

# **BRUNSWICK COUNTY, NORTH CAROLINA**



## **ENGINEERING DESIGN MANUAL TECHNICAL SPECIFICATIONS AND STANDARD DETAILS FOR WATER AND SEWER SYSTEMS**

November 2024

**ENGINEERING DESIGN MANUAL, TECHNICAL SPECIFICATIONS, AND  
STANDARD DETAILS**

TABLE OF CONTENTS

PAGE NUMBER

INTRODUCTION

SECTION 1: DESIGN GUIDANCE MANUAL

Administrative Information .....	8
Plan Review and Approval Process.....	10
Construction Process .....	13
Substantial Completion Process.....	15
Final Acceptance Process .....	17
Legal Documents Requirements	
Easements.....	18
Plats.....	27
Deed of Dedication & Lien Waiver Affidavit.....	28
Water and Sewer Indemnity Agreements .....	35
Utility Design Standards	
Part A: Water Systems .....	39
Part B: Gravity Sewer Systems .....	57
Part C: Sewer Force Main Systems .....	62
Part D: Sewage Pumping Station Systems .....	68
Part E: Low Pressure Sewer Systems with Grinder Pumps .....	76
Part F: Vacuum Sewer Systems .....	80
Part G: Sand, Oil, and Grease Interceptor Systems .....	98
Other Design Information	
Cross Connection and Backflow Protection Policy .....	106
Wastewater Pumping Station Design Guidelines .....	124
Drawing Submittals Required for a Sewer Pump Station in Brunswick County .....	134
Brunswick County Rural Sewer Policy .....	136

SECTION 2: TECHNICAL SPECIFICATIONS

<u>Specification Title</u>	<u>Specification Number</u>
Definitions and Terms	TS 001
Existing Underground Utility Lines and Structures	TS 002
Field Engineering	TS 003
Special Project Procedures	TS 004
Project Meetings	TS 005
Project Schedule	TS 006
Project Submittals	TS 007
Construction Facilities and Temporary Controls	TS 008
Erosion and Sedimentation Control	TS 009
As-Built Drawings	TS 010
Dewatering	TS 011
Trench Boxes, Sheeting, and Shoring	TS 012
Excavating, Grading, Trenching, & Backfilling	TS 013
Boring and Jacking	TS 014
Directional Drilling	TS 015
Concrete Curb, Gutters, Driveways, & Sidewalks	TS 016
Asphalt Paving	TS 017
Water Distribution System	TS 018
Storm Water Drainage Systems	TS 019
Gravity Sanitary Sewer System	TS 020
Low Pressure Sewer Systems & Grinder Pumps	TS 021
Waste Water Force Mains	TS 022
Waste Water Pump Stations with Submersible Pumps	TS 023
Sanitary Sewer Pipeline Restoration	TS 024
Landscaping	TS 025
Concrete Reinforcement	TS 026
Cast-In-Place Concrete	TS 027
General Electrical Information	TS 028
Electrical Services	TS 029
Grounding and Bonding	TS 030
Surge Protection	TS 031
Emergency Generators for Pump Stations	TS 032
Automatic Transfer Switch	TS 033
SCADA Control System for Sewer Pump Stations	TS 034
Electronic Marker Balls for Water Mains and Sewer Force Mains	TS 035

SECTION 3: STANDARD DETAILS

<u>Category</u>	<u>Number of detail sheets</u>
Water Details	5
Sewer Details	5
Water and Sewer Details	7
Sewer Pump Station Details:	
Drawing Submittals required for a sewer Pump Station in Brunswick County	1
Pump Station Antenna (used for all pump stations)	1
Pump Stations 1 – 50 HP site plan	4
Pump Stations 1 – 50 HP electrical details, non-Flygt pumps	4
Pump Stations 1 – 50 HP SCADA / RTU	5
Pump Stations greater than 50 HP site plan	3
Pump Stations Greater than 50 HP SCADA / RTU:	
RTU / Control Panel with Softstarts	11
RTU / Control Panel with VFDs	11

## INTRODUCTION

Any proposed additions to the water distribution and sanitary sewer collection systems of Brunswick County must meet minimum design standards to conform to State rules and the requirements of the Brunswick County Engineering and Public Utilities departments. The County requirements are contained in this “**Engineering Design Manual, Technical Specifications, and Standard Details for Water and Sewer Systems**” manual, hereinafter referred to as the “County Design Manual”, or the “Design Manual”.

This design manual is divided into three sections. These are:

- A general Design Section to assist with understanding design requirements, legal requirements, and plan review and approval procedures,
- Technical Specifications for the use of the design and contracting community, and
- Standard Details for water and sewer infrastructure to be included in all plan submittals.

Adherence to State and County regulations and this Design Manual will ensure a quality water and sewer system for the citizens of Brunswick County, and will also facilitate an increased system life span as well as a reduction in overall cost of operations and maintenance.

These guidelines have been adopted by the Brunswick County Commissioners and shall be incorporated into the design and construction of all water distribution and sanitary sewer systems. Brunswick County realizes that there are occasions when extenuating circumstances occur and, therefore, these guidelines sometimes will not be the best choice for certain situations. In these cases, please consult with County Engineering to obtain approval for any alternative designs.

Meetings may be requested with County Engineering at:

Brunswick County Engineering Department  
Building I  
75 Courthouse Drive  
Bolivia, NC 28422  
(910) 253-2500  
[engineer@brunswickcountync.gov](mailto:engineer@brunswickcountync.gov)

Copies of this Design Manual can be obtained from the Brunswick County web page or County Engineering.

This design manual is subject to updates on a periodic basis. Revisions will be posted on the Brunswick County web page or may be obtained from County Engineering. Pages are dated and numbered to assist in the maintenance of current information. It is the responsibility of the public to ensure they have the most recently approved version of the Design Manual for their use.

Any questions or comments concerning this Design Manual should be submitted to the Brunswick County Engineering Department at 910.253.2500 or [engineer@brunswickcountync.gov](mailto:engineer@brunswickcountync.gov)

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Brunswick County will only consider for ownership, operation, and maintenance water and sanitary sewer systems installed:

- 1) Within the boundaries of Brunswick County and in the service area of the County Public Utilities Department,
- 2) In accordance with this Design Manual,
- 3) In accordance with Brunswick County's most recent Water and Wastewater Master Plans. Developers and their design engineers are encouraged to contact Brunswick County, prior to beginning design, to ensure their project is consistent with Brunswick County Public Utilities' master planning for water and sewer systems,
- 4) In accordance with the latest version of the Brunswick County *Sewer Use Ordinance and Utility Policy* (on Brunswick County Utilities website),
- 5) In accordance with all minimum design criteria for water and sewer systems as published by the North Carolina Department of Environmental Quality (NCDEQ), Division of Water Resources (DWR),
- 6) In accordance with plans and specifications approved by Brunswick County and complying with the procedures outlined in this Design Manual,
- 7) In accordance with the provisions of a detailed agreement approved by the Board of Commissioners if either or both of these systems require the installation of water supply facilities or wastewater treatment disposal facilities,
- 8) In accordance with the provisions of any water and/or sewer transmission reimbursement agreements approved by the Board of Commissioners.

**SECTION 1**

**DESIGN GUIDANCE MANUAL**

**BRUNSWICK COUNTY ENGINEERING DEPARTMENT**

## **ADMINISTRATIVE INFORMATION**

The following is a general description of the responsibilities of the parties involved with the design, review and approval of water and sewer installation projects in Brunswick County:

### **1) Brunswick County Engineering Department**

- a) County Engineering will review plans submitted by a licensed professional engineer in the State of North Carolina and grant approval after all review comments have been satisfactory addressed.
- b) The County reserves the right to request changes in the work that is not in accordance with this Design Manual, or if work is being performed in an improper manner that may result in incorrect installation of the water and/or the sanitary sewer system.
- c) The County reserves the right to disallow work from an Engineer or Developer who consistently does not comply with this Design Manual and other County policies.
- d) The County reserves the right to request revisions to the Design Engineer's plans for any discrepancies found during construction that may have been overlooked during review of the plans and specifications.
- e) Pre-Construction Conferences are required with County Engineering prior to any work on County owned utility systems.

### **2) Design Engineer of Record**

- a) The Design Engineer of Record is a North Carolina state licensed professional engineer hired by a developer or property owner to prepare a set of plans and specifications for submittal to County Engineering for review and approval.
- b) The Design Engineer will:
  - 1) Prepare plans and specifications in accordance with this Design Manual, all North Carolina Department of Environmental Quality (NCDEQ) regulations, and all other local, state and federal regulations pertaining to the project.
  - 2) Ensure plans are consistent with Brunswick County's water and sewer master plans.
  - 3) Submit plans and specifications to County Engineering for review and approval.
  - 4) Make any revisions necessary to the plans and specifications to comply with any and all plan review comments received from Brunswick County Engineering Department staff.

- 5) Submit for all required permits with State agencies on behalf of their clients after plan approval is received from County Engineering.
- 6) Attend the mandatory Pre-Construction Conference once all permits are issued and the conference is scheduled as requested.
- 7) Review all phases of the work in progress during construction and conduct any required testing of systems in order to be able to issue "Engineering Certification" for the project.
- 8) Promptly furnish Brunswick County with pertinent information concerning any changes which may be necessary during the progress of the work. No major changes shall be performed without the prior approval of Brunswick County.
- 9) Obtain final approval from Brunswick County and applicable state and federal agencies.
- 10) Provide sealed record drawings (as-builts) in paper, PDF, and AutoCAD format at the conclusion of the project per County requirements. Currently the AutoCAD format for submitted record drawings must be AutoCAD 2007-2013. Individual PDFs of each plan sheet must also be provided as part of the as-built record drawing submittal. AutoCAD and PDF's must be submitted on a flash drive.

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**PLAN REVIEW AND APPROVAL PROCESS**

The following is a general description of the plan submittal, review, and approval process for proposed extensions of the Brunswick County water distribution and sanitary sewer collection systems:

**1) General Information**

- a) For new water and/or sewer main extensions a complete plan submittal shall consist of the following items: (1) set of plans (Arch D – 24”x 36”) including the most recent Brunswick County Cover Sheet, the most recent County Standard Details, the most recent County Technical Specifications with a sealed cover sheet, engineering calculations, related modeling information for water, sewer, and fire flow as applicable, water and/or sewer main extension permit applications, Engineer’s Report, and engineering narrative. All submittals must be sealed by a North Carolina state licensed professional engineer.

- b) Submittal packages should be submitted for review to:

<p>Brunswick County Engineering Department PO Box 249 Building I, 75 Courthouse Drive, Bolivia, NC 28422 910.253.2500 <a href="http://www.brunswickcountync.gov">www.brunswickcountync.gov</a></p>
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- c) Once the submitted plans and specifications are approved the County will issue an acceptance letter and execute the water and/or sewer applications. The approved package will be returned to the design engineer of record for submittal to the State agencies for permit issuance. **Note: Brunswick County Engineering does not make submittals to State agencies for developer installed projects, nor do we accept any monies for permit application fees.**
- d) Plans for installing taps on existing water and/or sewer mains versus new main extensions must also be submitted for review and approval. Two sets of the water and/or sewer plan sheets only will be sufficient for the review of a proposed tap installation. It is the design engineer’s responsibility to obtain existing system operating parameters from County Engineering in order to properly design the proposed connection.
- e) If any meetings are necessary to resolve any plan review comments or issues those meetings can be scheduled by contacting County Engineering for a meeting appointment or to arrange a telephone conference call as needed.
- f) Pre-Construction Conferences with County Engineering are mandatory prior to any work on any County owned water and/or sewer systems. **Note: all permits must be obtained, and all offsite public utility easements must be deeded and recorded prior to having a Pre-Construction Conference. This requirement includes any NCDOT encroachment permit needed for work in the public right-of-way.**

**2) Preliminary Plan Approval**

- a) Developers, Designers, Planners, Engineers and others associated with submitting design proposals should ensure that the proposed project conforms to the most recent edition of the County's water and sewer master plans.
- b) Plans that only require installing new taps to existing water and/or sewer mains versus new main extensions will be reviewed on an expedited basis; and will require an on-site Pre-Construction Conference.
- c) For water and/or sewer main extensions the Design Engineer shall submit a preliminary review package to Brunswick County. The package shall include the following at a minimum:
  - 1) One set of water and/or wastewater utility plans. Plans should include:
    - a) Cover sheet showing the general location of project utilizing the Brunswick County Standard Title Sheet. The Standard Title Sheet is available on the County website on the Engineering Department webpage
    - b) Complete water and/or sewer systems design, including plan and profile for proposed gravity sewer systems, and associated County Standard Details
    - c) Location and width of all existing public and private access and utility easements
    - d) Location and width of all proposed private access and utility easements
    - e) Location and width of all proposed public access and utility easements to be dedicated to Brunswick County
    - f) Location and width of all proposed temporary construction easements
    - g) Indicate all rights-of-way as either public or private. Plans should also indicate ownership of existing roadways
    - h) For all commercial developments show location of all proposed water (including irrigation) and sewer service taps and size of water meter (s)
    - i) County Tax Map Parcel ID number for the project property to be called out on the Brunswick County Cover Page
  - 2) One set of typed calculations sealed by the Engineer.
  - 3) Engineer's Report for water main extension requests.
  - 4) Any required water and/or sewer modeling information.

- d) Upon review and approval County Engineering will return to the Design Engineer:
  - 1) Written review comments on the proposed design.
  - 2) Written approval if no changes are required.
  - 3) Notification of any required encroachment applications, certifications, permits, or easements.
  - 4) Request for any other required information pertinent to the proposed project.

3) **Final Plan Approval**

- a) Once preliminary plan approval is received, the design Engineer shall submit the following to County Engineering:
  - 1) One complete set of plans addressing all corrections requested by County Engineering. The final submittal will be checked against the set of plans and specifications retained by County Engineering during “Preliminary Plan Approval” for completeness and accuracy.
  - 2) Completed permit applications to be signed by the County management authority. These include water, sewer, pump station, NCDOT encroachment, etc., permit applications. **Note: it is the responsibility of the design engineer of record to submit the permit applications to the appropriate State agencies for permitting along with any required permit applications fees after permit application execution by the County.**
- b) County Engineering will prepare for pickup by the Engineer:
  - 1) Executed water, sewer, and/or NCDOT encroachment permit applications for the applicant to use for submittal to State agencies for permitting.
  - 2) The “Plans & Specifications Approval Letter” for use in submitting permit applications to the NCDEQ/DWR.

## **CONSTRUCTION PROCESS**

The following is a general description of the construction process for proposed extensions of the Brunswick County water distribution and sanitary sewer collection systems:

### **1) General Information**

- a) The following items (as applicable) must be received by Brunswick County Engineering prior to scheduling a Pre-Construction Conference (“PreCon”) and receiving permission to work on utility systems owned by Brunswick County:
- NCDEQ/DWR water main extension permit
  - NCDEQ/DWR sewer main extension permit
  - NCDEQ/DWR sewer pump station permit
  - NCDEQ/DWR low pressure sewer main extension permit
  - NCDOT Right of Way Encroachment
  - Deed of Easement recorded for any required offsite public utility easements
  - Shop Drawings - Brunswick County may require the submittal of Shop Drawings for pumps, valves, hydrants, and other appurtenances involving construction of water and sewer systems. Notification will be made in writing to the Developer’s design engineer if shop drawings are deemed necessary by County Engineering for review and approval
  - Stormwater Permits – State and County – if required to begin any site grading preparatory to installation of water and/or sewer infrastructure
- b) Construction should be coordinated in advance with County Engineering – a minimum of forty-eight (48) hours’ notice is required for scheduling purposes for the pre-construction meeting.
- c) PreCons are held at County Engineering in the conference room at the specified time scheduled by the Engineering Department. At the discretion of the County Engineer and the Engineering Inspector assigned to the construction project a field PreCon may be allowed. All field PreCons will be scheduled by the Engineering Inspector assigned to the project.
- d) The design engineer and North Carolina licensed utility contractor must attend the PreCon – if any utility work is to be sub-contracted to a second firm that firm must also be a North Carolina licensed utility contractor and must attend the PreCon. The utility contractor foreman, supervisor, or project manager who will oversee daily work activities in the field must be present at the PreCon.
- e) NCDOT requires a separate PreCon before beginning any work in the public rights-of-way – this PreCon must be scheduled by the Developer or the Design Engineer for developer installed infrastructure. The County Engineering Inspector will attend the NCDOT PreCon as the County representative, as needed. All requirements in the issued NCDOT Encroachment Permit must be fulfilled by the contractor prior to beginning work on the project.

**2) Construction Activity**

- a) After the completion of all required pre-construction meetings the contractor may commence construction on the project with a forty-eight (48) hour notice to the County Engineering Inspector.
- b) Once construction commences the primary contact person for the project will be the County Engineering Inspector assigned to the project.
- c) All water, sewer, and pump station infrastructure will be installed in accordance with this Design Manual, and in accordance with the requirements in all State issued permits for the project.
- d) All required system testing will be conducted in accordance with this Design Manual, and under the direction of the County Engineering Inspector.
- e) If any requirements for carrying out construction are not met, Brunswick County reserves the right to issue a Stop Work Order for the project.
- f) If a Stop Work Order is issued for a project, a second PreCon will be required before work can commence again to discuss the issues and required corrective actions. This PreCon will be held in the offices of County Engineering to discuss the relevant issues and requirements for work to be allowed to commence again.
- g) At the completion of construction and prior to start up the developer, design engineer, or contractor must provide (3) copies minimum, or as specified in the relevant Technical Specification for a particular system or piece of equipment, all operational, maintenance, and service manuals (O & M Manuals) as needed for any pump station equipment or other specialty type equipment specific to the project.
- h) The project will be deemed Substantially Complete once all the requirements in the SUBSTANTIAL COMPLETION section of this Design Manual have been met and approved by County Engineering staff.
- i) There is a mandatory one-year warranty that must be provided by the Developer for all developer installed water, sewer, and pump station infrastructure. This warranty begins on the date of recordation of the Deed of Dedication and Affidavit by the Brunswick County Legal Department after review and acceptance by the Brunswick County Board of Commissioners at a regularly scheduled Board meeting.

**SUBSTANTIAL COMPLETION PROCESS**

The following is a general description of the process for proposed extensions of the Brunswick County water distribution and sanitary sewer collection systems to be deemed Substantially Complete:

**1) General Information**

- a) When new water and/or sewer systems have been installed and have passed all required testing in accordance with this Design Manual, and have also met all requirements in all State issued permits, the Developer and/or Design Engineer can submit all documentation required to County Engineering to achieve Substantial Completion for the water and/or sewer systems.

**BRUNSWICK COUNTY CONSTRUCTION CHECKLIST  
SUBSTANTIAL COMPLETION**

Project: \_\_\_\_\_ Phase: \_\_\_\_\_ Lots: \_\_\_\_\_

Engineering Firm: \_\_\_\_\_ Contractor: \_\_\_\_\_

Date of PreCon Meeting: \_\_\_\_\_ Date of NCDOT Pre-Con: \_\_\_\_\_

**WATER / SEWER / BOTH**

\_\_\_\_\_ Engineering Certification for Water  
Rec'd from Engineer: \_\_\_\_\_ PWSS Partial or Final Approval: \_\_\_\_\_

\_\_\_\_\_ Engineering Certification for Sewer  
Rec'd from Engineer: \_\_\_\_\_ DWQ Partial or Final Approval: \_\_\_\_\_

\_\_\_\_\_ Bacteriological Test Reports (from a N. C. licensed lab)

\_\_\_\_\_ All Testing Results

\_\_\_\_\_ Substantial Completion Walkthrough  
Note: if older style double meter boxes installed verify direct bury check  
valve installed on double boxes Yes: \_\_\_\_\_ No: \_\_\_\_\_

\_\_\_\_\_ Water Indemnity Agreement

\_\_\_\_\_ Sewer Indemnity Agreement

\_\_\_\_\_ Copy of Contractor's Utilities License

\_\_\_\_\_ Copy of Contractor's Certificate of Insurance

\_\_\_\_\_ Asbuilt record drawings – (1) sealed paper set and a USB flash drive with AutoCAD file (AutoCAD version 2007 minimum and 2013 latest version) **and** PDFs of all individual sheets; AutoCAD file **must** be georeferenced or asbuilts will not be accepted

**Note: Water and /or Sewer Certifications will not be processed without approved asbuilts**

- b) The Construction Checklist for Substantial Completion is available on the County website at [www.brunswickcountync.gov](http://www.brunswickcountync.gov) or may be obtained from County Engineering.
- c) The Water Indemnity Agreement and the Sewer Indemnity Agreement are available on the County website at [www.brunswickcountync.gov](http://www.brunswickcountync.gov) or may be obtained from County Engineering.
- d) Once newly installed water and sewer systems have achieved Substantial Completion a letter will be sent to the design engineer, and Brunswick County will allow a water meter to be installed and water service to commence.  
**NOTE: A Certificate of Occupancy (C.O) will not be issued until Final Acceptance (Deed of Dedication) has occurred.**
- e) The requirements for as-built (record) drawings are covered in detail in Brunswick County Technical Specification TS 010: As-Built Drawings.
- 1) Basic information required for as-builts:
- Brunswick County Cover Sheet with subdivision or project name, date, scale, and north arrow.
- Sealed by a North Carolina licensed Professional Land Surveyor or Professional Engineer (engineer seal required for all profiles).
- For sewer projects, the as-built plans shall include accurate information regarding pipe size, pipe material, pipe length, manhole construction (size of manhole, invert, rim, alignment, and location), services, and pump stations along with any relevant rights-of-way, utility easements, and property boundaries; profiles are required for sewer.
- For pump stations, the as-built plans shall include accurate information regarding interior and exterior pipe sizes, material, and length, as well as all structural dimensions of the pump station, all electrical equipment (make and model), pump information (make, model, and impeller size), and site layout information. Both top view and side view drawings are required on the as-built plans.
- For water projects, the as-built plans shall include accurate information regarding pipe size, pipe material, pipe length, valve locations, hydrant locations, fitting locations, services, and blow off locations along with any relevant rights-of-way, utility easements, and property boundaries.
- f) Contact Brunswick County Engineering Department concerning any guidance needed with the Substantial Completion Process.

**FINAL ACCEPTANCE OF INSTALLED INFRASTRUCTURE PROCESS**

The following is a general description of the process for proposed extensions of the Brunswick County water distribution and sanitary sewer collection systems to be legally conveyed to the County for ownership, operation, and maintenance after achieving Substantial Completion:

**1) General Information**

- a) When new water and/or sewer systems have been installed and have passed all required testing in accordance with this Design Manual, and have been designated as Substantially Complete, the developer or the design engineer shall submit the following items to County Engineering for Final Acceptance of the installed infrastructure to Brunswick County:

<p>BRUNSWICK COUNTY CONSTRUCTION CHECKLIST</p> <p>FINAL ACCEPTANCE</p>	
<p>_____ Paving on all streets</p> <p>_____ Final Walk Through with Engineering Inspector</p> <p>_____ Revised As-builts (if any changes were made) AutoCAD, PDF and paper copy</p>	<p>_____ Statement of Fixed Assets Amount</p> <p>Water _____</p> <p>Sewer _____</p> <p>Pump Station _____</p> <p>_____ Deed of Dedication</p> <p>_____ Lien Waiver Affidavit</p> <p>_____ Check for recording fees (made out to Brunswick County Register of Deeds)</p>

- b) The Deed of Dedication and the Lien Waiver Affidavit forms are available on the County website at [www.brunswickcountync.gov](http://www.brunswickcountync.gov) or may be obtained from Brunswick County Engineering.
- c) Once all required items have been received and approved by County Engineering the dedication package will be forwarded to the County Attorney for review and placement on the Board of Commissioner’s agenda for final acceptance.
- d) The County Attorney will record the Deed of Dedication and Affidavit after acceptance by the Board of Commissioners. The required one-year warranty period for developer installed infrastructure will commence on the date of recording of the Deed of Dedication and Affidavit.
- e) Contact Brunswick County Engineering Department concerning any guidance needed with the Final Acceptance process.

## **Legal Document Requirements**

The following information is provided as a general guide concerning permanent easements, pump station sites, temporary construction easements, plat maps, and the Deed of Dedication.

### **1) Public Utility Easements**

- a) Public Utility Easements (PUE) shall be conveyed to Brunswick County in a standard format that is acceptable to County Engineering and County Legal.
- b) All required offsite public utility easements needed for a project shall be deeded and recorded at the Brunswick County Registry of Deeds prior to requesting a Pre-Construction Conference to install any water and sewer infrastructure.
- c) All required offsite public utility easements required for a Plat Map shall be deeded and recorded either a) with the requested Plat Map or, b) as a separate Deed of Easement prior to the requested Plat Map being signed by County Engineering.
- d) All onsite public utility easements can be deeded at the time of dedication of any publicly permitted infrastructure including utility easements for pump station sites using the Brunswick County Deed of Dedication.
- e) A developer must grant a public utility easement over all private streets within a subdivision if any public infrastructure is installed within the private street rights-of-way. This public easement may be granted with the Deed of Dedication for the infrastructure being legally conveyed to Brunswick County.
- f) Water and sewer mains shall be installed outside of street pavement whenever possible.
- g) All water and sewer mains within a public utility easement shall be installed per County standards and must meet NCDEQ/DWR/PWS requirements for separation between water and sewer mains.
- h) Structures are not permitted within public utility easements.
- i) Clear all easements of trees and debris. The easement is to be grassed unless other treatment is specifically approved by Brunswick County.
- j) Any proposed facility to be constructed within a public utility easement or any crossing of a public utility easement will require permission of County Engineering and/or Public Utilities prior to commencement of construction.
- k) All references to easements herein shall refer to permanent public utility easements. Temporary construction easements shall be exclusive of the descriptions herein.
- l) No trees or shrubs shall be planted in public utility easements.

- m) No privacy berms or berms of any kind shall be placed in public utility easements.
- n) No fencing shall be placed in public utility easements.
- o) Required Easement Widths

- 1) Water Mains – minimum twenty (20) feet in width.
- b) Sewer Force Mains – minimum twenty (20) feet in width.
- c) Gravity Sewer Mains:

Easement width not in public road right-of-way: (20) feet minimum.

See table below for depth of sewer vs. required easement width:

Depth of Sewer (ft)	Easement Width (ft)
0-7.9	20
8-11.9	25
12-19.9	30
20-24.5	35
25+	40

- p) When more than one line is placed in the same easement, the Design Engineer shall coordinate with County Engineering to determine the width requirement for the easement prior to plan preparation, with a minimum of 25 feet.
- q) Sewer Pump Station Sites
  - 1) Public pump station sites shall be a minimum of (50) feet x (50) feet (2,500 square feet) and may be required to be larger depending upon the size of the pump station and any SCADA antenna down guying requirements. County Engineering and Utilities will determine the minimum size required for the pump station site for other than standard duplex sewer pump stations with the County standard non-guyed antenna.
- r) Water and Sewer Separation requirements in easements
  - 1) When water and sewer mains are placed in the same easement, mains shall be laid to provide a minimum ten (10) foot horizontal separation between water and sewer. The width of the easement shall be increased to provide a distance from the edge of the easement to the sewer main not less than ten (10) feet and the distance from the edge of the easement to the water main not less than five (5) feet.

**FOR EXAMPLE ONLY**  
 SEE [www.brunswickcountync.gov](http://www.brunswickcountync.gov) for official version

Prepared by: \_\_\_\_\_  
 Firm and Address: \_\_\_\_\_

DEED OF UTILITY EASEMENT

STATE OF NORTH CAROLINA  
 COUNTY OF BRUNSWICK

THIS DEED OF EASEMENT executed this the \_\_\_ day of \_\_\_\_\_, 20 \_\_, by and  
 Between \_\_\_\_\_, (hereinafter referred to as Grantor (singular or plural)); and  
 Brunswick County by the politic and political subdivision of the State of North Carolina, whose  
 address is P.O. Box 249, Bolivia, North Carolina, 28422 (hereinafter referred to as Grantee);

W I T N E S S E T H:

For and in consideration for the sum of one dollar (\$1.00) and other good and valuable consideration paid by the Grantee to the Grantor, the receipt of which is hereby acknowledged, the Grantor have bargained, sold and conveyed and by these presents do hereby grant, bargain, sell and convey unto Grantee, its successors and assigns a perpetual and permanent right, privilege and easement to go through, under and upon the land and premise hereinafter described and referred to as a certain permanent easement for the purpose of constructing, installing, maintaining, repairing, replacing, removing, extending, improving, building and/or operating a public utility system including but not limited to mains, pipes, valves and other appurtenant facilities. Together with a temporary right, privilege and easement to go through and upon the lands of the premises hereinafter described and referred to as construction easements for the purpose of access to the permanent easement; said permanent easement and temporary construction easement being more particularly described as follows:

All of that parcel shown on "Easement \_\_\_\_\_", as described on a map recorded in Map Cabinet \_\_\_\_, Page \_\_\_\_, Brunswick County Registry and designated thereon as a utility easement.

TO HAVE AND TO HOLD said permanent and construction easements to Grantee, its successors and assigns, it being agreed that the permanent easement hereby granted is appurtenant to and runs with the land owned by the Grantors and that said temporary construction easement is to exist through the period of construction of the nearby utility system facilities;

The facilities to be placed under and upon and across the said easement shall remain the property of the Grantee. The Grantee shall have the right to inspect, remove, repair, replace, maintain and improve the facility together with the rights of ingress and egress to the facilities, and to make such changes and additions to the facilities upon the permanent easement as the Grantee from time to time may deem advisable.

Except as otherwise stated herein, Grantee shall at all times have the right to keep the areas of permanent easement clear of all buildings or structures and such vegetation as will, in its judgment, interfere with the purpose of this easement. Except as otherwise stated herein, the Grantor expressly promises and agrees not to construct or allow to be constructed any building, structure or other improvement in the easement area except that the Grantor shall retain the right to install driveways into the property across the easement area with the approval of the Grantee, which approval shall not be unreasonably withheld. The Grantor further promises not to plant or allow to be planted any trees, shrubs, bushes, undergrowth or other vegetation which would encroach upon or interfere with Grantee's rights hereunder, other than shallow rooted plants as may be approved by Grantee, which approval shall not be unreasonably withheld. It is expressly understood and agreed hereunder that the Grantor and his heirs and assigns shall retain the right to cultivate the ground lying within the boundaries of the permanent easement and use said easement for any other lawful purpose, however, such cultivation or use shall not be inconsistent with the rights herein granted to the Grantee, and Grantee, unless otherwise stated herein, shall not be liable to any damages or loss due to the exercise of its rights hereunder within this easement.

By acceptance of this deed of easement, the Grantee agrees that it will restore the surface of the land to its approximate level prior to the construction by filling or grading in the course of construction or maintenance of the aforesaid facilities so long as the same are not inconsistent with or do not interfere with the rights herein granted to the Grantee. It is specifically agreed that any trees removed for the construction or maintenance work will not be replaced.

The construction or maintenance area may be seeded by the Grantee, but the Grantee will not be responsible for landscaping or otherwise improving the area. It is understood and agreed that the execution of this deed by the Grantor and its acceptance by the Grantee shall not obligate the Grantee to construct or maintain any mains, pipes, valves or other utility system facilities or permit any connection to its utility system, or maintain any roadway which may be within this easement; but Grantor shall retain the right to maintain driveways into the property across the easement area.

The use of the masculine gender includes the feminine and neuter; and the singular number used herein shall particularly include the plural.

IN WITNESS WHEREOF, the parties of the first part have hereunto set their hands and seals the day and year first above written.

\_\_\_\_\_(SEAL)

\_\_\_\_\_(SEAL)

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

I, \_\_\_\_\_, a Notary Public of the County and State aforesaid, certify that \_\_\_\_\_ personally, came before me this day and acknowledged the execution of the foregoing instrument. Witness my hand and official stamp or seal, this \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_.

My commission expires:

\_\_\_\_\_

\_\_\_\_\_  
Notary Public

IN CONSIDERATION of the sum of \$\_\_\_\_\_ to it in hand paid, the receipt whereof is hereby acknowledged, \_\_\_\_\_ joins in the execution of this easement in order to subordinate the lien of its security interest in the subject property created by that certain deed of trust recorded in Book\_\_\_\_\_, Page \_\_\_\_ in the office of the Register of Deeds of Brunswick County, to this instrument.

CORPORATE SEAL

\_\_\_\_\_  
By: President

ATTEST:

\_\_\_\_\_(SEAL)  
Secretary

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

I, \_\_\_\_\_, a Notary Public in and for the state and county aforesaid, hereby certify that \_\_\_\_\_ personally came before me this date and acknowledged that he/she is secretary of \_\_\_\_\_ and that by authority duly given and as an act of the company, the foregoing instrument was signed in its name and by its president, sealed with its corporate seal and attested by \_\_\_\_\_ as its secretary.

Witness my hand and official stamp or seal this the \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_.

\_\_\_\_\_(SEAL)  
Notary Public

My commission expires:

\_\_\_\_\_

**2) Temporary Construction Easements**

- a) Temporary Construction Easements may be required for bore and jack operations, horizontal directional drilling operations, pipe staging areas, equipment laydown areas, pump station construction, and other situations related to the installation of water, sewer, and pump station infrastructure.
- b) For a County Capital Improvement Program (CIP) project any required Temporary Construction Easements will be negotiated by County staff with the private property owner.
- c) For developer installed infrastructure projects the Developer, Engineer, and/or Contractor is responsible for obtaining any required Temporary Construction Easements.
- d) A copy of any agreement between the Developer, Engineer, and/or Contractor, and the private landowner, for a temporary construction easement, shall be provided to County Engineering before commencement of any work related to the project on that private property.
- e) Contact Brunswick County Engineering Department with any questions concerning temporary construction easement requirements.

**FOR EXAMPLE ONLY**

**ACCESS AND TEMPORARY CONSTRUCTION EASEMENT**

NORTH CAROLINA  
COUNTY OF BRUNSWICK  
PARCEL NUMBER: \_\_\_\_\_

THIS DEED OF EASEMENT, entered into this the \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_ , by and between \_\_\_\_\_, hereinafter referred to as the GRANTORS, and Brunswick County, whose mailing address is Post Office Box 249, Bolivia, NC 28422, hereinafter referred to as the GRANTEE. The designations Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, feminine, or neuter as required by context.

**WITNESSETH**

THAT the GRANTORS, for themselves, their heirs, successors, executors, and assigns, for and in consideration of the sum of \$10 and other valuable considerations agreed to be paid by the GRANTEE to the GRANTORS, do hereby give, grant and convey unto the GRANTEE, its successors, and assigns, a temporary easement for construction purposes, subject to the terms and provisions hereinafter set forth, over a portion of real property described in deed(s) recorded in Deed Book \_\_\_\_\_ Page \_\_\_\_\_, in the office of the Register of Deeds of Brunswick County, said easement being described as follows:

The temporary construction easement to be acquired from the above property is illustrated by the attached survey and described as follows:

Description Contained in Exhibit 1

There are no conditions to this ACCESS AND TEMPORARY CONSTRUCTION EASEMENT not expressed herein:

Insert terms and conditions of the Temporary Construction Easement herein.....  1.  2.  3.
--

TO HAVE AND TO HOLD said temporary easement for water and/or sewer construction purposes, subject to the terms and provisions hereinabove set forth, unto the GRANTEE, its successors and assigns, and the GRANTORS, for themselves, their heirs, successors, executors and assigns, hereby warrant and covenant that they are the sole owners of the property; that they solely have the right to grant the said temporary easement; and that they will warrant and defend title to the same against the lawful claims of all persons whomsoever, and the GRANTORS, for themselves, their heirs, successors, executors and assigns, release the GRANTEE from any and all claims for damages by reasons of said temporary easement herein conveyed over property of the GRANTORS and the past and future use thereof by the GRANTEE, its successors and assigns, for all purposes for which the GRANTEE, its successors and assigns, is authorized by law to subject the same, subject to the terms and provisions herein above set forth.

IN WITNESS WHEREOF, we have hereunto set our hand and affixed our seals the day and year first above written.

IN WITNESS WHEREOF, the parties of the first part have hereunto set their hands and seals the day and year first above written.

\_\_\_\_\_(SEAL)

\_\_\_\_\_(SEAL)

STATE OF NORTH CAROLINA

COUNTY OF BRUNSWICK

I certify that the following persons personally came before me this day, each acknowledging to me that he or she signed the foregoing document:

This \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_

(OFFICIAL SEAL)

\_\_\_\_\_ Notary Public

My commission expires: \_\_\_\_\_

STATE OF NORTH CAROLINA

COUNTY OF BRUNSWICK

I certify that the following persons personally came before me this day, each acknowledging to me that he or she signed the foregoing document:

This \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_

(OFFICIAL SEAL)

\_\_\_\_\_ Notary Public

My commission expires: \_\_\_\_\_

**3) Plats**

- a) All plats that create a subdivision of land, or plats of easements, or plats of rights-of-way, or any other proposed plat, that are submitted for Engineering Department review and approval shall meet all County standards for design and recordation contained within the most recent version of the Brunswick County Unified Development Ordinance and all applicable Engineering and Utilities utility easement and drainage easement standards.
- b) Contact Brunswick County Engineering Department at 910.253.2500 or [engineer@brunswickcountync.gov](mailto:engineer@brunswickcountync.gov) with any questions concerning plat maps.

**4) Deed of Dedication & Lien Waiver Affidavit**

- a) As previously stated, for developer installed infrastructure that is permitted in the County's name, the final dedication to the County will require the submittal of the County's Deed of Dedication and Lien Waiver Affidavit.
- b) Contact Brunswick County Engineering Department at 910.253.2500 or [engineer@brunswickcountync.gov](mailto:engineer@brunswickcountync.gov) for further information.
- c) The County's Deed of Dedication and Lien Waiver can be found on the County's website at [www.brunswickcountync.gov](http://www.brunswickcountync.gov) on the County Engineering webpage.

**FOR EXAMPLE ONLY**  
SEE [www.brunswickcountync.gov](http://www.brunswickcountync.gov) for official version

**Instructions for Deed of Dedication and Affidavit (Lien Waiver)**

***Please note that the attached documents are samples.***

1. There must be a 3-inch margin on the first page of each document. If there is not a 3-inch margin on the first page, there is an additional \$25.00 fee for recording each document that is not in compliance.
2. The preparers name must be on the front page of the Deed of Dedication.
3. Recording fees for **each** document are as follows:

\$26.00 for the first 15 pages

\$4.00 for each additional page beyond 15 pages

These are considered 2 separate documents therefore the average Deed of Dedication and Affidavit will cost \$52 to record.

**(MUST HAVE 3 INCH MARGIN AT THE TOP OF THE FIRST PAGE)**

Prepared by:  
(Note: Name of preparer must be on first page of this document.)

**DEED OF DEDICATION**

STATE OF NORTH CAROLINA

COUNTY OF BRUNSWICK

THIS DEED OF DEDICATION, made and entered into this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between \_\_\_\_\_, a North Carolina \_\_\_\_\_, (Name of Developer) (Corporation or LLC) with an office and place of business in Brunswick County, North Carolina, party of the first part, hereinafter referred to as “Developer”, and BRUNSWICK COUNTY, a governmental entity created and existing under the laws of the State of North Carolina, whose mailing address is P.O. Box 249, Bolivia, NC 28422, party of the second part, hereinafter referred to as Grantee;

**WITNESSETH:**

That whereas Developer is the owner and developer of a tract or parcel located in \_\_\_\_\_ Township, Brunswick County, North Carolina, known as \_\_\_\_\_; And whereas Developer has caused to be installed water distribution lines [and/or sewer lines] under and along the road rights-of-way hereinafter described and referenced; And whereas Developer wishes to obtain water [and/or sewer] from Grantee for the property and to make water [and/or sewer] from Grantee’s system available to individual owners. And whereas Grantee has adopted through appropriate resolution stated policy regarding water distribution [and/or sewer] systems under the terms of which, among other things, in order to obtain water [and/or sewer] for said subdivision Developer must

convey title to the water [and/or sewer] distribution system to Grantee through an instrument of dedication acceptable to Grantee;

NOW, THEREFORE, Developer, in consideration of Grantee accepting said water [and/or sewer] lines and making water [and/or sewer] available to said subdivision, has conveyed by these presents does hereby convey to Grantee, its lawful successors and assigns, the following described property:

[Description of Property]

TO HAVE AND TO HOLD said water [and/or sewer] lines and equipment above described together with the privileges and appurtenances thereto belonging to Grantee forever.

Non-exclusive easements over, along and upon the entire area of the streets and cul-de-sacs depicted on the maps and serving the areas referenced above for purposes of entry into the subdivision for maintenance, repair and upkeep of the water [and/or sewer] distribution systems and for connecting the same to the individual lots developed or to be developed lying adjacent to said streets and cul-de-sacs reserving unto Developers, its successor and assigns, equal rights of easement and easement over, in, along and upon said streets and cul-de-sacs for purposes of installing and maintaining such utilities as may be required for the development of said subdivision, including, but not limited to, electric, gas, telephone, cable and sewer.

And Developer does hereby covenant that it is seized of said water [and/or sewer] lines and equipment described above in fee simple and has the right to convey the same in fee simple, that the same are free and clear of encumbrances, and that it will warrant and defend the title to the same against all persons whomsoever.

Developer warrants to Grantee that the system herein conveyed is of good quality and free from faults and defects, and conforms to as-built drawings. Developer warrants said system for a period of one (1) year from the date of recording this Deed of Dedication in the office of the Brunswick County Register of Deeds.

IN WITNESS WHEREOF, the Grantor has caused this instrument to be duly executed, the day and year first above written.

\_\_\_\_\_  
(Name of Developer)

By: \_\_\_\_\_  
(Name and Title of Officer signing)

STATE OF NORTH CAROLINA  
COUNTY OF BRUNSWICK

I, \_\_\_\_\_, a Notary Public of the County and State aforesaid, do hereby certify that \_\_\_\_\_ personally came before me this day, and (I have personal knowledge of the identity of the principal) OR (I have seen satisfactory evidence of the principal's identity, by a current state or federal identification with the principal's photograph in the form of a \_\_\_ ) OR (a credible witness has sworn to the identity of the principal(s)); and he/she acknowledged that he/she is (Title of officer, ie: President, Vice President, Member, Manager) of (Name of Developer), a North Carolina Corporation or LLC, and that he/she, as (Title of officer), being authorized to do so, executed the foregoing on behalf of the (Corporation or LLC).

Witness my hand and official seal, this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Signature of Notary Public

(NOTARY SEAL)

\_\_\_\_\_  
Printed or Typed Name of Notary Public

My Commission Expires:

ACCEPTANCE OF DEED

This Deed of Dedication and accompanying Affidavit for (Name of Developer) was accepted by the Brunswick County Board of Commissioners on the \_\_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_.

Brunswick County Board of Commissioners

\_\_\_\_\_  
Randy Thompson, Chairman

\_\_\_\_\_  
Daralyn Spivey  
Clerk to the Board

**(MUST HAVE 3 INCH MARGIN AT THE TOP OF THE FIRST PAGE)**

STATE OF NORTH CAROLINA

COUNTY OF BRUNSWICK

AFFIDAVIT

(Name of Developer), a North Carolina (corporation or LLC), with an office and place of business in \_\_\_\_\_ County, North Carolina, hereinafter referred to as Affiant, being first duly sworn, hereby deposes and says under oath as follows:

1. That it is the owner of certain property located in \_\_\_\_\_ Township, Brunswick County, North Carolina, known as \_\_\_\_\_ Subdivision, containing lots numbered \_\_\_\_\_ thru \_\_\_\_\_, as more particularly described in a Deed of Dedication in favor of Brunswick County of even date herewith.

2. That it has caused to be installed water distribution lines [and/or sewer lines] under and along the road right-of-ways property hereinafter described and referenced:

[Description of property]

3. All the work which has been performed in the construction and installation of said water distribution lines [and/or sewer lines] described in paragraph 2, above, has been fully paid for and there are now no liens of any kind including any lien for labor or material against the subdivision property which would in any way jeopardizes title of Affiant to the property in said subdivision nor are there any legal actions pending against Affiant or any contractor arising out of any work performed in said subdivision or the water lines [and/or sewer lines] installed therein which would in any way jeopardize title to the subdivision or the water distribution lines [and/or sewer lines] located therein.

IN WITNESS WHEREOF, the Affiant has caused this instrument to be duly executed by its authorized officer(s), this \_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_.

(NAME OF DEVELOPER)

By: \_\_\_\_\_  
(Name and Title of Officer Signing)

STATE OF NORTH CAROLINA  
COUNTY OF BRUNSWICK

Signed and sworn to (or affirmed) before me this day by \_\_\_\_\_.  
(Name of Principal)

Date: \_\_\_\_\_

\_\_\_\_\_  
Signature of Notary Public

(NOTARY SEAL)

\_\_\_\_\_  
Printed or Typed Name of Notary Public

My Commission Expires:

**5) Water and Sewer Indemnity Agreements**

- a) As previously stated, for developer installed infrastructure that is permitted in the County's name, one of the requirements for *Substantial Completion* of the water and/or sewer infrastructure are for the Developer to execute either the *Water Indemnity Agreement* or the *Sewer Indemnity Agreement*, or both forms if both water and sewer were installed.
- b) Contact Brunswick County Engineering Department at 910.253.2500 or [engineer@brunswickcountync.gov](mailto:engineer@brunswickcountync.gov) for further information.
- c) The County's *Water Indemnity Agreement* and the *Sewer Indemnity Agreement* can be found on the County website at [www.brunswickcountync.gov](http://www.brunswickcountync.gov) on the County Engineering webpage.

**FOR EXAMPLE ONLY**  
 SEE [www.brunswickcountync.gov](http://www.brunswickcountync.gov) for official version

**WATER INDEMNITY AGREEMENT**

This Agreement made this the \_\_\_\_ day of \_\_\_\_\_, 20 \_\_\_\_, between \_\_\_\_\_, hereinafter Developer, and the County of Brunswick, a body politic and corporate, duly organized under the Constitution and laws of North Carolina, hereinafter County,

Whereas, the Developer has declared an intention to or has constructed a new water system to serve a property generally known as \_\_\_\_\_, and has made provision for the use of this water system to supply the current and future needs of its development goals, and it is the intention of the Developer and the County that the new water system will be accepted into the County’s water system to serve its customers at or near the subject property area, and

Whereas, the Developer has expressed a desire to have the new water system installed in an area that the Developer intends to cover with an impervious material, for uses including, but not limited to, parking, storage, or any other use that would impair the County’s access to the said water system in the event of needed repair or other modification of the said system, and

Whereas, the County wishes not to unduly impede the progress of the Developer in the business of its scheduled construction and development, and to help the Developer meet its water needs while supplying quality water service to all of its customers,

Therefore, in consideration of the mutual covenants herein, the County will supply water service to \_\_\_\_\_, in exchange for this agreement, whereby the Developer agrees that at all times subsequent to the transfer of this new water system by the Developer to, and acceptance by, the County into the County’s water system, this agreement shall continue in force.

The said Developer for so long as it owns, or until NC DOT has accepted for maintenance as a dedicated public roadway, the area covered with an impervious material which lay above the water line, in exchange for the County’s acceptance of the said water line being located beneath an impervious material, shall timely make all necessary and prudent repairs to the said impervious surface should said surface be disrupted by the County due to necessary maintenance activity. All repairs shall conform with the surrounding material such that there shall not be, after any pavement repair, that a hazardous condition exist, or any condition that would result in damage or injury to the said water system.

Developer further agrees that upon transfer of title to a third party, it shall include a covenant or other express condition applicable to the grantee, its successors or assigns (including a property owner association which holds the property as common area), assigning the obligation to make in a timely manner all necessary and prudent repairs to the said impervious surface under which the water line is located. Developer further agrees that the instrument assigning the obligation shall be appropriately filed with the Brunswick County Registry of Deeds. Provided that, in the case of a dedicated public road, upon receipt of a maintenance agreement from NC DOT, Developer will assign said repair obligation by covenant or other instrument, on the grantees, their successors or assigns (including a property owners association), of the development in which said public roads are located.

In witness thereof, the parties hereto have affixed their signatures on the date first entered above.

\_\_\_\_\_  
Developer

\_\_\_\_\_  
William L. Pinnix, P.E.  
Director of Engineering  
Brunswick County

**FOR EXAMPLE ONLY**  
 SEE [www.brunswickcountync.gov](http://www.brunswickcountync.gov) for official version

**SEWER INDEMNITY AGREEMENT**

This Agreement made this the \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, between \_\_\_\_\_, hereinafter Developer, and the County of Brunswick, a body politic and corporate, duly organized under the Constitution and laws of North Carolina, hereinafter County,

Whereas, the Developer has declared an intention to or has constructed a new sewer system to serve a property generally known as \_\_\_\_\_, and has made provision for the use of this sewer system to supply the current and future needs of its development goals, and it is the intention of the Developer and the County that the new sewer system will be accepted into the County’s sewer system to serve its customers at or near the subject property area, and

Whereas, the Developer has expressed a desire to have the new sewer system installed in an area that the Developer intends to cover with an impervious material, for uses including, but not limited to, parking, storage, or any other use that would impair the County’s access to the said sewer system in the event of needed repair or other modification of the said system, and

Whereas, the County wishes not to unduly impede the progress of the Developer in the business of its scheduled construction and development, and to help the Developer meet its sewer needs while supplying quality sewer service to all of its customers,

Therefore, in consideration of the mutual covenants herein, the County will supply sewer service to \_\_\_\_\_, in exchange for this agreement, whereby the Developer agrees that at all times subsequent to the transfer of this new sewer system by the Developer to, and acceptance by, the County into the County’s sewer system, this agreement shall continue in force.

The said Developer for so long as it owns, or until NC DOT has accepted for maintenance as a dedicated public roadway, the area covered with an impervious material which lay above the sewer line, in exchange for the County's acceptance of the said sewer line being located beneath an impervious material, shall timely make all necessary and prudent repairs to the said impervious surface should said surface be disrupted by the County due to necessary maintenance activity. All repairs shall conform with the surrounding material such that there shall not be, after any pavement repair, that a hazardous condition exist, or any condition that would result in damage or injury to the said sewer system.

Developer further agrees that upon transfer of title to a third party, it shall include a covenant or other express condition applicable to the grantee, its successors or assigns (including a property owner association which holds title to the property as common area), assigning the obligation to make in a timely manner all necessary and prudent repairs to the said impervious surface under which the sewer line is located. Developer further agrees that the instrument assigning the obligation shall be appropriately filed with the Brunswick County Registry of Deeds. Provided that, in the case of a dedicated public road, upon receipt of a maintenance agreement from NC DOT, Developer will assign said repair obligation by covenant or other instrument, on the grantees, their successors or assigns (including a property owners association), of the development in which said public roads are located.

In witness thereof, the parties hereto have affixed their signatures on the date first entered above.

\_\_\_\_\_  
Developer

\_\_\_\_\_  
William L. Pinnix, P.E.  
Director of Engineering  
Brunswick County

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## **UTILITIES DESIGN STANDARDS**

### **PART A: WATER SYSTEMS**

#### **1) General**

- a) These water system design standards are based on Federal, State and county engineering design criteria.
- b) Design criteria not indicated herein shall comply with “Ten States Standards”
- c) The design engineer should be familiar with the *NCAC Title 15A Subchapter 18C - Water Supplies* and specifically *Section .0900 - Distribution Systems* to ensure that plans submitted for county plan review and approval adhere to those rules and standards for water systems.
- d) The design engineer is also directed to the NCDEQ/PWS document *Engineering, Planning, and Development Guidance Document* that can be found on the PWS website that addresses many required water system design topics.
- e) All installations are to meet the bacteriological and chemical quality standards of the NCDEQ –State Primary Drinking Water Regulations.
- f) These design standards are applicable to all developments including, but not limited to, residential, commercial and industrial developments, subdivisions, commercial and industrial developments, and/or parks requiring water service from Brunswick County.
- g) Comply with all applicable requirements of Federal, State, and local regulations.
- h) Refer to Brunswick County Technical Specification TS 018: *Water Distribution System* and the county water Standard Details for more information on water system construction requirements.

#### **2) Water System Design Criteria**

- a) Water transmission mains – twelve (12) inch diameter and larger - shall be sized in accordance with the County’s Water Master Plan and shall be designed to provide one-thousand five hundred (1,500) GPM fire flow at twenty (20) psig residual pressure.
- b) Water distribution mains shall be sized to provide a minimum pressure at all points within the system of not less than twenty (20) psig during periods of peak demand (fire flow).
- c) Water mains shall not be less than two (2) inches in diameter.
- d) A two (2) inch water main shall not exceed one-thousand (1,000) feet in length.

- e) Water mains shall be a minimum eight (8) inches in diameter unless otherwise approved by Brunswick County and all polyvinyl chloride (PVC) water mains shall be C-900 with a minimum DR-18 rating.
- f) Water mains less than six (6) inches in diameter shall not have fire hydrants.
- g) The maximum length of a dead end six (6) inch main shall be twelve hundred (1,200) feet.
- h) The maximum length of a dead end eight (8) inch main shall be two thousand (2,000) feet.
- i) A six (6) inch main shall only have one (1) fire hydrant unless it is looped.
- j) Four (4) inch mains are permitted on residential cul-de-sacs less than four hundred (400) feet long. Two (2) inch mains are permitted on cul-de-sacs, hammerheads, and stub streets with the approval of Brunswick County.
- k) Water mains providing fire service shall be a minimum eight (8) inches diameter unless approved by Brunswick County.
- l) Water mains not designed for fire flow shall not have fire hydrants.
- m) Design mains so they are looped and interconnected at intersections.
- n) No more than twenty (20), or the equivalent of twenty (20) residences, shall be connected to a two (2) inch water main, unless the main is looped or otherwise supplied from two (2) connections.
- o) A looped two (2) inch water main shall not supply more than forty (40) residences, or the equivalent water demand of forty (40) residences.
- p) Flushing devices and/or fire hydrants shall be installed at the ends of dead-end water mains per county Standard Details or as directed by county staff.
- q) Water mains shall be constructed of PVC pipe except when other materials are required. Water service laterals shall be constructed of minimum one (1) inch diameter SDR-9 CTS polyethylene (PE) tubing.
- r) Hazen and Williams design coefficients:
  - 1) Ductile iron pipe:  $C=120$
  - 2) PVC / HDPE pipe:  $C=130$
- s) When a design is being considered for a project, a main depth of between thirty-six (36) and forty-eight (48) inches below finished grade will be used to establish main and branch line profiles.
- t) Easements for waterlines not in public road rights-of-way shall be a minimum of twenty (20) feet wide or as required by Brunswick County.

- u) All new subdivisions with County water shall have a fire hydrant in close proximity to the subdivision entrance - either existing or a new installation.
- v) Maximum distance between fire hydrants in residential areas, or on water transmission mains in the right-of-way and/or a public utility easement, shall be five hundred (500) feet unless otherwise approved by County staff.
- w) Maximum distance between fire hydrants in multi-family, commercial and industrial areas is four hundred (400) feet unless otherwise approved by County staff.
- x) Fire hydrants shall not be placed on privately owned and maintained fire lines – refer to the County Standard Detail for fire service to a building.
- y) Where a building utilizes a sprinkler system, or has a Fire Department Connection (FDC), the required level of backflow protection is a Reduced Pressure Zone (RPZ) backflow preventer.
- z) Where a building utilizes a sprinkler system, or has a Fire Department Connection (FDC), then a fire hydrant shall be installed within one hundred fifty (150) feet of the FDC or as directed by the county Fire Marshal.
- aa) All building fire sprinkler systems, if required, shall be reviewed and approved by the county Fire Marshal prior to including fire protection systems in any plan submitted to county Engineering for water distribution system review and approval.
- bb) Backflow prevention devices are required on all fire lines and sprinkler systems to prevent cross-contamination of the county's water transmission and distribution system. Please refer to the Brunswick County Public Utilities Department's *Cross-Connections and Backflow Protection Policy* for additional information.
- cc) A post indicator valve (PIV) is required at the right-of-way or easement line on all fire lines to delineate ownership of the fire line between the County and the property owner. The top of the PIV shall be thirty-six (36) inches above finished grade. Refer to county Standard Details for fire lines. Fire lines shall be permitted as private fire lines, when PWS permitting is required, except for those fire lines serving County owned property.
- dd) Backflow prevention devices shall be installed at the right-of-way or easement line immediately adjacent and downstream of the PIV. With County approval the backflow prevention device may be installed inside a building's mechanical room where the sprinkler riser is located if the building is within two hundred (200) feet of the County's water main.
- ee) Valves shall be installed on all system branches from feeder mains, on hydrant legs, at each end of horizontal directional drills per standard detail, per a), b) and c) as follows, or as directed by county staff or the Engineer:
  - a) Install three (3) valves at crosses
  - b) Install two (2) valves at tees
  - c) Install one (1) valve on a fire hydrant leg

- ff) For distribution mains isolation valves are required at approximately every one hundred (100) feet per one (1) inch diameter of the installed main up to a maximum distance of two thousand (2,000) feet between valves. For example, for an eight (8) inch diameter main install a main line isolation valve every eight hundred (800) feet. Place main line isolation valves in close proximity to fire hydrants. Also adjust main line isolation valve placement to take into account subdivision entrances, driveways, fences, street intersections, other underground utilities, etc, or as directed by county staff.
- gg) For water transmission mains - defined as twelve (12) inches and larger - install an isolation valve approximately every two hundred (200) feet per one (1) inch diameter of the installed main up to a maximum distance of five thousand (5,000) feet between valves. Place main line isolation valves in close proximity to fire hydrants. Also adjust main line isolation valve placement to take into account subdivision entrances, driveways, fences, street intersections, other underground utilities, etc, or as directed by county staff.
- hh) All valves shall open left – no right-hand open valves are allowed.
- ii) Valves shall be rodded back to the cross or tee if within ten (10) feet of the cross or tee.
- jj) Brunswick County uses the Sensus AMR/AMI water meter. All water meter boxes used in the service area of Brunswick County Public Utilities must accommodate the Sensus AMR/AMI water meter. Refer to County Standard Details – Water, Sheet 2 of 5, and/or Brunswick County Technical Specification TS 018: Water Distribution System – for current water meter box manufacturers and model information.

### 3) **Sizing of Mains**

- a) System Design and Fire Flow (pipe size six (6) inches and larger):
  - 1) Size piping based on either (1/5) the instantaneous maximum flow plus fire flow or maximum instantaneous demand, whichever is greater. When fire protection is to be provided, system design should be such that fire flows and facilities are in accordance with the requirements of Brunswick County and the state Insurance Service Office (ISO).
  - 2) The minimum acceptable design fire flow for one and two family dwellings shall be one-thousand (1,000) GPM at twenty (20) psig residual pressures.
  - 3) The minimum acceptable design fire flow for other than one and two family dwellings shall be one thousand five hundred (1,500) GPM at twenty (20) psig residual pressure or as approved by the County Fire Marshal and/or the North Carolina State Rating Response System.
  - 4) All water transmission mains (12-inch diameter and larger) shall be designed to provide one thousand five hundred (1,500) GPM fire flow at twenty (20) psig residual pressure.

- b) Pipe size of four (4) inches and less (when approved by Brunswick County):
- 1) Size piping based on either (1/5) of maximum instantaneous demand plus blow off flow to meet flushing requirements or maximum instantaneous demand - whichever is greater.
- c) The maximum instantaneous demand is to be calculated using the **Community Water System Source Book** by Joseph S. Ameen, as a reference – see following tables:

**Table XXI - Maximum Instantaneous Flows for Residential Areas**

<b>Number of Residences Served</b>	<b>Flow per Residence in GPM</b>
1 (First)	15.0
2 - 10*	5.0
11 - 20**	4.0
21 - 30	3.8
31 - 40	3.4
41 - 50	3.2
51 - 60	2.7
61 - 70	2.5
71 - 80	2.2
81 - 90	2.1
91 - 100	2.0
101 - 125	1.8
126 - 150	1.6
151 - 175	1.4
176 - 200	1.3
201 - 300	1.2
301 - 400	1.0
401 - 500	0.8
501 - 750	0.7
751 - 1,000	0.5

\*Second, third, etc., through tenth residence served.

\*\*Eleventh, twelfth, etc., through twentieth residence served.

\*\*\*Each unit of an apartment building should be considered as an individual residence.

**Table XXII - Maximum Instantaneous Flows for Commercial Areas**

<b>Type of Business</b>	<b>GPM on Basis Shown</b>
Barber Shop	3.0 gpm per chair
Beauty Shop	3.0 gpm per chair
Dentist Office	4.0 gpm per chair
Department Store*	1.0 - 2.0 - 3.0 gpm per employee
Drug Store	5.0 gpm
With Fountain Service	add 6.0 gpm per fountain area
Serving Meals	add 2.0 gpm per seat
Industrial Plants**	4.0 gpm plus 1.0 gpm per employee
Laundry	30.0 gpm per 1,000 pounds clothes
Launderette	8.0 gpm per unit
Meat Market, Super Market	6.0 gpm per 2,500 sq. ft. floor area
Motel, Hotel	4.0 gpm per unit
Office Building	0.5 gpm per 100 sq. ft. floor area or 2.0 gpm per employee
Physician's Office	3.0 gpm per examining room
Restaurant	2.0 gpm per seat
Single Service	6.0 to 20.0 gpm total
Drive-In	2.0 to 7.0 gpm total
Service Station	10.0 gpm per wash rack
Theater	0.2 gpm per seat
Drive-In	0.2 gpm per car space
Other Establishments***	Estimate at 4.0 gpm each

\*Including customer service      \*\*Not including process water  
 \*\*\*Non-water using establishments

**Table XXIII - Maximum Instantaneous Flows for Institutions**

<b>Type of Institution</b>	<b>Basis of Flow, GPM</b>
Boarding Schools, Colleges	2.0 gpm per student
Churches	0.4 gpm per member
Clubs: Country, Civic	0.6 gpm per member
Hospitals	4.0 gpm per bed
Nursing Homes	2.0 gpm per bed
Prisons	3.0 gpm per inmate
Rooming House	Same as Residential*
Schools: Day, Elementary, Junior, Senior High	
Number of Students	GPM Per Student
0 –50	2.00
100	1.90
200	1.88
300	1.80
400	1.72
500	1.64
600	1.56
700	1.44
800	1.38
900	1.32
1,000	1.20
1,200	1.04
1,400	0.86
1,600	0.70
1,800	0.54
2,000	0.40

- d) Design for (2.5) fps (feet per second) flushing velocity.
- e) All water mains, including those not designed to provide fire protection, shall be sized using a hydraulic analysis based on flow demands and pressure requirements. The minimum pressure in all public water mains under conditions of maximum instantaneous demand shall be twenty-five (25) pounds per square inch. Twenty (20) pounds per square inch residual pressure will be acceptable when fire flows are provided in excess of maximum peak hourly flow.
- f) The design engineer shall determine available static and residual pressures at the delivery point for the water to a new development. The data is to be obtained under the direction of a Professional Engineer who is registered in the State of North Carolina.
- g) Acceptable pipe material:

<u>Nominal Diameter (inches)</u>	<u>Material Type</u>
1" - 1 ¾ "	200 psi, SDR 9, HDPE
2"	200 psi, SDR 9 HDPE or ASTM D2241, IPS, SDR21, gasketed pipe
4" – 12"	AWWA C900 PVC, Class 235, DR18 or DIP Pressure Class 350
14" and larger	AWWA C905 PVC, Class 235, DR 18 or DIP Pressure Class 250

Note 1: For horizontal directional drills (HDD) the mains may be ductile iron pipe, Fusible PVC (FPVC) with minimum DR-18 rating, or High-Density Polyethylene (HDPE) with minimum SDR-9 rating.

Note 2: PVC water main pipe shall bear the seal of NSF

Note 3: PVC joints shall conform to ASTM D3139 or ASTM D3212

Note 4: DIP water main shall have bituminous asphalt outside coating in accordance with ANSI/AWWA C151/A21.51

Note 5: DIP water main shall have an interior cement-mortar lining in accordance with ANSI/AWWA C104/A21.4

Note 6: Service line piping shall not have any joints between the main service tap and the meter stop

Note 7: In proven contaminated soil conditions service piping may be required to be copper (Type K)

#### 4) **Fittings and Specials**

- a) Fittings and specials shall be DIP, pressure class 350, push on or mechanical joints in accordance with ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/21/53, with elastomeric gaskets, and fittings shall be cement-mortar lined on the interior with exterior bituminous asphalt outside coating. Fittings shall be for bell and spigot pipe.

5) **Materials and Requirements for Restrained Joints, Pipes, and Fittings on Water Systems**

- a) Restrained joints are required to prevent movement of system piping caused by forces in or on buried piping tees, valves, branches, bends, plugs, etc.
- b) Restrained joints shall be installed as shown on the approved plans, standard details, or as directed by county staff or the Engineer.
- c) Concrete thrust blocking shall be installed as shown on the approved plans, standard details, or as directed by county staff or the Engineer.
- d) All carrier pipe installed inside a casing shall be pressure class 350 ductile iron pipe per county standard details with restrained joints.
- e) All restrained joint systems shall have a pressure rating equal to or greater than that of the pipe on which they are installed.
- f) Restraint type gaskets that provide internal restraint by means of stainless steel inserts embedded within the gasket are **not** permitted for use in Brunswick County.

g) **Ductile Iron Pipe (DIP)**

- 1) Install restraints in strict accordance with the manufacturer's recommendations.
- 2) All ductile iron horizontal directional drill and bore-and-jack installations shall use boltless, integral, positive locking restraint systems that allow for joint deflection and disassembly should the need arise. The restrained joint system shall be a manufacturer's standard restrained joint system such as American (Flex-Ring or Lok-Ring), US Pipe (TR-Flex), or Griffin (Snap-Lok), or approved equal.

Note: the aforementioned boltless, integral, positive locking restraint systems are also acceptable for use in open cut pipe installation locations.

- 3) External bell restraint harness shall have ductile iron glands. The dimensions of the gland shall be such that it can be used with the standard mechanical joint bell. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

- 4) Restraint for valves and fittings shall have ductile iron glands. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

- 5) Stainless steel rodding and fasteners, Type 304 minimum, is acceptable per county standard details. Manufacturer's restraint system and/or glands are preferred in lieu of rodding.

h) Polyvinyl Chloride Pipe (PVC)

- 1) Install restraints in strict accordance with the manufacturer's recommendations.
- 2) External bell restraint harness shall have ductile iron glands. The dimensions of the gland shall be such that it can be used with the standard mechanical joint bell. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

- 3) Restraint for valves and fittings shall have ductile iron glands. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

- 4) Stainless steel rodding and fasteners, Type 304 minimum, is acceptable per county standard details. Manufacturer's restraint system and/or glands are preferred in lieu of rodding.

6) Valves

- a) Provide two (2) valves for a tee intersection, three (3) valves for a cross, and four (4) valves for two-offset tee intersections.

- b) Sufficient main valves shall be provided on water mains so that the number of County water customers out of service due to a main break or maintenance activity is minimized. Refer to Section 2 ff) and 2 gg) for required valve spacing.
- c) Brunswick County reserves the right to require additional valves on any design if it is deemed in the best interest of current and future county water customers.
- d) Valves shall be properly located, operable, and at the correct elevation. All valves and reducers shall be bolted or rodded to the tee or cross. Thrust blocking or other restraining methods shall be installed per standard details.
- e) The maximum depth of the valve nut shall be five (5) feet. When valve extension kits are used, they must be manufactured by the same company that manufactured the valve.
- f) Valve boxes shall be cast iron, adjustable, screw type with a lid marked WATER. The valve box shall be centered over the wrench nut and seated on compacted backfill with a masonry brick under the valve box for support as shown on the standard details. Valve boxes shall not rest directly on the bonnet of the valve.
- g) The valve box shall not touch the valve assembly. Valve boxes shall be brought flush to finished grade. Concrete valve markers are required except inside platted subdivisions and on fire hydrant gate valves.
- h) All valve boxes in traffic bearing areas shall be encased in a precast concrete pad of (3,000) psi concrete beneath the asphalt. Precast concrete valve box encasements may be used for valve box encasement outside of traffic bearing areas.
- i) Provide one (1) valve for each fire hydrant branch.
- j) All valves shall be minimum two (2) inch diameter.

7) **Industrial or Special Design Conditions**

- a) Design of water systems for industrial or other systems not covered in this section shall be approved on a special case basis only. Special requests shall be submitted to the Brunswick County Engineering Department for review.

8) **Dead End Mains**

- a) Minimize dead end mains by looping of all mains whenever possible.
- b) Where permanent dead ends occur: provide a fire hydrant, water line stubout for future line extension, an automatic flushing device on lines six (6) inches and larger, or a manual flushing device on lines less than six (6) inches in diameter. An isolation valve the same size as the main must also be installed. Flushing devices should be sized to provide flows which will give a velocity of at least (2.5) feet per second in the water main being flushed. A flushing device may be required to be an automatic type with UV resistant cover at the discretion of the County. See County Standard Water Details for further information.

- c) Do not connect any flushing device to any sanitary or storm sewer or any other non-approved connection.

9) **Separation of Water Mains and Sewer Mains**

- a) Horizontal and Vertical Separation
  - 1) Minimum horizontal separation between water mains and sanitary sewer shall be ten (10) feet. The distance shall be measured edge of pipe to edge of pipe.
  - 2) Should ten (10) foot separation not be feasible, then the water main may be located closer to the sewer main provided that:
    - a) It is laid in a separate trench,
    - b) It is laid in the same trench with the water main located at one side on a bench of undisturbed earth,
    - c) In either of the above cases, crown elevation of the sewer main shall be at least eighteen (18) inches below invert elevation of the water main.
  - 3) Sewer mains crossing water mains shall be laid to provide a minimum vertical separation of eighteen (18) inches between the invert of the water main and the crown elevation of the sewer main. The crossing shall be arranged perpendicularly so that the sewer main joints will be equidistant and at least ten (10) feet from the crossing in each direction.
  - 4) If it is impossible to maintain the required horizontal and vertical separation as described above, or anytime sewer must be laid above a water main, then both the water main and sewer main must be constructed of pressure class 350 ductile iron pipe with watertight joints and pressure tested to (150) psi to assure water tightness before backfilling. At the discretion of Brunswick County, a ferrous sleeve may be installed around existing water mains and force mains to meet this requirement provided NCDEQ approval for the ferrous sleeve is first obtained by the Engineer.
  - 5) Mechanical joints will be required for the transition in the sewer main at water main/sewer main crossings. Fernco couplings are not permitted to be used. Special structural support for the water and sewer mains may be required.
- b) Special Cases involving water mains:
  - 1) Water mains may not be placed in contaminated areas unless piping material, including gaskets, are adequate to protect the water quality
  - 2) Water mains may not be less than ten (10) feet from any waste water tile field or spray field.

- 3) There may not be any connection between the water distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminated materials may be discharged or drawn into the system.
- 4) Neither steam condensate nor cooling water from jackets or other heat exchange devices may be returned to the potable water supply.

**10) Water Main, Sewer Main, and Storm Drainage System Interference Manholes**

- a) No water pipe shall pass through or come in contact with any part of a sewer manhole or storm drainage pipe or structure.

**11) Exceptions**

- a) Brunswick County Engineering must specifically approve any variance from any separation requirements when it is impossible to obtain the specified distances as stated herein.

**12) Surface Water and Wetlands Crossings**

- a) Surface water and wetland crossings, whether over or under water, present special challenges. Brunswick County Engineering Department should be consulted before plans are prepared. Water mains crossing surface waters must be adequately supported and anchored, protected from damage and freezing, and be accessible for repair or replacement. Any support or anchoring system should be designed to be corrosion resistant using concrete and/or minimum Type 304 stainless steel. Water mains crossing under water bodies must maintain a minimum cover of three (3) feet from the deepest point to the crown of the pipe. When crossing water courses which are greater than fifteen (15) feet in width, the following must be provided:
  - 1) The pipe material and joints shall be designed appropriately.
  - 2) Valves must be located so that the section can be isolated for testing or repair; the valves must be easily accessible, and not subject to flooding.
  - 3) An automatic flushing device must be provided on the side opposite the supply service.

**13) Thrust Block Design**

- a) Maximum soil pressure: 1,000 lbs/sq ft.
- b) Minimum water pressure: 150 psi.
- c) Safety factor: 1.5.
- d) Concrete: 2500 psi minimum
- e) Refer to Water Standard Details for thrust blocking detail information.

**14) Cover Over Water Mains**

- a) Provide suitable cover on all water mains. Minimal cover depth for PVC pipe is thirty-six (36) inches – use ductile iron pipe if (36) inches depth of cover cannot be obtained for PVC pipe:
  - 1) 4" - 24" diameter main: 36 inch minimum cover.
  - 2) 30" diameter and larger main: 48 inches minimum cover.
  - 3) All piping located within a public right-of-way shall be constructed in accordance with applicable permits and Brunswick County's minimum requirements.
  - 4) Special conditions other than those listed above may be approved if requested in writing from Brunswick County.
  - 5) No berms shall be placed over utility lines.

**15) Tap Size in Relation to Main Size**

- a) As a general rule all water service taps shall be a minimum of one size smaller than the water main being tapped. In the case where the water service tap is the same size as the main being tapped a tapping sleeve, approved by County Engineering, must be utilized instead of a tapping saddle. Brunswick County reserves the right to stipulate the maximum size tap available off of any water main, or to require a cut-in tee instead of a tapping sleeve. It may be necessary to schedule a water system shutdown and install a main line tee versus a tapping saddle or tapping sleeve if the County requires the full size cut in tee.
- b) Horizontal directionally drilled (HDD) pipe shall not have service taps.

**16) Combination Air Valves**

- a) Mains shall be designed to minimize high points. At high points in water mains where there are no service taps within (2,000) feet, and where air can accumulate, provisions shall be made to remove the air by means of a combination air valve. Combination air valves shall not be used in situations where flooding of the manhole or chamber may occur. Air valves should be sized based on the size of the water main. Air valves should be detailed on the design drawings and approved by Brunswick County. Air valves shall be installed per county standard details.

**17) Water Main Flushing Assemblies**

- a) All dead-end water mains shall be designed to include a standard flushing device. Mains six (6) inches and larger require an automatic flushing device. A standard fire hydrant or other approved flushing device must be utilized for main flushing. A temporary flushing device may be utilized in cases where the main is to be extended at a later date with approval of Brunswick County.

- b) Flushing devices and other such appurtenances to a water distribution system shall not be connected directly to any storm drain or sanitary sewer. Blow-off chambers must include a removable extension to direct the water away from the blow-off box.
- c) Refer to county standard details for additional information.

**18) Water Services**

- a) Water meters shall be installed for all service connections to water mains.
- b) No water meters allowed in driveways. Meters shall be in non-traffic areas and a minimum of (18) inches away from driveways or sidewalks.
- c) Brunswick County has standardized with the Sensus AMI/AMR meter – see County Engineering for any questions concerning proper meter selection.
- d) All commercial and industrial service connections shall be sized appropriately by a licensed plumber and provided with fire service as required by local building codes. See location schematic standard detail.
- e) All non-residential water meters and all irrigation water meters must have an approved backflow cross-connection protective device installed to protect the County water distribution system against cross – contamination.
- f) All new in-ground irrigation systems on lots platted and recorded after July 1, 2009 (ref: NCGS 143-355.4) are required to have a separate water meter for the irrigation system.
- g) All new developments that will have public sewer in addition to public water are required to have a double water meter box on each lot to accommodate both the domestic and irrigation water meters – refer to county standard water meter details.

**19) Utility Easements and Rights-of-Way**

- a) No trees or shrubs shall be planted in utility rights-of-way and/or public utility easements.
- b) No privacy berms or berms of any kind shall be placed in utility rights-of-way and/or public utility easements.
- c) No permanent structures or fencing shall be placed in utility rights-of-way and/or public utility easements.
- d) Public utility easements shall be a minimum twenty (20) feet wide unless prior approval is obtained from Brunswick County Engineering.

**20) Valve Markers**

- a) Concrete valve markers shall be placed, in public rights-of-way, behind all valve boxes not installed for individual, residential, or commercial connection. Fire hydrant isolation valves are not required to have a concrete valve marker.

Fiberglass valve markers may be utilized in utility easements. Refer to County Standard Details.

**21) Existing Driveways**

- a) For new utility lines crossing existing concrete or asphalt driveways, concrete driveways shall be removed and reinstalled to nearest expansion joints and asphalt drives shall be saw-cut and replaced to minimum three (3) feet from each side of the open excavation for the utility line installation.

**22) Fire Hydrants**

- a) All hydrants shall be installed on a minimum six (6) inch water line and should be installed in close proximity to road intersections whenever possible. Only one (1) fire hydrant may be installed when the line is served by a six (6) inch tap and is not looped to another main. When placed at intersections hydrants shall be offset from the top of the intersection to minimize vehicular strikes to the hydrant. The minimum acceptable flow for fire hydrants is one thousand (1,000) gpm with twenty (20) psi residual pressure for residential and one-thousand-five-hundred (1,500) gpm with twenty (20) psi residual pressure for all other areas unless otherwise specified by the County Fire Marshal. The Engineer shall contact the local fire department and/or the County Fire Marshal during the design phase to coordinate the proper location of all fire hydrants within the project area.
- b) All new residential subdivisions shall have a fire hydrant placed at the entrance to the subdivision and thereafter a maximum of five hundred (500) feet apart, measured along street centerlines, unless otherwise approved by the County Fire Marshall.
- c) In multi-family, commercial, business, office, institutional and industrial zoning the maximum distance between hydrants, measured along street centerlines, shall be four hundred (400) feet, unless otherwise approved by the County Fire Marshal.

New buildings or additions that result in a total building area of ten-thousand (10,000) square feet require hydrants to be installed at three-hundred (300) foot intervals along sides of the building that are accessible to fire jumpers. These hydrants shall be at least fifty (50) feet away from the building.

- d) Where sprinkler systems are used, a fire department connection (FDC) shall be installed and shall be within one hundred fifty (150) feet of an accessible fire hydrant, or as directed by the County Fire Marshal.

**23) Automatic Fire Sprinkler Systems**

- a) All automatic fire sprinkler systems shall be approved by the County Fire Marshal. Design engineers shall obtain Fire Marshal review and approval as required.

- b) When a fire protection system is proposed the type of backflow prevention assembly to be installed to protect the public water supply shall be commensurate with the degree of any actual or potential hazard. At a minimum the backflow protection device will consist of a double check detector valve assembly. Refer to Brunswick County Utilities *Cross – Connections and Backflow Protection Policy*.
- c) All backflow protection devices for automatic fire sprinklers will meet the requirements listed in the Brunswick County Public Utilities Department *Cross – Connections and Backflow Protection Policy*. At a minimum the backflow protection device will consist of a double check valve detector assembly including (2) check valves, (2) OS&Y gate valves, and (4) test cocks. All fire systems using toxic additives or booster pumping facilities shall be required to be protected with an approved reduced pressure principle assembly (RPZ or RP). These backflow prevention assemblies shall be American Water Works Association (AWWA), National Fire Protection Association (NFPA), and the Foundation for Cross Control and Hydraulic Research of the University of Southern California (FCCCHR-USC) approved. All fire sprinkler backflow protection devices shall be installed on the supply side of the sprinkler fire protection line.
- d) The backflow prevention assembly shall be installed on the back side of the right-of-way on the customer's side of the water service and shall be installed above ground in an insulated box and shall be operated and maintained by the customer at his or her expense. No underground installations will be approved or accepted. If the building is (200) linear feet or less from the water main serving the building, then the backflow prevention device may be installed inside the building.
- e) A post indicator valve (PIV) shall be provided at the right-of-way line or edge of easement line. The top of the PIV shall be thirty-six (36) inches above finished grade. The County shall own and maintain up to and including the PIV but not beyond the PIV on private property.
- f) Where automatic fire sprinkler systems are used a fire department connection (FDC) shall be provided at the direction of the County Fire Marshal. The FDC shall be located within one hundred fifty (150) feet of a fire hydrant, or as directed by the County Fire Marshal. When a sprinkler system serves only a part of a large structure, the FDC shall be labeled, with minimum (2) inch letters on a permanent sign, as to which section of the structure that sprinkler riser serves. Remote FDCs may be installed (versus wall mounted FDCs) with the approval of the County Fire Marshal – refer to County Water Standard Details.

#### 24) **Cross Connection and Backflow Protection Policy**

- a) Refer to the Brunswick County Public Utilities Department *Cross – Connection and Backflow Protection Policy* for a complete understanding of the required protection for County water mains for any proposed design.
- b) The intent of this policy is to define the authority of Brunswick County as the water purveyor, in the elimination of all hazards, both actual and potential, to the potable water within the County's public water supply system.

- c) All commercial and industrial customers must have an approved backflow prevention device.
- d) All irrigation systems must have an approved backflow prevention device.

**25) New In-Ground Irrigation Systems**

- a) All new in-ground irrigation systems must have their own separate water meter with an approved backflow prevention device.

**26) Locate Tape, Wire, and Electronic Marker Balls**

- a) Tape shall be three (3) inches wide, blue in color, bearing continuous message "CAUTION WATER LINE BURIED BELOW". Tape shall be made of plastic or other permanent material and shall be buried continuously above the water main at a depth of eighteen (18) inches below finished grade.
- b) All water mains shall have a #12 AWG, high strength copper clad steel conductor (HS-CCS) such as Copperhead Superflex, Pro Trace High Flex or approved equal, with HDPE insulation, and rated for direct burial. Listed and approved underground connectors shall be used for all splices. The wire shall be brought up in valve boxes per County Standard Detail. In any event, the wire shall be brought up into a valve box at 1,000 feet maximum intervals to provide wire access points. The wire shall be taped to the top of the water main at minimum ten (10) feet intervals.
- c) The contractor shall be required to perform a signal strength test of the installed tracer wire at the end of the project with County staff present. Refer to County Standard Details for tracer wire information.
- d) Individual water services shall have tracer wire installed from the main to the meter box.
- e) In addition to the tracing wire, electronic marker balls shall be installed on the water main in accordance with Brunswick County Technical Specification TS 035: *Electronic Markers for Water and Sewer Pressure Mains.*

## **UTILITIES DESIGN STANDARDS**

### **PART B: GRAVITY SEWER SYSTEMS**

#### **1) General**

- a) These gravity sanitary sewer system design guidelines are based on federal, state and County engineering design criteria.
- b) These design standards are applicable to existing systems and new extensions of the County sewer system including, but not limited to, residential, commercial and industrial developments.
- c) Per the Brunswick County Public Utilities Sewer Use Ordinance, Article II, Section 4.2 (a) (3) gravity sewer is the preferred method of sewer collection. In order to promote the use of gravity sewer collection systems and clarify when other types of sewer collection may be considered the County has the following guidance:
  - 1) The County will consider the feasibility of gravity installation deeper than ten (10) feet based upon soil type, required shoring, water table, and the cost of initial installation compared to a low-pressure sewer system or vacuum sewer system, cost of future repairs, etc.
  - 2) A combination of gravity and low-pressure sewer systems will be considered by County staff due to topography and/or possible phasing plans for a development if an excessive number of pump stations are required to serve the project.
  - 3) Pump station wetwells and receiving manholes will not be considered when applying depth criteria for gravity sewer to determine the suitability of alternative sewer collection systems as it is expected that these will be in excess of ten (10) feet.

#### **2) Gravity Sewer System Design Criteria**

- a) Minimum main line size for public sewer mains is eight (8) inches.  
Minimum main line size for private sewer mains is six (6) inches.
- b) Service lines:
  - 1) Single 4" or 6" PVC or DIP service lateral per residential unit.
  - 2) A single 6" service line may serve two residential units upon specific approval from County Engineering.
  - 3) Commercial units utilize a single 6" service lateral.
  - 4) Multi-family units shall have services designed by an engineer and may utilize an 8" service line.

- 5) 8" service lines shall connect to a manhole only and not to a main.
- 6) No Fernco couplings allowed on sewer mains or service laterals.
- c) Minimum Pipe Slope in Feet per Thousand Feet (Ft / 1000):
  - 1) Gravity Sewer mains
    - a) 8-inch: 4 feet (= 0.40%)
    - b) 10-inch: 2.8 feet (= 0.28%)
    - c) 12-inch: 2.2 feet (= 0.22%)
    - d) 15-inch: 1.5 feet (= 0.15%)
    - e) 18-inch: 1.2 feet (= 0.12%)
    - f) 20-inch or 21-inch: 1.0 foot (= 0.10%)
    - g) 24-inch: 0.8 foot (=0.08%)
  - 2) Service lines:
    - a) 4-inch: 2.0%
    - b) 6-inch: 1.0%
    - c) 8-inch: 0.4%

Note: Sewers shall not be oversized to justify using flatter slopes.

### 3) Capacity Design

- a) Minimum flow for residential or apartment unit: 70 gallons per bedroom.
- b) All other flows: comply with the unit contributory loading criteria, North Carolina Department of Environmental Quality (NCDEQ) regulations.

### 4) Sewer Mains

- a) Straight alignment and uniform slope between manholes – no exceptions.
- b) Depth adequate to receive wastewater from the lowest service and to prevent freezing.
- c) If slopes are greater than twenty (20) percent, then anchor using concrete blocking.
- d) Where two or more mains of different diameters enter a sanitary manhole, it is required to match the crown elevations of the different size pipes.
- e) Service laterals to be a minimum of five (5) feet from each property corner pin and as far from water laterals as possible depending on site conditions. No cleanouts allowed in driveways.
- f) Locate sewer mains and manholes outside of paved roadways whenever possible.
- g) Restraint type gaskets that provide internal restraint by means of stainless steel inserts embedded within the gasket are **not** permitted for use in Brunswick County.

**5) Separation of Sewer Mains and Water Mains**

- a) Horizontal and Vertical Separation
  - 1) Minimum horizontal separation between water mains and sanitary sewer mains shall be ten (10) feet. The distance shall be measured edge of pipe to edge of pipe.
  - 2) Should ten (10) foot separation not be feasible, then the water main may be located closer to the sewer main provided that:
    - a) It is laid in a separate trench,
    - b) It is laid in the same trench with the water main located at one side on a bench of undistributed earth,
    - c) In either of the above cases, crown elevation of the sewer shall be at least eighteen (18) inches below invert elevation of the water line.
  - 3) Sewer mains crossing water mains shall be laid to provide a minimum vertical separation of eighteen (18) inches between the invert of the water main and the crown elevation of the sewer main. The crossing shall be arranged perpendicularly so that the sewer main joints will be equidistant and at least ten (10) feet from the crossing in each direction.
  - 4) If it is impossible to maintain the required horizontal and vertical separation as described above, or anytime sewer must be laid above a water main then both the water main and sewer main must be constructed of pressure class (350) ductile iron pipe with watertight joints and pressure tested to (150) psi to assure water tightness before backfilling. At the discretion of Brunswick County, a ferrous sleeve may be installed around existing water mains and force mains to meet this requirement provided NCDEQ approval for the ferrous sleeve is first obtained by the Engineer.
  - 5) Mechanical joints will be required for the transition in the sewer main at water main/sewer main crossings. Fernco couplings are not permitted to be used. Special structural support for the water and sewer mains may be required.

**6) Cover over Sewer Mains and Utility Easement Widths**

- a) Provide suitable cover on all lines. Minimal cover depth as follows:
  - 1) All PVC mains shall have minimum thirty-six (36) inches of cover.
  - 2) 8" to 20" diameter mains shall have minimum thirty-six (36) inches of cover.
  - 3) 24" diameter and larger mains shall have minimum forty-eight (48) inches of cover.

- 4) All piping located within a public right-of-way shall be constructed in accordance with applicable permits and Brunswick County's minimum requirements.
- 5) Special conditions other than those listed above may be approved if requested in writing from County Engineering and if the requested condition meets or exceeds the NCDEQ/DWR requirements in the document "Minimum Design Criteria for Gravity Sewer".
- 6) Easement width not in public road right-of-way shall be a minimum twenty (20) feet wide.

Depth of Sewer (ft)	Easement Width (ft)
0-7.9	20
8-11.9	25
12-19.9	30
20-24.5	35
25+	40

#### 7) **Ductile Iron Pipe (DIP) required usage**

- a) The use of ductile iron pipe on public sewer is only allowed with express written consent of Brunswick County Public Utilities or Engineering. If ductile iron pipe with sanitary sewer is allowed the following must be followed:
  - 1) Has a depth of cover less than thirty-six (36) inches.
  - 2) Has a depth of cover greater than eighteen (18) feet.
  - 3) Crosses beneath storm drain pipe with less than twenty-four (24) inches of clearance – refer to County Standard Details for additional information.
  - 4) Crosses above storm drainage or other pipe with less than two (2) feet of clearance.
  - 5) Crosses creeks, rivers and other water bodies unless another pipe material is specified by County Engineering.
  - 6) Is installed within a casing pipe.
  - 7) Crosses through storm sewer interference junction boxes.

#### 8) **Sewer Manholes**

- a) Manhole diameters:
  - 1) Minimum diameter four (4) feet.
  - 2) Inside drop manholes: minimum diameter five (5) feet per NCDEQ/DWQ rules.

- b) Extended bases are required on manhole base sections – see Standard Details.
- c) Maximum manhole spacing: (400) feet standard – other spacing as requested and approved by County Engineering in accordance with NCDEQ/DWQ regulations.
- d) Minimal angle between sewer mains intersecting at manhole: (90) degrees or greater to the downstream side – variances allowed by approval of County Engineering.
- e) Manhole top elevations:
  - 1) Shall be at or above finished grade elevation.
  - 2) Set to match finished pavement grade if located in paved areas.
- g) Use inside drop manholes where the difference in incoming and outgoing pipe invert elevation is 30 inches or greater.
- h) Eccentric manhole cones on all manholes with 24 inch clear opening on the ring and cover.
- i) Use water tight ring and covers in flood plan areas or areas subject to flooding.
- j) Use shallow precast manholes with flat tops where necessary and approved by County Engineering.
- k) Provide 0.1-foot elevation fall through all manholes except straight through manholes.
- l) Concrete manholes shall be coated with coal tar epoxy coating minimum 20 mils thick.
- m) Use vented manholes as required per NCDEQ/DWQ requirements.
- n) For applications requiring the use of plastic polypropylene or polymer concrete manholes refer to Brunswick County Technical Specification TS 020: Gravity Sanitary Sewer System.

## **UTILITIES DESIGN STANDARDS**

### **PART C: SEWER FORCE MAINS**

#### **1) General Information**

- a) The following sewer force main design standards are based on Federal, State and local health requirements and Brunswick County engineering design criteria.
- b) These design standards are applicable to all developments including, but not limited to, residential, commercial and industrial developments, subdivisions and/or parks requiring sewer service from Brunswick County.

#### **2) Sewer Force Main Design Criteria**

- a) Minimum pipe size shall be four (4) inches.  
NOTE: Under conditions that arise from time to time, where normal installations cannot be implemented, Brunswick County will review submittals for a grinder station installation. Minimum pipe size for grinder pump station force mains is two (2) inches.
- b) Design velocity shall be a minimum two (2) feet per second scouring velocity.
- c) Maximum pipe size:
  - 1) Provide so as to maintain the minimum two (2) feet per second scouring velocity and minimize pump discharge head.
- d) Hazen and Williams design coefficient:
  - 1) PVC:  $C = 130$ .
  - 2) Ductile iron pipe:  $C = 120$ .
  - 3) HDPE:  $C = 130$ .
  - 4) Fusible PVC:  $C = 130$ .

#### **3) Combination Air and Vacuum Release Valves**

- a) Provide at high points in the force main or as required by the DWQ *Minimum Design Criteria for Pump Stations and Force Mains*. Combination air/vacuum valves shall be installed where the distance between the low point and high point in the force main exceeds ten (10) vertical feet and at all localized high points in the force main.
- b) Maintain minimum forty-eight (48) inches cover over force main at location of air release valves.  
  
Design force main to minimize the number of air release valves.
- c) Provide at one thousand (1,000) foot intervals where force main is installed at no slope.

- d) Refer to County Standard Details for additional information.

**4) Plug and Check Valves**

- a) Force mains greater than (5,000) feet in length shall have a plug valve at the halfway point or as directed by the Engineer and/or County staff.
- b) An initial isolation valve shall be installed on the sewer force main within one hundred and fifty (150) feet from the sewer pump station valve vault.
- c) Refer to Brunswick County Technical Specification TS 022: Waste Water Force Mains and the Brunswick County Standard Details.

**5) Force Mains Entering Manholes**

- a) Force main to enter at the receiving manhole's flow line if possible.
- b) Force mains that do not enter at the receiving manhole's invert must be constructed as an inside drop per County Standard Sewer Details.
- c) Existing gravity manholes that have sewer force mains entering them shall be polymer concrete or plastic polypropylene to protect against hydrogen sulfide corrosion per Brunswick County Technical Specification TS 020: Gravity Sanitary Sewer Systems – Section 5.0 (c) (11). If the existing manhole is concrete, it will be required to either replace the existing concrete manhole with a plastic polypropylene or precast polymer concrete manhole or add an additional polymer concrete or polypropylene transitioning manhole.
- d) New gravity manholes, and transitioning manholes installed to allow a new force main to connect to an existing sewer system, shall be plastic polypropylene or precast polymer concrete sections.

**6) Materials and Requirements for Restrained Joints, Pipes, and Fittings on Force Mains**

- a) Restrained joints are required to prevent movement of system piping caused by forces in or on buried piping tees, valves, branches, bends, plugs, etc.
- b) Restrained joints shall be installed as shown on the approved plans, standard details, or as directed by County staff or the Engineer.
- c) Concrete thrust blocking shall be installed as shown on the approved plans, standard details, or as directed by County staff or the Engineer.
- d) All carrier pipe installed inside a casing shall be pressure class 350 ductile iron pipe per County standard details with restrained joints.
- e) All restrained joint systems shall have a pressure rating equal to or greater than that of the pipe on which they are installed.

f) Restraint type gaskets that provide internal restraint by means of stainless steel inserts embedded within the gasket are **not** permitted for use in Brunswick County.

g) Ductile Iron Pipe (DIP)

The use of ductile iron pipe on public sewer is only allowed with express written consent of Brunswick County Public Utilities or Engineering. If ductile iron pipe with sanitary sewer is allowed the following must be followed:

- 1) Install restraints in strict accordance with the manufacturer's recommendations.
- 2) All ductile iron horizontal directional drill and bore-and-jack installations shall use boltless, integral, positive locking restraint systems that allow for joint deflection and disassembly should the need arise. The restrained joint system shall be a manufacturer's standard restrained joint system such as American (Flex-Ring or Lok-Ring), U S Pipe (TR-Flex), or Griffin (Snap-Lok), or approved equal.

Note: the aforementioned boltless, integral, positive locking restraint systems are also acceptable for use in open cut pipe installation locations.

- 3) External bell restraint harness shall have ductile iron glands. The dimensions of the gland shall be such that it can be used with the standard mechanical joint bell. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

- 4) Restraint for valves and fittings shall have ductile iron glands. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

- 5) Stainless steel rodding and fasteners, Type 304 minimum, is acceptable per County standard details. Manufacturer's restraint system and/or glands are preferred in lieu of rodding.

h) Polyvinyl Chloride Pipe (PVC)

- 1) Install restraints in strict accordance with the manufacturer's recommendations.

- 2) External bell restraint harness shall have ductile iron glands. The dimensions of the gland shall be such that it can be used with the standard mechanical joint bell. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

- 3) Restraint for valves and fittings shall have ductile iron glands. Twist off nuts with preset factory torque setting shall be used to ensure proper actuation of the restraint device. All nuts, bolts, and fasteners shall be high strength alloy steel. Mechanical joint restraints shall conform to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153, latest revision.

The restrained joint system shall be a manufacturer's standard restrained joint system manufactured by EBAA Iron, Inc., Smith-Blair, Inc., JCM, Inc., or approved equal.

- 4) Stainless steel rodding and fasteners, Type 304 minimum, is acceptable per County standard details. Manufacturer's restraint system and/or glands are preferred in lieu of rodding.

## 7) **Separation of Sewer Force Mains and Water Mains**

### a) Horizontal and Vertical Separation:

- 1) Minimum horizontal separation between water mains and sewer force mains shall be ten (10) feet. The distance shall be measured edge of pipe to edge of pipe.
- 2) Should ten (10) foot separation not be feasible, then the water main may be located closer to the force main provided that:
  - a) It is laid in a separate trench,
  - b) It is laid in the same trench with the water main located at one side on a bench of undistributed earth,
  - c) In either of the above cases, crown elevation of the force main shall be at least eighteen (18) inches below invert elevation of the water line.
- 3) Force mains crossing water mains shall be laid to provide a minimum vertical separation of eighteen (18) inches between the invert of the water main and the crown elevation of the sewer force main.

The crossing shall be arranged perpendicularly so that the sewer main joints will be equidistant and at least 10 feet from the crossing in each direction.

- 4) If it is impossible to maintain the required horizontal and vertical separation as described above or anytime sewer must be laid above a water main, then both the water main and sewer main must be encased in ferrous sleeves. Sleeves shall have sealed ends. If the water main is ferrous with joints equivalent to water main standards, then the water main does not have to be encased within an additional sleeve.
- 5) Mechanical joints will be required for the transition in the sewer main at water main/sewer main crossings. Fernco couplings are not permitted to be used. Special structural support for the water and sewer mains may be required.

## 8) **Cover**

- a) Provide suitable cover on all sewer force mains. Minimal cover depth for PVC pipe shall be thirty-six (36) inches – if thirty-six (36) inch depth of cover cannot be obtained for PVC then ductile iron pipe shall be used.
  - 1) 4" diameter through 24" diameter mains shall have thirty-six (36) inches minimum cover.
  - 2) 30" diameter and larger mains shall have forty-eight (48) inches minimum cover.
- b) All piping located within a public right-of-way shall be constructed in accordance with applicable permits and Brunswick County's minimum requirements. All force mains located within NCDOT rights-of-way shall be minimum DR-18 rated.
- c) Special conditions other than those listed above may be approved if requested in writing and approved by County Engineering.

## 9) **Ductile Iron Pipe (DIP) usage**

- a) Use ductile iron pipe where a sewer force main:
  - 1) In accordance with Section (6) for water/force main crossings.
  - 2) Crosses beneath storm drainage pipe with less than twenty-four (24) inches of clearance – refer to County Standard Details.
  - 3) Crosses above storm drainage pipe with less than two (2) feet of clearance.
  - 4) Is attached to bridges or other structures above grade.
  - 5) Cover is less than the depth prescribed in Part (8) above.

**10) Valve Markers**

- a) Force main valve markers shall be placed behind all valve boxes not installed for individual, residential, or commercial connections. See standard details.

**11) Existing Driveways**

- a) For new utility lines crossing existing concrete or asphalt drives, concrete driveways to be removed and reinstalled to nearest expansion joint and asphalt drives to be saw-cut and replaced to minimum three (3) feet from open excavation required to install the force main.

**12) Locate Tape, Wire, and Electronic Marker Balls**

- a) Marking tape shall be three (3) inches wide, green or purple in color, bearing continuous message "CAUTION SEWER LINE BURIED BELOW" or "CAUTION REUSE LINE BURIED BELOW". Tape shall be made of plastic or other permanent material and shall be buried continuously above the force main at a depth of eighteen (18) inches below finished grade.
- b) All force mains shall have a #12 AWG, high strength copper clad steel conductor (HS-CCS) such as Copperhead Superflex, or approved equal, with HDPE insulation, and rated for direct burial. Listed and approved underground connectors shall be used for all splices. The wire shall be brought up into a valve box at 1,000 foot maximum intervals to provide wire access points. The wire shall be taped to the top of the force main at minimum ten (10) foot intervals.

The contractor shall be required to perform a signal strength test of the installed tracer wire at the end of the project with County Engineering and Public Utilities staff present. Refer to County Standard Details for tracer wire information.

- c) In addition to the tracing wire, electronic marker balls shall be installed on the force main in accordance with Brunswick County Technical Specification TS 035: *Electronic Marker Balls for Water Mains and Sewer Force Mains.*

**13) Low Pressure Sewer Service**

- a) Size low pressure sewer mains to maintain minimum flows per NCDEQ requirements.
- b) Locate valves, lines, grinder pump station and appurtenances in relation to buildings, easements, and rights-of-way lines as indicated in the County Standard Details.
- c) Grinder pumps to have minimum 24-hour storage in the wetwell in case of a power outage or required minimum per NCDEQ/DWQ rules - whichever is greater – if a standby emergency power source is not installed.
- d) Refer to Part (E) of this Design Manual and County Technical Specification TS 021: *Low Pressure Sewer Systems and Grinder Pumps* for additional information on low pressure sewer systems and force mains.

## **UTILITIES DESIGN STANDARDS**

### **PART D: SEWAGE PUMPING STATIONS**

#### **1) General Information**

- a) The following sanitary sewer pump station design guidelines are based on Federal, State and local health requirements and the Brunswick County Wastewater Pumping Station Design Guidelines.
- b) These pump station design guidelines are not intended to be the complete list of requirements for designing and constructing a sewer pump station that is acceptable to Brunswick County Engineering and Utilities Departments. The design engineer must refer to any and all Technical Specifications for pump stations, force mains, grinder pumps, etc., that are found in this Engineering Design Manual, Technical Specifications, and Standard Details for Water and Sewer Systems.
- c) These design guidelines are applicable to all developments including but not limited to residential, commercial and industrial developments, subdivisions and/or parks requiring sewer service from the Brunswick County and also for County Capital Improvement Program (CIP) projects.
- d) Design criteria for abnormal circumstances are to be presented to County Engineering for approval prior to preparation of plans and specifications.
- e) Design Engineers undertaking a sewer pump station design are strongly encouraged to read the Brunswick County Wastewater Pumping Station Design Guidelines (available on the County Website and in this Engineering Design Manual, Technical Specifications, and Standard Details for Water and Sewer Systems), the NCDEQ/DWQ Minimum Design Criteria for Pump Stations and Force Mains, and the NCDEQ/DWQ NCAC Title 15A Subchapter 2T rules to ensure a thorough understanding of all pump station design requirements.
- f) Contact County Engineering with any questions concerning permitting of pump stations in Brunswick County. Refer to Brunswick County Technical Specifications TS 023: Waste Water Pump Stations with Submersible Pumps and TS 032: Standby Emergency Power Generator for Sewer Pump Stations.

#### **2) General Pump Station Design – (2) pump submersible station**

- a) Minimum of two (2) pumps of equal capacity with each capable of handling the design peak flow with the second pump out of service.
- b) Minimum (2.5) peaking factor or per NCDEQ Minimum Design Criteria for Pump Stations and Force Mains.
- c) Suction and discharge piping: minimum four (4) inch diameter and capable of passing minimum three (3) inch diameter spherical solids.

- d) Consideration is to be given when designing pumps of the ultimate sewer basin built out capacity requirements as outlined in Brunswick County's Sewer Master Plan.
- e) Provide a check valve and plug valve on each pump discharge line.
- f) Provide a discharge pressure gauge on the common force main within the valve vault per County Pump Station Standard Details.
- g) Pumps shall have an operating point at or near peak efficiency.
- h) Pumps shall be non-overloading for all duty points.
- i) Provide all components of the pump station per County Technical Specifications and Standard Details.
- j) Provide by-pass connection per pump station Standard Details.
- k) Provide manhole on influent line at pump station per Standard Details.
- l) The maximum depth of all pump stations shall not exceed thirty (30) feet. Capacity or grade issues will be resolved by increasing the diameter of the wet-wells and the size of the gravity main in accordance with NCDEQ/DWQ design rules for gravity sewers and pump stations.
- m) Three phase power is required on all County pump stations. No phase converters or "add-a-phase" systems are allowed. Single phase power may be allowed for pumps ten (10) HP and less as approved by County Engineering.
- n) Transient Voltage Surge Suppressors (TVSS) are required for all services that supply power to duplex sewer pump stations.

### 3) **Wetwell Design Criteria**

- a) The wetwell shall be sized to accommodate the ultimate built out flow from the sewer basin in accordance with the Brunswick County sewer Master Plan.
- b) Pump station flows to be determined using the "Unit Contributing Loading Requirements" as otherwise outlined by NCDEQ's latest revision.
- c) Minimum allowable wetwell diameter shall be 8'-0".
- d) All new wetwells and pump station influent manhole adjacent to the pump station shall be precast polymer concrete sections conforming to ASTM C478 as manufactured by Armorock, Meyer Polycrrete, or approved equal.
- e) Normal operating volume shall prevent any one pump from starting more than six (6) times per hour.
- f) Existing wetwell interior shall be coated with an approved hydrogen sulfide resistant coating per Brunswick County Technical Specification TS 023: Waste Water Pump Stations with Submersible Pumps.

- 1) Coatings shall be installed at one hundred and twenty (120) mils nominal thickness. Contractor shall verify thickness during installation by the use of a wet film thickness gauge. Approved coatings are Raven 405 Epoxy System, Zebron 386, Duramar 1030 Sewerkote, or approved equal.
- 2) Testing of coating: coatings shall be tested for pinholes using approved spark test method (high voltage holiday detection equipment). The installation contractor will correct any defect found during the test. The installation contractor shall provide a one-year warranty to the County for materials and workmanship.
- g) Wetwells to be located within the pump station to allow access with vacuum truck and boom truck for ease of maintenance.
- h) Wetwells shall have a filleted bottom to direct flow toward the pumps and the center of the wetwell.
- i) No steps allowed inside wetwells.
- j) The bottom slab of the wetwell shall be set on a minimum of twelve (12) inches of # 57 washed stone. All over-excavated areas greater than eighteen (18) inches below the wetwell bottom invert shall be filled with concrete with a minimum strength of (3,000) psi.
- k) The influent line shall terminate a minimum of twelve (12) inches inside the wetwell and shall enter the wetwell so as not to project sewer flow on the pump control floats.
- l) The pump station site shall be graded and sloped to ensure positive drainage away from the pump station.
- m) Pump station stone shall extend eighteen (18) inches beyond the pump station fence on all sides.

#### 4) **Electrical Design**

- a) Electrical design of pump stations shall conform to the latest editions of the National Electrical Code (NEC), the National Electric Manufacturers Association (NEMA), the Institute of Electrical and Electronic Engineers (IEEE), the Insulated Cable Engineers Association (ICEA), the American Society of Testing Materials (ASTM), the American National Standards Institute (ANSI), the requirements of the Occupational Safety Hazards Act (OSHA), the NCDEQ/DWQ *Minimum Design Criteria for Pump Stations and Force Mains*, and all other applicable Federal, State and local laws and/or ordinances.

All material and equipment shall bear the inspection labels of Underwriters Laboratories, Inc., if the material and equipment is of the class inspected by said laboratories.

- b) Design the electrical service to handle the ultimate capacity of the pump station. Compile a load list which will include the horsepower of the two pumps as well as any miscellaneous loads. Submit the load information to the utility so that the utility can size the appropriate service feed prior to design of pump station controls. Acquire the available voltage, service ampere rating and available fault current from the utility for use in choosing a starting device for the motors. Main disconnect device shall be rated and labeled for use as service entrance equipment.
- c) All conduit connections to electrical and SCADA panels shall utilize a watertight connector such as a Meyers Hub or approved equal and shall enter the bottoms of the panels – no side entries allowed. No conduit fittings (LL, LR, LB, C, or T) are allowed.
- d) Provide GFI Duplex receptacle for pump station site maintenance use.
- e) All electrical work shall be performed by a North Carolina state licensed electrical contractor.
- f) Electrical permit shall be obtained from the applicable permitting agency by the utility contractor.
- g) All electrical components will be installed as shown on the Brunswick County Pump Station Standard Details. Any variances require prior approval from County Engineering.
- h) The main circuit breaker ampere rating shall be sized larger than the current draw of the pump station when both pumps are running and all miscellaneous loads are in use.
- i) The automatic transfer switch ampere rating shall be sized larger than the current draw of the pump station when both pumps are running and all miscellaneous loads are in use.
- j) The generator shall be sized large enough to operate both pumps and all miscellaneous loads. The generator shall include a weatherproof enclosure, stainless steel silencer, and base mounted fuel tank. Refer to Brunswick County Technical Specification TS 032: Standby Emergency Generator for Sewer Pump Stations.
- k) Pump Starting Methods:
  - 1) **Full Voltage Non-Reversing (FVNR) Starter:** Commonly referred to as an “across the line” starter. Full voltage starters are typically chosen for low horsepower applications. Starting a motor using a full voltage starter will create the most current draw and largest voltage drop out of all the available starting methods. Coordinate with the electrical utility to acquire the available fault current and determine the percent voltage drop on the system when starting a single pump using a full voltage starter.

If the voltage drop on the system exceeds 35%, do not use a full voltage starter. Full voltage starters shall be assigned a NEMA size based on the horsepower rating of the motor. The minimum size starter shall be NEMA 1.

- 2) **Reduced Voltage Solid State (RVSS) Starter:** Commonly referred to as an “soft starter”. Reduced voltage starters are typically chosen for pumping applications where a full voltage starter will create too large of a voltage drop on the system and where the pump only needs to operate at a single speed. Reduced voltage solid state starters will start the motor at a lower voltage and ramp the voltage up until the motor is at full speed, at which point the reduced voltage starter will lock in at its operating voltage. Starting a motor using a reduced voltage starter will have a lower starting current and a smaller voltage drop than an equivalent full voltage starter. Reduced voltage starters shall be sized to provide, indefinitely, 110% of the motor full load ampere (FLA) rating.
- 3) **Variable Frequency Drive (VFD):** Variable frequency drives (also known as adjustable frequency drives) are used where the speed of the motor needs to be varied depending on a specific set of conditions. Often variable frequency drives are used in pumping applications to control the flow rate of the water leaving the pump station. When using variable frequency drives a number of conditions must be considered. Variable frequency drives create harmonic distortion on the electrical system. In order to ensure that this harmonic distortion does not create unnecessary problems a variable frequency drive must meet the requirements listed in IEEE 519 and have a total harmonic distortion (THD) that is less than 5% of the fundamental frequency. To achieve this, line reactors, DC link chokes, and harmonic filters may be placed between the utility and the variable frequency drive. Variable frequency drives also produce a significant amount of heat and therefore will often need to be in a conditioned space to extend the life cycle of the drive and to prevent overheating. Contact a variable frequency drive manufacturer for more information. Variable frequency drives shall be sized to provide, indefinitely, 110% of the motor full load ampere (FLA) rating.
  - l) Overcurrent protective devices directly ahead of motors in the electrical circuit shall be sized to supply indefinitely 125% of the full load ampere (FLA) rating of the motor in accordance with the National Electric Code (NEC) requirements.
  - m) Conduit & Wire:
    - 1) Wire Sizing: The wire shall be sized for all electrical loads based on the connected load amperage in accordance with the National Electric Code. Minimum wire size for power conductors shall be #12. Minimum wire size for discrete signal conductors shall be #14. Analog signal conductors shall be #16 twisted shielded pairs.

- 2) **Ground Conductor Sizing:** A separate equipment grounding conductor shall be provided for each circuit. The conductor shall be terminated at the proper device, terminal, or lug at the power source. Grounding conductors shall be sized based on the upstream overcurrent protective device as indicated in Article 250 of the National Electric Code. Minimum ground wire size when run with power conductors shall be #12. Minimum ground wire size for discrete or analog signal conductors shall be #14.
- 3) **Conduit Sizing:** Conduit shall be sized based on the size and number of conductors in the conduit. Reference the tables in the NEC for conduit sizing information. Conduit shall be Schedule 80 PVC unless otherwise approved by County Engineering.
- n) Provide ground rods and ground conductors to provide a sufficient ground grid. The ground grid shall have a maximum resistance to ground of 5 ohms. Ground rods shall be a minimum 3/4" in diameter and 10' in length. Ground wires shall be exothermically welded to the ground rods. Refer to Pump Station Standard Details.
- o) When the electrical equipment is located in a separate building and anytime Variable Frequency Drives (VFDs) are used it is required to provide sufficient heating and cooling for the VFDs. Refer to County Pump Station standard details.
- p) The duplex pump control panel shall have a factory applied white, heat reflective finish if installed outdoors in open air on an open air equipment rack.
- q) The standby emergency generator shall be a Clarke, Caterpillar, Cummins, or approved equal, and shall meet all electrical and technical specifications in Brunswick County Technical Specification TS 032: Emergency Generators for Pump Stations.

5) **Pump Station SCADA / RTU**

- a) All SCADA/RTU panels shall conform to and be compatible with all existing and current Brunswick County SCADA systems as determined by County Engineering and Utilities Departments.
- b) The minimum standard antenna tower shall be forty (40) feet in height, un-guyed, self-supporting, Rohn 65G, or equal, with manufacturer's foundation requirements.
- c) The radio signal strength must be (-) 80 dBA or better for County acceptance.
- d) Refer to the Brunswick County Standard Detail drawings for further information.

6) **Pump Station Site**

- a) Minimum 50' x 50' (2,500 sq. ft.) is required. Larger pump stations will require a larger site. Pump stations will be deeded and conveyed to the County on the Deed of Dedication for developer installed infrastructure with a public utility easement shown including and surrounding the pump station site.

- b) Site shall be serviced by a gravel road with top of road two (2) feet above the 100-year water surface elevation. Road and site drainage shall be included and approved by appropriate agency. The service road shall be a minimum sixteen (16) feet in width and topped with a minimum eight (8) inches of ABC stone.
- c) Area within pump station site:
  - 1) Geo-Fabric fabric underlayment.
  - 2) Eight (8) inches of ABC stone.
  - 3) Stone must extend eighteen (18) outside of pump station fence.
- d) Pump Station fence
  - 1) See Pump Station Standard Details for all fencing and signage details.
  - 2) Brick fences will be reviewed and approved on a case by case basis.
  - 3) Wooden fences shall not be allowed.
- e) Design gate to allow entrance of service trucks without blocking the main roadway.
- f) Design site layout to allow access of service trucks to the pump station wetwell.
- g) Power shall be located underground and shall be located on the rack in such a manner so the electric meter can be easily read from outside the fenced area.
- h) The station shall have a 1” water service with an approved backflow prevention device and a County water meter – see Pump Station Standard Details.
- i) All power lines within the site shall be underground. No overhead power line will be allowed to cross the site.

7) **Pump Station Operational Test**

- a) A pump station drawdown performance test is required to be satisfactorily completed as part of the engineering certification and acceptance procedure for all newly constructed or upgraded sewer pump stations.
- b) The utility contractor, design engineer of record, and sewer pump manufacturer representative is required to attend this drawdown test along with County Engineering and Public Utilities staff. Minimum forty-eight (48) hours’ notice is required to County Engineering to schedule a pump station operational drawdown test.

- c) Contact County Engineering with any questions regarding the pump station operational drawdown test procedure.

**8) Pump Station Spare Parts and Manuals**

- a) The utility contractor shall furnish, on or before final inspection, one (1) complete set of spare parts for the specific pump station design. See Brunswick County Technical Specification TS 023: Waste Water Pump Stations with Submersible Pumps Technical Specification for required spare parts.
- b) Required drawings, manuals, and electrical schematics will be provided per the appropriate County technical specification for the pump station and associated equipment.

**9) Low Pressure Sewer Grinder Pumps**

- a) The use of grinder pumps may be allowed on a case by case basis as approved by County Engineering. Refer to Part (E) of this Design Manual and Brunswick County Technical Specification TS 021: Low Pressure Sewer Systems and Grinder Pumps.

**UTILITIES DESIGN STANDARDS**  
**PART E: LOW PRESSURE SEWER**  
**SYSTEMS AND GRINDER PUMPS**

1) **General Information**

- a) The design engineer should be familiar with all NCDEQ/DWQ rules and minimum design criteria for low pressure sewer systems with grinder pumps.
- b) Several key points from NCAC Title 15A Subchapter 2T Section .0305 are:
- c) Per NCAC Title 15A Subchapter 2T Section .0305 (j) (2) only single-family residences may have a simplex (single) grinder pump. All other buildings connected to a low-pressure sewer system shall at a minimum have duplex pumps and the station must be capable of pumping the peak flow with the largest pump out of service.
- d) Per NCAC Title 15A Subchapter 2T Section .0305 (h) (1) (A) and (B) all non – residential grinder pump stations shall have multiple pumps and a standby emergency power supply.
- e) Per NCAC Title 15A Subchapter 2T Section .0305(h) (1) (A) and (B) all non – residential grinder pump stations shall have controls that will automatically activate the standby power source and signal an alarm condition.
- f) Per NCAC Title 15A Subchapter 2T Section .0305 (j) (1) the design engineer shall submit hydraulic modeling of the proposed system to NCDEQ/DWQ that incorporates the projected number of grinder pumps running at one time.
- g) Other rules may apply to a low-pressure design and it is the design engineer’s responsibility to incorporate all relevant rules and design criteria in the proposed project.
- h) As a general rule simplex grinder pumps are permitted as part of an overall low-pressure system design project and duplex grinder pumps are permitted in the private owner’s name.
- i) There are three (3) existing situations that allow for variations on the design and permitting of grinder pump stations. These are:
  - Per the **Brunswick County Rural Sewer Program** guidelines, the County may allow a residential single-family structure to be connected to a high-pressure force main with a high discharge head simplex grinder pump. There are several restrictions and parameters that must be met before this type of connection is allowed. The pump station may have to be permitted through NCDEQ. Contact Brunswick County Engineering Department for additional information on this program and type of connection,

- A community guardhouse with a simplex pump station (360 GPD maximum) versus a duplex station permitted as part of a residential low-pressure permit,
  - An Amenity Center Duplex pump station (1,680 GPD maximum) that is permitted as part of a residential low-pressure permit.
- j) The design engineer may request a variance to one or more of these NCDEQ rules with the concurrence of Brunswick County.
- k) New development (multi-family, commercial, industrial, etc.) and any subdivision of land seeking to connect to an existing low pressure system will be required to extend the low pressure mains with a sewer extension permit that has been permitted as part of the North Carolina Department of Environmental Quality's Alternative Sewer Extension Permitting process with the exception of:
- New development (multi-family, commercial, industrial, etc.) on a single parcel consisting of one habitable structure and any accessory structures as defined in Session Law 2020-61. In this case a single low pressure service to the existing low pressure main may be used for connection. The existing low pressure system must have been designed for the wastewater flows from the new development.
  - Subdivision activity resulting from Court action. Only those resulting parcels having frontage on the existing low pressure system may connect. The parcel Owner is responsible for service installation unless otherwise approved by the Public Utilities Director.
  - Subdivision activity for the purpose of transfer to a family member provided that no more than ten lots are created and meeting the requirement of the Unified Development Ordinance. Only those resulting parcels having frontage on the existing low pressure system may connect. The parcel Owner is responsible for service installation unless otherwise approved by the Public Utilities Director.

## 2) **Permitted by Regulation**

- a) Per 15A NCAC 02T Section .0303 (3) (A) (B) (C) (D) and (E), a new pump station or sewage ejector and force main are deemed "permitted by regulation" if all of the following criteria are met:
- (A) the pump station serves a single building,
  - (B) the force main does not traverse other property or parallel a street ROW,
  - (C) the force main ties into a non-pressurized pipe/manhole/wetwell (i.e., is not part of an alternative sewer system),
  - (D) the system is approved by the local building inspector as being in complete compliance with the North Carolina Plumbing Code to the point of connection to the existing sewer, and,

- (E) no other connections are made to the sewer without prior approval from NCDEQ/DWQ
- b) The design engineer should contact Brunswick County Engineering to discuss this type of sewer connection if a project can possibly be served in this manner.

### 3) **Design Parameters**

- a) The low-pressure sewer system design shall take into account the maximum build out of the proposed service area. Adequate growth factors shall be consistent with the latest Brunswick County Sewer Master Plan. A meeting with Brunswick County Public Utilities staff may be necessary in order to ensure conformance with the Sewer Master Plan.
- b) Low pressure sewer systems shall be the grinder pump type.
- c) Septic Tank Effluent Pump (STEP) systems are only allowed with the approval of the Brunswick County Director of Public Utilities.
- d) Design flows shall be in accordance with NCDEQ/DWQ design flow rates and peaking factors.
- e) The peak design velocity in the force mains shall be between two (2) and five (5) feet per second in all piping. The minimum allowable peak design velocity shall be two (2) feet per second.
- f) Simplex grinder pump stations shall have a minimum storage volume of twenty-four (24) hours of storage based on the permitted daily flow for the unit being served.
- g) The minimum velocity in the low-pressure sewer system force main shall not be less than two (2) feet per second.
- h) Pumps shall not be rated for greater than one hundred–sixty (160) psi operating pressure.
- i) In line cleanouts and shutoff valves shall be provided on low pressure sewer mains. Spacing of cleanouts and shutoff valves shall not be less than (1) per six hundred (600) feet of main line in high density areas and not less than (1) per one thousand (1,000) feet of main line in low density areas.
- j) Air and vacuum release valves are required per NCDEQ/DWQ requirements and Brunswick County Technical Specification TS 022: Waste Water Force Mains.
- k) The contractor shall provide all operation and maintenance manuals as applicable for the systems being installed to Brunswick County Public Utilities.

- l) At the discretion of Brunswick County Public Utilities, the grinder pump station shall be located no further than 300 linear feet from the sewer service box located in the R/W or easement, as measured along the pipe. Sewer service may be deemed unavailable if the piping distance from the nearest point for locating a low-pressure grinder pump station to the low pressure sewer collection system main is in excess of the limiting lengths contained herein.
- m) Pipe alignment from the grinder tank to the service box shall be designed to follow the most direct path possible.
- n) No more than one (1) residence and/or accessory structure, under the same ownership, can contribute flow to a single grinder tank.
- o) The building footprint or building potential envelope area shall be shown on wastewater plans when low pressure sewer systems are proposed.
- p) All grinder pump tanks and low pressure sewer service piping shall be shown to scale on site drawings. An Installation and Maintenance Access envelope, no less than fifteen (15) feet in diameter centered on the grinder tank lid, shall be provided and shown on all Engineered plans. Refer to Brunswick County Sewer Detail S-13.

Insufficient clearance may result in the grinder pump station not being installed until adequate clearance is provided. Brunswick County may modify installation, if necessary, to maintain the fifteen (15) foot envelope for installation and maintenance.

- q) Grinder tanks installed within six (6) feet of a building foundation, due to insufficient available clearance, may require the builder - at the builders own cost, to have a design professional certify that the foundation has not been compromised prior to receiving further building permits.
- r) The ten (10) foot utility easement, as required by the Unified Development Ordinance (UDO) Section 6.17.6.C, shall be shown to scale on site drawings.

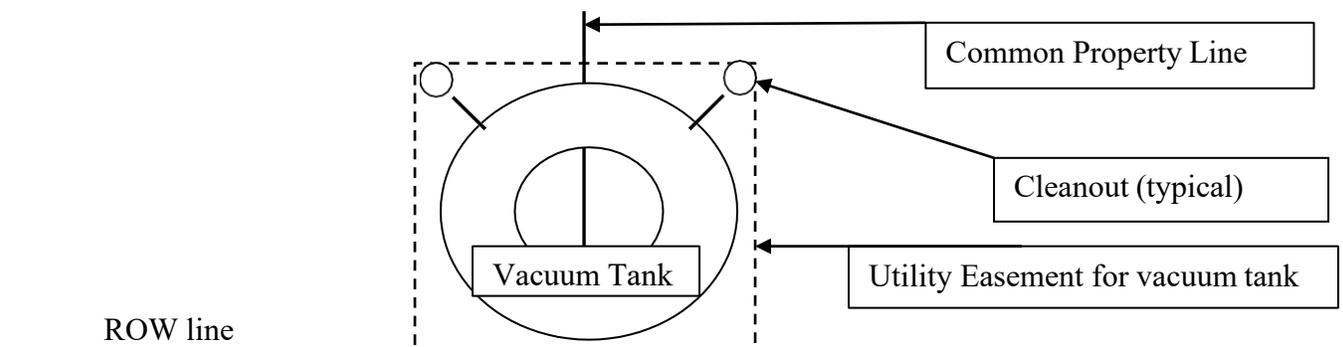
#### 4) **System Installation Information**

- a) Refer to Brunswick County Technical Specification TS 021: Low Pressure Sewer Systems and Grinder Pumps.

## UTILITIES DESIGN STANDARDS

### PART F: VACUUM SEWER SYSTEMS

- 1) General Information from North Carolina Administrative Code Subchapter 2T
  - a) Per NCAC 15A 02T .0302 (a) (1) vacuum sewer systems are classified as alternative sewer systems.
  - b) Per NCAC 15A 02T .0302 (a) (12) a vacuum sewer system is defined as a mechanized system of wastewater collection utilizing differential air pressure to move the wastewater. Centralized stations provide the vacuum with valve pits providing the collection point from the source and also the inlet air required to move the wastewater. In conjunction with the vacuum pumps, a standard (non-vacuum) pump station and force main is used to transport the wastewater from the vacuum tanks to a gravity sewer or ultimate point of treatment and disposal.
  - c) Per NCAC 15A 027 .0304 (g) vacuum sewer systems shall be submitted for a full technical review by NCDEQ using the official application form for those systems.
  - d) The design engineer shall follow all NCDEQ/DWQ rules and minimum design criteria for vacuum sewer systems.
  
- 2) Basic System Design Guidelines
  - a) The vacuum sewer system design shall take into account the maximum build out of the proposed service area. Adequate growth factors shall be consistent with the latest Brunswick County Sewer Master Plan. A meeting with Brunswick County Public Utilities staff may be necessary in order to ensure conformance with the Sewer Master Plan.
  - b) The contractor shall provide to Brunswick County all operations and maintenance manuals as applicable for the systems being installed.
  - c) One valve pit will be installed to serve two single family houses. The pit will be installed on private property, within a designated utility easement, at the common property line between the two houses. A service line and cleanout will be installed at the property line or easement line for each house from the valve pit. A basic installation diagram shall be as follows:



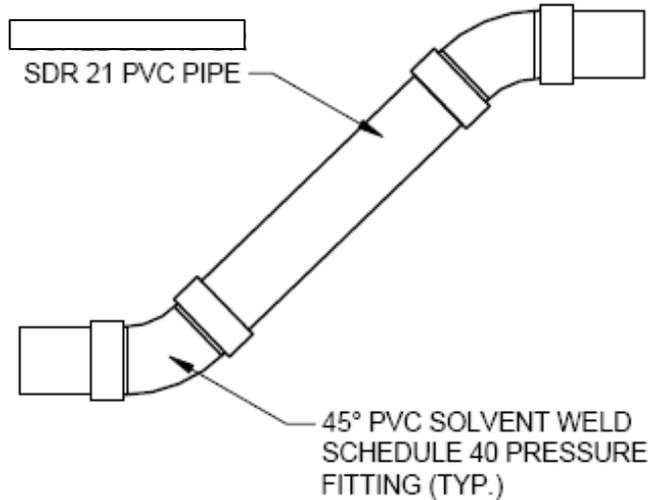
- d) The standard valve pit has a maximum service capacity equivalent to twelve (12) bedrooms. A single-family house cannot use more than one-half (1/2) of the pit capacity.
- e) If a single-family house needs more than one-half (1/2) the valve pit capacity, based upon the number of bedrooms in the house, that house will require its own valve pit.
- f) Large volume users such as schools, apartments, nursing homes, and single-family houses with more than twelve (12) bedrooms require a buffer tank instead of the standard valve pit. Buffer tanks are designed with a small operating sump in the lower portion, with additional emergency storage available in the tank.
- g) Developer installed vacuum sewer systems – the developer will install the valve pit and provide the vacuum interface valve to the county for future installation.
- h) For multi-family installations no more than twelve (12) bedrooms to a single valve pit with a maximum of four (4) units to a single valve pit.
- i) Long runs of vacuum main without valve pits are not recommended. The lack of valve pits, which act as energy inputs to the system to move the waste, could have a detrimental effect on system hydraulics.
- j) The engineer shall design the system per AIRVAC design guidelines and provide a statement from AIRVAC that the proposed system layout has been reviewed and approved by AIRVAC.
- k) Valves shall be installed at all vacuum main intersections with sewer valve markers per county standard detail.
- l) Separation requirements for water and sewer mains:
  - a) Horizontal and Vertical Separation
    - 1) Minimum horizontal separation between water mains and sanitary sewer shall be ten (10) feet. The distance shall be measured edge of pipe to edge of pipe.
    - 2) Should ten (10) foot separation not be feasible, then the water main may be located closer to the sewer main provided that:
      - a) It is laid in a separate trench,
      - b) It is laid in the same trench with the water main located at one side on a bench of undistributed earth,
      - c) In either of the above cases, crown elevation of the sewer shall be at least eighteen (18) inches below invert elevation of the water line.

- 3) Sewers crossing water mains shall be laid to provide a minimum vertical separation of eighteen (18) inches between the invert of the water main and the crown elevation of the sewer main. The crossing shall be arranged perpendicularly so that the sewer main joints will be equidistant and at least ten (10) feet from the crossing in each direction.
- 4) If it is impossible to maintain the required horizontal and vertical separation as described above or anytime sewer must be laid above a water main then both the water main and sewer main must be constructed of pressure class 350 ductile iron pipe with watertight joints and pressure tested to (150) psi to assure water tightness before backfilling. At the discretion of Brunswick County, a ferrous sleeve may be installed around existing water mains and force mains to meet this requirement provided NCDEQ approval for the ferrous sleeve is first obtained by the Engineer.
- 5) Mechanical joints will be required for the transition in the sewer main at water main/sewer main crossings. Fernco couplings are not permitted to be used. Special structural support for the water and sewer mains may be required.

3) Basic System Construction Guidelines

- a) Typical vacuum piping network sizes are 4, 6, 8, and 10-inch pipes which connect the individual valve pits to the collection tank at the vacuum station.
- b) Vacuum system piping shall be a PVC thermoplastic SDR-21 pipe conforming to ASTM D-2241 and shall be green in color for sewer.
- c) Tee fittings and (90) degree bends shall not be used for vacuum sewers. Bends are restricted to (45) degree ells only. Service laterals from the main shall utilize a wye fitting and never a tee fitting.
- d) Solvent weld fittings shall be PVC schedule 40 per ASTM D-2466 from a PVC compound having a cell classification of 12454 conforming to ASTM D-1784.
- e) Gasketed joint fittings shall be IPS diameter fabricated from SDR-21 PVC pipe per ASTM D-2241 and shall be the “Rieber Style”, or approved equal, per ASTM D-3139.
- f) The engineer shall verify that all fittings and mains are suitable for use in a vacuum sewer system.
- g) Vacuum system mains shall be designed and constructed in a sawtooth profile per AIRVAC specifications and as shown:

Table 4-13 Recommended Lift Height	
Pipe Diameter (in)	Lift Height (ft)
3	1.0
4	1.0
6	1.5
8	1.5
10	1.5

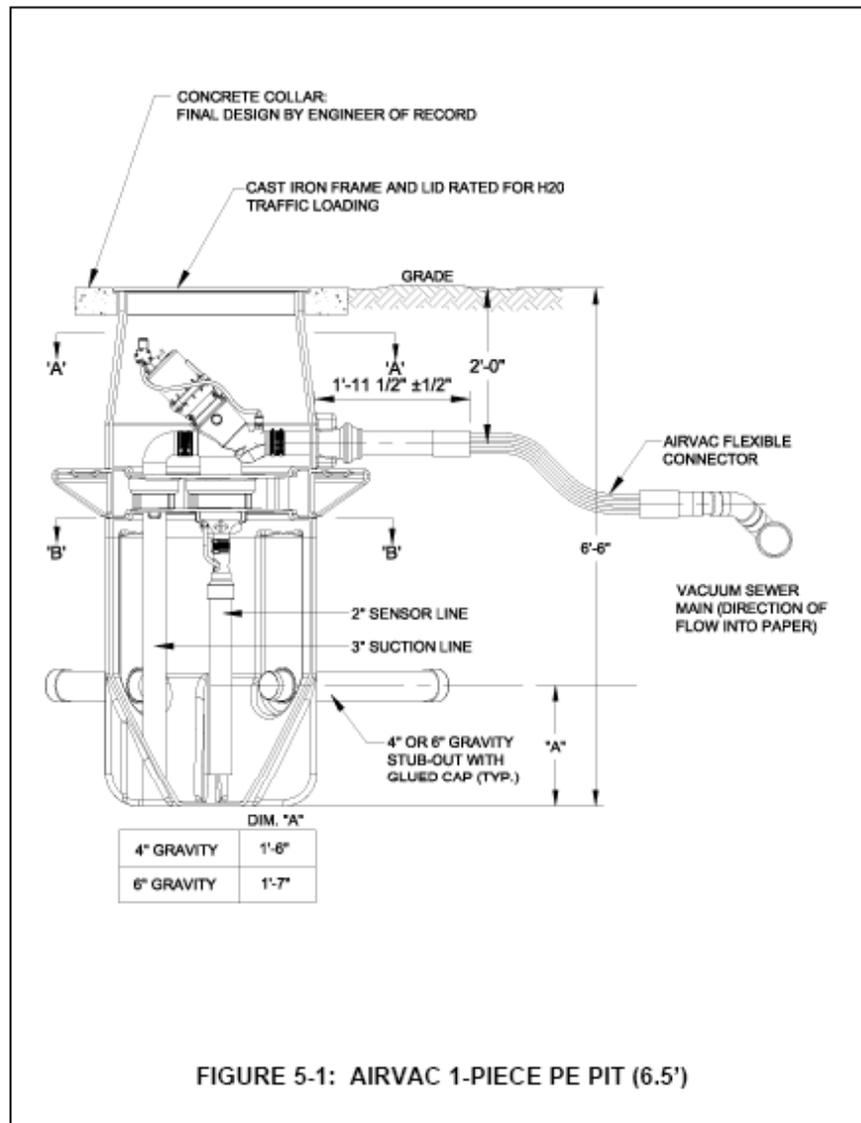


- h) Cleanouts and inspection ports shall not be installed on vacuum sewers.
- i) Horizontal directional drills (HDDs) shall not be installed on vacuum sewers.
- j) Daily system testing- at the end of each day all vacuum sewer mains and vacuum service laterals laid that day shall undergo a two (2) hour vacuum test. This shall be accomplished by creating a vacuum of 22” HG applied to the pipes with a maximum loss of vacuum of 1% per hour over the two-hour testing time frame.
- k) Final system testing – at the end of the construction period, and prior to system certification, and prior to the installation of any AIRVAC vacuum valve, the complete vacuum sewer system is to be vacuum tested to 22” Hg for four (4) hours, with a maximum permissible loss of 1% per hour over the four hour test.
- l) Maximum line lengths shall be:

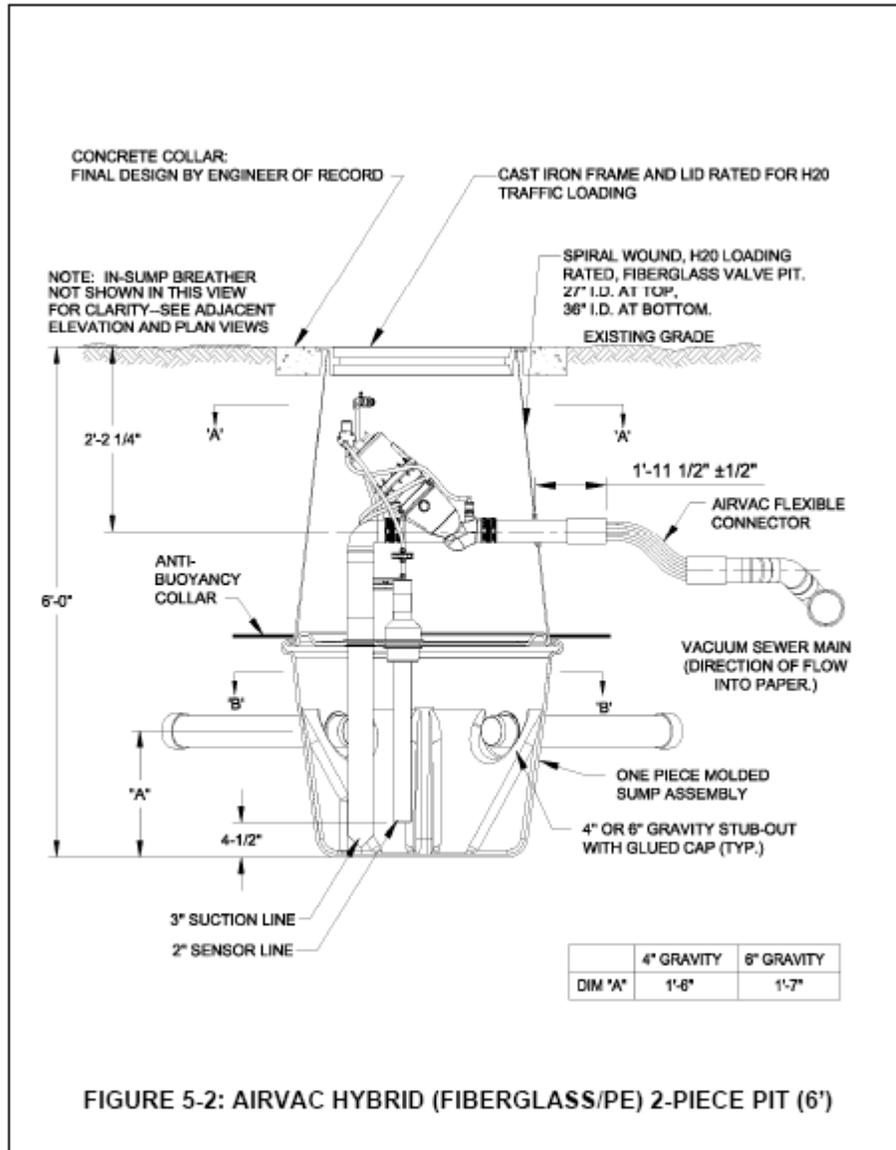
<u>Maximum Line Length for Various Pipe Sizes</u>		
<u>Pipe Diameter</u>	<u>Where Used</u>	<u>Maximum Recommended Length</u>
3 inch	Service Lateral	300 feet
4 inch	Branch line /End of main line	2,000 feet
6, 8, & 10 inch	Main lines	Limited by static & friction losses

## m) Service Connections and Valve Pits:

- 1) For all valve pit types the maximum combined peak flow to these valve pits is limited to three (3) GPM. For larger water users with peak flows in excess of three (3) GPM a buffer tank must be used.
- 2) Valve pits can physically accept up to four incoming plumbing lines, subject to the three (3) GPM maximum flows.
- 3) If a six-inch Air Terminal (AT) is used at the valve pit then one of the four sump openings must be reserved for the AT connection, reducing the maximum possible number of house connections to three. The manifolding of a building sewer to the AT outside of the valve pit is not recommended.
- 4) Valve pits and buffer tanks shall be as manufactured by AIRVAC.



Valve Pits



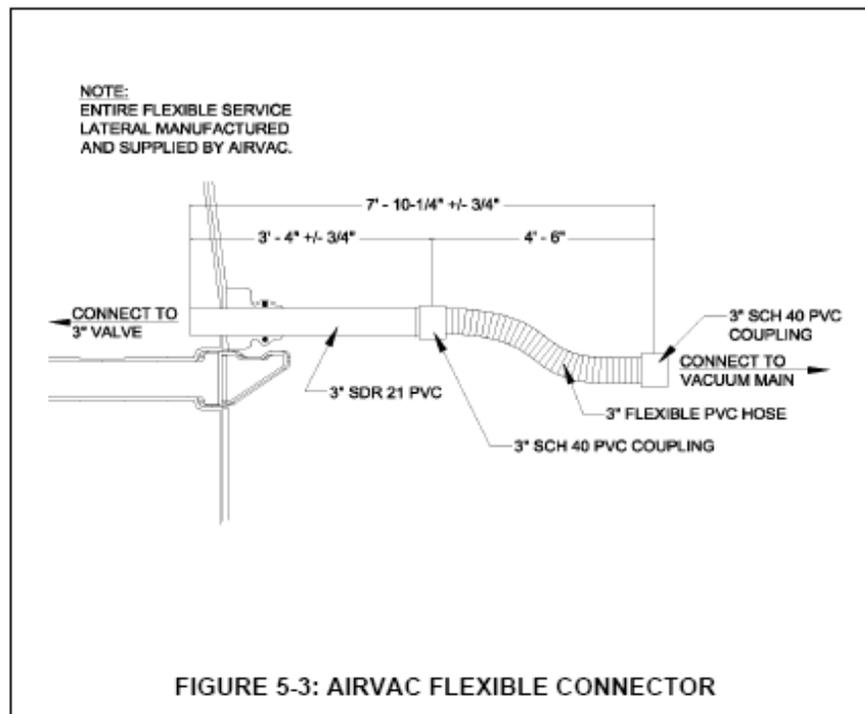
Valve Pits

- n) Flexible connection between the valve pit and the vacuum sewer main—it is important to provide a flexible connection between the valve pits and vacuum mains as shown in order to account for different elevations between the valve pit and main, and also to reduce the number of fittings and/or stress on the tank, service laterals, and mains. All flexible connectors shall be as manufactured by AIRVAC.

## o) AIRVAC flexible connectors:

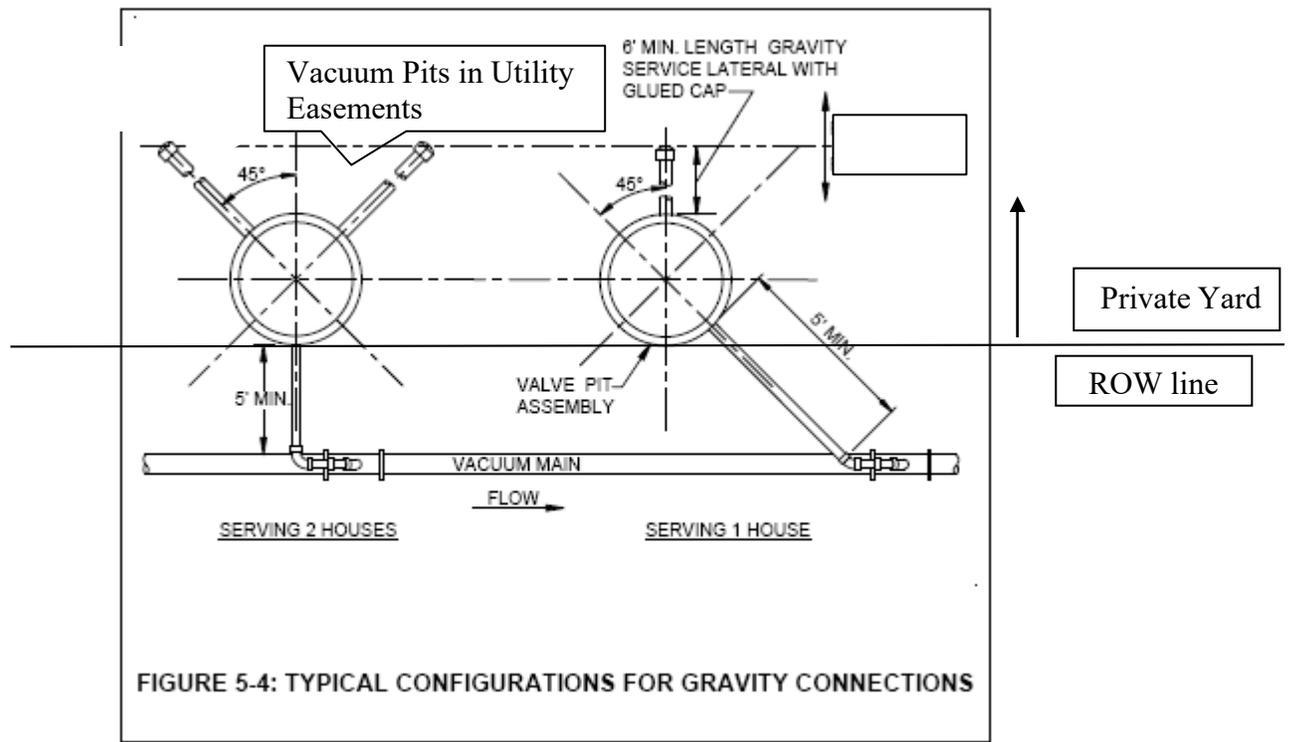
AIRVAC Flexible Connector

The contractor must be careful when making the connection between the valve pit and the vacuum main or branch line. The difficulty arises when the contractor must connect two fixed points at different locations/elevations with rigid, solvent-welded pipe. Many times this requires multiple fittings, some of which may be deflected beyond an acceptable range. In certain cases, this can result in either a vacuum leak, or worse, a line break caused by overstressing of the joint.



The AIRVAC Flexible Connector, which uses 3" flexible PVC hose, eliminates this problem. Connections at both ends of the flexible connector are the same as with PVC pipe. The use of an AIRVAC flexible connector virtually eliminates stress-related leaks caused by poor workmanship or ground settlement.

- p) Gravity plumbing line connections to AIRVAC valve pits:



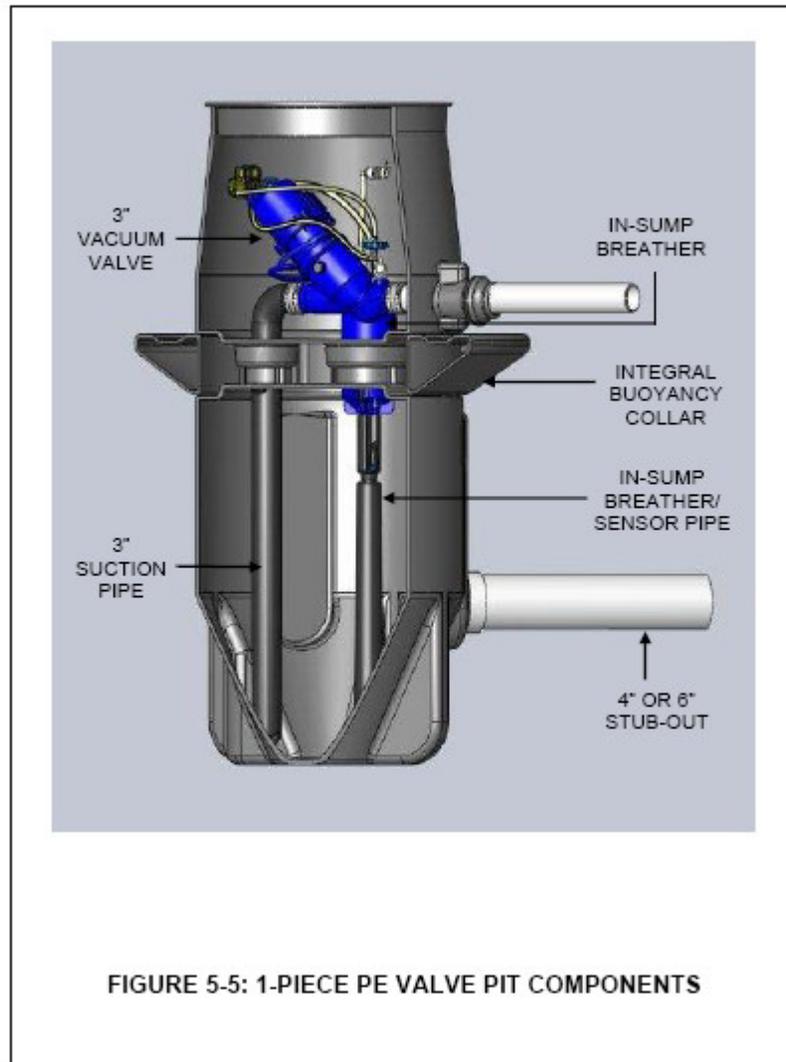
Valve Pits

- q) Valve pit covers – all AIRVAC valve pits utilize cast iron covers and frames that are designed for H-20 traffic loading. Contact AIRVAC for a list of those vendors that supply traffic rated frames and covers that match the dimensions of AIRVAC valve pits.

r) AIRVAC valve pit components:

VALVE PIT COMPONENTS: PE 1-PIECE PITS

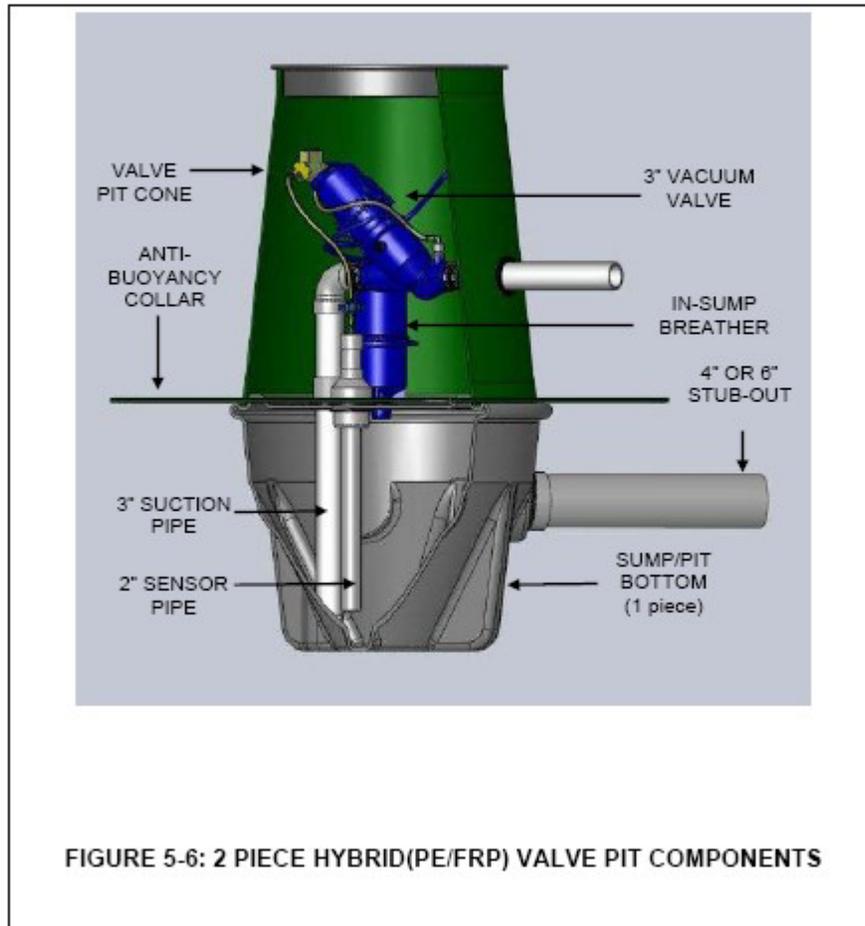
Figure 5-5 shows the 6.5' deep AIRVAC 1-piece PE valve pit assembly.



Valve Pits

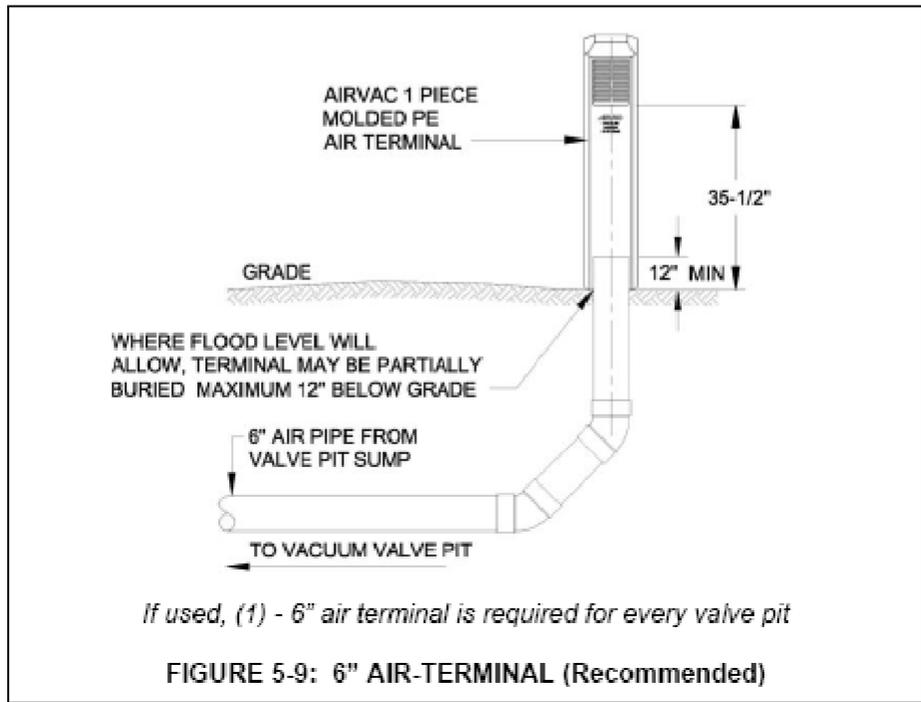
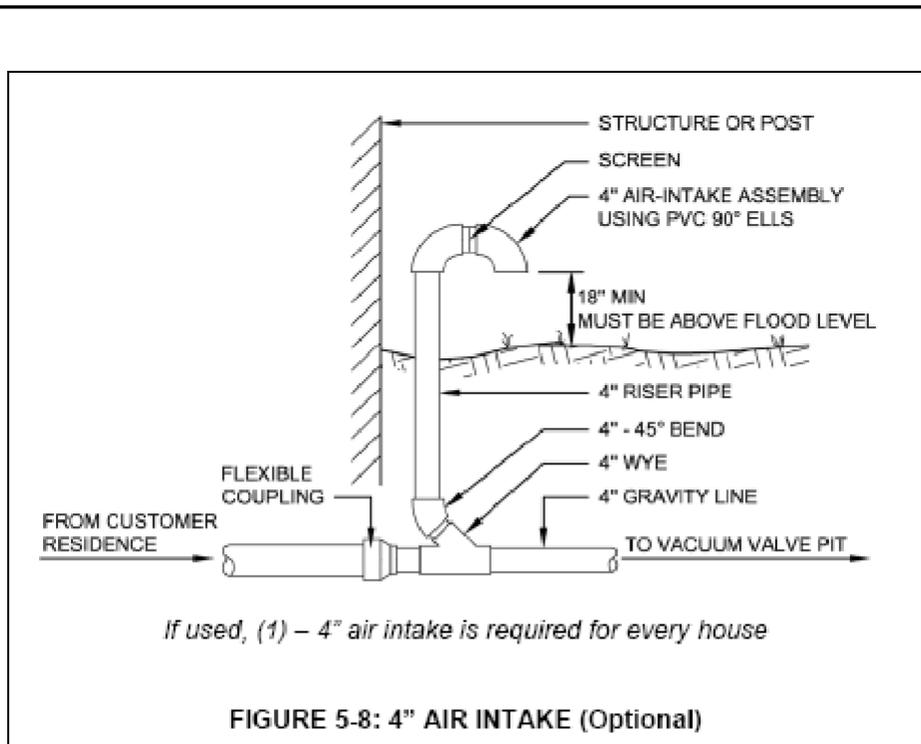
**VALVE PIT COMPONENTS: PE/FRP HYBRID 2-PIECE PITS**

Figure 5-6 shows the 6 ft deep AIRVAC PE/fiberglass (FRP) hybrid 2-piece valve pit assembly. The 2 major pieces are the valve pit cone, and the combined sump/pit bottom.



Valve Pits

- s) Atmospheric air must be introduced into the valve pit by the use of either a 6-inch Air Terminal (AT), which is recommended, or a 4-inch air intake, which is the optional method. These are as follows:



**6" Air-Terminal (AT) - recommended**

As an alternative to requiring each house to have a 4" air-intake on their building sewer, AIRVAC recommends that the AIRVAC molded 6" Air Terminal (AT) be used at each valve pit instead. The Air Terminal was designed to look like other utility boxes/structures typically seen in rights-of-way. Testing indicates that using the 6" AT results in a much more effective method of air induction than using the combined air/sewage method associated with the 4" air intakes.



**4" air intake**

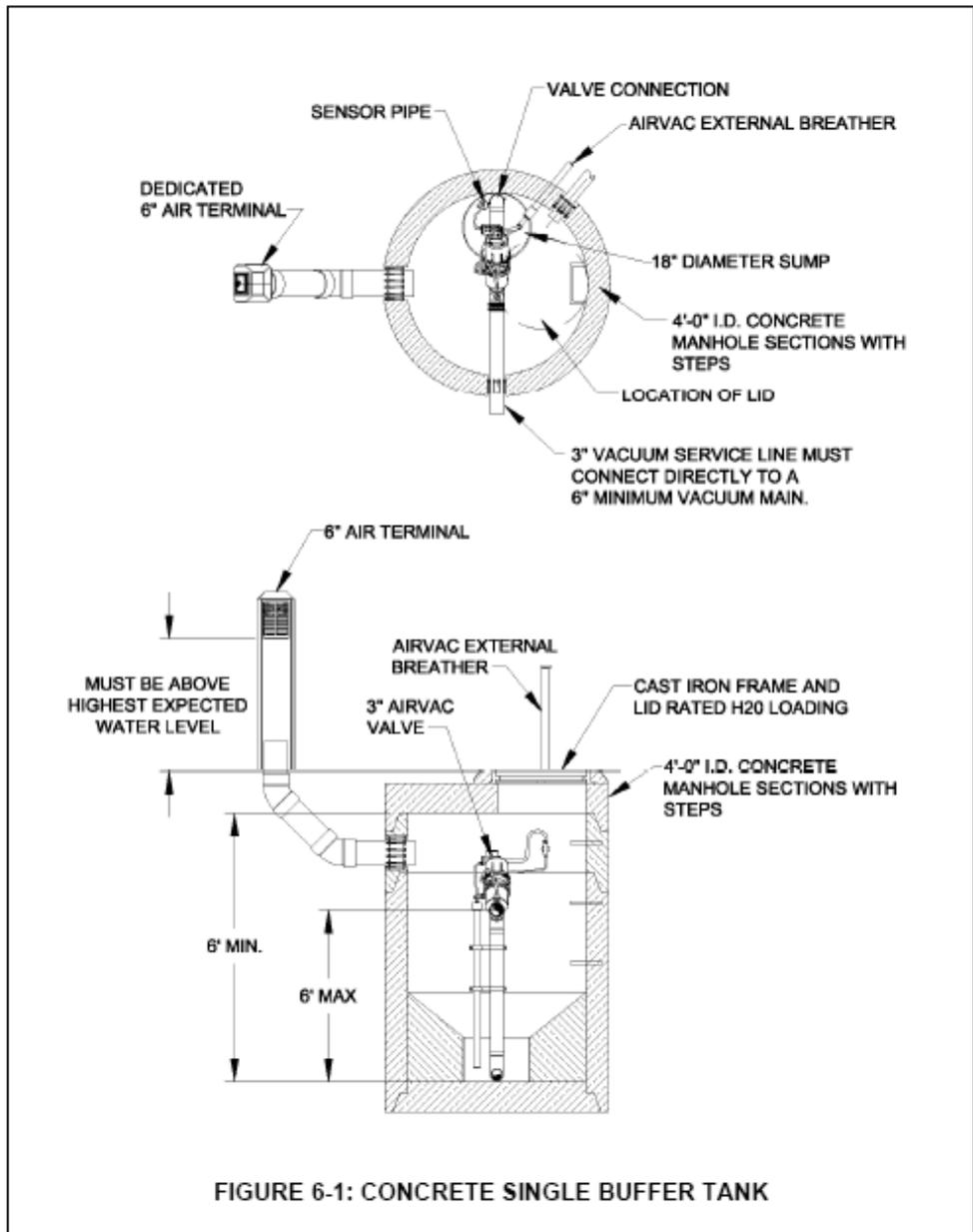


**6" Air Terminal**

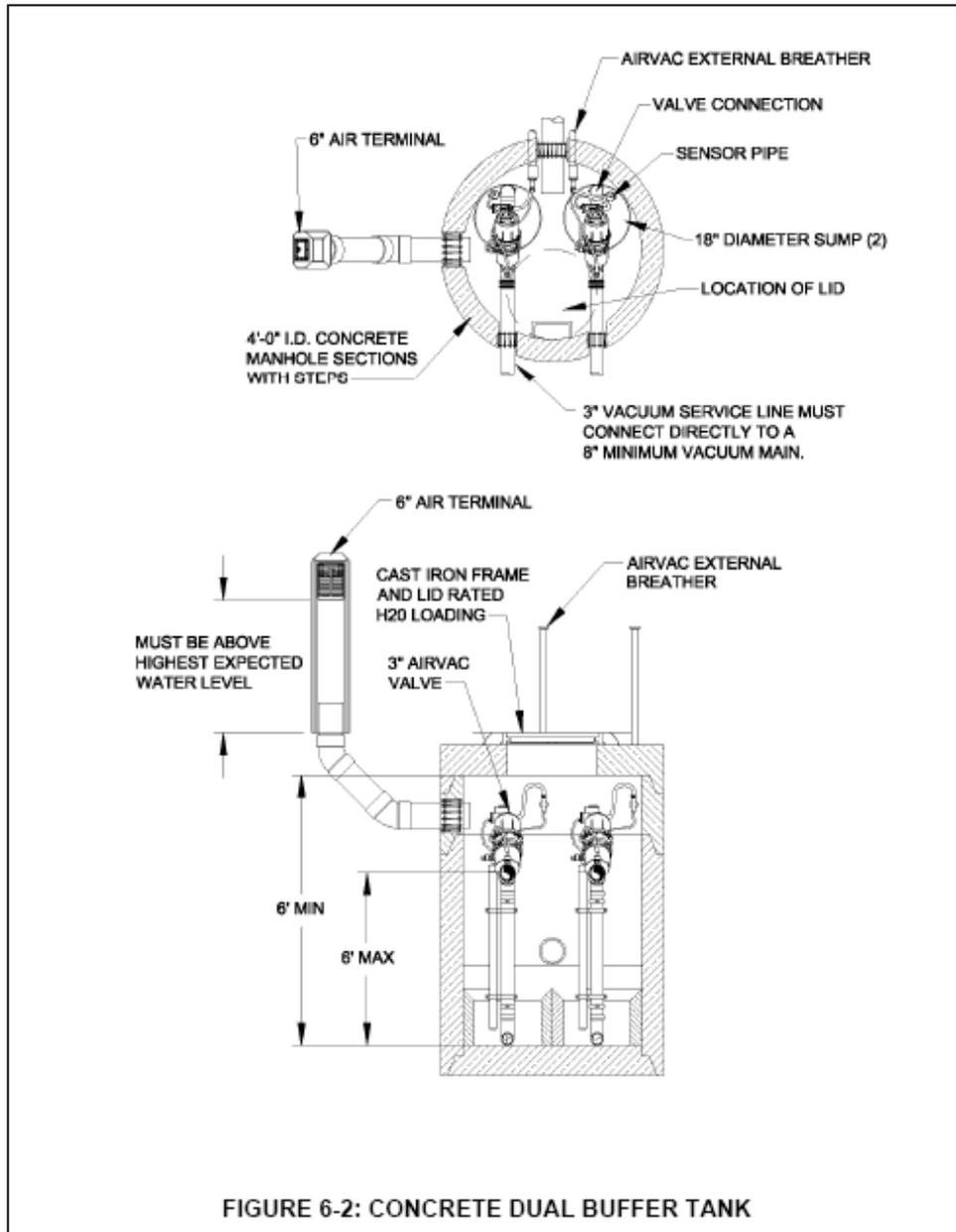
The AIRVAC Air Terminal is available with or without an access door and is available in 3 colors: sandstone, utility green, & gray granite. AIRVAC recommends the sandstone color (shown above).

t) **Buffer Tanks:**

Buffer tanks are typically used for schools, apartments, nursing homes, etc and the tank will be required to have additional emergency sewage storage provided above the sump area. Buffer tanks should not be used where individual valve pits could otherwise be utilized.



Buffer Tanks



Buffer Tanks

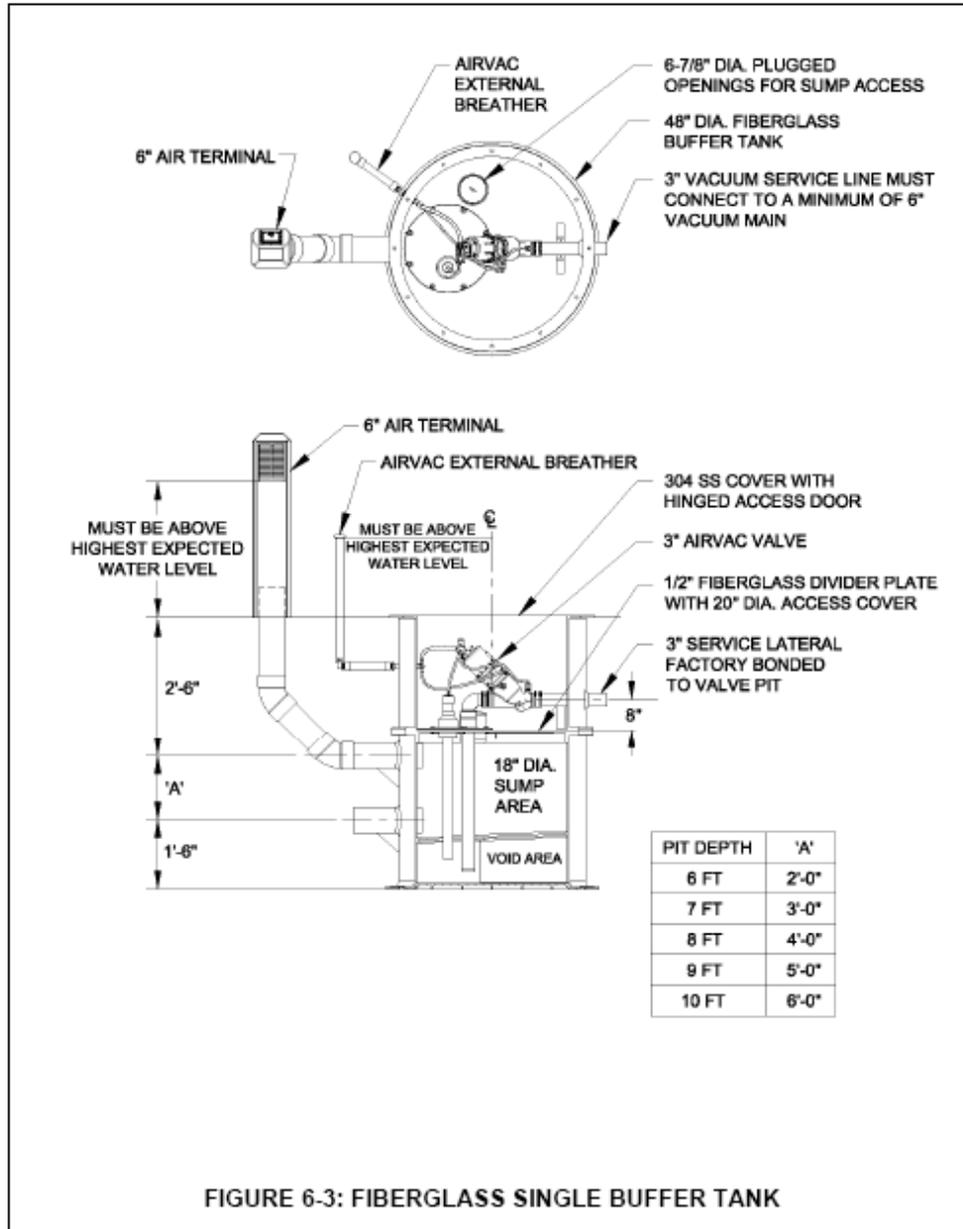


FIGURE 6-3: FIBERGLASS SINGLE BUFFER TANK

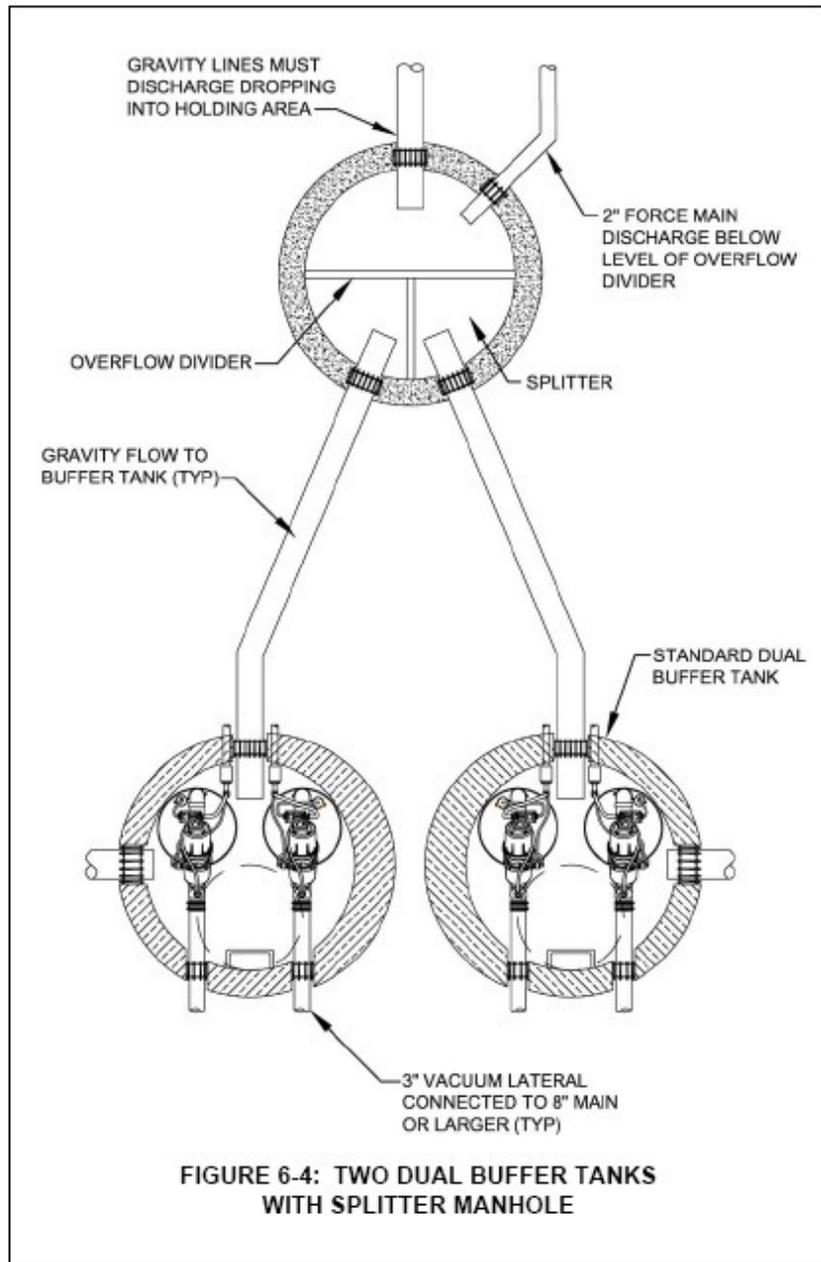
Buffer Tanks

Table 6-4 shows the recommended design capacities as well as the maximum allowable design flow rates to use for buffer tanks.

<b>TABLE 6-4</b>		
Recommended Design Flow Rates For Buffer Tanks		
Buffer Tank Type	Recommended Design Peak Flow (gpm) (as a general rule)	Absolute Maximum Peak Flow (gpm) (case by case) *
Single Buffer tank	3.1 - 15.0 gpm	30 gpm
Dual Buffer tank	15.1 - 30.0 gpm	60 gpm
Consult AIRVAC	> 30.0 gpm	> 60 gpm

\* Depending on static and friction loss, the overall amount of peak flow entering the system through buffer tanks and the exact location of the buffer tank, it may be possible to size a particular buffer tank with the upper limits shown in this column. Consult AIRVAC's Engineering Department for guidance and approval.

- u) The use of a splitter manhole in conjunction with dual buffer tanks, is recommended for high flow situations and/or to also accommodate the connection of a force main discharge to a vacuum sewer system as shown:



Buffer Tanks

## v) Limitations on buffer tank usage:

**LIMITATIONS ON USE**Maximum flow contributed by buffer tanks

To minimize the possibility of system water-logging, AIRVAC recommends the use of buffer tanks be limited as follows:

- **25% rule:** No more than 25% of the total peak flow of the entire system should enter through buffer tanks.
- **50% rule:** No more than 50% of the total peak flow of a single vacuum main (i.e. – single flow path) should enter through buffer tanks.
- **On a case by case basis:** Depending on static and friction loss and the exact location of the buffer tank, it may be possible to exceed the 25% and 50% limits shown above. Consult AIRVAC's Engineering Department for guidance and approval.

Maximum flow at a single location

The positioning of a buffer tank(s) within the collection system has an impact on system hydraulics. In general, the greater the distance from the vacuum station the buffer tank is positioned and the higher the static loss that must be overcome, the larger the negative effect becomes on the overall transport capabilities of the system.

There are no hard and fast rules regarding this issue, however please consult AIRVAC's Engineering Department for guidance on the placement of buffer tanks.

Buffer tanks fed by a pump

When a lift station or grinder pump discharges to a buffer tank, the conventional peak flow figures for the customers served by the pump should not be used. Rather, **the rated discharge capacity of the pump should be used** to size the buffer tank. Consult AIRVAC for guidance on input values for friction loss.

## **UTILITIES DESIGN STANDARDS**

### **PART G: SAND, OIL AND GREASE INTERCEPTORS**

#### **1) General Information**

- a) Grease, oil, and sand interceptors or traps shall be provided when, in the opinion of Brunswick County, they are necessary for the proper handling of wastewater containing excessive amounts of sand, oil, grease or other harmful ingredients. All interceptors or traps shall be of a type and capacity approved by the County and shall be properly located to facilitate ease of inspection, cleaning, and maintenance. All interceptors shall be installed by the Owner and continuously maintained in satisfactory and effective condition at the Owner's expense.
- b) There shall be no discharge to the County's sewer collection system of any wastewater containing fats, wax, grease or oils (of animal or vegetable origin - whether emulsified or not), in excess of one-hundred (100) mg/liter or containing substances which may solidify or become viscous at temperatures between 32 degrees F and 150 degrees F.
- c) It is the intent of this *Sand, Oil, and Grease Interceptor* design guideline to provide standards for the interceptor design, location, installation, operation, and maintenance in order to comply with all County requirements. It should be noted that failure to comply with this Standard shall be considered violations of the applicable sections of the existing Brunswick County Public Utilities Department's *Sewer Use Ordinance* (SUO), which can be found on their website and consequently, subject to applicable penalties and/or discontinuance of water and/or sewer service to the Owner.
- d) Grease and oil traps or other interceptors shall be provided at the user's expense when such user operates an establishment preparing, processing, or serving food and/or food products.
- e) Grease interceptors may also be required in other industrial or commercial establishments when they are necessary for the proper handling of liquid wastes containing oil and/or grease in amounts in excess of one-hundred (100) mg/ liter, or for any flammable wastes.
- f) Sand, Oil, and Grease Interceptors shall not be required for residential users.

#### **2) Definitions**

- a) Food Service Establishment

Any commercial facility discharging kitchen or food preparation wastewaters including restaurants, motels, hotels, cafeterias, hospitals, schools, bars, etc. and any other facility which, in the County's opinion, would require a grease trap installation by virtue of its operation. Such definition normally includes any establishment which is required to have a North Carolina State food service license.

b) Grease Trap/Grease Interceptor

The device which is utilized to affect the separation of grease and oils in wastewater effluents from food service establishments. Such traps or interceptors may be of the "outdoor" or "underground" type normally referred to as large grease interceptors, or the "under-the-counter" package units normally referred to as the smaller grease traps. However, for the purposes of this Guideline, the words "trap" and "interceptor" are generally used interchangeably.

c) Sewer Use Ordinance (SUO)

Brunswick County Public Utilities Department ordinance which covers wastewater treatment and pretreatment as a condition of discharge to the County owned sewer collection and treatment system.

3) **General Requirements**

a) The following administrative, operational, and other general requirements are applicable to all food service establishments, new or existing:

- 1) All food service establishments in Brunswick County's sewer service area shall have grease handling facilities approved by Brunswick County. Establishments whose grease handling facilities are not in accordance with this Standard shall be given a compliance schedule with a deadline not to exceed three (3) months from initial notification date.
- 2) All food service establishment grease handling facilities and operations shall be subject to periodic review, evaluation, and inspection by Brunswick County at any time. Results of inspections will be made available to facility owners, with overall ratings assigned and recommendations for correction and improvement (if necessary) delineated.
- 3) Any facility receiving three (3) consecutive unsatisfactory evaluations shall be subject to penalties and restrictions as provided for Brunswick County for non-compliance.
- 4) Violations of these Grease Trap and Grease Interceptor Guidelines and/or the Sewer Use Ordinance will be considered grounds for discontinuance of water and/or sewer service.
- 5) Food service establishments whose operations cause or allow excessive grease to discharge or accumulate in the sewer collection system are liable to Brunswick County for all costs related to Brunswick County, such as service calls for line blockages, line cleanings, line and pump repairs, property damages, etc. including all labor, materials, equipment, and overhead. Failure to pay all service related charges may also be grounds for water and/or sewer servicediscontinuance.

- 6) Maintenance contracts and/or records of grease removal frequencies for grease handling facilities may be required at the discretion of the Brunswick County Public Utilities Department. These reports are to be submitted periodically to ensure routine and adequate system maintenance.
- 7) In the maintaining of the grease interceptors, the Owner(s) shall be responsible for the proper removal and disposal by appropriate means of the captured material and shall maintain on site records of the dates and means of disposal which are subject to review by Brunswick County. Any removal and hauling of the collected materials not performed by Owner(s) personnel must be performed by currently licensed waste disposal firms. Materials removed from Sand, Oil, and Grease Interceptors **is not** to be discharged to the County's sewer collection system.
- 8) Any food service establishment whose effluent is suspected or perceived by Brunswick County Public Utilities Department to contain a concentration of greater than 100 mg/liter of oil and grease may be required to routinely sample their grease trap effluent and have it analyzed for oil and grease at the expense of the Owner and furnish a copy of the analysis to the County.
- 9) All grease traps and interceptors shall be designed, installed and located in accordance with this requirement to allow for complete access to inspection, maintenance, and other required activities.
- 10) All grease traps and interceptors must be installed by properly licensed plumbing contractors and/or licensed utility contractors.

#### 4) **Construction Standards**

- a) New Food Service Facilities (new construction)
  - 1) All newly constructed (or newly located) food service establishments shall be required to install a grease interceptor approved by Brunswick County. Grease interceptors shall be sized at 20 gallons per food service seat with no interceptor less than 1,000 gallons total capacity.
  - 2) New facilities are required to submit plans, specifications, plumbing diagrams, riser diagrams, etc. to Brunswick County for review and approval prior to installation. An approval letter for each new installation will be issued by the County prior to installation.
  - 3) The construction and location criteria for grease interceptors shall be in accordance with the Environmental Protection Agency (EPA) Guidance Document, "*On Site Wastewater Treatment and Disposal Systems*," Chapter 8. Refer to County standard details for grease interceptors.

- 4) All grease interceptors must be directly accessible from the surface and must be fitted with an extended outlet sanitary tee that terminates 6" above the tank floor. The minimum access opening dimensions shall be 24" x 24" or a minimum of twenty-four (24) inches in diameter. Two (2) access openings (inlet and outlet) to underground traps are required and should have a 24" cast iron frame and cover easily removable by one person.
  - 5) All below ground grease interceptors must be two-chambered. The dividing wall must be equipped with an extended elbow or sanitary tee terminating 12" above the tank floor. An extended outlet sanitary tee must also be provided at the outlet of the second chamber. Both chambers must be directly accessible from the surface. See grease interceptor Standard Details for reference.
  - 6) Above criteria (1 thru 5) apply primarily to outdoor type (underground) grease trap units.
  - 7) Maintenance of grease traps and interceptors must include thorough pump-out and/or cleaning as needed with a minimum frequency of four (4) times per year. Maintenance contracts may be required to be submitted to Brunswick County as called for in this standard. The Owner, however, is ultimately responsible for the proper maintenance of the grease trap facilities.
  - 8) No new food service facility will be allowed to initiate operations until grease handling facilities are installed and approved by Brunswick County.
  - 9) For cases in which underground type grease interceptors are not feasible to install, new food service establishments will be required to install adequate and approved "under-the-counter" grease traps for use on individual fixtures, including pot sinks, mop sinks, pre-rinse sinks, wok ovens, floor drains, and other potential grease containing drains. In such cases, units will be considered acceptable only if approved flow control fittings are provided to the grease interceptor inlet to prevent overloading of the grease trap and to allow for proper interceptor operation.
  - 10) Approved manufacturers shall include Zurn, Rockford, Thermaco, or equal as approved by Brunswick County. Brunswick County approval of flow control devices and grease trap design must be given prior to installation. Dishwashers and garbage grinders shall not be piped directly to under-the-counter or underground type grease traps without prior Brunswick County approval.
- b) Existing Food Service Facilities
- 1) All existing food service establishments (or renovated or expanded establishments) shall have grease handling facilities approved by Brunswick County.

Food service establishments without any grease handling facilities will be given a compliance deadline not to exceed three (3) months from date of notification to have an approved grease interceptor installed.

Failure to install the required grease interceptor before the compliance deadline will be considered a violation of this requirement and be subject to penalties regarding water and/or sewer service discontinuance.

- 2) For cases in which "outdoor" units are feasible to install, construction requirements will be as specified herein.
- 3) Sizing of "under-the-counter" grease trap units will be in accordance with (EPA) recommended ratings for commercial grease traps. The grease retention capacity rating in pounds shall be at least two (2) times the gpm flow rate of the type fixture which it serves.
- 4) Location of "under-the-counter" units must be as close to the source of the wastewater as physically possible while remaining accessible for maintenance.
- 5) Wastewater from dishwashers and garbage grinders should not be discharged to grease traps and interceptors unless approved by Brunswick County in advance.
- 6) In the maintaining of existing grease traps and interceptors, the Owner(s) shall be responsible for the proper removal and disposal by appropriate means of the captured material and shall maintain records of the dates and means of disposal which are subject by Brunswick County.
- 7) In the event that an existing food service establishment's grease handling facilities are either under designed, substandard, or poorly operated, the Owner(s) will be notified, in writing, of the required improvements and given a compliance deadline not to exceed three (3) months to conform with the requirements of these guidelines.
- 8) Exclusive use of enzymes or other grease solvents, emulsifiers, etc. in lieu of physical cleaning is not considered acceptable grease trap maintenance practice.
- 9) Grease consuming bacteria may be considered for interim approval for grease trap maintenance, provided approval is obtained from Brunswick County, and providing that this control method is considered effective and satisfactory to Brunswick County's Pretreatment Inspector. Exclusive use of bacteria (in lieu of physical cleaning) may not be sufficient for long-term grease trap maintenance especially for non-biodegradable waste fractions.

- c) New Food Service Establishments constructed within Existing Buildings
    - 1) Where practical, new food service establishments locating in existing buildings will be required to comply with this requirement as applicable to new facilities, i.e., outdoor type grease interceptors (minimum size 1,000 gallons) shall be installed.
    - 2) Where physically impossible to install "outdoor" units, "under-the-counter" units may be allowed as with existing food service establishments provided prior approval of unit type, size, location, etc. is approved by Brunswick County. Flow control fittings and/or automatically cleaned units will be required in all cases. Maintenance contracts and/or clean-out records will also be required.
  - d) Refer to County standard details for grease interceptors for further information.
- 5) **Sand and Oil Interceptor**
- a) Provide a precast concrete vault, 3,500 psi compressive strength concrete, usable liquid capacity not less than one thousand (1,000) gallons, six (6) inch diameter inlet and outlet tees, outlet tee to terminate six (6) inches above floor, the dividing wall must have a six (6) inch diameter tee that terminates twelve (12) inches above the floor.
  - b) Refer to County standard detail for the Sand and Oil Separator.
- 6) **Location and Cleaning of Grease Interceptor**
- a) Grease interceptor must be easily accessible for cleaning and solids removal.
  - b) Remove solids when approximately seventy-five (75) percent of the interceptor's capacity is reached.
- 7) **Manhole Frame and Cover**
- a) Manhole ring and cover shall be gas and water tight providing a twenty-two (22) inch minimum clear opening.
  - b) Coat frames and covers with two (2) shop coats of bitumastic paint.
  - c) Provide watertight covers, where indicated, conforming to above requirements and with frame tapped for four bolts, countersunk in cover, and provide a rubber gasket between the frame and cover.
  - d) Refer to County standard details for Sand and Oil Separator for further information.

**8) Enforcement**

- a) Failure to comply with these guidelines may be grounds for penalty imposition and/or discontinuance of water and/or wastewater service. Additionally, failure to comply may result in notification to the Brunswick County Health Department for request of enforcement action which may lead to revocation of food service permits.
- b) For new food service establishments, Brunswick County may elect to request from the appropriate building official that certificates of occupancy be withheld until compliance with Brunswick County’s requirements, including grease interceptor compliance is fully met by the business owner.

**9) Recommended Ratings for Commercial “Under the Counter” Package Unit Grease Traps and Grease Interceptors**

<u>Type of Fixture</u>	<u>Flow Rate</u> (GPM)	<u>Grease Retention</u> <u>Capacity Rating</u> (LB)	<u>Recommended Maximum</u>
			<u>Capacity per Fixture</u> <u>Connected to Trap</u> (GAL)
Restaurant kitchen sink	15	30	50.0
Single compartment scullery sink	20	40	50.0
Double-compartment scullery sink or triple compartment sink	25	50	62.5
(2) single compartment sinks	25	50	62.5
(2) double compartment sinks	35	70	87.5
Wok ovens	15	30	50
Other fixtures	*	*	*

Note: For multiple fixtures served by one tap, the required grease trap capacity will be additive

\* As determined by Brunswick County

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COUNTY OF BRUNSWICK  
PUBLIC UTILITIES DEPARTMENT

CROSS-CONNECTIONS AND BACKFLOW  
PROTECTION POLICY

CONTENTS

A. GENERAL..... 1

B. PURPOSE.....1

C. RESPONSIBILITIES.....2

D. DEFINITIONS.....2

E. WATER SYSTEM.....8

F. RIGHT OF ENTRY.....9

G. BACKFLOW ASSEMBLY INSTALLATION.....9

H. TYPE OF BACKFLOW ASSEMBLY.....11

I. TESTING AND MAINTENANCE REQUIREMENTS.....11

J. CATEGORICAL FACILITIES.....12

K. CONNECTION TO UNAPPROVED WATER SUPPLIES.....13

L. FIRE PROTECTION SYSTEMS.....14

M. CONTROLLED CROSS-CONNECTIONS (TEMPORARY).....14

N. ENFORCEMENT.....14

O. INSTALLATION OF RAIN SENSOR DEVICES REQUIRED ON  
NEW AUTOMATIC IRRIGATION SYSTEMS .....15





C. **RESPONSIBILITIES.** The Public Utilities Director, hereinafter referred to as *Director*, shall be responsible for the protection of the public potable water distribution system from contamination or pollution due to the backflow or back-siphonage of contaminants or pollution through the water service connection. If, in the judgment of the Director, or his duly appointed representative, an approved backflow prevention assembly is required (at the Consumer's water service connection; or, within the Consumer's private water system) for the safety of the water system, the Director, or his authorized representative, shall give notice, in writing, to said Consumer to install such an approved backflow prevention assembly(s) on his or her premises. The Consumer shall install, or have installed, within a period of time defined in this policy, such an approved backflow prevention assembly(s) at the Consumer's own expense. Failure, refusal, or inability on the part of the Consumer to install, have tested, and maintain said assembly(s), shall constitute grounds for enforcement (i.e., stipulated penalties, disconnection of water service, etc.) until such requirements have been satisfactorily met. Enforcement of this policy shall be administered by the Director or an authorized representative of the County.

D. **DEFINITIONS.**

1. **Air Gap (Separation).** The term "*air gap*" shall mean 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, but in no case less than 1-inch (2.54 cm).
2. **Approved.** (1) The term "*approved*" as herein used in reference to water supply shall mean a water supply that has been approved by the North Carolina Division of Environmental Quality (NCDEQ), Public Water Supply Section. (2) The term "*approved*" as herein used in reference to an air gap, a double check valve assembly, a reduced pressure backflow prevention assembly or other backflow prevention assemblies or methods shall mean an approval by the Public Utilities Department based on a favorable report by an approved testing laboratory (i.e., FCCCHR-USC, Underwriters Laboratory, Factory Mutual, etc.).
3. **Atmospheric Vacuum Breaker (AVB).** A backflow prevention assembly used to prevent back-siphonage which is designed so as not to be subject to static line pressure. These devices are not approved in the County's service areas except in special conditions approved by the Director, or by his authorized representative(s).
4. **Auxiliary Water Supply.** Any water supply on or available to the premises other than the purveyor's (County) approved public water supply will be considered as an auxiliary water supply. These auxiliary waters may include, but not limited to, water from another purveyor's public potable water supply or any natural source(s) (i.e., well, spring, river, stream, pond, lake, re-use waters, or industrial fluids, etc.). These waters may be contaminated or polluted or they may be objectionable and constitute an unacceptable water source over which the water purveyor does not have sanitary control.

5. **Backflow**. The undesirable reversal of flow of waters or mixtures of water and other liquids, gases, or other substances into the distribution lines of the potable supply of water from any source(s). See terms *Back-pressure* and *Back-siphonage* (see **D.9** and **D.10**, respectively).
  
6. **Backflow Prevention Assembly** (Approved). An assembly or means designed to prevent backflow into the potable water supply system. These assemblies shall be reviewed and approved by the County and shall have been shown to meet or exceed the design and performance standards of the *American Society of Sanitary Engineers* (ASSE), *American Water Works Association* (AWWA), and/or the *Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California* (FCCCHR-USC). The approval of backflow prevention assemblies by the Public Utilities Department is based on a favorable report by an approved testing laboratory (i.e., FCCCHR-USC, Underwriters Laboratory, Factory Mutual, etc.), recommending such an approval. The following are approved methods for backflow prevention:
  - a. Air Gap (AG) (see **D.1**);
  - b. Reduced Pressure Principle Assembly (RP or RPZ) (see **D.41**);
  - c. Double-Check Valve Assembly (DCVA) (see **D.23**);
  - d. Double-Check Detector Assembly (fire system) (DCDA) (see **D.22**);
  - e. Reduced Pressure Principle-Detector Assembly (fire system) (RPDA) (see **D.42**); and
  - f. Pressure Vacuum Breaker (PVB) (see **D.38**).
  
7. **Backflow Prevention Assembly** (Unapproved). An assembly that has been investigated by the County and has been determined to be unacceptable for installation within the County's water system. Consideration for disapproval and removal from the "Approved List" shall be based upon, but not limited to, the following criteria:
  - a. Poor performance standards (i.e., significant failure rate);
  - b. Lack of or unavailability of repair parts; and/or,
  - c. Poor service or response from assembly's manufacturing representative(s).
  
8. **Backflow Prevention Assembly Technician (Certified)**. A person that has proven his or her competency to the satisfaction of the State of North Carolina and is certified to make competent tests, or to repair, overhaul and make reports on backflow prevention assemblies shall be knowledgeable of applicable laws, rules, and regulation; shall be a licensed plumber or have had at least two (2) years' experience under a licensed plumber or plumbing contractor, or have equivalent qualifications acceptable to the State of North Carolina; and must hold a certificate of completion, from an acceptable training program (i.e., NC AWWA) in the testing, repair, and reporting of backflow prevention assemblies.

9. **Backpressure.** Backflow caused by a pump, elevated tank, boiler, or other means that could create pressure within the system greater than the supply pressure.
10. **Back-siphonage.** A reversal of the normal direction of flow in the lines due to a negative pressure (vacuum) being created in the supply line with the backflow source subject to atmospheric pressure.
11. **Bypass Loop.** Loops installed to circumvent an installed backflow preventer (including detector loops on check valves). These loops are prohibited unless the loops are equipped with and approved backflow preventer of the same type used on the main supply line.
12. **Check Valve.** A device that is drip-tight in the normal direction of flow when the inlet pressure is at least one (1) psi and the outlet pressure is zero. The check valve shall permit no leakage in a direction reversed to the normal flow. The closure element (clapper, poppet, or other design) shall be internally spring loaded to promote rapid and positive closure. An approved check valve is just one component of an approved backflow prevention assembly (i.e., pressure vacuum breaker, double-check valve assembly, double-check detector assembly, reduced pressure principle assembly, or reduced pressure principle detector assembly).
13. **Consumer's Potable Water System.** That portion of the privately owned potable water system located between the point of delivery (service connection) and the point of use. This system shall include, but not limited to, the following: all pipes, conduits, tanks, receptacles, fixtures, equipment, and appurtenances used to produce, convey, store, or use potable water.
14. **Consumer's Water System.** Any water system located on the consumer's premises, whether supplied by a public potable water supply or an auxiliary water supply. The system or systems may be either a potable water system or an industrial piping system.
15. **Customer/Consumer.** Any person, firm, or corporation responsible for property at which water from the County of Brunswick's public water supply system is received. In the absence of other parties or the failure of other parties to accept the responsibilities herein set forth, the owner of record shall be ultimately responsible.
16. **Containment.** Preventing the contamination/pollution of the public potable water supply by installing an approved backflow prevention assembly and /or method at the service connection. The term "*service protection*" shall mean the appropriate type or method of backflow protection at the service connection, commensurate with the degree of hazard of the consumer's potable water system.

17. **Contamination**. An impairment of the quality of the water which creates an actual hazard to the public health through poisoning or through the spread of disease by sewage, industrial fluids, waste, etc.
18. **Cross-Connection**. Any unprotected, actual or potential connection or structural arrangement between a public or a Consumer's potable water system and any other source or system through which it is possible to introduce into any part of the potable system any used water, industrial fluids, gas, or substance other than the intended potable water with which the system is supplied. Bypass arrangements, jumper connections, removable sections, swivel or change-over devices and other temporary or permanent devices through which or because of which backflow can or may occur are considered to be cross-connections. (1) The term "*direct cross-connection*" shall mean a cross-connection which is subject to both back-siphonage and backpressure. (2) The term "*indirect cross-connection*" shall mean a cross-connection which is subject to back-siphonage only.
19. **Cross-Connection (Controlled)**. A connection between a potable water system and a non-potable water system with an approved backflow prevention assembly properly installed and maintained so that it will continuously afford the protection commensurate with the degree of hazard.
20. **Cross-Connection, Direct**. Any arrangement of pipes, hoses, fixtures, or devices connecting a potable water supply to a non-potable source which is permanent (i.e., a boiler feed line connected directly to potable water line, etc.). This definition does not apply to any county, municipal or volunteer personnel engaged in public fire protection.
21. **Cross-Connection, Indirect**. Any arrangement of pipes, hoses, fittings, or fixtures that may be temporary in nature (i.e., garden hose; hose connected directly to a fire hydrant for filling a tank, etc.) connecting to a potable water supply to a non-potable supply.
22. **Director**. County of Brunswick, Public Utilities Director, his successor or designee(s).
23. **Double-Check Valve Detector Assembly (DCDA)** (Approved). A 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 (up to 3-gallons per minute) and shall show a registration for all rates of flow. The unit shall include tightly closing shut-off valves located at each end of the assembly and each assembly shall be fitted with properly located test cocks. This assembly shall be used to protect against a non-health hazard on fire line systems.
24. **Double-Check Valve Assembly (DCVA)** (Approved). Any assembly composed of two (2) independently acting, approved check valves, including tightly closing resilient seated shut-off valves located at each end of the assembly and suitable connections for testing the water tightness of each check valve.
25. **Dual Check Valve**. A self-closing device designed to permit flow in one (1) direction and close if there is a reversal of flow. A dual check valve is not an in-line testable device and is only allowed for residential use in ¾" and 1" meter assemblies, excluding irrigation systems.

26. **Dwelling Unit.** A single unit providing complete, independent living facilities for one (1) or more persons including permanent provisions for living, sleeping, food preparation and sanitation, per *Article 2* of the County's zoning ordinance.
27. **Fire System.** A system of piping which may include sprinklers, hose connections, hydrants, or fixed spray nozzles that may be wet or dry, open or closed for the use of suppressing fires.
28. **Hazard, Degree of.** Either a polluttional (non-health) or contamination (health) hazard and is derived from the evaluation of conditions within a system. (1) *Health* - An actual or potential threat of contamination of a physical or toxic nature to the public potable water system or the Consumer's potable water system that would be a danger to health. (2) *Plumbing* - An internal or plumbing type cross-connection in a Consumer's potable water system that may be either a polluttional or a contamination type hazard. This includes, but not limited, to cross-connection to toilets, sinks, lavatories, wash trays and lawn sprinkling systems. Plumbing type cross-connections can be located in many types of structures including homes, apartment houses, hotels, and commercial or industrial establishments. Such a connection, if permitted to exist, must be properly protected by an appropriate type of backflow prevention assembly. (3) *Polluttional* - An actual or potential threat to the physical properties of the water system or the potability of the public or the Consumer's potable water system but which would not constitute a health or system hazard, as defined. The maximum degree or intensity of pollution to which the potable water system could be degraded under this definition would cause nuisance or be aesthetically objectionable or could cause minor damage to the system or its appurtenances. (4) *System* - An actual or potential threat of severe danger to the physical properties of the public or the Consumer's potable water system or of a pollution or contamination which would have a protracted effect on the quality of the potable water in the system.
29. **Industrial Fluids.** Any fluid or solution which may be chemically, biologically, or otherwise contaminated or polluted in a form or concentration which would constitute a health, system, polluttional, or plumbing hazard if introduced into an approved water supply. This may include, but not limited to, polluted or contaminated used waters; all types of process waters and "*used waters*" originating from the public potable water system which may deteriorate in sanitary quality; chemicals in fluid form; plating acids and alkalis; circulated cooling waters connected to an open cooling tower and/or cooling waters that are chemically or biologically treated or stabilized with toxic substances; contaminated natural waters such as from wells, springs, streams, rivers, ponds, lakes, irrigation canals or system, etc.; oils, gases, glycerines, paraffins, caustic and acid solutions and other liquid and gaseous fluids used industrially, for other processes, or for fire fighting purposes.
30. **Industrial Piping System** (Consumer's). Any system used by the Consumer for transmission of or to store any fluid, solid, or gaseous substance other than an approved water supply. Such a system would include, but not limited to, all pipes, conduits, tanks, receptacles, fixtures, equipment, and appurtenances to produce, convey, or store substances which are or may be polluted or contaminated.
31. **Interconnection.** A connection between the County's potable water supply system and an uncontrollable source of water, such as a private well. Interconnections are strictly PROHIBITED by this policy and State codes.

32. **Isolation.** The act of confining a localized hazard within a Consumer's water system by installing approved backflow prevention assemblies, or devices. The County of Brunswick may make recommendations, upon facility inspection, as to the usage of isolation devices/assemblies, but does not assume or have responsibility whatsoever for such installations.
33. **Laboratory Testing** (Approved). Refers to *the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California* (FCCCHR-USC) or another lab having the equivalent facilities for both the laboratory and field evaluation of the assemblies approved by the AWWA and/or ASSE.
34. **Non-Potable Water.** A water supply which has not been approved for human consumption by the North Carolina, Division of Environmental Quality (NCDEQ), Public Water Supply Section.
35. **Pollution.** An impairment of the quality of the water to a degree which does not create a hazard to the public health, but which does adversely and unreasonably affect the aesthetic qualities of such waters for domestic use.
36. **Potable Water.** Any public potable water supply which has been investigated and approved by the State of North Carolina Division of Environmental Quality, Public Water Supply Section. The system must be operating under a valid health permit. In determining what constitutes an approved water supply, the NCDEQ, Public Water Supply Section has final judgment as to its safety and potability.
37. **Premises.** A building, complex, golf course, median, or any other location that receives water provided by the County of Brunswick.
38. **Pressure Vacuum Breaker (PVB)** (Approved). A backflow prevention assembly suitable for continuous pressure, to be used to provide protection against back-siphonage.
39. **Public Potable Water System.** Any publicly or privately owned water system operated as a public utility, under a current permit, to supply water for domestic purposes. This system will include all sources, facilities, and appurtenances between the source and the point of delivery (service connection) such as valves, pumps, pipes, conduits, tanks, receptacles, fixtures, equipment, and appurtenances used to produce, convey, treat, or store a potable water for public consumption or use.
40. **Purveyor Water.** Owner or operator of a public potable water system, providing an approved water supply to the public and permitted by the State of North Carolina to do so.
41. **Reduced Pressure Principle Prevention Assembly (RPZ or RP)** (Approved). An assembly containing 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 unit shall include properly located resilient seated test cocks and tightly closing resilient seated shut-off valves at each end of the assembly. This assembly is designed to protect against a non-health (i.e., pollutant) or a health (i.e., contaminant). This assembly shall not be used for backflow protection of sewage or reclaimed water.

42. **Reduced Pressure Principle Detector Assembly (RPDA)** (Approved). A specially designed assembly composed of a line-sized 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 (up to three gallons per minute) and shall show a registration for all rates of flow. This assembly shall be used on fire protection systems.
43. **Service Connection**. The terminal end of a service connection from the public potable water system, (i.e., where the water purveyor may lose jurisdiction and sanitary control of the water at its point of delivery to the Consumer's water system). If a water meter is installed at the end of the service connection, then the service connection shall mean the downstream end of the water meter.
44. **Thermal Expansion**. Expansion attributed to heating of water in an enclosed container such as a water heater.
45. **Unapproved Water Supply**. A water supply which has not been approved for human consumption by the State of North Carolina.
46. **Used Water**. Any water supplied by a water purveyor from a public potable water system to a Consumer's water system after it has passed through the service connection and is no longer under the control of the water purveyor (County).

#### E. **WATER SYSTEM.**

1. The water system shall be considered as made up of two (2) parts: The County's (water purveyor) System and the Consumer's System.
2. The County is permitted as a *treatment and supply system* by the State of North Carolina since the County does treat water from a natural source (i.e., well, spring, stream, river, pond, lake, etc.). The County sells some portion of its water to other State-permitted water purveyors. The County's System shall consist of treatment facilities, pumping, storage and distribution including all those facilities of the water system under the complete control of the County, up to the point where the Consumer's System begins (service connection).
3. The source shall include all components of the facilities utilized in the treatment, storage, and delivery of water to the County's distribution system.
4. The distribution system shall include the network of conduits used for the delivery of treated water from the source to the Consumer's System.
5. The Consumer's System shall include those parts of the facilities beyond the termination of the County's distribution system (service connection) which are utilized in conveying potable water to points of use.

- F. **RIGHT OF ENTRY.** The Director, or his authorized representative(s), shall have the right to enter any building, structure, or premises during normal business hours to perform any duty imposed upon him or her by this policy. Those duties may include sampling and testing of water, or inspections and observations of all piping systems connected to the public water supply. Refusal to allow entry for these purposes shall result in enforcement action (disconnection of water services, stipulated penalties, etc.).

On request from the Director, the Consumer shall furnish to the County any pertinent information regarding the water supply system on such property where cross-connections, either actual or potential, and backflow are deemed possible.

The Consumer's system should be open for inspection at all reasonable times to authorized representatives from the County to determine whether unprotected cross-connections or other structural or sanitary hazards, including violations of this policy, exist. Refusal to allow entry for these purposes shall result in enforcement action (disconnection of water services, stipulated penalties, etc.). When such a condition becomes known, the Consumer shall be notified, in writing, to disconnect the unprotected cross-connection(s) within a time period established in this policy. The degree of protection required, and the period of time required for conformance shall be commensurate with the actual or potential degree of hazard to the public potable water supply system.

1. Cross-connection with *private wells or other unapproved auxiliary water supplies* require immediate disconnection of unapproved source.
  2. Cross-connection requiring correction through: (1) elimination; (2) air gap separation; (3) reduced pressure principle backflow prevention assembly (RP) or double check valve assembly (DCVA) for sizes 3/4" through 2" require thirty (30) day maximum conformance period.
  3. Cross-connection requiring correction through reduced pressure principle backflow prevention assembly (RP) or double check valve assembly (DCVA) for sizes greater than 2" require one hundred twenty (120) day maximum conformance period.
  4. Upon completion of the above requirements, the Consumer shall be required to submit, in writing, notification of compliance to the Director.
- G. **BACKFLOW ASSEMBLY INSTALLATION.** An approved backflow prevention assembly shall also be installed, in accordance with manufacturer's installation instructions, on each Consumer's water system at or near the property line or immediately inside the building being served; but, in all cases, before the first branch line leading off the service line wherever the following conditions exist:
1. In the case of premises having an auxiliary water supply which is not or may not be of safe bacteriological or chemical quality and which is not acceptable as an additional source by the State of North Carolina, the public water system shall be protected against backflow from the premises by installing an approved backflow prevention assembly in the service line commensurate with the degree of hazard.

2. In the case of premises on which any industrial fluids or any other objectionable substance is handled in such a manner as to create an actual or potential hazard to the public water system, the public system shall be protected against backflow from the premises by installing an approved backflow prevention assembly in the service line commensurate with the degree of hazard. This shall include the handling of process waters and waters originating from the water purveyor's system which have been subject to deterioration in quality.
3. In the case of premises having: (1) internal cross-connections that can not be permanently corrected or protected against, or (2) intricate plumbing and piping arrangements or where entry to all portions of the premises is not readily accessible for inspection purposes, making it impracticable or impossible to ascertain whether or not dangerous cross-connections exists, the public water system shall be protected against backflow from the premises by installing and approved backflow prevention assembly in the service line commensurate with the degree of hazard.

Ownership, testing, and perpetual maintenance of the backflow prevention assemblies shall be the responsibility of the Consumer. All reduced pressure principle assemblies (RP) and double check valve assemblies (DCVA) shall be installed above ground in a protective enclosure or inside the building, if the building is less than 200 linear feet from the water main serving the Consumer. Pit and/or below grade installations are **PROHIBITED**. The installer shall be responsible to ensure that the assembly is installed and working properly and shall furnish the following information to the Director within five (5) working days after a backflow prevention assembly is installed:

- a. Owners name, address, phone number, and responsible contact.
- b. Assembly location (specific).
- c. Date of installation.
- d. Installer's name, address, and phone number.
- e. Installer's certification number.
- f. Type of assembly.
- g. Manufacturer.
- h. Model number.
- i. Serial number.
- j. \*Test results/reports.

\*All reduced pressure principle assemblies (RP) and double check valve assemblies (DCVA) are required to be tested following installation by a certified backflow prevention assembly technician (tester).

All commercial and industrial Consumers connected to the public potable water system of the County on or before the effective date of this policy, upon notification from the County, shall install or have installed an approved backflow prevention (containment) assembly, commensurate with the degree of hazard. The period allowed for this installation shall not exceed the following:

<u>Degree of Hazard</u>	<u>Time Frame, days</u>
<u>2" Service or Smaller:</u>	
Low	60
Medium	60
High	30
<u>Service Greater Than 2":</u>	
Low	180
Medium	180
High	120

Submit plans and specifications sealed by a registered engineer to the Director for review and approval. Acquire all necessary permits prior to installation. Upon satisfactory installation of approved backflow prevention assembly and appurtenances, forward a certificate of completion to the Director.

- H. TYPE OF BACKFLOW ASSEMBLY.** The type of backflow prevention assembly to be installed to protect the public potable water supply required by this ordinance shall be commensurate with the degree of, either actual or potential, hazard. Any backflow prevention assembly required herein shall be a make, model, and size approved by the County. The term "*approved backflow assembly*" shall mean an assembly that has been manufactured in full conformance with the standards established by the American Water Works Association (AWWA) entitled:

AWWA/ANSI C501-92 (or subsequent revisions) *Standard for Double Check Valve Backflow Assemblies*;

AWWA/ANSI C11-92 (or subsequent revisions) *Standard for Reduced Pressure Principle Backflow Prevention Assemblies*;

and, have met completely the laboratory and field performance specifications of the *Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California* (FCCCHR-USC) established in:

Specifications of Backflow Prevention Assemblies - Section 10 of the most current edition of the *Manual of Cross-Connection Control*.

- I. TESTING & MAINTENANCE.** It shall be the responsibility of the Consumer at any premise where backflow prevention assemblies are installed to have a field test performed by a certified backflow prevention assembly technician (tester) upon installation and at least once per year for the life of the assembly. In instances where the Director deems the hazard to be great enough, he may require field tests at more frequent intervals. These tests shall be at the expense of the Consumer (water user) and shall be performed by a certified technician (tester) approved by the State of North Carolina. It shall be the responsibility of the Director, or his authorized representative, to see that these tests are conducted in a timely manner.

All tests must be completed on or before December 31 of each year. If problems are detected with the backflow prevention assembly(s), it is the responsibility of the Consumer to report these discrepancies to the Director within five (5) working days of detection. These assemblies shall be repaired, overhauled, or replaced at the expense of the Consumer whenever said assembly(s) are found to be defective. Records of such tests, repairs, overhauls, and replacements shall be kept by the Consumer and shall be made available to the County.

All presently installed backflow prevention assemblies which do not meet the requirements of this ordinance but were approved devices for the purposes described herein at the time of the installation and which have been properly maintained, shall, except for the testing and maintenance requirements, be excluded from the requirements of this policy as long as the Director is assured that the affected backflow prevention devices/assemblies will satisfactorily protect the County's water supply system. Whenever the existing device/assembly is moved from the present location or requires more than minimum maintenance or when the Director determines that the maintenance constitutes a hazard to health, the device/assembly in question shall be replaced with an approved backflow prevention assembly meeting or exceeding the requirements of this policy at the Consumer's expense.

When it is not possible to interrupt water service, provisions shall be made for a "*parallel installation*" of backflow prevention assemblies. The Director shall not accept an unprotected bypass around a backflow prevention assembly when the assembly is in need of testing, repair, or replacement.

When repair work is required on any approved backflow prevention assembly, whether determined through testing or routine inspection by the Consumer (owner) or by the County (water purveyor), these repairs shall be completed within a specified period of time commensurate with the degree of hazard at the Consumer's expense. In no case shall this period of time exceed thirty (30) days.

**J. CATEGORICAL FACILITIES.** Approved backflow prevention assemblies shall be installed on the service connection to any premises that the County has identified as having a potential for backflow, including but not limited to, the following:

1. Amusement Parks.
2. Automotive Plants.
3. Automotive Service Stations (dealerships, repair shops, etc.).
4. Auxiliary Water System:
5. Private Water Supply.
6. "Used Water", "Re-Use Water" and "Industrial Fluids".
7. Bakeries.
8. Beauty Shops/Barber Shops.
9. Beverage Bottling Plants.
10. Breweries.
11. Buildings (hotels, motels, apartments, public and private buildings or other structures having unprotected cross-connections).
12. Buildings of Five (5) or more stories above ground level.
13. Canneries, Packing Houses, and Rendering Plants.
14. Chemical Plants (manufacturing, processing, and compounding or treatment).
15. Chemically Contaminated Water System.
16. Commercial Car Washing Facilities.

17. Commercial Greenhouses.
18. Commercial Laboratories.
19. Commercial Sales Establishments (department stores, malls, etc.).
20. Concrete/Asphalt Plants.
21. Dairies and Cold Storage Plants.
22. Electroplating Processes.
23. Film Laboratories.
24. Fire Systems.
23. Hospitals, Medical Buildings, Sanitariums, Morgues, Mortuaries, Autopsy Facilities, Funeral Homes, Nursing & Convalescent Homes, Medical Clinics and Veterinary Hospitals.
24. Industrial Facilities.
25. Irrigation Systems (lawn, commercial, etc.).
26. Laundries and Dye Works.
27. Metal Manufacturing, Cleaning, Processing, and Fabricating Plants.
28. Mobile Home Parks.
29. Motion Picture Studios.
30. Oil and Gas Production, Storage or Transmission Properties.
31. Painting and Staining Operations Related to Finished Woods and Metals.
32. Paper and Paper Product Plants.
33. Pest Control (exterminating & fumigating).
34. Pharmaceutical Manufacturing.
35. Plating Plants & Facilities.
36. Plastic Molding Facilities.
37. Power Plants.
38. Radioactive Materials or Substances (plants or facilities handling).
39. Restaurants.
40. Restricted, Classified, or Other Closed Facilities.
41. Rubber Plants (natural & synthetic).
42. Sand and Gravel Plants.
43. Schools and Colleges.
44. Swimming Pools.
45. Water Treatment Facilities.
46. Waterfront & Port Facilities & Industries.
47. Wastewater Treatment and Storm Drainage Facilities.
48. Weaving, Spinning Operations.
49. Other premises specified by the Director, or his authorized representative, when the cause can be shown that a potential cross-connection hazard, not enumerated in the above list, exists.

All backflow prevention assemblies and installations shall be subject to approval and inspection by the County.

- K. CONNECTION TO UNAPPROVED WATER SUPPLIES.** No person shall connect or cause to be connected any supply of water not approved by the State of North Carolina to the public potable water supplied by the County. Any such connection allowed by the County must be in conformance with the backflow prevention requirements set forth in this policy.

- L. **FIRE PROTECTION SYSTEMS.** All connections to fire sprinkler systems hereinafter connected with the public water supply system shall be protected with an approved backflow prevention assembly (i.e., double check valve detector assembly, etc.) in conformance with specific standards established by the *American Water Works Association (AWWA)* (or subsequent versions) and the *National Fire Prevention Association (NFPA)* (or subsequent revisions). All fire systems using toxic additives or booster pumping facilities shall be required to be protected with an approved reduced pressure principle detector assembly (RPDA) at the main.

Except for an eminent health hazard as defined herein, as determined by the Director, or his authorized representative, any fire sprinkler system connected with the public potable water system of the County on or before the effective date of this policy, shall have twenty-four (24) months to get into conformance with the provisions of this policy.

- M. **CONTROLLED CROSS-CONNECTIONS (TEMPORARY).** The purpose of this section is to describe an acceptable use of a controlled cross-connection (temporary) between the County's water supply system and a non-potable source (i.e., filling a tank or tanker from a fire hydrant for use other than fire protection). This shall be accomplished through the use of an approved meter and a reduced pressure principle assembly (RP) or an air gap properly installed and maintained so that it will continuously afford the required protection. At no time shall this temporary cross-connection be unprotected.

- N. **ENFORCEMENT.** Any person, firm, or corporation responsible for an installation or action found not to be in compliance with this policy shall be issued a Notice of Violation (NOV) specifying corrective action, if required, enforcement action to be taken by the County, if required, and a specified period of time to achieve compliance, if required.

As provided herein, termination of water service is a remedy available to the County to enforce any of the provisions of this policy. A violation of any of the provisions of this policy shall constitute a misdemeanor, punishable as provided in G.S. Section 14-4, with a fine not to exceed five hundred dollars (\$500).

1. **Direct Cross-Connection** - Any installation which remains in noncompliance after notice is given and the time prescribed in **Section G.3** shall be considered in violation of this policy and shall realize the disconnection of water service(s) until compliance is achieved and/or possible legal action. In addition, any person who shall continue any violation beyond the time limit provided for in the aforementioned NOV and **Section G.3** shall be subject to a penalty in the amount not to exceed one-hundred dollars (\$100) for each violation. Each day in which any violation continues after the offender has been notified of the violation shall be deemed a separate offense.
2. **Indirect Cross-Connection** - Any installation or action found to be in noncompliance of this policy shall be considered in violation of the same. In addition, any person found to be in violation of this policy shall be fined in the amount not to exceed one-thousand dollars (\$1000) for each violation. If the installation or action involves the theft of water said offender shall be charged according to state and local law and shall pay, in full, the cost for the estimated usage (See rate schedule currently in force) to the County.

Enforcement of this program shall be administered by the Director or by an authorized representative.

The County Manager, or his/her authorized representative, is authorized to make all necessary and reasonable rules and policies with respect to the enforcement of this policy. All such rules and policies shall be consistent with the provisions of this policy and shall be effective upon the date of adoption by the County of Brunswick Board of Commissioners.

**O. INSTALLATION OF RAIN SENSOR DEVICES REQUIRED ON NEW AUTOMATIC IRRIGATION SYSTEMS.**

- a. **Definitions.** The following terms, when used in this section, shall have the meanings indicated below.
1. **Automatic irrigation system** means a device or combination of devices having a hose, pipe, or other conduit installed in the landscape which transmits potable water from Brunswick County, through which said device or combination of devices potable water supplied by Brunswick County is drawn and applied to residential or commercial lawns, landscapes, or greenspace.
  2. **Rain sensor** means an automatic device that will override the irrigation cycle of an automatic irrigation system, thus turning it off, when a predetermined amount of rain has fallen. To meet the requirements of this section, a rain sensor shall be adjusted to shut off irrigation systems when up to one-fourth inch of rain has fallen.
- b. **Required installation.**
1. **New installation.** From and after May 1, 2008, rain sensors shall be required on all automatic irrigation systems that will receive Brunswick County potable water.
  2. **Existing systems.** Property owners with existing irrigation systems installed prior to May 1, 2008, are encouraged but not required to install a rain sensor.
- c. **Required maintenance.** All rain sensors shall be adjusted and set so that they automatically shut off the irrigation system after not more than one-fourth inch of rainfall has occurred. All rain sensors shall be installed according to manufacturer's instructions in a location that will provide full exposure to rainfall such that accuracy of operation is assured and shall be maintained in good working condition. No person shall, with the intent of circumventing the purpose of this section, adjust either the rain sensor or irrigation system so that the rain sensor is not able to override and turn off the irrigation system after one-fourth inch of rain has fallen.
- d. **Enforcement.** The Public Utilities Director or designee shall be responsible for enforcing this section. Whenever the director determines that a violation of this section exists, the director shall issue a written citation identifying the date, location, and nature of the violation, the person cited, and specifying the penalty and the date by which the penalty must be paid.
- e. **Penalties.** Penalties for violation of this Section of the Cross Connection and Backflow Protection Policy are included in Section N of this policy.

The foregoing standard policy is hereby adopted by the County of Brunswick Utility Operations Board and the Board of Commissioners this the 17<sup>th</sup> day of March, 2008.

Earl Andrews, Chairman  
Utility Operations Board  
County of Brunswick

William M. Sue, Vice Chairman  
Board of County Commissioners  
County of Brunswick

Attest:

Debby Gore  
Clerk to the Board of Commissioners

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# **BRUNSWICK COUNTY**

## **Wastewater Pumping Station Design Guidelines**

### **Brunswick County Engineering Department - Contacts**

#### ***Address***

Brunswick County Engineering  
Department Building I  
75 Courthouse Dr  
P.O. Box  
249  
Bolivia,  
NC 28422

#### ***Phone/Fax***

(910) 253-2500  
(910) 253-2704

### **Submittal Process**

A private development company (Developer) who desires to connect to the Brunswick County waste water system using a pump station to be dedicated to the County shall follow the guidelines presented herein for submittal, approval and acceptance by Brunswick County. Developers of privately-owned pump stations (non-County owned) in which the NCDEQ sewer permit and Operation and Maintenance Agreements are in the Developer's name shall be required to meet the appropriate portions of these guidelines. Where the term "Developer" is used, it refers to the persons, entities, representatives or engineers responsible for the land development

The following is an overview of the process for design of pump stations to be dedicated to the County:

- 1) Pre-Design Conference – This conference will be held to determine wastewater needs and other requirements pertinent to the proposed project.
- 2) Design Submittal Package – The Developer will be required to submit a full design package to Brunswick County for review and comment by Brunswick County staff.
- 3) Final Design Submittal Package - The Developer shall incorporate changes and comments as provided by Brunswick County and resubmit a final design package for approval by Brunswick County staff.
- 4) Construction & Final Acceptance – Upon approval by Brunswick County and acquisition of all necessary state, local, and federal permits, and a pre-construction meeting with Brunswick County Engineering Department staff the Developer may construct the approved infrastructure. Brunswick County Engineering Department

staff shall review and inspect the construction during and after completion of construction. Once the infrastructure improvements are complete and meet Brunswick County standards, the Engineering Department will issue Substantial Completion in anticipation of final Deed and Dedication.

**Note on Private Pump Stations** - The section "Construction and Final Acceptance" noted above is not applicable to Developers of privately-owned pump stations (non-County owned) in which the NCDEQ sewer permit and Operation & Maintenance Agreements are in the Developer's name. Additionally, Design Parameters (section 3.31) that only affect sewer system improvements to be owned, maintained, and/or operated by the Developer may not be applicable. However, Developers constructing private pumping stations are strongly encouraged to follow Brunswick County's Wastewater Pumping Station Design Guidelines.

A detailed guideline for the submittal process is provided as follows:

## **SECTION 1 – PRE-DESIGN CONFERENCE**

### **Section 1.1 Requirements**

The Developer shall schedule and attend a Pre-Design Conference with the Brunswick County Engineering Department to determine project requirements. The Developer shall provide the following information to Brunswick County Engineering Department staff a minimum of 14 days prior to the Pre-Design Conference:

- Map denoting location of proposed project. The map must clearly indicate the Parcel Identification Number, property lines, and road names.
- Brief description of proposed project.
- Estimated Wastewater Demand of proposed project per 15A NCAC 02T .0144. If a daily design flow parameter is not provided in 02T .0144 applicable to the Developer's project, Developers shall submit calculations of how estimated wastewater demand was derived.
- Location of the proposed project's connection to the existing wastewater system.

The Developer should come to the meeting prepared to discuss potential locations of the proposed pump station(s) on the property and the type of collection system proposed (for example, gravity, low pressure, combination, etc.). Please note that gravity collection systems are required "unless proven otherwise unfeasible by the Developer/Owner or the Developer's/Owner's engineer to the satisfaction of the County" (Sewer Use Ordinance, Section 4.2).

After the Pre-Design Conference, Brunswick County will provide a letter to the Developer with the following information:

- The need (if applicable) for Regional Wastewater Pump Stations.
- The need (if applicable) for additional infrastructure improvements due to impacts to existing infrastructure caused by the proposed project.
- Hydraulic Grade Line information for design of the proposed project and for connection to the Brunswick County wastewater system.

- The type of collection system to be used on the project or specific information needed for County staff to determine the collection system type to be used.
- The specific location or general area for location of the pump station.
- Any other design parameters agreed to at the Pre-Design Conference.

## **SECTION 2 – DESIGN SUBMITTAL PACKAGE**

### **Section 2.1 General**

The Developer shall submit a complete design package for the proposed project to Brunswick County for review and comments. The design package shall include (as a minimum) the following components.

- Design Report & Checklist.
- Complete plans and specifications sealed by a licensed PE in North Carolina.
- Completed permit applications.
- Hydraulic calculations utilizing standard format indicated on spreadsheet supplied by Brunswick County. Calculations shall be sealed by a licensed PE in North Carolina.
- Copies of proposed manufacturer's pump curves including "Total System Head" curves superimposed on each pump curve for each pump station submitted.
- Sewer CAD model results (if required by County staff).

### **Section 2.2 Design Submittal Requirements**

The design of proposed wastewater pump stations shall adhere to the following basic requirements:

#### 1) Design Report:

- Submit a Design Submittal Checklist as provided by Brunswick County.
- General Project Overview & Description of Pump Station Configurations.
- Summary of Wastewater Needs (Calculation of demands by type, etc. per 15A NCAC 02T .0114 or substantiation of estimated demands if not per 02T .0114).
- Summary of Calculations & Findings to include:
  - Proposed Pump Station Data (Design Points, Operational Points, TDH, Horsepower, RPM, Proposed Pump Make and Model, Impeller Size, etc.).
  - Calculated Peaking Factors.
  - Discussion of Impact to Existing System and upgrades/modifications proposed to mitigate the impact. The "Existing System" shall also include permitted sewer infrastructure improvements not yet constructed. This shall address maximum system pressures, maximum system velocities, pump station capacity, etc.

#### 2) Complete Plans & Specifications

- Plans must comply with all applicable state, local, and federal regulations. Additionally, for pump stations that will be owned, maintained, and/or operated by the County, plans must comply with current Brunswick County standards and specifications.

- Plans must be sealed by licensed North Carolina Professional Engineer. These may be marked “For Review Only – Not For Construction” for the initial Design Submittal. For pump stations that will be owned, maintained, and/or operated by the County, deviations from Brunswick County standard specifications must be clearly indicated in the Supplementary General Conditions.
- 3) Completed Permit Applications
- All permit applications necessary for the proposed project must be completed and submitted as part of the design package. These shall include, at a minimum, all NCDEQ sewer permits (Fast-Track, Low Pressure, etc.) and 3-Party NCDOT Encroachment Applications. Other items may include CAMA Permits, FEMA Compliance, NCDOT Driveway Permits, State and Local Stormwater Permits, etc.
  - Where required (i.e. NCDEQ Fast-Track Application), permit applications must be sealed by a licensed North Carolina Professional Engineer. The signing official for Brunswick County shall be the Director of Engineering.
- 4) Hydraulic Calculations
- Hydraulic calculations must be sealed by a licensed North Carolina Professional Engineer. These may be marked “For Review Only – Not for Construction” for the initial Design Submittal. Any deviations from the standard calculation spreadsheet or additional calculations must be documented in the Design Report.
  - Developer will utilize the same format as indicated in the Brunswick County basic “Wastewater Pump Station Calculations” spreadsheet.
  - If required by Brunswick County staff, output data from the Sewer CAD XM model shall be submitted as supporting documentation.
- 5) Proposed Manufacturer’s Pump Curves
- For pump stations that will be owned, maintained, and/or operated by the County, pumps must be selected from Brunswick County list of approved wastewater pumps.
  - Pump curves shall indicate design flow rates, operating points, and Total Dynamic Head (TDH).
  - System Curves shall be indicated on pump curves for the following operating conditions:
    - Proposed pump station operating independently of all other pump stations in the system.
    - Proposed pump station operating in parallel with all existing or future pump stations in the Brunswick County wastewater system.

**Subsequent submittals shall be made until all comments by Brunswick County staff are addressed. The final set of plans, specifications and calculations must indicate that they are "Final" and appropriate for bidding and construction.**

## SECTION 3 - BASIC DESIGN PARAMETERS

### Section 3.1 General

All wastewater pump stations designed for connection to the Brunswick County wastewater system that shall be owned, operated and/or maintained by Brunswick County shall meet the requirements as stipulated in this section, current Brunswick County Standards, and shall comply with all state, local and federal regulations as applicable. Developers of privately owned pump stations (non-County owned) in which the NCDEQ sewer permit and Operation and Maintenance Agreement are in the Developer's name shall not be required to meet Design Parameters (section 3.31) that only affect sewer system improvements to be owned, maintained, and/or operated by the Developer. Specifically, these include items 4, 5, 9 and 10 in section 3.31.

### Section 3.2 Information Provided by Brunswick County

After completion of the Pre-Design Conference, Brunswick County staff shall provide the following information to the Developer in writing:

- Hydraulic Grade Line (HGL) elevations at the proposed point of connection for the project. The elevations will be given for a range of wastewater flows above and below the peak design pumping rate of the proposed pump station, sufficient to determine system operating ranges for the project.
- If the proposed project connects to a manifold force main system, Brunswick County staff will provide a range of HGL elevations for two conditions:
  - Condition 1 – Proposed pump station operating alone or independent of other pump stations in the wastewater system.
  - Condition 2 – Proposed pump station operating in parallel with the other pump stations in the wastewater system.
- The need for a Regional Wastewater Pump Station or guidance regarding the existing pump station to which wastewater must be directed.
- If analysis by Brunswick County staff indicates that the proposed pump station has significant adverse impacts to the existing sewer system (including permitted infrastructure improvements not yet constructed) that must be mitigated, Brunswick County staff will notify the Developer of such impacts so that the Developer may design, construct, and fund upgrades necessary to mitigate the adverse impacts.
- Size and material of the infrastructure at the connection point to the wastewater system.
- Copies of any available Record Drawings of the existing infrastructure associated with the connection point to the wastewater system.
- A preliminary determination of wastewater treatment capacity availability. Wastewater treatment capacity is not allocated until the County signs all NCDEQ permits, provides signed NCDEQ/ DWQ Flow Tracking/Acceptance forms, and approves all plans and specifications. Wastewater treatment capacity is not guaranteed until issuance of all building permits.
- When available, the force main size shown on the latest Wastewater Master Plan.
- For collection systems to be owned, maintained, and/or operated by the County, the type of collection system to be used on the project or specific information needed for County staff to determine the collection system type to be used.

- For pump stations that will be owned, maintained, and/or operated by the County, the specific location or general area for location of the pump station.
- Any other design parameters agreed to at the Pre-Design Conference.
- Electronic file of Sewer CAD hydraulic model (if requested by Developer or required by County staff).

### Section 3.3 Design Requirements & Guidelines

Design of wastewater pump stations for the Brunswick County wastewater system shall meet the following criteria:

#### 3.31 Design Parameters

- Hydraulic calculations shall be performed using the same format as used in the Brunswick County "Wastewater Pump Station Design Calculations" Excel spreadsheet. The Engineer is responsible for ensuring the validity of calculations performed using any Brunswick County-supplied spreadsheets. Additional calculations may be submitted by the Engineer if necessary. The Engineer shall notify Brunswick County staff if formulas in Brunswick County-supplied spreadsheets deviate from standard practice or NCDEQ guidelines.
- Calculate Ultimate Flow for Pump Station. Ultimate flow includes flow from the entire parcel(s) to be served and all phases of the proposed development. Brunswick County staff may provide input into the ultimate flow determination based on the wastewater needs tributary to the pump station. Interim flow values may be determined for pump stations serving large developments that must be phased in order to meet design requirements.

Note the following Brunswick County requirements for determining wastewater flow:

- 210 GPD/3-Bedroom House located in the County service area and served by the West Brunswick Wastewater Treatment Plant (WWTP), Sea Trail Wastewater Treatment Facility (WWTF), Ocean Isle Beach WWTF, Shallotte WWTF, Northeast Brunswick Regional WWTP and the Carolina Shores WWTP. All other areas shall utilize the NCDEQ 2T Regulations of 360 GPD/3-Bedroom House.
- Non-residential wastewater flows shall be in accordance with NCDEQ 2T Regulations.
- Peaking Factor shall be as per the formula required by NCDEQ 2T Regulations.
- Determine required force main diameter. The minimum allowable force main size is the larger of the following:
  - 4"
  - The size indicated on the latest Wastewater Master Plan.
  - The size required by the Director of Public Utilities.

County "Wastewater Pump Station Design Calculations" Excel spreadsheet. The Engineer is responsible for ensuring the validity of calculations performed using any Brunswick County-supplied spreadsheets. Additional calculations may be submitted by the Engineer if necessary.

The Engineer shall notify Brunswick County staff if formulas in Brunswick County-supplied spreadsheets deviate from standard practice or NCDEQ guidelines.

Pumps and force main systems must be designed to provide a minimum velocity of 2 feet per second. Maximum velocity for a new force main shall be limited to 5 feet per second, unless otherwise approved by Brunswick County.

- Wetwell shall be sized to accommodate this ultimate flow or the Brunswick County minimum size, whichever is greater. The minimum wetwell size shall be determined as follows:

Average Daily Flow (GPD)	Minimum Wetwell Diameter
0–450,000	8 Ft
450,001 – 700,000	10Ft
700,001 – 1,000,000	12 Ft (or Equivalent Design)
>1,000,001	Design

\*Note minimum depth of wetwell from top of slab to wetwell invert shall be 19 feet. Other depths may be allowed with written consent by the Director of Public Utilities.

- Determine Wetwell Depth and float levels as follows:
  - Pumps Off = 11 Feet below lowest invert in elevation
  - Lead Pump On = Pumps off elevation plus required vertical cycle height
  - Lag Pump On = 1 Foot above Lead Pump On
  - High Water Alarm = 1 Foot above Lag Pump On and a minimum of 2 Feet below Lowest Invert In
  - Bottom Invert Elevation of Wetwell = As recommended by pump manufacturer to prevent vortexing within the wetwell and maintain minimum pump submergence, but in no case less than 4 Feet below Pumps Off
  - Cycle time calculations shall be provided for both Ultimate Flow and Interim Flow (if applicable) to the pump station. Both ultimate and interim flow cycle time conditions shall adhere to 2-8 cycle per hour requirements per NCDENR 15A 2T regulations. Removable Baffles may be used for interim flow conditions in order to meet this requirement.
- Minimum depth of pump station receiving manhole is 5’.
- The “Wastewater Pump Station Design Calculations” spreadsheet provides the following design parameters:
  - Utilizes Hazen-Williams ‘c’ value of 130.
  - Adds 5% to force main length to account for fittings and minor losses. Other means of minor loss evaluation may be considered upon approval by Brunswick County staff.
  - Determines equivalent length of wetwell piping (separate of minor losses).
  - Static Head is calculated as the highest point along the force main route or the connection point elevation (provided by Brunswick County), whichever is most appropriate, less the “Pumps Off” elevation of the wetwell.

- Calculations include System Curves for manifold and non-manifold conditions.
  - Deviations from the spreadsheet to accommodate unique conditions may be acceptable; however, notification of Brunswick County staff for such deviations is required. Deviations and additional calculations shall be noted in the Design Report.
- Force Main pressures may not exceed 100 pounds per square inch (psi) in the wastewater system for existing, existing not yet constructed, and proposed infrastructure.
  - Pipe velocities shall be between 2 feet per second and 5 feet per second. Deviations from this requirement require approval by Brunswick County staff.
  - Pumps shall be selected from the Brunswick County approved list and shall meet the requirements of the Brunswick County standards specifications. Some specific items relevant to initial pump station design include the following requirements (deviations from Brunswick County requirements require prior approval of Utilities Department):
    - Submersible, non-clog, solids handling, capable of passing a 3-inch spherical solid.
    - 3-Phase – 277/480 Volt power shall be required for all motors in excess of 10 Horsepower. Deviations from this requirement must be approved in writing by Brunswick County.
    - In situations where 3-Phase power is not readily available then motors 10 horsepower and under may be 120/240 Volt Open Delta (High Leg).
    - Standard Size Impeller, preferably the pump and impeller combination chosen will allow for impeller upgrades in the future.
    - Electrical infrastructure shall be sized for the entire parcel(s) to be served and all phases of the proposed development (ultimate flow). Services and facilities shall be sized for the full range of impellers available for the selected pump.
    - Brunswick County staff acknowledges that various operating conditions are possible within the wastewater system; therefore, options have been provided to accommodate such varying conditions. Pumps & Motors for pump stations shall be evaluated/selected in the following order of preference:
      - First Option (Preferred): Maximum constant motor speed of 1800 RPM
      - Second Option: Maximum constant motor speed of 3600 RPM
      - Third Option: Variable Frequency Drives (VFD's) or two-speed pumps with the written consent of the Director of Public Utilities

Note that Brunswick County staff approval is required for the second and third options noted.

- A separate, climate controlled, electrical building to house all electrical panels and pump control panels shall be provided for constant speed motors in excess of 50 horsepower.
- A separate, climate controlled, electrical building to house all electrical panels, VFD's, and pump control panels shall be provided for motors operated by VFD's 25 horsepower or larger.
- For all motors operated by VFD's less than 25 horsepower, the VFD's shall be provided with a self-contained, ventilated and/or air-conditioned cabinet.
- Motor Horsepower shall be non-overloading for maximum impeller diameter of selected pump and of a commercially available size.

- Pumps shall be selected for highest head conditions of all scenarios unless otherwise approved by County staff in writing.

All pump stations shall be evaluated for odor control requirements and anti-flotation. All pump stations shall be constructed with wetwell corings and piping to accommodate odor control systems. Odor control systems shall be installed in accordance with State and County specifications.

## **SECTION 4 – CONSTRUCTION AND FINAL ACCEPTANCE BY BRUNSWICK COUNTY**

### **Section 4.1 General**

Prior to final acceptance of the wastewater pump station or associated infrastructure, the following must be completed and/or submitted to the Brunswick County Engineering Department:

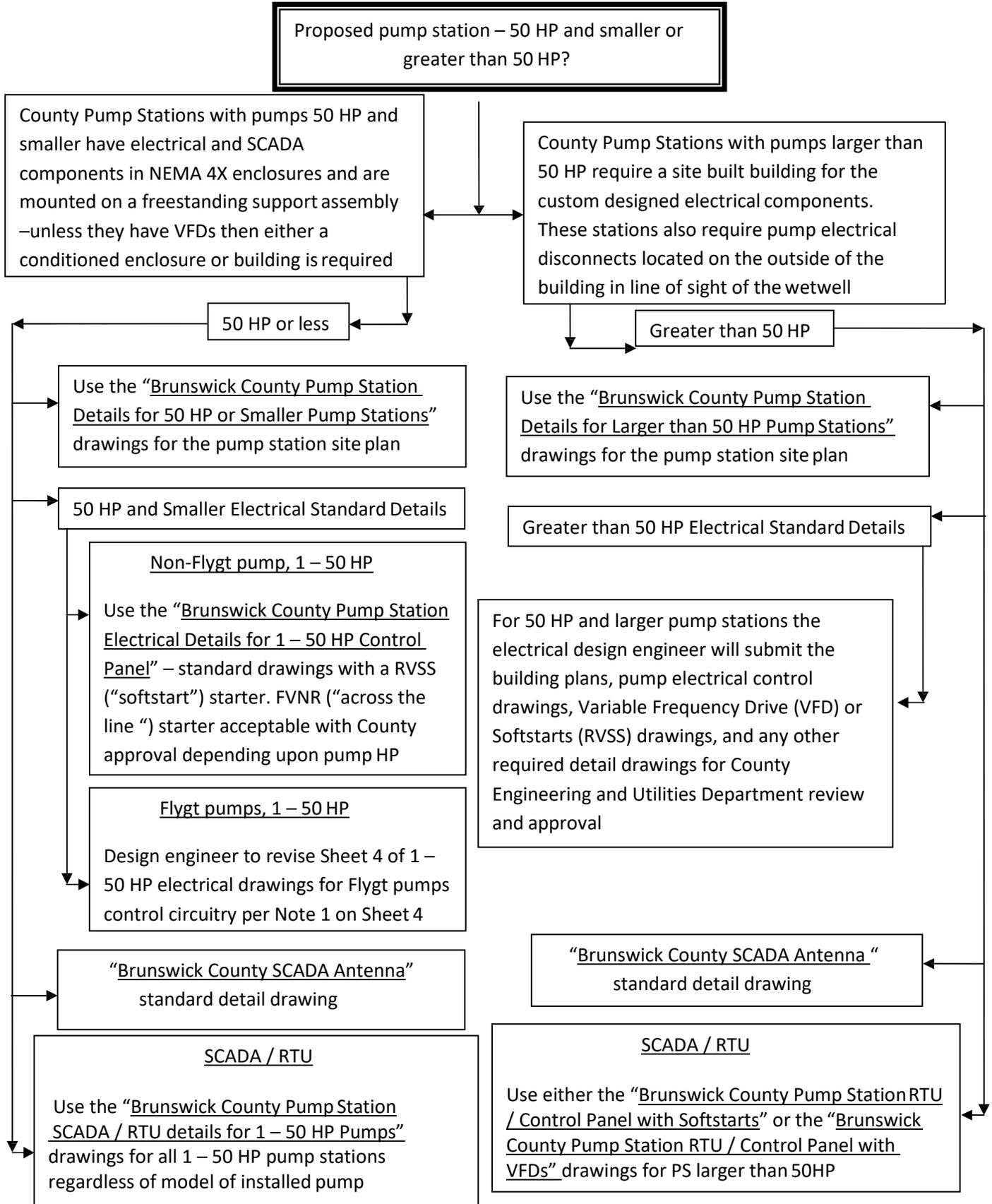
- An inspection of the constructed facilities must be scheduled by the Developer with Brunswick County staff.
- All facilities must comply with Brunswick County standards and all applicable state, local, and federal regulations.
- All defective items noted in Brunswick County staff inspection must be corrected.
- A ‘Start-Up’ inspection of the pump station must be held as per Brunswick County requirements. A ‘Pump Station Data Sheet’ (provided by Brunswick County) shall be filled out and provided to Brunswick County staff.
- Copy of contractor’s Utility License
- Copy of contractor’s Certificate of Insurance
- Testing Results
- Indemnity Agreement
- A completed “Deed of Dedication”
- An affidavit that no liens exist for the work or infrastructure
- Fixed Assets Amount
- Recording Fees
- NCDEQ certifications and Record Drawings sealed by a licensed North Carolina PE must be submitted.
- Electronic as-built drawings in AutoCAD, MicroStation, or ArcView submitted to Brunswick County.

While all of the items noted above are required for Final Acceptance, many of the listed items are required for Substantial Completion prior to Final Acceptance.

END OF SECTION

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**DRAWING SUBMITTALS REQUIRED FOR A SEWER PUMP STATION IN BRUNSWICK COUNTY**



**Brunswick County Engineering and Public Utilities Departments**  
 May 7, 2013

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## **BRUNSWICK COUNTY RURAL SEWER PROGRAM**

### **PURPOSE**

The county understands the importance of properly designed and functioning onsite wastewater treatment and disposal systems. The county also recognizes that a sewer collection system, either gravity sewer or low-pressure sewer, is not available in many areas of the county and this lack of a sewer collection system creates a hardship for many property owners.

The purpose of the **Brunswick County Rural Sewer Program** is to eliminate failing septic tanks and provide sewer service to existing lots of record that would not otherwise have sewer service due to (1) unsuitable land for an onsite septic disposal system (new construction) or (2) the inability to obtain a septic system repair permit from the Brunswick County Health Department (existing dwelling units). If either of these conditions exists, then a connection will be allowed to a county high pressure sewer transmission force main with the use of a high discharge head sewer grinder pump.

The program is not intended to provide sewer service to new subdivisions and new development. A developer is still responsible for providing sewer service to those developments according to all applicable county ordinances and policies.

### **NOTE**

**The installation of a sewer grinder pump requires the homeowner to obtain the services of a licensed plumbing contractor and a licensed electrical contractor to make the required plumbing and electrical connections to the grinder pump once installed. These costs are the responsibility of the homeowner and are not included in any fees paid to Brunswick County for a grinder pump installation.**

### **APPLICABILITY**

The Rural Sewer Program is intended to serve properties that do not have a sewer collection system available and cannot obtain a county Health Department improvement permit for an onsite septic disposal system. Prior to making application for connection under this program the applicant must first make application to the county Health Department for either a new septic permit or a repair permit for an existing septic system.

Eligible properties are:

- (1) Existing residential homes and commercial establishments that existed on April 3, 2006 (the original approval date of this policy) on roads with a sanitary sewer transmission force main constructed within the road right-of-way or an easement immediately adjacent to the road right-of-way, or
- (2) New single-family homes and new commercial development constructed on lots of record as of April 3, 2006 on roads with a sanitary sewer transmission force main constructed within the road right-of-way or an easement immediately adjacent to the road right-of-way.

While not intended to provide sewer service for new subdivisions of land, the Rural Sewer Program will allow for service to a minor subdivision of an existing parcel into six (6) or fewer residential lots. The conditions for this type of connection are:

- All lots must have frontage along the road or easement with the sewer transmission forcemain,
- A (15) foot wide public utility easement, adjacent and parallel to the road or easement that contains the sewer transmission main, on the (6) or fewer parcels, must be legally deeded and recorded prior to the installation of any sewer infrastructure on the lots,
- A (2) inch diameter sewer main must be designed, permitted, and installed by the developer within the onsite easement and,
- the (2) inch sewer main will only be allowed to connect to the sewer forcemain at one connection point.

Each of the (6) parcels would then be allowed to connect to the (2) inch sewer main for the discharge of sewer flow to the county system via individual grinder pumps for each lot. Contact the county Engineering Department for further information concerning this type of connection.

## **POLICY**

- (1) Property owners must meet the requirements outlined in this program and pay all applicable fees per the current *Brunswick County Water and Wastewater Rate Schedule*.
- (2) The existing or proposed structure must connect to the county water system if available. If water is available and the structure is not connected, the property owner must agree to connect to the county water system and pay all applicable fees before sewer service is initiated. If water service is not available, the property owner shall agree to have a water meter installed on their well to measure the sewer flow discharged to the county sewer system. Where a meter cannot be installed on the well, the Director of Public Utilities may estimate the flow to be generated by the particular use and establish a flat rate for the sewer service charge. The well meter will be installed at the same time as the sewer grinder pump.

## **PROCEDURE**

1. The Board of County Commissioners shall establish the fees and charges associated with the Rural Sewer Program on a regular basis. The fees and charges shall be established by ordinance and published along with the other water and sewer fees and charges.
2. To receive service under this program a sewer collection system cannot be available. The property owner must first make application to the county Health Department for an onsite disposal system. If a Health Department permit is unobtainable, and is documented in writing from the Health Department, then the applicant can apply for sewer service under the Rural Sewer Program and must meet all of the requirements for the program as stated herein.
3. For **residential properties** the Engineering Department shall review the application to make sure that it meets all the requirements of this program and will also evaluate whether a NCDEQ / DWQ permit is required for the installation of the grinder pump to serve the structure. If a permit is

required, the applicant is responsible for obtaining the services of a licensed engineer to assist in obtaining the sewer permit. Single family residential homes can be served by a simplex (single pump) grinder pump but some situations may require the issuance of a NCDEQ / DWQ permit prior to pump installation.

4. Any sub-main installed on private property within an easement to provide for multiple houses to connect under this program will, as previously stated, require a NCDEQ / DWQ permit.
5. If the residential application meets the requirements of the program the property owner will be notified, and the property owner may apply for service and pay all applicable fees and connection charges at the county Utilities Customer Service department. This will require the execution of the *Sewer Service Agreement* and *Water Service Agreement* as applicable.
6. Upon payment of the fees and the execution of the *Sewer Service Agreement*, the Public Utility staff will meet with the property owner to determine the exact location to set the pump station and electrical control panel on the structure. In order to minimize the number of connections to major sewer transmission force mains the county requires a spacing of approximately (1,000) feet between taps. County Engineering will work with Public Utilities to identify the optimum placement of the sewer tap to serve the residential property.
7. Upon receipt of the NCDEQ / DWQ authorization to construct, if applicable, the Public Utility staff will then schedule the work and provide the property owner with an estimated date of installation.
8. The property owner is responsible for hiring a properly licensed electrician and plumber to provide a power source from the house to the proposed location of the sewer pump station control panel and rerouting the house waste line from the septic tank to the grinder pump tank. The cost of providing electricity to the pump station and the monthly electrical charges associated with operation of the station are the responsibility of the property owner.
9. For **commercial properties** the Engineering Department shall review the application to make sure that it meets all the requirements of this program and will also ensure that the NCDEQ / DWQ permit is issued for the installation of the grinder pump station to serve the structure. It is the responsibility of the applicant to retain the services of a licensed engineer to design and permit the commercial pump station with NCDEQ / DWQ. Commercial projects, with the proper approval from NCDEQ/DWQ, may utilize either a simplex or a duplex grinder pump system.
10. Once all permits are obtained the commercial property owner will be provided the total amounts of fees due. County Engineering will calculate these fees based upon the permitted flow in the NCDEQ / DWQ permit and a Fee Sheet will be provided to the applicant. All fees due are payable at the county Utilities Customer Service department – County Engineering does not collect any fees associated with connection to county water and /or sewer.
11. Upon payment of the fees and the execution of the *Sewer Service Agreement*, the Public Utility staff will meet with the property owner to determine the exact location to install the sewer tap. In order to minimize the number of connections to major sewer transmission force mains the County requires a spacing of approximately (1,000) feet between taps. County Engineering will work with Public Utilities to identify the optimum placement of the sewer tap to serve the commercial property.

12. The commercial property owner is responsible for hiring a licensed utility contractor to install the duplex pump station. The duplex station must meet the minimum requirements of the county. The property owner is also responsible for hiring a properly licensed electrician to provide a power source from the building being served to the proposed location of the sewer pump station control panel, a telephone line for the control panel telemetry (if required), and a standby electrical generator (if required), as well as a licensed plumber to connect the building waste line to the grinder pump tank. The cost of providing electricity to the pump station and the monthly electrical charges associated with operation of the station are the responsibility of the property owner.
13. The individual pump station shall be designed in such a manner to hold at least (360) gallons and be able to pump against a head condition of at least (200) feet (minimum 90 psig).
14. Once the individual pump stations are installed, the property owner responsibilities for operation and maintenance shall be the same as the other properties served by individual pump stations including all electrical charges and county monthly pump maintenance costs.
15. The county will install up to (300) feet of sewer service line from the individual grinder pump to the near side service box in the right-of-way or utility easement. The property owner must pay for all sewer service line in excess of (300) feet.
16. Properties connected under this program shall pay the same monthly base rate, pump maintenance fee, and sewer service charges as other customers connected to the county sewer system.
17. Under the Rural Sewer Program Policy of Brunswick County, residential new structure and existing structure owners must pay all application fees, capital recovery fees, transmission capital recovery fees, and grinder pump installation costs associated with connection to the sewer system at the time of application for service.
18. Under the Rural Sewer Program Policy of Brunswick County, commercial new structure existing structure owners must pay all application fees, capital recovery fees, and transmission capital recovery fees associated with connection to the sewer system at the time of application for service.
19. Failure to pay all applicable monthly charges would result in the discontinuance of water and/or sewer service to the property being served.

**BRUNSWICK COUNTY**  
**RURAL SEWER PROGRAM**  
**APPLICATION FOR SERVICE**

Date of Application: \_\_\_\_\_ Receipt of Program Guidelines: \_\_\_\_\_ (sign or initial)

Applicant Name & Address of Property where the Grinder Pump will be installed:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Parcel PID where the Grinder Pump will be installed: \_\_\_\_\_

Daytime Telephone Number: \_\_\_\_\_

Email address: \_\_\_\_\_

**Please check one:**

\_\_\_\_\_ Existing Residential Structure      \_\_\_\_\_ New Residential Structure  
\_\_\_\_\_ Existing Commercial Structure      \_\_\_\_\_ New Commercial Structure

For existing structures: connected to county water (if available)? \_\_\_ Yes \_\_\_ No \_\_\_ N/A

Type of use (please check one):

\_\_\_ Single Family Home      \_\_\_ Multi-Family Home      \_\_\_ Commercial

**County Environmental Health Department information:**

Has an on-site septic permit application been submitted to the Health Department?

\_\_\_\_\_ Yes      \_\_\_\_\_ No

**Note: It is required under the Rural Sewer Program to first apply to the county Environmental Health Department for either a new construction septic permit or an existing septic system repair permit and obtain a denial in writing from Env. Health**

Application for Connection via the county Rural Sewer Program:

Approved: \_\_\_\_\_ Denied: \_\_\_\_\_

For information or clarification concerning this program or application please contact:

William L. Pinnix, P.E.      Beverly Adams  
Engineering Services Director      Engineering Administrator  
Brunswick County Engineering Department  
910.253.2500

NOTES: \_\_\_\_\_  
\_\_\_\_\_