
CITY OF GOLDSBORO WATER AND SEWER DESIGN STANDARDS

These standards establish general design criteria for the City of Goldsboro which shall be utilized for the preparation of plans for new utility extensions, utility line replacements, and subdivision utility extensions.

Plan and profile drawings shall be prepared and certified by a registered professional engineer. The plans shall show elements of the utility mains and shall include an overall utility plan layout on a single sheet with a scale no smaller than 1-inch=200 feet. The utility drawings shall be on separate sheets free of landscaping and other details not pertinent to the utility plans. The water and sewer drawings may be on the same sheets. All engineering drawings shall be prepared on plan sheets that measure 24-inches by 36-inches.

No plans will be approved for construction until all off-site easements have been obtained. All plans shall show the existing utilities and their size with the book and page number being shown for existing easements. Off-site drainage shall be indicated on the plans along with proposed utilities. These plans shall include the services stubs for the individual lots to be served. Once installed, "as built" plans shall be provided to the City showing the utilities. As built plans shall be prepared in accordance with section V.C. of these standards. "As built" drawings for the utilities shall be submitted to the Engineering Department at the time of acceptance of the project by the City. All service stubs shall be shown on the "as built" plans and shall be referenced to the property lines.

I. WATER DESIGN

A. Locations:

1. All mains shall be installed within dedicated street rights-of way or easements.
2. Water mains shall be located either in the south or east side of the street pavement.

B. Size:

1. Major mains are to be sized according to the Pitometer Associates Report and/or City of Goldsboro Engineering Department.

2. Minimum main size shall be six inches. Maximum length of dead end six inch mains is 1500 feet.
3. When the proposed project or subdivision is confined by natural topographic features or existing developments, and it is determined that the streets will not be extended to serve adjacent properties, then the mains shall be sized to provide adequate domestic and fire flows.
4. Fire flows shall be as specified in the Fire Protection Handbook published by the National Fire Protection Association with a residual pressure of 20 psi.

C. **Fire Hydrants:**

1. All fire hydrants shall be installed on a 6-inch lead with a hydrant branch valve. All hydrants shall be located at the right-of-way or in a two foot by two foot easement adjacent to the right-of-way and installed in accordance with City of Goldsboro typical construction details and standards.
2. In all residential districts, there shall be a fire hydrant located at each street intersection. The maximum distance between fire hydrants in these districts, measuring along public street centerlines and/or other private travel ways shall be 500 feet or as determined by the Engineering Department and/or Fire Department.
3. In all business, commercial, office and institutional, shopping center, multi-family, mobile home and industrial districts, fire hydrant locations shall be determined by the City of Goldsboro Fire Department.

D. **Valves:**

1. Each proposed new intersection shall have one less main line valve than the number of streets, i.e., a four-way intersection shall have three main line valves, a TEE intersection shall have two main lines valves.
2. Each fire hydrant shall have a hydrant branch valve.
3. Main line valves on straight runs between street intersections shall be spaced no grater than the distances given below. However, main line valves should coincide with fire hydrants.

Main Size**Maximum Spacing**

6 in.	600 ft.
8 in.	900 ft.
12 in.	1000 ft.
16 in.	1000 ft.
24 in.	1500 ft.

E. Installation:

1. All water mains shall be installed with a minimum cover of 4 feet from the top of finished ground to pipe crown and shall be in accordance with all applicable City Standards.
2. Mains which can be extended in the future must terminate with a main line gate valve prior to the last joint of pipe. Dead-end mains shall be designed with a blow-off assembly of sufficient size to permit complete flushing of the dead-end main.
3. Service connections 2-inches and smaller shall be made using service saddles and corporation cocks. Services 4-inches and larger will require a tapping sleeve and valve in accordance with City standards.
4. Service connections shall be allowed on mains installed in dedicated street rights-of-way. All service connections will be made perpendicular to the main.
5. Meter installations shall be in accordance with the City of Goldsboro typical Construction Details and Standards.

All new water meters shall be located within street rights-of-way as required by Section 53.20 of the City's Code of Ordinance unless an agreement is executed between the City and property owner addressing location of the water meter(s) outside street rights-of-way on private property. This agreement will be prepared by the City Attorney and will address ownership of the water service line, the property owner's responsibility for obtaining the services of a licensed plumber to make repairs, payment by the property owner for all cost incurred for repairs, charges for water lost due to a defective service line, and termination of water service if the property owner fails to repair a defective service line after notification by the City. This agreement shall be executed by both the City and property owner prior to the provision of water service to the property owner's property.

F. **Limits of Installation:**

All water mains, of proper size, shall be installed complete, along all boundaries abutting existing public roadways, from property line to property line regardless of the land use, proposed lot arrangement of the subdivided property or the availability of connection to a main in service. Within all dead-end streets that may be extended, the water main must extend to the property line of the subdivision.

II. **SEWER DESIGN**

A. **Location:**

1. All sanitary sewer mains shall be installed within dedicated street rights-of-way or dedicated utility easements. When sanitary sewer mains are installed in street rights-of-way, they shall be located in the center of the pavement or right-of-way where practical.
2. Minimum widths of permanent utility easements are as follows:

<u>Pipe Size</u>	<u>Minimum Easement Width</u>
8 in.	20 ft.
10 in	20 ft.
12 in. to 18 in.	30 ft.
24 in.	40 ft.

Easement widths for pipe sizes greater than 24-in. will be determined by the City Engineer. Sewer mains shall be centered in the easement. All sewer easement boundaries must be field staked and flagged by developer's surveyor and at his expense.

3. The minimum combination easement width for sanitary sewer and storm sewer is 30 feet. There must be a separation of 10 feet between outside diameters of pipes and 10 feet from the center line of the sanitary sewer to the easement line. Such easements are to be recorded as "City of Goldsboro Utility Easement".
4. All off-site easements shall be acquired by the developer. These off-site easements shall be recorded by map and by deed of easement. The easements shall be dedicated to the City of Goldsboro and entitled "City of Goldsboro Utility Easement".

5. No permanent structure or impoundment shall be constructed within a utility easement or over a utility main.
6. Deflection angles for all horizontal turns shall be shown on the drawings. All elevations shall be tied to mean sea level and the benchmark shall be shown and described on the plans. Spot elevations on 100 ft. stations, 75 ft. from the centerline on both sides, shall be shown on the plan or cross-sections to ensure that the sewer can adequately serve the property. The plans shall show the manhole number, top elevation, station, invert elevations, length of sewer reach, and slope (in percent).
7. Proposed sanitary sewer lines paralleling a creek shall be designed to a proper depth to allow lateral connections such that all creek crossings will be below the stream bottom elevation. The top of the sewer pipe shall be at least 1 foot below the stream bed elevation and be of ductile iron. Manholes along these sewers must be protected against the 100-year flood by raising the top elevation of the manhole to two (2) feet above the base flood elevation or by providing sealed manholes. All sealed manholes must be vented every 1,000 feet along the sewer line.

B. Size:

1. All gravity sewer mains shall be designed and sized to serve the total natural drainage basin. Total off-site drainage area in acres must be shown on the plans and calculations shall be submitted to the Engineering Department. An 8-inch main shall be minimum size permitted.
2. Pipe size shall be determined based on *15A NCAC 02T.0114*

Sanitary Sewers shall be designed to carry the peak design flow with a maximum depth of one-half pipe diameter.

Sewer size design shall be half full or 50% capacity for the maximum depth of flow for all grades.

3. **Slope:**

<u>Pipe Diameter (in.)</u>	<u>Minimum Slope</u>
8	0.40%
10	0.28%
12	0.22%
14	0.17%
15	0.15%
16	0.14%
18	0.12%
21	0.10%
24	0.08%
27	0.067%
30	0.058%
36	0.046%

4. Grades for sanitary sewers must be such that a minimum flow velocity of 2 fps is maintained. The maximum grade for sanitary sewers is 10%.
5. Any grades which exceed the maximum of 10% must be approved by the Engineering Department and must be accompanied with details of a high velocity manhole. Any time the grade is greater than 15%, ductile iron pipe shall be used with high velocity blocking.
6. Pipe diameter changes shall occur in a manhole with the pipe crowns matched provided a minimum drop of approximately 0.10 feet is maintained between inverts.

C. **Gravity Flow and Pump Stations:**

1. In situations where the gravity sewer is not available, the City may consider the installation of a privately owned and maintained pump station and force main. The engineer for the project must address these factors:
 - (a) Evaluate the capacity of the receiving sewer main at the point of discharge and downstream to determine that the line can handle the transferred sewer flow.
 - (b) Perform a cost analysis of the pump system and gravity system. The gravity must be at least 2.5 times more expensive for the City to consider a pump station.

- (c) The pump station must be sized to accommodate the total basin area that could gravity flow into it.

In some circumstances, the City may choose to accept for permanent ownership and maintenance pump stations designed in accordance with the City Standards. Those stations suitable for acceptance by the City must meet the following criteria:

- (a) Be determined by the City to be in the “best interest” of the City.
 - (b) Be necessary due to limitations imposed by existing facilities.
- 2. The evaluation of the use of a pump station (public or private) must be completed and submitted for review by the Engineering Department prior to subdivision submittal to the Planning Department for consideration.
 - 3. Pump stations will have 100% reserve peak pumping capacity (dual pumps) and shall be submersible type unless specific approval is granted by the Public Utilities Director for use of other type pumps. Detailed engineering plans shall be approved by the Engineering Department prior to construction. The public pump stations shall include a remote monitoring system. Pump stations shall be provided with either on-site standby power or be compatible with the City’s portable generators.
 - 4. All force mains shall be designed and installed in accordance with City of Goldsboro water main standards.
 - 5. Public pump stations must be provided with a dedicated 20 ft. public access with a 10 ft. wide gravel roadway. The gravel roadway shall have a minimum of 4 in. cursher run stone.
 - 6. Private pump stations shall be equipped with a sign indicating a 24-hour on call service number.

D. Manholes:

- 1. Manholes shall be installed at each deflection of line and/or grade. Maximum distance between manholes shall be as follows:

<u>Pipe Size</u>	<u>Maximum Distance Between Manhole</u>
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8 in. to 18 in.	400 ft.
24 in. and greater	500 ft.

2. All manholes shall have a minimum drop between inverts of 0.10 feet. When there is an elevation difference between inverts greater than 2.5 feet, a drop manhole shall be used.
3. Eccentric or concentric cones may be used on 8 through 12-inch mains. On 15-inch and larger mains, concentric cones must be used.

E. **Installation:**

1. All installations shall be in accordance with established City standards for utility mains.
2. The depth of sewer mains shall be sufficient to serve adjoining property and allow for sufficient grade for the service line. Lateral connections are to be into manhole barrels (not the cone section) or into the top quarter of sewer mains.
3. All 4 in. sewer laterals may be tapped directly into mains or manholes. All sanitary sewer connections 6-inches and larger shall be made into manholes unless otherwise approved by the Engineering Department. If a new manhole is required, it shall be included in the cost of the service line. Service clean-outs shall be located at the right-of-way line or the easement boundary line.
4. All sewer mains shall have a minimum cover of 5 feet (measured from top of finished grade) in traffic areas to the pipe crown unless ductile iron pipe is provided where minimum cover shall be three (3) feet. Sewers shall be no deeper than 12 ft. unless approved by the Engineering Department. If a deeper cut is allowed, PVC pipe may be used only if the appropriate bedding is used and if the loading calculations are presented to the Engineering Department for review. If a special bedding is not used, ductile iron pipe shall be installed. Non-traffic areas shall have a minimum cover of 3 feet (measured from top of finished grade) to the pipe crown. Service laterals shall be of cast iron soil pipe, PVC, or ductile iron when installed in a public right-of-way. A clean-out is required at the easement or right-of-way line and must be constructed of cast iron,

ductile iron, or PVC. If constructed of PVC, the clean-out must be equipped with a bronze clean-out plug to facilitate location.

F. **Limits of Installation:**

Extensions of sanitary sewer mains are to be to the farthest property line of the tract, where necessary to serve adjoining property with gravity sewer. In all instances, plans shall show the total area in acres draining to the uppermost bounds of the tract on any established watercourse.

III. **GENERAL INSTALLATION STANDARDS**

A. **Horizontal Relation of Water Mains to Sewers:**

Lateral Separation of Sewers and Water Mains. Water mains shall be laid at least 10 feet laterally from existing or proposed sewers, unless local conditions or barriers prevent a 10-foot lateral separation in which case.

The water main is laid in a separate trench, with the elevation of the bottom of the water main at least 18-inches above the top of the sewer.

*Note: All distances measured from outside diameter to outside diameter.

B. **Vertical Relation of Water Mains to Sewers:**

Crossing a Water Main Over a Sewer. Whenever it is necessary for a water main to cross over a sewer, the water main shall be laid at such an elevation that the bottom of the water main is at least 18-inches above the top of the sewer, unless local conditions or barriers prevent an 18-inch vertical separation in which case both the water main and sewer shall be constructed of ductile iron and with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing.

Crossing a Water Main Under a Sewer. Whenever it is necessary for a water main to cross under a sewer, both the water main and the sewer shall be constructed of ductile iron and with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing and maintain a minimum of 18" vertical

separation. A section of water main pipe shall be centered at the point of crossing.

*Note: All distances measured from outside diameter to outside diameter.

C. **Vertical Relation of Sanitary Sewer Mains & Water Mains to Storm Sewer**

When a sanitary sewer or water main is crossing over or under a storm sewer, a vertical separation of 18-inches shall be maintained unless both lines are of ductile iron or encased in concrete.
Distance measured outside diameter to outside diameter.

D. **General Vertical Clearance:**

When other underground utilities are encountered 12-inches of separation should be maintained.

IV. **PERMITS**

During the course of designing and prior to constructing a utility project, various permits from the City and State Government must be secured. Below is a brief description of some of the major permits that may be required on these projects. All required permits must be obtained by the Owner/Developer and submitted to the Engineering Department prior to construction.

A. **State Permits:**

Application for State Permits are to be submitted to the appropriate State agency with copies of the applications provided to the Engineering Department. Any fees required should be made payable to the State agency involved and submitted at the same time as the application. It is the responsibility of the Owner/Developer to ensure all permit applications, fees, and final plans are obtained prior to construction. All applicable permits **MUST BE OBTAINED PRIOR TO ANY CONSTRUCTION.**

1. **Sanitary Sewer System Extension.** For any proposed extension of the public sewer system or privately maintained sewer collection system, a Non-Discharge Permit from the North Carolina Department of Environment and Natural Resources must be obtained. The application for the permit should be submitted to NCDENR at the time of final plan or subdivision approval. One (1)

copy of the application, one (1) set of plans, and any pump station or gravity sewer calculations shall be submitted to the Engineering Department. Fee schedules and application forms may be obtained from the North Carolina Department of Environment and Natural Resources.

2. **Water System Extension.** For all public waterline extensions a Water Main Extension Permit shall be obtained from the North Carolina Department of Environment and Natural Resources. One (1) copy of plans and one (1) copy of the application shall be submitted to the Engineering Department. Application forms may be obtained from the North Carolina Department of Environment and Natural Resources.
3. **North Carolina Department of Transportation Encroachment Forms and Driveway Permit.** When any part of the project will encroach on NCDOT right-of-way, an encroachment form must be submitted and approved by NCDOT prior to construction. All encroachment applications and driveway permits require five (5) sets of plans and five (5) copies of the encroachment form. Fee schedules and encroachment forms are available from the NCDOT.
 - a) For installation of utilities a 3-party agreement between the developer, the City of Goldsboro and the NCDOT is required. There is no fee.
 - b) For roadway widening, sidewalk installation, addition of curb and gutter, storm drainage, etc., a 2-party agreement between the developer and the NCDOT is required. The fee is determined by the NCDOT.
 - c) Driveway Permits must be obtained prior to any driveway cuts to be made on a State maintained road. The fee is determined by the NCDOT.

B. **Wetland Permit:**

It is the responsibility of the developer/engineer to verify if wetlands exist on a project. The regulatory agency that controls wetlands is the US Army Corp of Engineers. If wetlands are present it is developers/engineers responsibility to obtain necessary permits.

C. **Neuse River Riparian Buffer Rules:**

Streams that appear on either U.S. Geological Survey topographic maps or county soil survey maps are subject to the requirements of the Neuse River Riparian Buffer Rules. The agency that administers this program is the North Carolina Department of Environment and Natural Resources, Division of Water Quality.

D. **Other Permits:**

For work other than site work and utility installations, additional permits may be required by the City's Building Inspections Department.

V. **PROJECT CLOSE-OUT**

A. **Pre-Final Inspection:**

Upon completion of construction, the Contractor or Developer shall contact the Engineering Department to schedule a pre-final inspection. A pre-final inspection will not be scheduled until the following requirements are met:

1. The work shall be in accordance with the requirements of the City.
2. If applicable, a copy of the final estimate has been submitted and approved by the City.
3. The easements and dedicated property required for the work have been obtained and are recorded at the Register of Deeds.
4. The as-built plans for the work have received the approval of the Engineering Department.
5. All fees applicable to the project have been paid.
6. When a project includes sewer system extension(s), the Engineering Department has received certification by a Professional Engineer stating that the sewer system installation conforms with the requirements of the approved Contract Documents as required by the North Carolina Department of Environment and Natural Resources.

7. When a project includes water system extension(s), the Engineering Department has received certification by a Professional Engineer stating that the water system installation conforms with the requirements of the approved Contract Documents as required by the North Carolina Department of Environment and Natural Resources.

At the scheduled pre-final inspection, the Engineering Department shall perform a visual inspection in the presence of representatives of the Contractor and the Engineer. The Engineer or his representative shall prepare a detailed punch list of any deficiencies discovered and provide copies to the Developer, Contractor, and the Engineering Department. Any defective items noted shall be corrected prior to acceptance.

B. Final Inspection:

Upon completion of the items on the punch list, the Contractor or Developer shall contact the Engineering Department to schedule the final inspection. Any remaining defective items shall be noted and corrected prior to acceptance. No service shall be provided prior to project acceptance.

C. As-Built Plans:

1. No service shall be provided until the as-built plans are reviewed and accepted by the Engineering Department. Upon approval, the Contractor shall submit to the Engineering Department a mylar reproducible of the approved as-built plans. The as-built plans shall include both water and sewer combined on each drawing. The Contractor shall also submit one (1) print of the as-built plans.
2. The Engineering Department shall require at least two (2) weeks from date of receipt of the plans to complete its review and a reasonable time for review of any resubmittals.
3. The scale for as-built plans shall be the same as that of the construction plans.
4. Revised construction plans are acceptable if standard drafting techniques and practices are followed.
5. If the project has developed in phases, all lines should be clearly indicated and the title block of the plan sheets shall indicate the

phase number and section number (where applicable) and all building units or lots being served with the particular phase being submitted. Lots and building unit numbers must reflect the numbers that will later accompany the service application.

6. The as-built plans shall show the location and length of all services and shall indicate by lot and unit number the unit which each service will serve.
7. The plans shall indicate street names, pavement widths, rights-of-way, and easements.
8. Apartments, condominiums, and other developments with walkways and off street parking shall have these facilities shown on the as-built plans.
9. New water lines shall be located by horizontal dimensions from highly visible, permanent, fixed objects; such as the back of the street curb and gutter, the edge of a walk-way, street center-line, etc.
10. Valves shall be located by reference to two (2) permanent, visible objects, such as right-of-way monuments, fire hydrants, manholes, catch basins, etc.
11. Indicate the type and size of each water line, sewer line, water tap, and sewer tap installed.
12. Station numbers identifying location of services, fittings, crossings, etc., shall begin at zero at in-line valves except in cases where there is no valve within a reasonable distance. In those cases, stationing may begin with zero at sanitary sewer manholes or other easily visible, permanent features subject to the approval of the Engineering Department.
13. Where more than one (1) type of material is used for water or sewer pipe, note the station of change from one material to another at the beginning of each change.
14. Designate on the as-built plans that metallic detectable tape has been installed in accordance with City standards where required.

15. Station numbers shall be shown for water valves and blow-offs. Indicate by station the location of all fittings for water mains and wastewater force mains.
16. Lengths of gravity sewer between manholes shall be shown on the plans. The plan section shall indicate pipe lengths as measured horizontally between manhole centerlines. The profile section shall indicate pipe grades as measured from outside of manhole to outside of manhole (invert out to invert in).
17. The actual elevation, based on USGS datum only, of manhole tops, inverts (including services and taps) shall be shown.
18. The stationing of water services shall be shown.
19. The stationing of sewer services shall be shown.
20. All privately owned water and sewer lines shall be indicated.
21. As-built plans shall be prepared and certified by a Professional Engineer or Professional Land Surveyor.
22. The recorded plat and deeds of easement conveying easements and rights-of-way to the City shall accompany the as-built plans where applicable.

D. Satisfactory Completion:

If all required documentation has been obtained and the final inspection by the Engineering Department reveals no defects in materials or workmanship, the Engineering Department may issue a Certificate of Satisfactory Completion. The City shall be responsible for the general maintenance of the water and sewer system from the date of issuance of the Certificate. All damages occurring to the work prior to issuance of the Certificate shall be repaired by the Contractor at no expense to the City. The Contractor shall warrant the project work to be free of defects in materials or workmanship for a period of one (1) year from the date of execution of the Certificate of Satisfactory Completion.