CONNECTION SHALL BE LOCATED WITHIN 50 FEET OF THE PUMP STATION VALVE VAULT.
2. ALL PIPING WITHIN THE BYPASS ASSEMBLY SHALL BE INTERIOR COATED WITH PROTECTO 401.
3. ALL BURIED PIPES, VALVES, AND FITTINGS SHALL BE DUCTILE IRON AND RESTRAINED WITH WEDGE ACTION RETAINER GLANDS AND BLOCKING AS SHOWN.
4. ALL PIPING FOR THE PIGGING/BYPASS CONNECTION SHALL BE THE SAME DIAMETER AS THE FORCE MAIN.

CITY OF GOLDSBORO NORTH CAROLINA

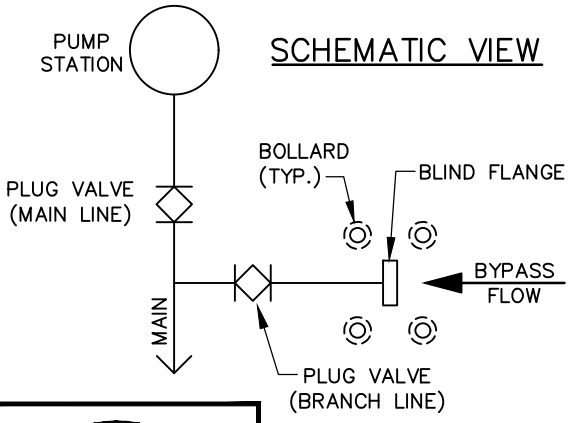
EFFECTIVE: 12/01/18

STANDARD FORCE MAIN PIGGING AND BYPASS CONNECTION

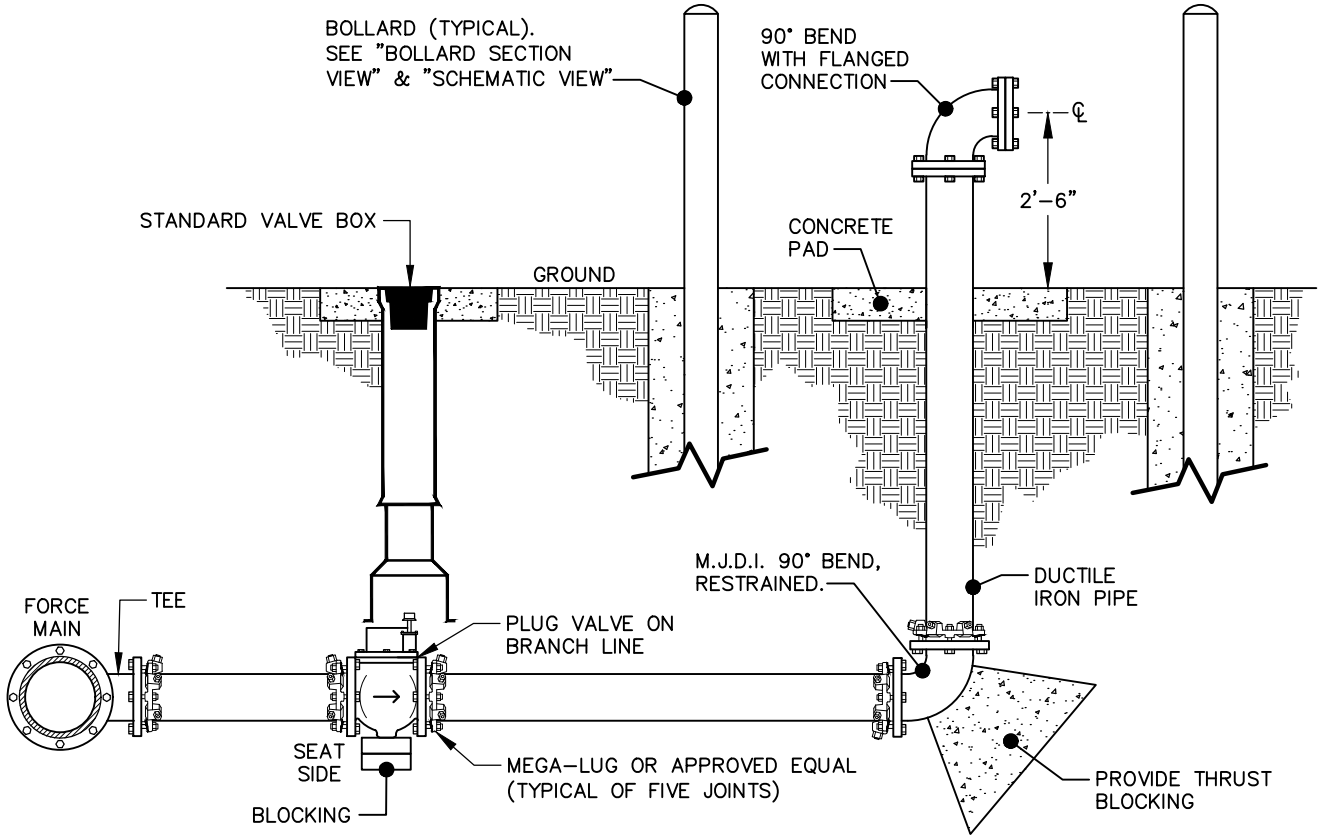
DETAIL No.
09000.07
SHEET 1 OF 2



BOLLARD SECTION VIEW



SCHEMATIC VIEW



BYPASS PUMPING CONNECTION SECTION VIEW

NOTES:
1. ALL PIPING WITHIN THE BYPASS ASSEMBLY SHALL BE INTERIOR COATED WITH PROTECTO 401.
2. ALL BURIED PIPES, VALVES, AND FITTINGS SHALL BE RESTRAINED WITH WEDGE ACTION RETAINER GLANDS AND BLOCKING AS SHOWN.
3. ALL PIPING FOR THE BYPASS CONNECTION SHALL BE SIZED BY THE ENGINEER OF RECORD.
4. THE CONNECTION SHALL BE SURROUNDED BY BOLLARDS AND LABELED "FOR EMERGENCY BYPASS PUMPING ONLY".
5. CONNECTION SHALL BE FIELD VERIFIED TO ENSURE ADEQUATE ROOM FOR PUMPING EQUIPMENT.

CITY OF GOLDSBORO NORTH CAROLINA

EFFECTIVE: 12/01/18

TYPICAL BYPASS CONNECTION TO FORCE MAIN

DETAIL No.
09000.07
SHEET 2 OF 2